LITERATURE CITATIONS, PART IV

1951

3607. ABBEY, S.
The High-Purity Revolution in Analytical Chemistry.
Trans. Can. Inst. Mining Met. Engrs. **54** (in Can. *Mining Met. Bull.*, No. **473**, 576–9) (1951).
C. A., **45**, 10117i (1951).

A discussion of some of the instruments and techniques applied in analyzing very pure metals for very small amts. of impurities. Emission spectroscopy, colorimetric photometry, polarography, vacuum fusion, and radioactive tracers are included.

3608. ADDINK, N. W. H.
Quantitative Spectrochemical Analysis by the Direct Current Carbon Arc. I. General Methods. II. Biological Materials, Possible Correlation Between the Zinc Content of Liver and Blood and the Cancer Problem.
Rec. trav. chim., **70**, 155–67, 168–81 (in English) (1951).
C. A., **45**, 5217c (1951).

A. uses a graphite anode with a conical cavity 8.5 mm. in diam. and 4 mm. deep drilled in a 10 mm. rod. Pb, Sn and their alloys burn smoothly if they are placed in this electrode, covered with powd. quartz, and a layer of powd. C added. W, Mo, Ta, and Al can be burnt away completely if sandwiched between layers of Ni and C in such an electrode. A graph is given to show the error involved in working without standard samples when the log intensity-log concn. curve does not have unit slope. K, Na, Ca, P, Mg, Fe, and Zn were detd. on tissues from 21 cancerous and noncancerous cases. Av. Zn contents were: normal blood, 7 p.p.m.; blood from patient with nontumorous disease, 12 p.p.m.; blood from cancer cases, 16 p.p.m., nontumorous livers, 53 p.p.m.; livers with neoplasm, 75 p.p.m. Standard deviations of means averaged about 15% of concn.

3609. AHRENS, L. H.
Quantitative Spectrochemical Analysis of Silicate Rocks, Silicate Minerals, and Allied Materials.
Spectrochim Acta, **4**, 302–6 (1951).
C. A., **45**, 7469a (1951).
Cf. *C. A.*, **44**, 4365c.

A system of quant. spectrochem. analysis of silicates (rocks, minerals, soils, meteorites, and allied material) with d.-c. arc excitation is outlined and discussed briefly. In the analytical scheme outlined here, a complete quant. analysis of a silicate involves a limited no. of arcings. Volatilization is considered the most important property in the grouping of elements for each arcing and for choosing an internal standard for each group. Standard deviations invariably fall within the range of 2.5–8%. Included in the analytical scheme are fluorine, all alkali metals, and the so-called major constituent elements.

3610. AHRENS, L. H.
IV. Spectrochemical Analysis of Some of the Rarer Elements in the Granite and Diabase Samples.
U. S. Geol. Survey Bull., No. **980**, 53–57 (1951).
C. A., **46**, 11009c (1952).

Spectrochem. and chem. analyses of BaO, BeO, B_2O_3, CoO, Cr_2O_3, CuO, Ga_2O_3, La_2O_3, Li_2O, MoO_3, Nd_2O_3, NiO, PbO, Rb_2O, Sc_2O_3, SrO, V_2O_3, Y_2O_3, ZnO, ZrO_2, and MnO are given.

3611. AHRENS. L. H.
Wavelength Tables of Sensitive Lines. Addison-Wesley Press, Cambridge, Mass. (1951), 86 pp.

Reviewed in *J. Opt. Soc. Am.*, **42**, 362 (1952) by W. R. Brode.—The principal portion of this book of tables is a reproduction of the last 70 pages of the authors text Spectrochemical Analysis which was published last year (reviewed in *J. Opt. Soc. Am.*, **41**, 485 (1951)). The author has, however, added considerable additional information including a discussion on line sensitivity, detection-limit concentration, visual (spectroscopic) sensitivity and some corrections to the M.I.T. tables. The principal tables indicated above are lists of most sensitive lines of 68 of the elements together with their ionization potentials and the adjacent lines of other elements which could interfere.

3612. AHRENS, L. H. AND GORFINKLE, L. G.
Quantitative Spectrochemical Analysis of Rubidium in Lepidolite.
Am. J. Sci., **249**, 451–6(1951).
C. A., **45**, 8398h (1951).

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The internal standard is K. The lepidolite is dild. with standard albite and mixed with RbCl is an albite matrix. In one method K is assumed const. In another allowance is made for possible significant variation in K.

3613. ALEKSEEVA, A. I. AND NAĬMARK, L. E.
Spectrographic Determination of High Concentrations of Tin in Lead.
Izvest. Akad. Nauk. Kazakh. S.S.R., No. **104**, *Ser. Astron. i Fiz.*, No. **5**, 91–7 (1951).
C. A., **48**, 2515a (1954).

High concns. of Sn in Pb were satisfactorily detd. spectrographically by the spark technique by making use of the following homologous line pairs: Sn 3352.4 and Pb 3455.0, Sn 3283.5 and Pb 3309.2, Sn 2913.5 and Pb 2973.0, and Sn 2913.5 and Pb 3118.9 Å. Relative error was 2–4.2%, with abs. error of 0.04–0.22% in concn. range of 2–10% Sn.

3614. ALEXANDER, G. V., NUSBAUM, R. E. AND MACDONALD, N. S.
The Boron and Lithium Content of Human Bones.
J. Biol. Chem., **192**, 489–96 (1951).
C. A., **46**, 2158a (1952).

Spectrographic analyses for B and Li were made on 116 ashed samples of bone from 33 individuals. The values for B ranged from 16 to 138 p.p.m., by wt., av. 61, standard error ±1.7 p.p.m. No Li was found in any specimen. Computations of the kinetic energy which would be liberated within bone tissue on exposure to thermal neutrons were made. Though normally present in small amt., by virtue of its large capture cross section, B would contribute significantly to the total amt. of ionizing radiation generated by neutron capture processes. The magnitude of this quantity of energy would be about 1.3 times that arising from the capture of neutrons by the N present in the bone.

3615. ALIEV, N. A.
Laboratory Method for Preparation of Metal Alloy Specimens.
Trudy Inst. Fiz. i Mat. Akad. Nauk Azerbaĭd. S.S.R., Ser. Fiz., **5**, 64–6 (in Russian) (1951).
C. A., **48**, 526g (1954).

In 1908 Stepanov devised a method of making metal specimens by drawing liquid metal up into a porcelain tube. Kornilov improved this method by using a rubber bulb to draw the metal into about 3 tubes simultaneously and by applying it to higher-melting alloys such as steels. The present method produced 3 specimens of different diams. A graphite mold was made having 3 cavities connected in a vertical series. The top cavity was 35 mm. in diam. and 25 mm. high, the middle cavity was 3 mm. in diam. and 75 mm. high, and the lower cavity was 1 mm. in diam. and 45 mm. high. Suction from a rubber bulb was applied to the bottom of the lower cavity at the same time that the liquid alloy was poured in at the top. The alloy filled the 2 upper chambers completely but solidified before reaching the bottom of the lower one. The 3 specimens so produced were free of pores and gas pockets.

3616. AMELINCKX, S.
Pyrite Crystals from the Coal Mine at Beringen, Limbourg.
Natuurw. Tijdschr. (Belg.), **32**, 223–5 (1951).
C. A., **46**, 4957h (1952).

Crystallographic data and the results of spectroscopic analysis are tabulated.

3617. AMSTUTZ, G. C.
Spectrographic Investigations into the Rare Elements in the Lavas From Glarus (Switzerland).
Verhandl. schweiz. naturforsch. Ges., **1951**, 139–40 (in German) (1951).
C. A., **48**, 5043f (1954).

The content of Ga, Ni, Zr, Co, Ba, Li, and Sr matches the av. for igneous rocks; Li and Sr are somewhat lower in quartz porphyries than in spilites. The content of Pb is lower by a factor of 2–5, of Cu by a factor of 8–10 than the av. for igneous rocks; Cr in spilites agrees approx. with the av. but is lower by a factor of nearly 10 in the quartz porphyries. In the lavas, Sc is enriched by a factor of 4–12, V by a factor of 2–4. The Rb content of spilites is very low, while in quartz porphyries it is somewhat higher than the av. The content of Ga and Zr remains rather const.

3618. ANDERSON, J. W. AND HUGHES, H. K.
Spectroscopic Determination of Vanadium in Residual Fuel Oils.
Anal. Chem., **23**, 1358–61 (1951).
C. A., **46**, 1241b (1952).

The method utilizes a d.-c. arc for detn. of V in residual fuel oils and other petroleum products. V is not lost during the controlled ashing. Fuel oils contg. 0.0004–0.045% V have been analyzed. The ashes contained 2–30% V. The use of a Ti internal standard and a matrix of silica and graphite extends the method to most ashes or powders contg. more than 1% V.

3619. ARAMBOURG, C. AND ORCEL, J.
Preliminary Observations on the Presence of a Vanadate of Uranium in Moroccan Phosphate Deposits.
Compt. rend., **233**, 1635–6 (1951).
C. A., **46**, 3910e (1952).

The mineral is similar to tyuyamunite, carnotite, or ferghanite. Spectral analyses of the mixt. of mineral and gang show much V, considerable Si, Ca, Al, Ba, Mg, P, Sr, Na and traces of Fe, Cr, Mn, and Ni. V and U were identified chemically.

3620. BALDI, F.
Calibration of Step Filters in the Ultraviolet.
Met. ital., **43**, 129–34 (1951).
C. A., **45**, 6930g (1951).

The detn. of the transparency in the ultraviolet of the 3 steps of a filter by comparison of spectra obtained with various apertures of the intermediate diaphragm in a Qu 24 Zeiss spectrograph with a Hg vapor lamp as luminous source is described. The evaluation of the readings at the photometer is discussed; the results obtained by means of a graphic method are compared with those obtained by the transformation of the rectilinearity of Seidel and Kaiser (*C. A.* **42**, 7637f; **43**, 8276e). For the filter investigated and for the types of plates used the transparencies and the contrasting factor *vs.* wavelength are reported.

3621. BALDI, F.
Plate calibration in spectrochemical analysis and methods for its performance.
Met. ital., **43**, 135–42 (1951).
C. A., **45**, 6954e (1951).

The internal standard method for the quant. spectrochem. analysis in various applications based on line intensities rather than opacities for plate calibration is studied. One method is described in detail which used a filter with only two steps with transparency of the second *vs.* the first not less than about 40%.

3622. BASSETT, L. G., HARLEY, J. H., AND WIBERLEY, S. E.
A Course in Instrumental Analysis.
J. Chem. Education, **28**, 466–71 (1951).
C. A., **46**, 1312d (1952).

Exptl. methods, equipment used, and student results are discussed for expts. in absorption and emission spectroscopy and electrometric analyses.

3623. BEKAERT, J. AND DEMEESTER, G.
The Influence of Glucose and Insulin Upon the Potassium Concentration of Serum and Cerebrospinal Fluid.
Arch. Intern. Physiol., **59**, 262–4 (in English) (1951).
C. A., **47**, 2860f (1953).

In dogs the intravenous infusion of 1–2 l. of a 5% glucose soln. contg. 80–130 units of insulin over a period of 3 hrs. caused a drop in both the serum and the cerebrospinal fluid K. The fall in the cerebrospinal K was less marked when 40 units of insulin were given slowly without the large fluid injection, while the serum K drop in this case was about the same as in the first instance. The K was detd. by flame photometry.

3624. BERNSTEIN, R. E.
Electrolyte and Water Variations in Serum and Red Blood Cells During the Phases of the Menstrual Cycle in the Baboon.
S. African J. Med. Sci., **16**, 93 (1951).
C. A., **46**, 6225c (1952).

The Na and K of serum and whole blood were estd. by flame photometry, by using a modification of a technique reported by B. previously (*C. A.*, **44**, 5418g) with an accuracy of ±1.3%. (*See C.A.* for complete abstract).

3625. BERTHA, H., MALISSA, H., AND POHL, F.
Microchemical Studies on the Topical Distribution of Trace Elements in the Brain.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 988–96 (1951).
C. A., **45**, 5749a (1951).

Besides K, Ca, Na, Mg, and P, all the spectrograms show the presence of Al and Cu in the brain although their distribution in different parts of the brain is not yet known. Pb, Zn, Sr, Ag, Be, and Ti also appear in the regions examd. The existence of sep. cells in certain sections of the brain makes it seem possible that special elements may be required for the exercise of special functions. No definite conclusions can be drawn now.

3626. BERTRAND, G.
The General Presence and the Probable Role of Sodium in Plants.
Ann. inst. Pasteur, **81**, 121–5 (1951).
C. A., **46**, 9167d (1952).

Na was detd. in plants spectrographically. In 540 specimens representing nearly 450 species of dicotyledons collected in France, England, Switzerland, and Italy, Na was found without exception. The Na concn. varied from over 20 g./kg. dry wt. (0.6% of specimens) to less than 0.1 g./kg. (18% of specimens). Most plants (60%) contained 0.1–1.0 g./kg. The principal role of Na was believed to be maintenance of osmotic pressure, but in small quantities it may also be necessary for key chem. reactions.

3627. BERTRAND, G. AND BERTRAND, D.
Rubidium and Other Alkaline Metals Contained in Human Blood.
Ann. inst. Pasteur, **80**, 227–30 (1951).
C. A., **46**, 8737a (1952).
See C. A., **45**, 1668f.

3628. BERTRAND, G. AND BERTRAND, D.
On the Partition of Rubidium in Blood Between Plasma and Cells.
Ann. inst. Pasteur, **80**, 339–42 (1951).
C. A., **46**, 8737a (1952).
See C. A., **45**, 5787g.

3629. BERTRAND, G. AND BERTRAND, D.
Distribution of Rubidium in the Blood Between Plasma and Erythrocytes.
Bull. acad. natl. méd., **135**, 27–9 (1951).
C. A., **45**, 5270a (1951).

The av. Rb content of man's serum was 1.14 mg. per l.; in whole blood it was 2.6 to 3.45 mg. Horse serum contained 1.14, the total blood 2.14 mg. per l. The erythrocytes contained about 3 times the quantity Rb as the corresponding amt. of plasma.

3630. BERTRAND, G. AND BERTRAND, D.
The Rubidium Content of Seeds.
Compt. rend., **232**, 2065–6 (1951).
C. A., **46**, 586c (1952).

The Rb contents of 46 samples averaged 9.0 mg. per kg. of dry material with a range from 0.6 in rye to 45.7 in coffee. The Gramineae were low, av. 3.6, and seeds in general had about half the Rb of aerial parts on the same concn. basis.

3631. BERTRAND, G. AND BERTRAND, D.
Rubidium in Seeds. I.
Compt. rend. acad. agr., France, **37**, 358–61 (1951).
C. A., **47**, 3937c (1953).

On a dry-wt. basis the Rb content of 46 different seed samples ranges from 0.6 and 1.0 p.p.m. in the rye and date-palms seeds, resp., to 46.7 p.p.m. in the coffee bean.

3632. BERTRAND, G. AND BERTRAND, D.
Microdetermination of Alkalies in Material of Biological Origin.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 1004–14 (1951).
C. A., **45**, 5749b (1951).

Take up the ash of the material in HCl, ppt. the alk. earths with NH_4OH + $(NH_4)_2HPO_4$, remove the excess phosphate with $PbCl_2$, whereby chlorides are formed from sulfates, ppt. the excess Pb with H_2S, and heat to redness to expel NH_4Cl. Examine the residue for the Na lines at 4669 or 4979 Å., the K line at 5859.7 Å., the Rb line at 4281.8 Å., the Li line at 6707.86 Å. and the Cs line at 4555.5 Å. Diagrams are given for detg. the contents and for correcting by the K:Na ratio. It has been possible to det. 0.01 γ Li, 0.2 γ Rb, and 0.2 γ Cs.

3633. BHADURI, B. N.
Plate Calibration by Step Filter and Its Use in the Estimation of Manganese, Silicon, and Vanadium in High-Speed Steels.
J. Sci Ind. Research (India), **10B**, 101–9 (1951).
C. A., **45**, 8936f (1951).

A rapid plate calibration method based upon the relative intensities of Mn lines 2939 and 2933 and its application to quant. analysis of high-speed steel by spectroscopy are described. The method is particularly useful for the detn. of Mn, Si, and V.

3634. BIRKS, F. T.
Spectrographic Determination of Silicon in Uranyl Nitrate Solutions.
Anal. Chem., **23**, 793–4 (1951).
C. A., **45**, 7914c (1951).

Uranyl nitrate solns. contg. Si were evapd. in a grease-sealed pre-arced C electrode first placing the filled electrode in an NH_3 atm. to neutralize HNO_3. They were then ignited in a Bunsen flame and arced for 30 sec. at 10 amp. Standards were prepd. from U_3O_8 and pure pptd. SiO_2. The standard deviation calcd. on 60 duplicate sample results was 9.42%.

3635. BLITZER, L. AND CADY, W. M.
Excitation Temperature in Time-Resolved Spectra of Single Condensed Spark Discharges.
J. Optical Soc. Am., **41**, 440–5 (1951).
C. A., **45**, 8349g (1951).

One of the simplest ways of detg. the temp. of a spectroscopic light source, in cases where transition probabilities are known, is to correlate the observed relative intensities of the emission lines with the known transition probabilities and the excitation potentials of the initial levels. From relative intensities of Fe I lines, a study has been made of the excitation temps. in short-time high current condensed spark discharges, both in the integrated light from single sparks and from time-resolved spectrograms. In all cases a Boltzmann distribution of the atoms among the various excited energy-states has been found to exist, with the temp. as the distribution parameter. A statistical equil. between the electron gas and the excited atoms is assumed to exist, in which case the excitation temp. is the temp. of the electron gas. The spectrum of the initial phase of the spark is characterized by short-lived broadened lines of N II and O II. During the latter phase of the discharge (4–14 microsec.), in spite of extreme variations in current and radiation intensity from the source, the temp. was found to be approx. const. (6000–7000°K.) both for damped and oscillatory discharges.

3636. BRANSCOMB, L. M.
Criteria for Preëxposure of Spectroscopic Plates.
J. Optical Soc. Am., **41**, 255–60 (1951).
C. A., **45**, 5518f (1951).

Criteria are found for the optimum preexposure to be used to hypersensitize spectroscopic plates for the spectrophotometry of very weak light sources. The concept of the ratio of line strength to granularity (signal-to-noise ratio) in spectrophotometry is developed. Exptl. investigations of the relations between emulsion response, granularity, and exposure yield a simple procedure for detg. the preëxposure which maximizes the ratio of line strength to granularity. This preëxposure also maximizes the incremental plate d. for weak exposures, so that under certain conditions the optimum preëxposure is the point on the H. & D. curve at which the 1st and 2nd derivs. are equal.

3637. BRATTAIN, R., JONES, L. C., JR., AND WIER, T. P., JR.
Spectrometric Methods of Petroleum Analysis.
Proc. 3rd World Petroleum Congr., Hague, Sect. **VI**, 81–93 (1951).
C. A., **48**, 9661b (1954).

Analytical methods, based upon the interaction between electromagnetic energy and mols. or atoms are discussed and examples are given of their application to petroleum research and manufg. Infrared absorption spectrometry is used as an example for the discussion of the reasons for the rapid growth within the last 10 years. The similarity between X-rays, ultraviolet, infrared, visible, emission, Raman, and mass spectrometry is discussed. The fields of usefulness and limitations of these methods in analyzing petroleum products are outlined. 65 references.

3638. BREALEY, L.
Determination of Potassium in Fertilizers by Flame Photometry.
Analyst, **76**, 340–3 (1951).
C. A., **45**, 7738b (1951).

It is shown that reproducible results can be obtained in detg. 8–11.65% K_2O which agree satisfactorily with those obtained by conventional quant. analysis. Other ions likely to be present have very little effect.

3639. BREALEY, L. AND ROSS, R. E.
Flame Photometers: a Description of Two Instruments.
Analyst, **76**, 334–9 (1951).
C. A., **45**, 7874i (1951).

Two flame photometers are described: a simple one for detg. Na and K and a more versatile, general-purpose instrument. Data are given to show the influence of other ions present.

3640. BRETÓN, A. S.
The Influence of Several Elements on the Blackening of the 2478 A. Line of Carbon.
Anales real soc. españ. fís. y quím. (Madrid), **47A**, 221–4 (1951).
C. A. **48**, 6902i (1954).

S. has investigated the change in intensity of the 2478 Å. line in the spark spectrum of C produced by introduction of solns. of Fe, Mn, Cu, and Cd between the electrodes. Fe, Mn, and Cu produce a reduction in intensity of this line, but Cd has no measurable effect. The results are discussed and it is recommended that solns. should be very dil. for spectrochem. analysis when C electrodes are used as the reference element.

3641. BRIGHT, H. A.
Standard Sample Program of the National Bureau of Standards.
Anal. Chem., **23**, 1544–7 (1951).
C. A., **46**, 1382i (1952).

The program began in 1905 and has steadily expanded until today more than 500 standards are available. Last year about 22,000 units were sold. A brief review of the work at the Bureau is given, especially with respect to the prepn. of metal and alloy samples.

3642. BRODERICK, E. J. AND ZACK, P. G.
Flame Spectrophotometry for Determination of Sodium, Potassium, and Lithium in Glass.
Anal. Chem., **23**, 1455–8 (1951).
C. A., **46**, 697e (1952).

A flame spectrophotometric method has been adapted to det. Na, K, Li in the presence of each other. The method compares favorably in accuracy with gravimetric methods. Statistical analysis of variance and an exptl. design make it possible to study several variables at once with an abs. min. of expts.

3643. BRUCELLE, G.
Spectrographic Analysis of Trace Components in Steel.
Congr. groupe. avance. méthod. anal. spectrog. produits mét., **14**, 63–79 (1951).
C. A., **46**, 9469d (1952).

For detg. small quantities of Mo, Si, and V in steels the arc emission had a greater sensitivity than the spark emission, even in cases where it was necessary to use ionized atomic lines. The last line of the neutral V atom, V I 4379.2, was less sensitive in the arc emission than the V II 3110.70, which occupies the third place in the order of decreasing sensitivity of the lines of ionized atoms according to Harrison. Comparison of the use of either pairs of lines of neutral atoms or of ionized atoms showed that the homologous line of the base metal need not be of the same type as the line of the metal being detd., since in analyses of trace components the precision is less important than the sensitivity. The assay of V can be obtained with reasonable precision by reference to either Fe II 3154.20 or Fe I 3083.74.

3644. BRYAN, F. R.
Metallurgical Microspectroscopy Using Microdrills.
J. Optical Soc. Am., **41**, 1061 (1951).
C. A., **46**, 2959g (1952).

An improved microspectrographic method of identifying metallic constituents in metallurgical specimens has been devised; it consists of drilling out the minute portion to be analyzed, flowing collodion over the resulting chips, and transferring the collodion and chips to a pure C electrode for spectrographic arc analysis.

3645. BURRIEL-MARTÍ, F. AND RAMÍREZ-MUÑOZ, J.
Methods of Previous Concentration in Spectral Analysis. I. Previous Concentration of Bismuth in Alloys Containing Lead by Means of Cupferron.

Anales real soc. españ. fís. y. quím., **47B**, 201–14 (1951).
C. A., **45**, 10119d (1951).

Alloys of Bi, Pb, and Cd were studied. Bi is pptd. by means of cupferron with 100% recovery at pH 0.5. After sepn. Zn is added to the ppt. as an internal standard and the mixt. is analyzed spectrographically.

3646. BURRIEL-MARTÍ, F. AND RAMÍREZ-MUÑOZ, J.
Spectrographic Techniques to Determine Some Trace Elements on Electrolytic Copper Electrodes.
Anales real soc. españ. fís. y quím. (Madrid), **47B**, 871–6 (1951).
C. A., **46**, 4417c (1952).

The following factors were considered: selection of materials, purification of reagents, prepns. of synthetic samples, line selection, and photometric methods. The elements studied in particular were Co, Ni, Mo, and Zn because of their distinct spectral behavior. These elements are also of interest in the study of biologic processes in plants and animals.

3647. BURRIEL-MARTÍ, F. AND RAMÍREZ-MUÑOZ, J.
Enrichment Methods Prior to the Spectrochemical Determination of Traces of Elements.
Mikrochemie ver Mikrochim. Acta, **36/37**, 495–512 (1951).
C. A., **45**, 5054i (1951).

The paper discusses the preliminary concn. of trace elements in soils, fertilizers, alloys, and other materials, with final spectrochemical detn. of the traces. During this preliminary work, not only the concn. of the trace elements is increased but other elements that might cause trouble are removed. In most cases, it is best to effect pptn. of the desired element either as a pure ppt. or one in which there is copptn. As an example, the case of detecting traces of Bi is typical. Cupferron is a useful reagent which ppts. Bi in the presence of Pb and Cd at pH 0.5–1.5 and the ppt. can be examd. for Bi. Similarly Ba can be pptd. together with Pb as sulfate and the Pb used as an internal standard.

3648. BURRIEL MARTÍ, F., RAMÍREZ MUÑOZ, J., AND FERNÁNDEZ CALDAS, E.
Previous Concentration Methods in Spectral Analysis. II. Determination of Small Quantities of Barium in the Presence of Other Elements.
Anales real soc. españ. fís. y quím., **47B**, 429–38 (1951).
C. A., **46**, 7928e (1952).
Cf. *C. A.*, **45**, 10119d.

Ba is concd. selectively by copptn. with Pb by means of SO_4^{2-} or CrO_4^{2-} which enables sepn. from other alk. earths. The ppt. is analyzed spectrographically.

3649. CALLON, R. W. AND CHARETTE, L. P.
Analysis of Aluminum and Aluminum Alloys with Pin Samples.
Anal. Chem., **23**, 960–6 (1951).
C. A., **45**, 8935a (1951).

Direct-reading spectrochem. methods are described which are more accurate, faster, and cheaper than photographic procedures. Samples 0.25 in. in diam. are used. Directions are given for detg. Fe, Ni, Mn, Re, Bi, Cr, Cu, Mg, and Mn.

3650. CARLSSON, C. G.
Spectrographic Analysis of Slags and Ores.
Jernkontorets Ann., **135**, 607–20 (1951).
C. A., **46**, 3902i (1952).

A flux was used to convert the samples to the same mineralogical state. The best flux was obtained by mixing 0.2 g. ore (100 mesh) with 1.6 g. powd. $Na_2B_4O_7$, melting the mixt. for 3–4 min. on a large Pt lid. The fused cake was pulverized and 400 mg. was mixed with 300 mg. graphite powder, pressed to a briquet, and analyzed. For samples of similar mineralogical compn. the 3 constituents can be mixed directly and pressed to a briquet; this allows the fluxing to take place during excitation. Suitable amts. to use are: 100 mg. sample, 300 mg. $Na_2B_4O_7$, and 300 mg. graphite.

3651. CASTRO, R.
Spectral Analysis in Steel Works.
Mém. soc. ing. civils France, **104**, 62–85 (1951).
C. A., **46**, 8566b (1952).

Principles, methods of application, calibration, and installations are described.

3652. CASTRO R. AND LOUDE, R.
Spectrochemical Analysis of Slags Containing Iron. Preparation of Synthetic Standards by Calcination.
Compt. rend., **233**, 1031–3 (1951).
C. A., **46**, 2959e (1952).

Synthetic slags, for use as standards, have been prepd. by calcining in a Pt crucible, at 1200°, finely powd. oxides and salts of metals known to be present in analytical samples. After the fused mass has hardened, it is broken and pulverized for subsequent use. The slags studied contained CaO from 30 to 70%, Al_2O_3 up to 50%, SiO_2, FeO, Cr_2O_3, MgO 20 to 30%, and TiO_2, MnO a few %. Spectrum analysis, by the method of internal standards, consists in measuring the intensities of selected lines of the metals relative to the Si line at 2528 A. In some cases it is convenient to add a little Ni to the samples and make the intensity measurements relative to the Ni line at 2913 A.

3653. CHADWICK, L. C.
Chemical Composition of Nigerian Columbite.

Colonial Geol. and Mineral Resources (London) **2**, 308–11 (1951).
C. A., **47**, 3190g (1953).

The columbite is widely disseminated as small crystals in biotite-granites. The compn. as detd. chemically and spectrographically in special concentrates of columbite from Liruei, Northern Nigeria, is Ta_2O_5, 3.89 Nb_2O_5 73.60, TiO_2 0.96, WO_3 0.10, FeO 18.59, MnO 2.14, MgO 0.28, H_2O^- 0.02, H_2O^+ 0.32, SnO_2 0.05, SiO_2 nil %. CaO, ZrO_2, Al_2O_3, Cr_2O_3, V_2O_5, and P_2O_5 were not detected. The Sn occurs in solid soln. with the columbite; addnl. Sn occurs as inclusions or intergrowths of cassiterite. The TiO_2, which is evenly distributed in the columbite grains, is definitely not present as rutile, but its presence as ilmenite is not established.

3654. CHANDLER, A. B.
Spectrographic Analysis of Lithium and Sodium in Solid and Liquid Samples.
Foote Prints, **23**, 18–23 (1951).
C. A., **46**, 376e (1952).

Spectrochem. analysis of Li- and Na-bearing materials is done by fusing the sample with $KHSO_4$, by proper diln., to bring the percentage of Li_2O and Na_2O into the range 0.1% to 1.0%, grinding to a fine powder, and heating a weighed sample in a d.-c. arc, interrupted by a rotating magnet mounted at right angles to the arc column. The resultant spectrum is photographed at 2800 to 3500 A. and intensity ratios for the lines Li I 3232.61 Å./K. I 3447.701 Å. and Na I 3302.988 Å./K I 3447.701 Å. are measured. The percentages of Li_2O and Na_2O are read from the curves obtained with standard samples.

3655. CHURCHILL, J. R.
Direct-reading Spectroscopy Speeds Aluminum Production.
Iron Age, **168**, No. 15, 97–100 (1951).
C. A., **45**, 10154d (1951).

High-speed analysis of Al alloys on direct-reading quantometers has cut waiting time of holding hearths to a min. A complete report can be obtained in 4 min. or less.

3656. CHYTIL, F. AND ŠONKA, J.
Estimation of Sodium and Potassium with the Flame Photometer.
Časopis Lékařů Českých, **90**, 284–5 (1951).
C. A., **50**, 106i (1956).

With H_2SO_4-washed C_2H_2 for flame photometry, higher serum levels of Na and K are found than when tech. C_2H_2 was used.

3657. CLARK, R. O., ET AL.
Quenched-Electrode Procedure in Spectrographic Analysis as Applied to New Detergent-Type Oils.
Anal. Chem., **23**, 1348–53 (1951).
C. A., **46**, 848h (1952).

A coöperative study was made of the use of the quenched electrode procedure in spectrographic analysis. Variables considered pertinent to the problem are given. They were studied separately or as a class, depending upon whether they were characterized by mineral oils or by spectrographic analysis as normally practiced. The basic working procedure employed in these studies consisted of impregnating heated C electrodes with an oil, and sparking in a spectrograph. The resulting spectragram is then densitometered, and line intensities converted to percentage figures of the desired constituent. The length of time that an electrode remains in an oil after quenching does not affect the precision of the results. The electrode tip shape has little effect on sensitivity but a variable effect on reproducibility, depending upon the elec. characteristics of the spark discharge. With max. capacitance and min. inductance, reproducibility is independent of the shape of the electrode tip, whereas with min. capacitiance and max. inductance the results are rendered more precise by decreasing the included angle from 120° to 22°. The effects of the nature of the oil base and the compn. of the additive are limiting variables of the technique. Altering the elec. characteristics of the spark can affect both the sensitivity and reproducibility of the method. The cooperators believe the quenched-electrode procedure is not applicable to oils that differ from the standards used for calibration purposes nor to used oils.

3658. CLAYTON, H. R.
Spectrographic Analytical Control.
Progr. in Phot. **1940–50**. (*Focal Press, London*) **1**, 369–71 (1951).
C. A., **49**, 14561 (1955).

Progress in the application of quant. spectrographic methods for analytical control during the past decade has exceeded that in any other analytical field. The advances fall into three groups (1) those brought about by a proper understanding of the photographic process, and its limitations when applied photometry, (2) those involving improved excitation sources resulting in more stable and controllable spectral emission from the analytical gap, and (3) those reducing personal errors in routine control procedures by the provision of spectrographs and auxiliary equipment which can be efficiently operated by relatively unskilled workers.

3659. COISSET, P. AND PERMINGEAT, F.
Tantalite and Columbite of the Anti-Atlas.
Protect. repub. franc, au Maroc, Dir. prod. ind. et mines, Div. mines et géol., Serv. géol., Notes et mém. No. **85**, *Notes du serv. géol.*, **5**, 237–42 (1951).
C.A., **49**, 4464h (1955).

A mangan-columbite from pegmatite at Iguerda contained Ta_2O_5 38.2, Nb_2O_5 37.5, MnO 10.8, FeO 6.1, SiO_2 9.9, sum 97.9%; sp. gr. 6.25. Samples from 2 other localities had sp. gr. 7.37, and 7.38. Spectrographic

analysis showed some Sn, W, and Ti, approx. 1 g./ton Au, and traces of Be, Zr, V, Mo, Zn, and rare earths.

3660. COJAN, J.
New Spectrograph for Qualitative and Quantitative Analysis.
Congr. groupement avancé méthodes anal. spectrograph. produits. mét., **14**, 225–33 (1951).
C. A., **46**, 6937c (1952).

A simple, small, double-quartz-prism type of spectrograph is described which is suitable for qual. and quant. analysis of Al, Mg, Cu, brass, bronze, Be bronze, Zn, Pb, Sn, and their alloys. The 60° prisms produce a spectral range of 2145–5893 A. of 103 mm. with a dispersion ranging from 7 Å./mm. at 2150 Å. to 250 Å./mm. at 5893 Å. It is capable of resolving the Fe triplet, 3099.971, 3100.304, and 3100.66 Å.

3661. CONWAY, J. G., MOORE, M. F., AND CRANE, W. W. T.
Emission Spectrum of Curium.
J. Am. Chem. Soc., **73**, 1308–9 (1951).
C. A., **45**, 6048i (1951).

The wavelengths of the most prominent lines in the arc and spark spectra of Cm were measured in the region 2516–5000 Å. The wavelengths are given, together with a discussion of methods of spectrographic analysis of Cm samples.

3662. CORNU, M. A.
Use of a Slitless Spectrograph for Spectrochemical Analysis.
Bull. Society for Applied Spectroscopy, **5**, 23–25 (1951).

An English translation of the paper which appeared in *Congr. groupe avancé method. anal. spectrograph. produits mét. Paris*, **8**, 29–32 (1947). (*See* reference **2645**, Part III of this Index.)

3663. CROSSWHITE, H. M., STEINHAUS, D. W., AND DIEKE, G. H.
Suppression of Certain Parts in Spark Spectra by Electronic Time Switching.
J. Optical Soc. Am., **41**, 299–302 (1951).
C. A., **45**, 6061a (1951).

An electronic device is described which renders a phototube sensitive only at prescribed but arbitrary intervals of a spark cycle. Such undesirable light, as air lines and continuous background, can then be suppressed. There is evidence that for purposes of spectrochem. analysis the spectrum thus recorded photoelectrically combines the stability and reproducibility of the condensed spark with the sensitivity of the d.-c. arc.

3664. CURTIS, G. W., KNAUER, H. E., AND HUNTER, L. E.
The effect of Organic Solvents on the Flame Photometric Emission of Certain Elements.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 67–74 (1951).
C. A., **47**, 7363e (1953).

A variety of solvents used in flame photometric analysis of metalloorg. compds. were tested with alkali and alk. earth metalloorg. compds. The solvents included hydrocarbons and O-, N-, and halogen-contg. materials. The intensity of the emission of Ba, Ca, and Na was greatest with 1-pentene, isopropyl ether, toluene, heptane, and cyclopentane.

3665. DAKSHINAMURTI, C. AND RAMAMOORTHY, B.
Effect of Manganese on the Intensity of Magnesium Lines in a Direct-Current Arc Spectrum.
Current Sci. (India), **20**, 216 (1951).
C. A., **46**, 6931g (1952).

From a synthetic soil base containing 2% MgO and 5% Fe_2O_3, 7 mixts., contg. 50, 100, 200, 500, 1000, 1500, and 2000 p.p.m. of Mn, were prepd. The finely ground mixts. were made into consistent pastes with dil. HNO_3 and arced in Cu electrodes of 5 mm. diam. at 6.5 amp. The intensity of the Mg line at 2798.0 A. was suppressed although the neighboring line, Fe 2797.8 Å., remained unaltered. Two other Mg lines, wavelengths 2776.7 and 2781.4 Å., were suppressed; 2 addnl. Mg lines, wavelengths 2802.7 and 2795.5 Å. were too strong to make estimates. Microphotometer traces showing the effect with 50 and 200 p.p.m. are presented.

3666. DEÁN GUELBENZU, M.
Possibilities of Spectrochemical Technique in the Investigation of the Oligoelements.
Inform. quím. anal. (Madrid), **5**, 172–80 (1951).
C. A., **47**, 7580i (1953).

A review of detn. in biol. materials. 18 references.

3667. DELANEY, J. C. AND OWEN, L. E.
Spectrochemical Analysis of Bismuth Matrices; Porous Electrode Technique.
Anal. Chem., **23**, 577–80 (1951).
C. A. **45**, 7911d (1951).

Corrosion studies required the spectrographic analysis of Bi and Pb-Bi matrices for from 0.0001 to 0.5 per cent Be, Co, Cr, Fe, Mn, Mo, Nb, Ni, Ta, Ti, V, and W. The size of samples was not sufficient to permit fabrication of satisfactory self-electrodes. A porous cup technique (*C. A.*, **43**, 8945b) was adopted. The entire sample was dissolved, often by special treatment, and acid solns. were sparked in specially drilled porous C electrodes. Pt was used as an internal standard. Analytical curves were obtained with standard solns. prepd. and excited in a manner similar to that used with samples. Five series of intensity ratio-

concn. curves were prepd.: the single test elements alone; multiple test elements alone; single elements plus Bi; multiple elements plus Bi and multiple elements plus Pb-Bi eutectic alloy. All solns. carried identical amts. of Pt. The acid concd. had a negligible effect. In some cases, e.g., 0–100 p.p.m. Fe and Cr (2599.396 Fe/2659.454 Pt; 2766.540 Cr/2659.454 Pt) there was likewise negligible extraneous element effect for all 5 curves; in others, such as was obtained with the 3021.588 Cr and the 2981.651 Ni lines, preponderance of Bi and(or) Pb in the matrix caused a shift of calibration lines. In practice, selection of an analytical curve depends on sample compn., sometimes approx. preknown, and sometimes roughly detd. by casting the samples into small rods and arcing them as self-electrodes. The best line pairs and concns. are given for the metals listed above.

3668. DENNEM, W. H., AHRENS, L. H., AND FAIRBAIRN, H. W.
III. Spectrochemical Analysis of Major Constituent Elements in Rocks and Minerals.
U. S. Geol. Survey Bull., No. **980**, 25–52 (1951).
C. A., **46**, 11009a (1952).

The precision of chem. and direct arc spectroscopic analyses are compared on the basis of statistical treatment of the data: for SiO_2, chem. analysis is superior; for Al_2O_3, chem. analysis superior; for Fe, spectrochem. analysis superior; for MnO, spectrochem. analysis superior; for MgO, spectrochem. analysis superior for granite; for CaO, chem. analysis is superior for diabase; for Na_2O, spectrochem. analysis superior and about the same as flame photometer; for K_2O, spectrochem. analysis about the same but inferior to the flame photometer. In chem. analyses the relative error is inversely related to the concn. for a given element.

3669. DE WAEL, J.
The Determination of Thallium in Urine.
Tijdschr. Diergeneesk, **76**, 537–9 (1951).
C. A., **46**, 5115a (1952).

Twenty-five ml. of urine is boiled in a 125-ml. flask with 10 ml. HCl and some $KClO_3$. If Cl liberation stops, more $KClO_3$ is added until a colorless liquid results. This is heated until dry and dissolved in 25 ml. Na citrate soln. (10%). This soln is brought to pH 9 with NH_4OH, and extd. two or three times with 2 ml. dithizone soln. (0.1% in $CHCl_3$). This soln. is evapd. to a small vol. A drop of it is observed spectroscopically. The green line (535 mμ) is observed with concns. as low as 1 γ Tl in 25 ml. of urine.

3670. DIAMOND, J. J. AND BEAN, L.
Use of Beckman and Perkin-Elmer Flame Photometers for the Determination of Alkalies in Portland Cement.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 28–32 (1951).
C. A., **47**, 7753a (1953).

Exptl. work was done to develop a procedure which would allow the use of the Beckman DU Spectrophotometer for the detn. of alkalies in portland cement. A modification of the ASTM tentative method C 228–49 T, which was based on the use of the Perkin-Elmer 52A flame photometer, was found to be satisfactory. Among the necessary changes in the procedure were: the use of decreased concn. of the solns. and the use of chemically resistant glassware. Comparative tests showed good agreement between the Beckman and Perkin-Elmer procedures. Approx. equal precision was obtained for the 2 instruments.

3671. DÍEZ DE URDANIVIA, I., AND NADER Y REYES RETANA, A.
Application of Quantitative Spectrometric Determination to the Investigation of Counterfeiting of Money by the Silver: Copper Ratio.
Ciencia (Mex.), **11**, 291–2 (1951).
C. A., **47**, 443c (1953).

The ratio of concns. of the principal metals can be used to distinguish counterfeit coins from the genuine. The presence of characteristic impurities may reveal the counterfeiter's source of metal.

3672. DOMANGE, L. AND LONGUEVALLE, S.
Flame Photometry in the Control of Medicinal Products.
Ann. pharm. franç., **9**, 647–51 (1951).
C. A., **46**, 4170d (1952).

Report on the detn. of K and Na in a variety of medicinal products.

3673. DOORSELAER, M. VAN.
A Micromethod for the Quantitative Study of Ancient Bronzes with the Aid of Spectrography.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 513–21 (1951).
C. A., **45**, 5068e (1951).

A spectrographic method for quant. analysis of bronze archaeological objects is described. A soln. of the metal in aqua regia is absorbed in pure graphite or carbon electrodes and excited by means of a condensed spark for the detn. of alloy components Cu, Sn, Pb, or an intermittent arc for the detn. of minor constituents and traces. Since only 4 mg sample is required this is a real micromethod especially suited for the analysis of ancient bronzes. Calibration is made with the aid of synthetic standard solns. The min. amts. of impurities detd. by this method are 3×10^{-8} g. of Ag, 3×10^{-7} g. of Sn, Pb, Ni, Co, Bi, Au and Fe, 1×10^{-6} g. of Zn, and 3×10^{-6} g. of As and Sb. (*See C. A.*, **45**, 2367a (1951).

3674. EECKHOUT, J., CRUSE, J., AND GILLIS, J.
The Spectrum Analysis of Highly Alloyed Steels.
Rev. universelle mines, **7**, 440–7 (1951).
C. A., **46**, 2446d (1952).

An A. R. L. multisource unit and an A. R. L. 2m grating spectrograph are employed for the detn. of the principal constituents of certain types of steel resistant to high temps. Capacitance, inductance, and resistance of the discharge circuit were varied to study the effects on reproducibility, slope of working curve, and influence of ternary elements. The best results were obtained with an oscillatory discharge. Analysis lines and working curves are given for the detn. of Cr, Mn, Ni, and Si. The following lines were used Cr 2691.05/Fe 2692.60, Mn 2701.70/Fe 2706.58, Ni 3458.47/Fe 3475.45, Si 2881.60/Fe 2883.73 Å.

3675. EGGERTSEN, F. T., WYLD, G., AND LYKKEN, L.
Control of Interferences Caused by Acids and Salts in the Flame Photometric Determination of Sodium and Potassium.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 52–65, discussion 66 (1951).
C. A., **47**, 7367b (1953).

Interference is caused by the presence of acids and salts in the test soln. which reduce the rate of evapn. of the mist droplets. The greater amt. of water carried over in the flame as a result of this effect lowers the radiation intensity produced by the test element. This interference can be virtually eliminated by the use of a buffer such as LiCl. Test data showing the interference and the effect of buffers are presented. Chem., phys., and microscopic tests of spray specimens are described.

3676. ELLENBURG, J. Y. AND OWEN, L. E.
Special Atmosphere Excitation in Generalized Semiquantitative Spectrographic Analysis.
Anal. Chem., **23**, 1512–14 (1951).
C. A., **46**, 849c (1952).

The Harvey special atm. excitation method (Method of Semi-Quant. Spectrographic Analysis, *C.A.*, **42**, 4498g (1957)) has been extended to analysis of trace metals. A 20% Oxygen, 80% He atm. lowers the limit of detection appreciably and makes a significant improvement in the signal-noise ratio. A list of special atm. Harvey consts. for various metals is given. Atm. chambers and electrodes are described. The method is proposed for detg. rare-earth elements.

3677. ELLIOTT, F. H.
Determination of the Characteristics of a Flame Photometer and Effects of Interfering Substances.
Can. J. Technol., **29**, 111–22 (1951).
C. A., **45**, 6681a (1951).

A method for finding the best flame for use in a Perkin-Elmer flame photometer is described. A comparison of reports on the effects of 5 interfering substances present in biol. materials and 3 aids used in the prepn. of biol. materials has been made and reveals that similar flame photometers burning the same fuel differ in their response to the same substances. Owing to the different responses to interfering substances, it is important to test the validity of every step, such as extent of diln., in the prepn. of a biol. material, even though it has been found satisfactory in another lab.

3678. ELLIOT, H. C. JR., AND HOLLEY, H. L.
Serum Sodium and Potassium Values in Four Hundred Normal Human Subjects, Determined by the Beckman Flame Photometer.
Am. J. Clin. Path., **21**, 831–5 (1951).
C. A., **45**, 10345e (1951).

The technique of Mosher (*C. A.*, **43**, 5441g) is reproduced using the flame photometer. The av. value for Na agrees with that of other workers, bur for K it is lower than reported by others.

3679. EMERY, R. ST. J.
A Modified Method of Sparking Thin Metal Sheets for Spectrographic Analysis Using the Alternating Current Condensed Spark Unit.
Spectrochim. Acta, **4**, 327–9 (1951).
C. A., **46**, 2952e (1952).

Difficulties arising from the use of point-to-plane sparking when the plane is a thin sheet are eliminated by placing the sample sheet between two similar graphite electrodes adjusted with a 6-mm. gap. The improvement in reproducibility is shown by results for a sample of 14 gage elec. steel sheet contg. 0.5% Al when the modified method and the point-to-plane method of sampling are used.

3680. ESKOLA, P.
Ore Deposits Around Pitkäranta [K.F.S.S.R.].
Ann. Acad. Sci. Fennicae Ser. A, III, No. 27, 90 pp. (in English) (1951).
C. A., **47**, 4798g (1953).

This extensive treatment includes some results of spectrochem. detn. of Be and Sn in rocks and ores.

3681. FAGNANI, G.
Rare Earths in the Gadolinite of Baveno.
Rend. soc. mineralog. ital., **7**, 45–6 (1951).
C. A., **47**, 2091e (1953).

The gadolinite of the geodes of the granite of Baveno contains Sc, Y, La, Ce, Pr, Nd, Sm, Gd, Dy, Er, Yb, and Lu.

3682. FAIRBAIRN, H. W., ET AL.
A Cooperative Investigation of Precision

and Accuracy in Chemical, Spectrochemical, and Modal Analysis of Silicate Rocks. I. Preparation and Distribution of the Samples.
U. S. Geol. Survey Bull., No. **980**, 1–6 (1951).
C. A., **46**, 11007i (1952).

The 96 lb. granite and 90 lb. diabase standards are described.

3683. FEJFAROVÁ, M. H., FEJFAR, Z., AND BROD, J.
Estimation of Sodium by Flame Photometry.
Časopis Lékařů Českých, **90**, 66–72 (1951).
C. A., **50**, 429h (1956).

The av. plasma Na concn. found in 13 healthy subjects was 134.8 ± 7.3 meq. No discrepancies between the values found in dild. plasmas and deproteinized plasmas were observed. Quant. recoveries of Na, added to urine, ranged from 91.9 to 97.4%. Neither urea nor glucose in concns. higher (6%) than those usually found in urine interfered with the estn. of Na.

3684. FIELDES, M., KING, P. J. T., RICHARDSON, J. P., AND SWINDALE, L. D.
Estimation of Exchangeable Cations in Soils with the Beckman Flame Spectrophotometer.
Soil Sci., **72**, 219–32 (1951).
C. A., **47**, 10162h (1953).

Methods for the estn. of Ca, Na, K, and Mg in soil leachates by a flame-photometer technique are described. The instrumental conditions, flame setting, atomizers, and the prepn. of solns. are discussed, and precautions necessary to prevent interference by, e.g., PO_4^{3-} and Fe in the estn. of Ca and Mg, resp., are outlined. Reliability and speed are claimed.

3685. FORD, O. W.
Report on Potash (Determination in Fertilizers).
J. Assoc. Offic. Agr. Chemists, **34**, 660–5 (1951).
C. A., **45**, 10460e (1951).

Cf. *C. A.*, **44**, 8582i.—Three potash methods were studied collaboratively by 19 analysts: (*1*) Official A.O.A.C. method, (*2*) the Perrin wet digestion method, and (*3*) the flame-photometer method. In general, the results obtained by the 3 methods showed fairly good agreement.

3686. FOX, C. L., JR.
Stable Internal Standard Flame Photometer—Potassium and Sodium Analyses.
Anal. Chem., **23**, 137–42 (1951).
C. A., **45**, 3661b (1951).

The design and construction of a flame photometer for K and Na analyses which is similar to the app. used by Berry, *et al.* (*C. A.*, **40**, 2083[5]) are described. Data are given showing its accuracy and stability with illuminating gas, room air, barrier layer photocells, and a galvanometer. A nonclogging type of atomizer replaces the former hypodermic needles.

3687. FOX, C. L., JR., FREEMAN, E. B., AND LASKER, S. E.
A Stable Internal Standard Flame Photometer for Sodium, Potassium, Lithium, and Calcium Analyses in Biological Fluids and a Study of Ion-Interference.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.*, No. **116**, 13–27 (1951).
C. A., **47**, 7264f (1953).

A description is given of the design, construction, and operation of an improved and simplified internal standard flame photometer. Data are presented and comparisons made of the interference effects in several different types of flame photometers. Less interference error, more stable operating conditions, greater workability, and greater precision are attained with the internal standard instrument. It is more suitable for Ca analysis than some other instruments. The problem of Ca analysis by flame photometry is discus ed.

3688. FRANKENBERG, B., HOSPADARUK, V., AND NEUFELD, A. H.
Flame Spectrophotometry. II. Sodium and Potassium in Blood and Urine.
Can. Med. Assoc. J., **65**, 388–9 (1951).
C. A., **46**, 2609a (1952).

Cf., *C. A.*, **46**, 2441d.—A detailed procedure for the detn. of Na and K in blood and urine is described. This procedure is suitable for use with the Beckman DU spectrophotometer with flame attachment.

3689. FREDERICKSON, L. D. JR., AND SMITH, L.
Spectrographic Determination of Nitrogen in Some Organic Nitrogen Compounds.
Anal. Chem., **23**, 742–4 (1951).
C. A., **45**, 7916b (1951).

The CN bands formed between C and N in an elec. arc are used as a means for detg. N in org. compds. The unknown is evapd. on pre-fired C electrodes and then arced in a CO_2 atm. Ca present in the electrodes in a fairly const amt. is used as the internal standard. An accuracy of ±2% was obtained with a visual-comparison densitometer.

3690. FUWA, I. K.
Spectrochemical Determination of Fluorine by the Band Spectra of Calcium Fluoride.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 985–6 (1951).
C. A., **46**, 6994b (1952).

Qual. and quant. analysis of F was carried out with the band spectra of CaF_2, band head 5291A. in the neg. flame of a C arc. II. *Ibid.* 986–8. Effects of other elements on

the qual. and quant. analysis of F were studied. The effect of P was found most remarkable. If more than 10% P_2O_5 is present, removal of F by distn. is necessary.

3691. FUWA, K.
Detection of Strontium in Calcium Oxide by the Band Spectra of Strontium Fluoride.
J. Chem. Soc. Japan, Pure Chem., Sect. **72**, 1027–8 (1951).
C. A., **46**, 8570a (1952).

Band spectra of SrF at 5771.9 and 6632.6 A. are used to detect Sr in CaO in the concn. range of SrO <3.0% and >0.5%, resp.

3692. GAMBLE, L. W.
Spectrographic Analyses of Cracking Catalysts. Determination of Magnesium and Zirconium.
Anal. Chem., **23**, 1817–20 (1951).
C. A., **46**, 5826i (1952).

Spectrographic methods are applicable to either natural clay, synthetic silica-alumina, or silica-magnesia catalysts, or their mixts. A 1.5-m. grating spectrograph is used with d.-c. excitation. For Mg the catalyst is mixed with CuO and graphite and arced at various intensity levels by means of a step sector; the ratio Mg 2779.8/Cu 2768.9 is used. Standards are prepd. by working pure catalyst into a slurry with known amts. of pure $Mg(NO_3)_2$ soln. and calcining. Cu is a better internal standard than Mo. The analytical range for Mg is 0.2–12% MgO. For Zr a similar technique with Co internal standard, is used. Line pairs for 0.01–0.3% ZrO_2 are Zr 3392.0/Co 3398.8; for 0.1–5%, Zr 2571.4/Co 2587.2. Concns. of Al_2O_3 above 40% suppress the Zr lines and if Fe in excess of 1% is present, Fe 3399.3 may interfere with Co 3398.8.

3693. GAMBRILL, C. M., GASSMANN, A. G., AND O'NEILL, W. R.
Spectrographic Analysis of New and Used Lubricating Oils.
Anal. Chem., **23**, 1365–9 (1951).
C. A., **46**, 1239e (1952).

Spectrographic methods are described for detg. material content of lubricating oils needed for controlling the blend of additive oils and for examg. used oils to aid engine performance studies. A spectrographic method using the porous-cup electrode technique is described for the detn. of the additives Ba, Ca, P, and Zn in new lubricating oils, and variables are discussed. An overall accuracy of 10% is claimed. A second method uses a rotating-disk electrode for the detn. of Pb, Fe, and the additives in used oils. Results for the additives are compared with those obtained with porous-cup electrodes. Accuracies of the order of 10% are claimed for the detn. of Pb and Fe and the additives. Film background read adjacent to the element line is used as an internal standard in both methods. The variables described include degree of excitation, pre-spark duration, electrode floor thickness, effect of air and N_2 jets, and effect of viscosity. The porous-cup method appeared to give a fairly high accuracy. A viscosity effect giving low results for oils of S.A.E. 60 viscosity was found to be present for the rotating-disk method as well as the porous-cup method.

3694. GAMMON, N., JR.
Determination of Total Potassium and Sodium in Sandy Soils by the Flame Photometer.
Soil Sci., **71**, 211–14 (1951).
C. A., **46**, 675b (1952).

The method described is a modification of the J. Lawrence Smith procedure (Cf. Hillebrand, *C. A.*, **14**, 389). It results in the accurate detn. of Na and K even at very low levels. The method is reproducible and checks well on National Bureau of Standards standard samples. The total Na and K are reported for 10 Florida soils.

3695. GATTERER, A.
Microdetermination of Halogens, Sulfur, and Selenium Spectrochemically.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 476–85 (1951).
C. A., **45**, 5065h (1951).

The sample is excited in a high-vacuum discharge tube under the influence of a high-frequency electromagnetic field. Its spectrum is then evaluated as usual. Under favorable conditions as little as 0.001% of the element can be detected. Results are usually within 10% of the truth.

3696. GATTERER, A.
Grating Spectrum of Iron.
Specola Vaticana, Vatican City, 11 pp. and 47 charts (1951).
Reviewed in *Spectrochim. Acta*, **4**, 426 (1951).

This is a new set of 45 charts for the iron spectrum photographed with a grating spectrograph and covering the region 2150 to 8900 Å. In addition, two charts cover the iron and neon spectra from 5900 to 8900 Å.

3697. GERBST, V. V. AND VAZILLO, N. A.
Experimental Use of Spectrographic analysis of Blood in Silicosis Diagnosis.
Klin. Med. (U.S.S.R.), **29**, No. 4, 58–60 (1951).
C. A., **46**, 4599g (1952).

Detn. of Si is readily achieved with a 2881.6 Å. line of Si although a 2516 Å. line can be used also. The course of therapy can be readily followed in this way, with gradual and significant decline of blood Si during treatment. In some cases as much as 4.3 mg. % Si was found in the patient's blood in severe silicosis.

3698. GILBERT, P. T., JR.
Determination of Tetraethyllead in Gasoline by Flame Photometry.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.*, No. 116, 77–90 (1951).
C. A., **47**, 7766e (1953).

A rapid method of detg. lead in gasoline without preliminary treatment is provided by a flame photometer attachment for the Beckman Model DU quartz spectrophotometer. At 405.8 mμ in the oxyhydrogen or oxyacetylene flame, the instrument is sensitive to 0.001 ml. tetraethyllead per gal. and precise to 0.01 ml. Routine detns. accurate to 0.01 ml. per gal. can be made at the rate of about 30 samples per hr. The app. and procedure are described.

3699. GILLIESON, A. H. AND BIRKS
Application of a Hollow-Cathode Source for Analysis.
Congr. groupe. avance. méthodes anal. spectrograph. produits mét., **14**, 155–73 (1951).
C. A., **46**, 6438i (1952).

A description is given of a hollow-cathode tube for gas spectrum excitation which is similar to those of Schuler and McNally but is simpler in construction and operation. A cooling system is built into the unit. The cathode is built of 18-8 stainless steel with a built-in thermocouple. A gas-circulating system employing a two-stage diffusion pump is described. Typical intensities are shown for F, Cl, and Br, and for the alkali metals Li, Na, K, Rb, and Cs.

3700. GILLILAND, J. L.
Applications of Flame Photometry for the Analysis of Alkalies in Silicates, Waters, and Metals.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.*, No. 116, 33–42, discussion 43 (1951).
C. A., **47**, 7946a (1953).

Among the applications of flame photometry discussed are: analysis of water, soil, lubricating oils, metals, and silicates. Cement investigations in which flame photometry is useful are the test for water-sol. alkalies in portland cement, the study of base exchange in pozzolans, and the reaction of pozzolans with cement alkalies, optimum gypsum studies, and the study of false set in portland cement.

3701. GILLIS, J.
Applied Spectrochemical Analysis.
Anales edafol. y fisiol. vegetal (Madrid), **10**, 67–78 (1951).
C. A., **46**, 53g (1952).

Applications in an industrial lab. to mass analysis of furnace slag, antifriction alloys, steels, sugar-beet ash, clay, silicates, and other minerals are described.

3702. GILLIS, J., DOORSELAER, VAN M., AND RAMÍREZ-MUÑOZ, J.
Spectrographic Analysis of Some Archeological Bronzes on the Micro Scale.
Anales real soc. españ. fís. y quím., **47B**, 609–18 (1951).
C. A., **46**, 2959d (1952).

Technique published earlier (*C. A.*, **45**, 2367a) is described in detail. Analysis of the residue insol. in aqua regia shows Sn and Si. Solns. contg. ppts. or colloids give erroneous results.

3703. GILLIS, J. AND EECKHOUT, J.
Comparative Study of Different Conditions of Excitation for the Quantitative Spectral Analysis of Slags.
Spectrochim. Acta, **4**, 284–301 (1951).
C. A., **45**, 7463f (1951).

Different techniques for the quant. spectrographic analysis of slags were studied. Three sources of excitation were used: (*1*) the d.-c. arc; (*2*) the Feussner spark unit; (*3*) the "multisource." The best operating conditions were detd. for each source. Results obtained with these conditions were compared with regard to the reproducibility of measurements, the slope of analytical curves, and the influence of the variation of oxide/silica ratio for some elements on the logarithmic intensity ratio of other elements being detd. Results obtained by spectrographic methods were compared with those obtained by chem. analysis. The best results were obtained by spark excitation with the Feussner spark unit. For several elements results obtained by this technique proved more reliable than those of routine chem. analysis.

3704. GOLUBKOVA, Y. M.
Rare Variety of Scheelite.
Zapiski Uzbekistan. Vsesoyuz. Mineralog. Obshchestva, **2**, 81–3 (1951).
C. A., **49**, 6040e (1955).

A water-clear variety of schellite with sp. gr. 6.22 and hardness 5 was found in Central Asia. Spectral and chem. analysis showed absence of impurities usually present in this mineral (assay: 19.56% CaO and 80.46% WO_3).

3705. GORBACH, G. AND POHL, F.
Enrichment and Spectral-Analytical Determination of Traces of Metals. Extraction with Organic Reagents. I.
Mikrochemie ver. Mikrochim. Acta, **38**, 258–67 (1951).
C. A., **45**, 9418h (1951).

The soln. of the sample is neutralized by adding HCl or NH_4OH, adjusted to a suitable pH, and extd. successively with solns. of dithizone and of oxine. The exts. are examd. in the spectrometer. Very small quantities of 35 metals were detd. successfully. 17 references.

3706. GORBACH, G. AND POHL, F.
Enrichment and Spectral-Analytical Determination of Trace Metals. II. Ashing the Sample and Separation of Trace Metals from Interfering Quantities of Iron.
Mikrochemie ver. Mikrochim. Acta, **38**, 328–34 (1951).
C. A., **46**, 2443i (1952).

Cf. *C. A.*, **45**, 9418h.—In ashing plant and animal samples, it is best to dry at 105°, carbonize at 400–450°, ext. with hot *N* HCl, treat the residue with HNO_3, and heat at 550° until all C is removed. In the HCl ext. remove Fe, Al, Cr, Ti, Sn, and Zr by a basic benzoate treatment. Take the benzoate ppt., dissolve in a little 6.5 *N* HCl and ext. $FeCl_3$ with ethyl or isopropyl ether and add the aq. soln. to the main soln. When trace metals are accumulated from the acid soln. of the ash, Fe is also detd. by dithizone and oxine. Ash the pptd. dithizonates and oxinates with the addn. of $HClO_4$, dil. suitably and use a blow-out pipet for introducing the soln. into the flame.

3707. GORBACH, G. AND POHL, F.
III. Enrichment and Spectral-Analytical Determination of Trace Metals.
Mikrochemie ver. Mikrochim. Acta, **38**, 335–41 (1951).
C. A., **46**, 2444b (1952).

The Feussner condensed high-tension sparking (*C. A.*, **27**, 3894) was used with Be as reference element, with lines 2348.6, 2650.9, and 3131.4 A. After the enrichment, as little as 10^{-6}–10^{-8}% of element can be detected in a 20-g. sample.

3708. GORBACH, G. AND POHL, F.
Microchemical Enrichment Procedure in Spectral Analysis.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 486–94 (1951).
C. A., **45**, 5054g (1951).

By the use of org. reagents which form inner complexes with trace elements, which complexes are sol. in $CHCl_3$, the desired enrichment can be effected by forming the complex and extg. in $CHCl_3$. Many org. reagents are suitable for such work. An extn. scheme is outlined in which interference of Fe is prevented by carrying out the $C_6H_5CO_2$-NH_4 sepn. and also by extg. $FeCl_3$ with ether. Then the trace metals are extd. after forming complexes with dithizone or 8-quinolinol.

3709. GORDINSKIĬ, S. M., ZOLINA, Z. M., KRAPIVENTSEVA, S. I., SHELUDYAKOVA, M. P., AND SHIRSKAYA, V. A.
Sanitary Working Conditions in Spectral Analysis Laboratories.
Gigienafi Sanit., **1951**, No. 3, 32–8 (1951).
C. A., **45**, 10119e (1951).

In research and industrial labs. concn. of O_3 may reach 2.5–2.8 mg./cu. m., causing lowered efficiency of personnel (0.1 mg. is accepted as the threshold limit). Oxides of N are usually about 0.006–0.0017 mg./cu. m., and CO is important only in labs. working with graphite electrodes, where an atm. concn. of 0.03 mg./l. may occur. Metal oxide vapors vary. The effects on vision are serious and frequent cases of nervous disturbances, hypertony, and irritation of the upper respiratory tract are found. Improved shielding and ventilation are recommended.

3710. GOTO, H. AND OTSUKI, T.
Quantitative Emission-Spectrum Analysis. V. Determination of Magnesium in a Nodular Graphite Cast Iron.
Nippon Kinzoku Gakkai-Shi, **B15**, 181–3 (1951).
C. A., **47**, 8580e (1953).

Quant. emission-spectrum analysis of 0.02–0.15% Mg in a nodular graphite cast iron was carried out with the Qu 24 quartz spectroscope (Carl Zeiss) and a porous C electrode (6 mm. diam. × 9 mm.). The standard soln. series was made from HCl solns. of pure Fe contg. known amts. of Mg. The amt. of Mg in a sample soln. in HCl (placed in the hole of the upper electrode) was detd. from the ΔS of the line pair, Mg 2802.7 Å.-Fe 2788.1 A. The mean deviation of ΔS of the standard soln. on the calibration curve by this procedure was ±4.96%. This method was applied to the detn. of 0.02–0.15% Mg in some nodular graphite cast irons. The relative accuracy in comparison with chem. analysis was ±5.75%.

3711. GUELBENZU, M. DEÁN
Note on the Content of Trace Elements in Wine and Vinegar Ash.
Anales bromatol. (Madrid), **3**, 319–22 (1951).
C. A., **46**, 10527h (1952).

Semiquant. spectrochem. analyses of ash from white wine and from vinegar from the same wine are compared with the analysis of white grapes. (Cf. *C. A.*, **46**, 3896b.)

3712. GUELBENZU, M. DEÁN
Spectrographic Analysis for Trace Elements.
Anales real acad. farm., **17**, 237–66 (1951).
C. A., **46**, 3896b (1952).

The results of analyses made during 7 years for several elements in various materials are shown in 8 tables. Ag (limit of detection 10^{-6}) is found in all cereal grains; but is rarely present in soils, water, animal tissues, and plants; fungi and mushrooms are rich in it. Al (10^{-4}) is always present in soils, waters and all animal and vegetable material examd. Ba (10^{-4}) is present in soils, vegetation, and in most animal products; in rats it is found mostly in the bones. Be (10^{-7}) is found in soils and subsurface waters but not in animal or vegetable matter. Co (10^{-5}) is usually present in less than detectable amt., but it

can be detected in fruits, seeds, excepting cereals, legumes, animal organs, and mollusks; rats excrete more in feces than in urine. Cr (10^{-4}) is found rarely in well water but not elsewhere. Cu (10^{-4}) is always present but in quantities less than Fe in vegetation; there is more in animal than in vegetable matter; the amt. in bones of rats decreased from birth to adult while the amt. in blood increased; rat milk has more than that of other animals and there is no decrease in the liver during suckling; and rat spleen is rich in this element. Fe (10^{-5}) is always found; in vegetable matter it is in quantities higher than Cu and Mn; in *Lens esculenta* most is present in the metabolically most active parts of the plant (root nodules and new shoots); in animal matter blood contained most; changes in bones and blood in suckling and adult rats were as given above for Cu; and excretion by rats is mainly in the feces. Li (10^{-4}) is present in all vegetables and in 74% of animal materials tested. Mn (10^{-4}) is always found like Fe and Cu; more is excreted by rats in feces than in urine. Mo (10^{-4}) is similar to Ag in distribution; there is less than the detectable amt. in soils and waters; it is concd. in seeds in a detectable amt.; root nodules of legumes show this element and it may be necessary for N fixation; in animals it is highest in muscle and viscera where metabolism is greatest; more is found in the livers of adult rather than in suckling rats; it is excreted by the rat in both urine and feces. Ni (10^{-5}) is present in all soils, some waters, all vegetation, and in 42% of the animal materials; it decreases with age, like Cu and Fe, in the bones of rats and is excreted mainly in feces. Pb (10^{-5}) is usually found in soils, waters, and animal specimens, but is present in less than half the plant specimens; it is probably not essential to metabolism. Si (10^{-5}) is universally present. Sn (10^{-5}) is not detected in soils and waters, but is found in preserved vegetable food where Fe and Pb were also high; is not considered an essential element. Sr (10^{-3}) is found only in some of soils and waters, not in plant or animal materials. Ti (10^{-5}) is found regularly in the green parts of plants and mainly in the liver of animals. V (10^{-6}) is present in cereal grains, root nodules, seeds and green parts of legumes, and in only 8% of the animal specimens, particularly in bones; it is excreted in feces but is not found in urine. Zr (10^{-4}) was found only in one specimen of wheat. Studies are being made of the trace element content of fodder as related to cattle raising and of normal and diseased human tissues.

3713. GUELBENZU, M. DEÁN
Possibilities of the Spectrochemical Technique for Trace Elements.
Inform. quím. anal. (*Madrid*), **5**, 172–80 (1951).
C. A., **46**, 3895i (1952).

Spectrochem. assay of ash or dried material is useful for certain trace elements. Al, Cu, Fe, Mn, Mg. and at times Ni and Ti exceed the amts. necessary for detection and can be detd. semiquantitatively. Co, Mo, and V need to be concd. for detection. B and Zn cannot be detd. since B is an impurity in the electrodes and Na lines obscure those of Zn. Sparking gives less sensitivity than the arc, but is necessary for some materials which form globules in the electrode. Compression in a graphite pellet can be used. 8-Quinolinol, tannic acid, and thionalide have been used to sep. certain metals and thus conc. the remainder. Fe in blood can be removed from acid soln. by isopropyl ether or Et_2O extn.

3714. GUELBENZU, M. DEÁN., LOPEZ DE AZCONA, J. M., AND SANTOZ RUIZ, A.
Trace Elements in the White Rat.
Rev. españ. fisiol., **7**, 63–79 (1951).
C. A., **46**, 2648e (1952).

The food, feces, urine, bones, skin, muscle, brain, eyes, blood, heart, lungs, stomach (with contents), intestines (with contents), liver, spleen, kidneys, and testicles of lactating and of other adult rats were studied spectrochemically. Al, Cu, Fe, Li, Mn, and Si were found in all organs, while Co, Mo, Ni, Pb, and Ti were found very often, and Ag, Ba, and V less often. Most of the oligo-elements were found in greater quantity in the feces than in the urine; Ag, Ba, Ni, Ti, and V were absent from the urine. All bone samples contained Al, Ba, Cu, Ca, Fe, Li, Mn, Si, and V, but some samples lacked Ni and Pb, and all lacked Ag, Mo, and Ti. The bones of lactating rats contained more Cu, Fe, Li, and Ni than those of other rats, which lacked Ni completely. The blood of lactating rats contained less Cu than that of other rats. The Cu content of liver and spleen and the Ni content of liver were higher in lactating rats. Muscle contained markedly more Ni than did other organs. Pb was distributed very irregularly.

3715. GUNN, E. L.
Spectrographic Determination of Metal Contaminants in Cracking Catalysts—Characteristics of Arc Excitation.
Anal. Chem., **23**, 1354–8 (1951).
C. A., **46**, 1237i (1952).

The moving-plate technique has been employed to investigate the spectrographic excitation characteristics of contaminant and added internal standard elements in cracking catalysts. The intensity in time relationship for a line of each element is detd. and results are correlated with the corresponding behavior of a selected line of the internal standard element. Results indicate that arcing the catalyst sample to depletion does not provide as good precision as that obtained by a somewhat shorter arcing period in analysis. Basic compn. of the catalyst is a

factor which significantly influences the excitation characteristics exhibited by spectra of the contaminant elements.

3716. HANS, A.
An Apparatus for Direct Spectrochemical Analysis.
Rev. universelle mines, **7**, 448–51 (1951).
C. A., **46**, 2347h (1952).

An electronic bridge arrangement is described. It permits the detn. of constituents in steel with a mean square error of less than 0.7%, especially Ni.

3717. HANSEN, J., SKIBA, P., AND HODGKINS, C. R.
Determination of Iron in Used Lubricating Oils (Spectrochemical Analysis).
Anal. Chem., **23**, 1362–5 (1951).
C. A., **46**, 1240a (1952).

A method for the detn. of a wide range of Fe content in used lubricating oils is described. It consists of a spectrochem. procedure capable of yielding accurate analyses of 2–3000 p.p.m. of Fe in used lubricating oils. A fixed quantity of internal standard is added to a weighed amount of sample and 10 drops of the resulting mixt. ashed in the cavity of an electrode. The electrode is designed so that the cavity wall can be easily removed to expose the ash on a conical tip. Satisfactory results were obtained with as little as 5 g. of sample. The over-all accuracy of the method is within approx. ±5% of the amt. present.

3718. HARMON, D. D. AND RUSSELL, R. G.
Impurities in Catalyst Materials—Quantitative Spectroscopic Analysis with an Alternating-Current Spark.
Anal. Chem., **23**, 125–8 (1951).
C. A., **45**, 3751a (1951).

A spectrographic method for the analysis of an Al silicate matrix catalyst for Fe, Ni, V, and Na with Si as an internal standard is described. A high voltage spark source is used with 0.021 microfarad and 0.18 millihenry for Fe, Ni, and V and 0.014 microfarad and 0.36 millihenry for Na. Samples of catalyst were ground to 100 mesh before ignition at 500° for 2 hours. A slide rule for simplifying calcns. is described.

3719. HAWLEY, J. E., LEWIS, C. L., AND WARK, W. J.
Spectrographic Study of Platinum and Palladium in Common Sulfides and Arsenides of the Sudbury District, Ontario.
Econ. Geol., **46**, 149–62 (1951).
C. A., **47**, 8598i (1953).

Most Pt is assocd. with pentlandite and most Pd with chalcopyrite and mixed arsenides; both Pt and Pd occur in pyrrhotite and pyrite. Distribution of the metals in the minerals suggests they are present mainly as finely intergrown minerals with minor amts. in solid soln. In the study, the method of concn. of Pt metals by fusion and cupellation has been further developed and modified. A new spectrographic technique for the analysis of precious metal beads by using Au amalgams has also been developed.

3720. HAWLEY, J. E., WARK, W. J., LEWIS, C. L., AND OTT, W. L.
Spectrochemical Analysis of the Palladium and Platinum Sponge.
Trans. Can. Inst. Mining Met., **54** (in *Can. Mining Met. Bull.*, No. **474**, 669–77 (1951)).
C. A., **46**, 1916i (1952).

Spectrographic methods are described for the analysis of minor constituents, such as the Pt-group metals, Au, Ag, and SiO_2, in Pd and Pt refinery sponge. These involve the conversion of the sponge metals to the black form by reduction with high-purity Al filings in either acid or alk. solns. Standards of known compn. are prepd. in the same manner from either refinery or spectrographically standardized sponge metals. Samples of the black metals are mounted in pellet form and a multisource spark discharge is used for excitation. The range of concns. of impurities studied are those common to refinery samples. For 3 lots of Pt sponge the spectrographic method gave values of 0.059, 0.115, and 0.221% Pd while corresponding chem. values were 0.10, 0.12, and 0.094% Pd, resp. Spectrographic values for Rh were 0.005, 0.052, and 0.028% against chem. values of 0.02, 0.05, and 0.016 resp.

3721. HEERTJES, P. M.
A Spectrographic Method for the Determination of Small Amounts of Copper and Lead (A Correction.)
Chem. Weekblad, **47**, 792–4 (1951).
C. A., **47**, 9210b (1953).
Cf. *C. A.*, **40**, 4314[7].

Two corrections are made to the original report on this method. First, in detg. the Pb content, the soln. is treated with a 50:50 NH_3:HCN mixt., not with NH_3 alone, to make sure that small quantities of Zn do not interfere with the Pb detn. Second, the dithiazone used was not as pure as had been thought. Therefore, new spectral curves are given.

3722. HEIDEL, R. H. AND FASSEL, V. A.
Instrument for Internal-Standard Flame Photometry.
Anal. Chem., **23**, 784–8 (1951).
C. A., **45**, 7875b (1951).

A description is given of a lab. monochromator modified for use as a direct reading internal-standard flame photometer. With the aid of a wedge and mirrors, a line of the element in question and an adjacent internal-standard line are positioned upon two 1P21

photomultiplier tubes, where their intensities are detd. A description of the atomizer and burner is also given. In the detn. of Ca in the rare earths in a concn. range from 0.025 to 2.5% the av. deviation was about ±1.5%.

3723. HEINZELMAN, D. C. AND O'CONNER, R. T.
Trace Metals in Cottonseed Kernels.
J. Am. Oil Chemists' Soc., **28**, 373–4 (1951).

The trace metals in cottonseed kernels were determined spectrochemically as part of an investigation of the influence of environment and variety on the chemical composition. Ashes of twenty samples, including nine varieties, were burned in a d.-c. arc and quantitatively analyzed for Cu, Fe, and Mn by using the spectral line-width method. Magnesium oxide, resulting from ashing the sample with magnesium nitrate, is a suitable spectroscopic buffer and provides a major component line, Mg I 2942.11 Å, for all analyses. The data show a variation from 0.0010 to 0.0021% for Cu, 0.0047 to 0.0089% for Fe, and 0.0009 to 0.0015% for Mn, and average values of 0.0015, 0.0066, and 0.0013% respectively. No typical differences in contents of Cu, Fe, and Mn were associated with variety and location of growth. All samples contained traces of B and Zn, but were free of Al, Cr, Ni and Sn.

3724. HOLLEBON, A. B. AND FINLAYSON, J. F.
Instrumental Methods of Analysis.
Proc. Australasian Inst. Mining and Met., Nos. **162–163**, 121–36 (1951).
C. A., **47**, 10393e (1953).

Spectrographic methods are included as follows: Analysis of refined lead: Spectrographic conditions for detg. Cu, Fe, Zn, Bi, Sb and Ag in 1.5 hrs. are given. Determination of the lime-silica ratio in blast-furnace slag: A statistical survey shows a relation between CaO/SiO_2 and Pb content. Spectrographic conditions are given.

3725. HÖRMANN, H.
Development Errors in Spectrochemical Analysis
Veröffentl. wiss. Photolab. AGFA, **7**, 508–13 (1951).
C. A., **47**, 12100i (1953).

Agfa Spektral Blau Extrahart spectrographic plates were exposed under carefully controlled conditions and developed by (*1*) tray development, with and without stop bath, (*2*) mechanically agitated development, and (*3*) brush development in which the plate was stroked with a long-haired brush. The d. differences followed a Gaussian law, and the mean square deviation of the plates could be calcd. from error theory. Procedure (*3*) gave the best results, although mech. development sufficed in most cases. Tray development should not be used if reproducible results are required.

3726. HOSPADARUK, V., FRANKENBERG, B., AND NEUFELD, A. H.
Flame Spectrophotometry. I. Standardization of the Instrument.
Can. Med. Assoc. J., **65**, 264–5 (1951).
C. A., **46**, 2441d (1952).
Cf. *C. A.*, **46**, 2609a.

Detailed procedures are given for establishing the optimum flame characteristics for any metallic element. Techniques for handling operational difficulties are described.

3727. HUNTER, F. R. AND BERENDA, G. D.
The Use of the Flame Photometer for Analyses of Blood.
J. Biol. Chem., **192**, 701–6 (1951).
C. A., **46**, 2119e (1952).

In detg. the amt. of K in blood serum a correction should be applied for the K contributed by hemolyzed erythrocytes. The amt. of Na in erythrocytes should be cor. for the Na in the serum which is included with the cells. A comparison of 3 different methods of treating blood and erythrocytes prior to analysis for K and Na yielded similar results.

3728. INAGAKI, M.
Spectroscopic Analysis of Inorganic Matters in Coal.
J. Coal Research Inst. (Japan), **2**, 229–34 (1951).
C. A., **49**, 7221a (1955).

(I.) Qual. analysis by spectroscopy was worked out for vitrain, durain, and their ash obtained from 15 coals. Generally observed elements were: Si, Al, Fe, Mg, Ca, Na, K, Ti, Mn, B, P, Zn, and Cu. Elements existing in minor quantity were: Be, Ga, V, Ni, Mo, Ag, Pt, Ge, As, Cr, Pd, In, Hg, Sn, and Co. No special difference in the kind of existing elements was found between petrographical components or between original coal and ignited ash.

(II.) Ibid, 262–8.—The contents of Si, Al, Fe, Ca, Mg, and Ge in coal ash were detd. by the "Flux" spectroscopic method and compared with the chem. analysis.

(III.) Ibid. 379–88.—Further description of analysis of Ge in various parts of Kayanuma (Hokkaido) coal is given. Ge content in ash was 0.017–0.26%. In some samples, Ge was concd. in the vitrain portion. The spectroscopic detn. of P and Ga was also tried.

3729. INMAN, W. R., ROGERS, R. A., AND FOURNIER, J. A.
Determination of Sodium and Potassium in Lithium Metal by a Flame Photometer
Anal. Chem., **23**, 482–3 (1951).
C. A., **45**, 5566h (1951).

Na in the range of 1% to as low as 0.001% and K in amts. less than 0.01% are readily detd. with a flame photometer; a blue-sensitive photocell is used for Na and a red-sensitive cell for K. Appropriate curves are

constructed to correct for the small neg. error caused by the presence of Li. The analysis is made by first detg. the lowest range in which the unknown can be analyzed. Next, the O point is set with distd. water, and the top of the curve with the standard soln. Then a reading of the unknown is taken, to get an approx. true value. The final figure is obtained by averaging several readings; the calibration points are checked each time on the reference curve. Na and K in the order of 0.01% can be detd. in Li metal with an accuracy of 10%, the error being pos. The limit of detection is about 0.02 p.p.m. Greatest accuracy is in the 0–2 p.p.m. range, while in higher ranges there is a suppression of about 10% for K and 7% for Na. This neg. error increases with increasing concn. of interferent, although there is a tendency for the percentage error to level off at about 6000 p.p.m. Li. It is possible to obtain results accurate to 2% of the amt. of ion present.

3730. IRWIN, B. L. AND SCHUCK, C.
Sodium Values of a Selected Group of Foods.
J. Am. Dietet. Assoc., **27**, 98–100 (1951).
C. A., **45**, 3526a (1951).

Foods for which variations in the Na content as reported in the literature were greatest were analyzed by the flame photometry method. Data on the Na contents of bananas frozen vegetables, beef broth, enriched farina, and onions are also presented.

3731. JAFFE, H. W.
The Role of Yttrium and Other Minor Elements in the Garnet Group.
Am. Mineralogist, **36**, 133–55 (1951).
C. A., **47**, 6828a (1953).

The minor and trace elements were detd. in 78 garnets. It was found that certain trace and minor elements are characteristic of particular varieties of garnet. Y is very prevalent in spessartites, in some instances in concns. greater than 2% Y_2O_3. The assocn. of Y and Mn suggests Y^{3+} ions with an ionic radius of 1.06 A. have replaced Mn^{2+} ions with an ionic radium of 0.91 A. The substitution scheme is Y^{3+} Al^{3+} for Mn^{2+} Si^{4+}. Sc is most abundant in pyropes, with Sc^{3+} with an ionic radius of 0.83 A. substituting for Mg^{2+} (0.78 A.) or possibly Fe^{2+} (0.83 A.). Zn is common in Mn, Fe, and Mg-rich garnets, proxying for Fe^{2+}. Other trace elements detected include Ga, Ti, Cr, Na, Li, Dy, Gd, Ho, Yb, Er, La, Ce, Nd, Pr, Sr, F, V, B, Be, Ge, Sn, Pb, Cu, and Nb. Also given are 7 new detns. of Y_2O_3, and x-ray *d* spacings for 5 spessartites.

3732. JANIEC, J.
Extraction of Impurities in Aluminum Alloys by Arc Spectra.
J. Applied Chem. (London), **1**, 482–8 (1951).
C. A., **46**, 2464g (1952).

Data utilizing a specific d.-c. spark app. are given; an internal comparison method is used for evaluation. Accurate and reproducible results are obtained in agreement with chem. analysis.

3733. JOHNSTON, D.
Spectral Excitation of Powdered Refractory Materials.
Metal Treatment, **18**, No. 67, 270–1 (1951).
C. A., **45**, 8221e (1951).

SiO_2 refractory samples of known Al_2O_3 content were held in a glass reservoir, and allowed to fall through a central hole in graphite electrodes forming the discharge gap of a spark circuit. Variation in the rate of fall is averaged out by increasing the exposure time and moving the photographic plate across the aperture of the spectrograph, parallel to the slit so that the spectral lines are drawn out to a length of about 4 cm. This enables several readings of the same selected line pair to be made.

3734. JONES, H. W.
The Flame Spectrophotometer. Its Employment in a Clinical Laboratory.
Bull. Mason Clin., **5**, 15–17 (1951).
C. A., **46**, 4604d (1952).

A discussion of applications is given.

3735. KAISER, H.
A "Perfect" Calculating Board for Spectrochemical Analyses.
Spectrochim. Acta, **4**, 351–65 (1951).
C. A., **46**, 2347f (1952).

A calcg. board is described which makes it possible to derive analyses from the observations of a spectrum as follows: First, by a cylindrical diagram the usual Seidel transformation can be carried out as a preliminary to drawing the calibration line. For the correction of backgrounds, or of interfering line effects, Gaussian subtraction logs are incorporated into a special slide. The mathematics of various methods of evaluating spectra are outlined in such a way as to show that each method can make use of this calcg. board; and its use is illustrated by a few examples in diagrammatic form.

3736. KARMILOVA, L. V. AND KONDRAT'EV, V. N.
Measurement of the Concentration of Oxygen Atoms in Flames.
Zhur. Fiz. Khim., **25**, 312–22 (1951).
C. A., **45**, 7869b (1951).

Gaydon's suggestion to use the light output on the reaction $NO + O \rightarrow NO_2 + h\nu$ as a means of measuring the concn. of at. O in flames forms the basis of a quant. method, which is applied to CO-O_2 flames. The temp. of these flames is detd. by the Na *D*-line reversal method. Preliminary expts.

with CO-air flames give temps. in agreement with those found earlier (Loomis and Perrott, *C. A.*, **22**, 4340). Since the temp. of $CO-O_2$ flames is too high for the optical pyrometer, an extrapolation is necessary; a linear relationship is found between the temp. T (in °K.) and $\sqrt{i}$, where i is the current passing through the filament of the lamp in the temp. measurement app. A straight line fitting exptl. data obtained between 1000 and 2250°K is extrapolated to higher temps. The temp. of a $CO-O_2$ flame (stoichiometric mixt.) is thus 2730 ± 50°K. Addn. of NO (0.6 to 20%) decreases this temp. by 37° on the av.

3737. KAYE, W., CANON, C., AND DEVANEY, R. G.
Modification of a Beckman Model DU Spectrophotometer for Automatic Operation at 210–2700 mμ.
J. Optical Soc. Am., **41**, 658–64 (1951).
C. A., **46**, 344c (1952).

A Beckman Model DU quartz spectrophotometer has been modified to record automatically absorption spectra from 210 to 2700 mμ. This improvement has been achieved through replacement of the red-sensitive phototube with a lead sulfide cell, replacement of the ultraviolet-sensitive phototube with an IP28 photomultiplier tube, provision of a rotating, slotted drum to interrupt the light beam, and use of an electronic recorder. The null meter circuit of the spectrophotometer can be used if desired. All of the standard Beckman accessories can be used without modification. In view of the demonstrated resolving power the ruggedness, and the relatively low cost of this modified instrument, it is believed to open a new field for analysis.

3738. KEIL, A.
Spectrochemical Investigation on the Beryllium Effect in Magnesium Alloys.
Z. Metallkunde, **42**, 13–16 (1951).
C. A., **45**, 4626a (1951).

The inflammability hazard of Mg alloys (92 Mg, 8 Al) is reduced by the presence of 0.004 to 0.006% Be. By local spectroscopic investigation it is shown that the protective effect of the small addn. of Be results from its enrichment at outer layers of the alloy caused by diffusion of the Be.

3739. KIESS, C. C.
Description and Analysis of the Second Spectrum of Chromium, Cr II.
J. Research Natl. Bur. Standards, **47**, 385–426 (1951)(Research Paper No. 2266).
C. A., **46**, 3395c (1952).

This analysis of Cr II is based on new wavelength measurements and estd. intensities, and on new observations of the Zeeman effect. Of approx. 2100 lines listed in the Tables, 89% have been classified as combinations of the levels of 48 even terms with levels of 51 odd terms. The even terms arise from the electron configurations $3d^5$, $3d^4\ 4s$, and $3d^3 4s^2$, the odd terms from the configuration $3d^4 4p$. No odd terms from the configuration $3d^3 4s 4p$ have been established. High even terms from the excited configurations $3d^4 4d$ and $3d^4 5s$ have been found that form Rydberg series with terms from the low even configurations. From them an ionization potential of 16.49 e.v. has been derived for the work required to convert a singly ionized Cr atom in the $a^6S_{2\frac{1}{2}}$ state to a doubly ionized atom in the a^5D_0 state. The terms of the $3d^3 4s^2$ configuration lie high in the energy scale, and only a few relatively faint combinations between them and the odd terms have been found.

3740. KIMURA, K., SAITO, N., SAITO, K., AND IKEDA, N.
Tracer Study on the Volatilization of Indium from the Electrode in Spectrographic Analysis.
J. Sci. Research Inst. (Tokyo), **45**, 133–7 (in English) (1951).
C. A., **46**, 833h (1952).

With radioactive In^{113} as a tracer it was detd. that volatilization of In from the electrode is complete after 50 sec. excitation in a continuous arc (4 amp., 30 v.). In the interrupted-arc method (5 amp. peak, on 0.6 sec., off 1.2 to 1.8 sec.) more than half the In remains on the electrode after an effective arc excitation of 1 min.

3741. KING, W. H., JR. AND PRIESTLEY, W., JR.
A Modified Recording Flame Photometer.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 97–103, discussion 104 (1951).
C. A., **47**, 7264e (1953).

A Beckman flame photometer modified for use as a recording instrument is described. A photomultiplier detector sensitive to low light intensity permits the detection of small amts. of many elements. The recorded flame spectra show the presence of elements not otherwise detectable. The method is rapid and zero drift, sensitivity drift, and aspirator change difficulties are compensated.

3742. KINGSBURY, G. W. J. AND TEMPLE, R. B.
Spectrographic Determination of Hafnia in Mixtures of Hafnium and Zirconium Oxides.
J. Applied Chem. (London), **1**, 406–11 (1951).
C. A., **46**, 3903h (1952).

A method for the quant. analysis of nonconducting solids was developed and applied to the detn. of HfO_2 in ZrO_2-HfO_2 mixt. over the range 0.01–55%. Not more than 10 mg. of oxides is required; this is applied to

the end of flat graphite electrodes by a drop of Bakelite varnish and excited by means of an impulse arc. Most suitable line pairs have been found to be ZrI 2647.8A. and Hf II 2641.-406A. for 0.01–1% HfO_2, and Zr 2545.6A. and Hf 2548.2A. for 1% and 50% HfO_2.

3743. KIPLINGER, C. C.
A Quantitative Sodium Flame Test.
J. Chem. Education, **28**, 641 (1951).
C. A., **46**, 3807i (1952).

The simple spectrophotometer described was devised from a Bunsen-type spectroscope by fastening a square of polaroid in front of the telescope objective and placing a small disk of polaroid in the eyepiece tube. An ordinary brass protractor, fitted with a pointer served as a scale. The calibration curve for the instrument was based on the extinction angles of flames produced by NaCl solns. of known molarity.

3744. KIRCHGESSNER, W. G.
A New Deflection Type Densitometer.
Rev. Sci. Instruments, **22**, 289–92 (1951).
C. A., **45**, 7829f (1951).

The design and performance of the Bausch and Lomb 33–84-91 densitometer is discussed. The instrument has a vertical principal optical path. Light from a closely coiled filament is directed by two different paths to illuminate selected areas of the plate to be measured. By one path the light passes through a heat-resisting filter and is focused by a system of condensing lenses in the plane of the emulsion surface of the spectrum plate which is held in a horizontal position. By the second path, another system of lenses, which includes an orange filter, receives light from the same source and illuminates at reduced intensity an extended area of the spectrum. A projection system of high resolving power and high numerical aperture projects an enlarged (16X) image of the illuminated area on a vertical screen. The instrument is equipped with a second illuminating and projecting system for projecting a comparison spectrum. A photoelec. cell serves as a detecting device; the current developed is read on a Weston meter. The meter scale is graduated in units of 1% from 0 to 100%. A "range switch" placed in the line between the photocell and amplifier aids in measuring more accurately lines of high d. The densitometer may be used as a recording unit by connecting to a com. recorder by insertion of a jack plug into the base of the instrument. In testing the stability of the instrument, a line voltage variation of ±10% gives an error of less than 0.5%. The "range switch" makes possible measurements of photographic ds. up to 3.0. The max. departure from linearity is 0.3% of full scale deflection.

3745. KLIMECKI, W.
Use of the Spectrograph in Industrial Analytical Laboratories.
Przemysl Chem., **30**, 652–60 (1951).
C. A., **46**, 10697h (1952).

The advantages which favor wide application of spectroscopy in industrial analytical labs. are outlined.

3746. KLIMECKI, W. AND KURYLOWICZ, J.
Spectrographic Determinations of Impurities in Zinc and Its Alloys.
Prace Glównego Inst. Met., **3**, 97–114 (1951).
C. A., **46**, 3903d (1952).

Methods of spectrographic detn. of several impurities in Zn and its alloys used for die casting are described. The first part of this paper deals with the detn. of the In in Zn. Two methods are described; one, employing sample and a standard soln., the other is based upon spectra excited by means of different a.-c. arcs. Flat-surface technique proved to be of considerable value for detg. Sn, Cd, and Pb impurities in casting alloys. A comparatively simple method is given. The metal being tested is used as the lower electrode and a pure C pencil serves as the upper one. Several types of a.-c. arc generators were examd., the Pfeilsticker type was found to be the most suitable. A method of prepg. synthetic standards is described. Numerous graphs and tables are included.

3747. KNICKMANN, E.
Flame Photometry.
Z. Pflanzenernähr. Düngung Bodenk., **54**, 117–24 (1951).
C. A., **46**, 8565e (1952).

An address discussing the development, the sensitivity and selectivity of interference, and color filters suitable for detn. of Na, K, and Ca by flame photometry.

3748. KNIGHT, S. B., MATHIS, W. C., AND GRAHAM, J. R.
Mineral Analysis with the Flame Photometer.
Anal. Chem., **23**, 1704–6 (1951).
C. A., **46**, 4417e (1952).

A report is given on the detn. of Na, K, and Ca in minerals by the flame photometer. Samples (1 g.) were dissolved by fuming with 10 ml. of 47% HF and 15 ml. of 70% $HClO_4$ and dild. to 100 ml. in a borosilicate-glass volumetric flask. Aliquots were taken so that the final Na or K concns. were about 15 p.p.m., and the Ca concn. was about 30 p.p.m. It was found that the direct-reading method is not as reliable as the internal-standard reading. In no case did the latter method give completely unreliable results. Some interference curves were prepd. to det. the effect of several alkalies and alk. earths on each other. Attempts. to correct for the presence of foreign ions was not very successful when more than one foreign ion was

present. An enhancement of K readings was caused by Na. There seemed to be no explanation for this effect, therefore, it was attributed to the instrument used. Errors caused by foreign ions appeared to be due to photochem. effects and not to light leakage through the instrument. Interference curves made with the internal standard method usually resulted in less enhancement or repression than those made by the direct-reading method. It was found that the optimum concns. of Na and K for final readings of the concn. of either were between 10 and 20 p.p.m. The Ca concn. should be twice as great.

3749. KOCH, G. P., TAYLOR, W. J., AND JOHNSON, H. L.
Recording Grating Spectrometer with Linear Wavelength Scale.
J. Optical Soc. Am., **41**, 125–30 (1951).
C. A., **45**, 3717g (1951).

A large Wadsworth grating spectrometer designed primarily for photoelec. recording is described. Important features of the instrument are an arrangement which permits any wavelength interval up to the full range of the spectrometer to be scanned in one continuous operation and a wave-length scale which is linear over the entire spectral range (2000 to 14,000 Å.). The linear scale results in part from scanning the spectrum on the grating normal, a condition which leads also to min. aberrations in the spectral image. Provision is made for indicating on the spectrum record reference marks which denote equal increments of wavelength. Multiplier phototubes, operating at liquid-*N* temp., are used in the photoelec. recording system. The scanning slit (or photographic plate) is maintained automatically on the focal curve by a simple focusing device. The spectrometer is fully adaptable to photographic work and can be converted from photoelec. recording (or vice versa) in about 5 min.

3750. KUDELYA, E. S.
Spectroscopic Investigation of Seam Welds.
Doklady Akad. Nauk S.S.S.R., **76**, 395–7 (1951).
C. A., **46**, 83e (1952).

A high-frequency elec. discharge was used in spectroscopic analysis of a 0.002 to 0.003 mm. layer on the surface of welds on steel. Stationary rods of Cu or Zn were used as electrodes and were sharpened to truncated cones 1 mm. in diam. in the working section. The arc spacing was 0.5 mm. and was 5 to 8 mm. from the 0.02 mm. slit. No condenser was used. Exposure time was 20 sec. In a steel contg. Cr 0.28, Mn 0.76, and Si 0.31%, the amounts of these elements in layers below the weld surface were: 0.003 mm., 0.15, 0.36, 0.08; 0.005 mm., 0.20, 0.57, 0.17; 0.010 mm., 0.18, 0.61, 0.20; 0.015 mm., 0.27, 0.72, 0.23; 0.050 mm., 0.28, 0.76, 0.31; 0.500 mm., 0.27, 0.77, 0.31%. The thinner the affected layer, the easier is the slag covering removed from the weld. In 4 steels alloyed with Cu 6.2, Cr 19.6, W 10.3, and Ti 11.7%, resp., the surface layers in which hot cracking occurred had Cu 18.3, Cr 30.2, W 14.5, and Ti 18.1%. Hot cracking was caused by a low-melting eutectic in the Cu alloy and by carbides in the others.

3751. KURAOKA, K., TAKAHASHI, K., AND HARA, K.
Spectrochemical Analysis of Silicates. I. Determination of Iron, Titanium, and Manganese.
Repts. Govt. Chem. Ind. Research Inst. (Tokyo), **46**, 279–85 (1951).
C. A., **46**, 4425h (1952).

Mix the silicate (ceramic materials) with $SrCO_3$ and C (11:1:4), stuff into a center-post C electrode, and flash from a C arc anode 3 mm. away with a d.-c. (stabilized at 7.5 ± 0.5 amp. with a 50-microfarad condenser and a 150-millihenry coil connected in series in the circuit) and the initial gap voltage 150 v. Evaluate the spectral lines thus obtained with internal-standard Sr lines 2569.50 and 2931.83 A. The analytical range (unaffected by the SiO_2 and Al_2O_3, constituting the bulk of the materials) thus detd. was 0.01–15 for Fe_2O_3, 0.05–10 for TiO_2, and 0.01-5.0% for MnO_2.

3752. KURAOKA, J., TAKAHASHI, K., AND HARA, K.
Spectrochemical Analysis of Silicates. II. Determination of Alkali (Sodium and Potassium) and Alkaline-Earth (Calcium and Magnesium) Metals.
Repts. Govt. Chem. Ind. Research Inst. (Tokyo), **46**, 286–91 (1951).
C. A., **46**, 4425i (1952).

The analytical range was 0.5–4.8 for Na_2O, 0.6–10 for K_2O, 0.30–25 for CaO, and 0.05–2.0% for MgO.

3753. KURAOKA, K., TAKAHASHI, K., AND HARA, K.
Spectrochemical Analysis of Silicates. III. Determination of the Major Constituents Silica and Alumina.
Repts. Govt. Chem. Ind. Research Inst., **46**, 292–6 (1951).
C. A., **46**, 4426a (1952).

The Al_2O_3 was detd. within the range 1.40–27.4%, but the SiO_2 could not be detd. by the internal-standard method because of its bulk, and was calcd. from SiO_2 = [100% − (minor constituents + ignition loss)] (1 + Al_2O_3/SiO_2).

3754. LANGE, B.
A New Flame Photometer.
Dechema Monograph, **17**, 149–59 (1951).
C. A., **47**, 3621e (1953).

The history of flame photometers is reviewed. Lange's new instrument is described,

and a table of wavelengths and sensitivities of various elements is given.

3755. LAWRENCE, L. J.
Notes on an Occurrence of Native Tin at Emmaville, N.S.W.
Australian J. Sci., **14**, 82–4 (1951).
C. A., **46**, 4429c (1952).

A small specimen (5.5 mm. × 2.5 mm.) of native tin was found in alluvial cassiterite. Spectroscopic analysis showed the presence of 95–97% Sn, with Pb and other undetd. impurities.

3756. LEPPÄNEN, V. AND FORSANDER, O.
Flame Photometric Determinations of Potassium and Sodium in Biological Fluids.
Scand. J. Clin. Lab. Invest. **3**, 33–40 (1951).
C. A., **46**, 161g (1952).

A discussion on the operation of a Wallace type (*J. Lab. Clin. Med.*, **37**, 621 (1951)) internal standard (Li) flame photometer (diagrams included) and its application to clinical analysis of Na and K in biol. material.

3757. LEVI, G. R.
Direct, Quantitative Analysis of Sodium, Potassium, and Other Metals.
Chimica e industria (Milan), **33**, 9–11 (1951).
C. A., **45**, 5566g (1951).
See C. A., **45**, 62b.

3758. LEYTON, L.
Improved Flame Photometer
Analyst, **76**, 723–8 (1951).
C. A., **46**, 1821h (1952).

The design, construction, and performance is described of a relatively simple flame photometer with improvements in reliability and performance. The use of a concentric type of atomizer and a new burner system enables reliable results to be obtained on less than 1 ml. of soln. contg. 0.2 p.p.m. of K and 0.5 p.p.m. of Ca. Selectivity has been increased by the introduction of interference filters.

3759. LOPEZ DE AZCONA, J. M. L. AND JIMENO-MARTÍN, L. J.
Influence of the Presence of Tin in Lead, and *vice versa*, on the Spectrochemical Analysis of the System Zinc-Lead-Tin Rich in Zinc.
Spectrochim. Acta, **4**, 265–79 (1951).
C. A., **45**, 7916i (1951).

The influence of Sn on the spectrochem. evaluation of Pb, and *vice versa*, with Zn as a base element, is studied both in solns. prepd. from Zn dissolved in HNO_3 with addns. of $Pb(NO_3)_2$ and $SnCl_2 + 2H_2O$ and in metallic electrodes obtained by melting Zn, Pb, and Sn. The analytical lines are selected in which the effect of the third element is most marked. This effect is statistically studied and compared to the error due to the method of evaluation. In the evaluation of Pb in the solns. studied there is an influence of Sn which gives an apparent increase in the values of Pb. The difference between the apparent values and the real ones increases constantly until a concn. of 6 at. % Sn, with respect to Zn, is reached. As to the alloys, there is also an apparent increase of the Pb content. In the same solns. if one wants to evaluate Sn in the presence of Pb, the results obtained are very high, and show a tendency to become stable at approx. 10 at. % Pb. An empirical correction, the application of which to the evaluation of Pb has reduced the dispersions to nonsignificant values, is statistically demonstrated.

3760. LOUNAMAA, N.
Spectrographic Analysis of Pure Tungsten Oxide.
Spectrochim. Acta, **4**, 400–12 (1951).
C. A., **46**, 2960h (1952).

The semi-quant. method for the detn. of 20 elements occurring as impurities in WO_3 is described. Owing to the use of a large sample in the anode, from which only the impurities are distd., the bulk of the sample is reduced by C to W and thus made nonvolatile. By establishing a quant. procedure for some elements and by choosing suitable internal standard elements, the behavior of the various elements as regards volatility and their cathode-layer effect was thoroughly studied. The internal-standard principle was adopted in a form with not only a single element as internal standard but the combination of 2 elements similar to the element to be detd.

3761. LUNDEGÅRDH, H.
Leaf Analysis.
Translated by R. L. Mitchell. Hilger & Watts, London (1951), 176 pp.
C. A., **45**, 7286b (1951).

Methods of sampling and preparation for analysis are given (pp. 109–110), and methods of chemical and spectrographic analysis are described (pp. 111–125). The Lundegårdh flame method is discussed, including an automatic device for analyzing a series of solutions. The arc method was not found satisfactory for detn. of P. The flame detn. of K, Ca, etc., combined with colorimetric detn. of P is recommended.

3762. LUTHER, H.
The Development of Spectroscopic Methods for the Analysis of Petroleum Products.
Erdöl u. Kohle, **4**, 387–94 (1951).
C. A., **45**, 9842a (1951).

A review.

3763. MACDONALD, N. S., NUSBAUM, R. E., STEARNS, R., EZMIRLIAN, F., MCARTHUR, C., AND SPAIN, P.
The Skeletal Deposition of Nonradioactive Strontium.

J. Biol. Chem., **188**, 137–43 (1951).
C. A., **45**, 3925e (1951).

The chronic toxic effects of Sr lactate in the drinking water of growing mice are described. . . . A spectrographic method for the quant. simultaneous detn. of Ca and Sr in bone ash is described.

3764. MACQ, M.
Electron-Multiplier Cell and Its Application to Direct Analysis.
Congr. groupement avance. méthodes anal. spectrograph. produits mét., **14**, 25–61 (1951).
C. A., **46**, 6438f (1952).

A description is given of a photomultiplier cell, RCA type IP28, used in conjunction with a spectrograph to give an instrument capable of direct analysis of line-spectrum intensities. The elec. and mech. details of recording, amplifying, and calibrating the photocurrents produced are described.

3765. MALAMAND, F.
Spectrographic Analysis of Surface Metallic Layers Obtained by the Thermal Diffusion of Chromium Into Iron and Steel.
Compt. rend., **232**, 236–8 (1951).
C. A., **45**, 6555e (1951).

The sample is automatically displaced parallel to the optical axis of the spectrograph at a rate of 0.5 mm./sec. A fixed counter-electrode of Ag is also used. The movement minimizes local attack of the spark and reduces error from inhomogeneity. Analysis in the previously impossible range 30–50% Cr can be done. The lines photometered are Fe II 2599.39 A., Cr II 2677.15 and Ag I 3280.68, and Cr II 3132.05. The mean quadratic error for 45 analyses is ±2.3% for the Fe-Cr couple and ±4% for the Ag-Cr couple. This method combined with a 30 sec. electrolytic polishing at 20 amp./sq. dm. in a bath, 2/3 acetic and 1/3 perchloric acids, is used to det. the depth of Cr penetration in Fe and steel exposed to Cr at 1075° for two hrs. Each polishing removes a 0.005 mm. layer. The % Cr in the 0.01-mm. surface layer is higher than below the surface and its concn. drops faster as the % C in the sample is increased. For Fe with 0.014% C (I), the surface is 45% Cr; for steel with 1.2% C (II), the surface is 70% Cr. The curves, % Cr *vs.* depth, show a discontinuity at 13% Cr. This occurs at a depth of 0.13 mm. for I at 0.035 mm. for II. It is presumed as due to a difference in the rate of diffusion due to a change of phase of the Fe-Cr system at 13% Cr.

3766. MALAMAND, F.
Spectrographic Analysis of Superficial Metallic Layers. Application to Layers Obtained by the Thermal Diffusion of Chromium in Iron and Steel (Chromization).
Congr. groupement avancement méthodes anal. spectrograph. produits mét., **14**, 85–113 (1951).
C. A., **46**, 6990c (1952).

Chromized surface layers of Fe and steel alloys were analyzed spectrographically with only superficial volatilization by the elec. discharge by using a very feeble spark and by sample movement during excitation. A counter electrode of Ag is used since it has few lines and does not interfere with the analysis lines of Cr and Fe. Sparking conditions are: 10,000 v., 1500-cm. capacity, 80,000-cm. inductance, and 150-ohm resistance. The 2677.159 Å. line of Cr and the 2599.39 Å. line of Fe were used as suitable lines. The Fe and steel samples were chromized by a thermal process in the vapor phase at 1075° for 2 hr. Curves are given showing the Cr concn. as a function of depth at various C contents, for Fe and steel with and without decarburization.

3767. MALAMAND, F.
Spectrographic Analysis of Protective Surface Layers of Metallic Alloys. Application to Chromium Layers.
O.N.E.R.A. (*Office natl. études et recherches aéronaut.*), **1951**, No. 22, 27–31.
C. A., **46**, 2959a (1952).

The propulsion methods now used and envisioned in aeronautics necessitate the protection of certain metallic surfaces against intense erosive action of hot, swiftly flowing gases. Diffusion layers constitute one means of protection that is particularly effective. Their constitution and the diffusion phenomenon itself is capable of study by spectrographic methods, especially when classical chem. analysis is inapplicable. A spectrographic method of analysis is described, which, when used in conjunction with electrolytic polishing, is capable of giving a quant. distribution of metal in the zone of diffusion. This method is illustrated by applying it to the diffusion of Cr in the layer obtained by the thermal chromization of steel. At least 20 analyses can be performed in a total depth of 0.1 mm.

3768. MANSFIELD, W. O., JR., FUHRMEISTER, J. C., AND FRY, D. L.
Spectrographic Determination of Halogens and Sulfur in Engine Deposits.
J. Optical Soc. Am., **41**, 412–16 (1951).
C. A., **45**, 7468a (1951).

Methods are described for the detn. of Br, Cl, S, and Pb in Pb-C matrices with ordinary spectrographic equipment. One to two mg. of powd. sample dild. with an equal wt. of pure Zn powder are pressed into the end of a pure Ag pellet which is sparked against a pure Ag counter-electrode. Corrections for background are necessary. By properly blowing He through the analytical gap during the exposure, background corrections are elimi-

nated and detectability is enhanced. Spectra are shown for comparison. Min. detectability of the order of 0.05% is indicated for qual. work. Analytical curves covering the concn. ranges 1–10% for Cl and S, 1–16% for Br, and 25 to 50% for Pb have been used to analyze engine deposits with an accuracy of ±15% of the amt. present. Excitation conditions are given for two sources (one com.) as used with two different spectrographs. Lines and line pairs used are listed.

3769. MARTÍN, L. JIMENO.
Auxiliary Ionization in Spectrographical Chemistry. IV. Application of the Flame in the Analysis of Gun Metal.
Anales real soc. españ. fís. y quím. (Madrid), **47B**, 709–12 (1951).
C. A., **46**, 10040e (1952).
Cf. *C. A.*, **45**, 10050e.

A British method for flame analysis of gun metal is described.

3770. MARTÍN, L. JIMENO AND SANCHEZ SERRANO, E.
Auxiliary Ionization in Spectrochemistry. III.
Anales real soc. españ. fís. y quím., **47B**, 175–6 (1951).
C. A., **45**, 10050e (1951).
Cf. *C. A.*, **45**, 6049a.

The electrode is hollow and perforated at one end, allowing a flame to form around the spark. This is more reproducible than a horizontal flame from an external source.

3771. MASON, G. L. AND SPEIGHT, G. E.
The Spectrographic Determination of Alumina in Silica Brick.
Trans. Brit. Ceram. Soc., **50**, 35–46 (1951).
C. A., **45**, 6815h (1951).

A spectrographic technique for the rapid detn. of Al_2O_3 in silica brick was developed and results are given for 23 samples. The sample, mixed with graphite, is excited by an intermittent a.-c. arc discharge. The mean result of 3 exposures shows good agreement with chem. results (±0.05% Al_2O_3). Closer agreement is obtained from an av. of 2 such sets of exposures.

3772. MATHIS, W. T.
Report on spectrographic methods.
J. Assoc. Offic. Agr. Chemists, **34**, 604–6 (1951).
C. A., **45**, 10432c (1951).

Collaborative results are reported for 10 minerals in alfalfa and tobacco detd. spectrographically.

3773. MCCOY, W. J. AND CHRISTIANSEN, G. G.
The Determination of Lithium Oxide in Portland Cement by Flame Photometer.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 44–9, discussion 50–1 (1951).
C. A., **47**, 7753e (1953).

A rapid and reasonably accurate method for the detn. of Li_2O in portland cement is described. Two series of cements with Li_2O added in known quantities from 0.1 to 1% were tested. Satisfactory reproducibility and precision in the detn. of Li_2O, K_2O, and Na_2O were obtained by 3 operators.

3774. MEGGERS, W. F.
Fundamental Research in Atomic Spectra.
J. Optical Soc. Am., **41**, 143–8 (1951).
C. A., **45**, 4555b (1951).

The discovery, refinement, and quantum interpretation of at. energy levels have been the principal goal of fundamental research in at. spectra during the past 25 years. Analyses of the fine structure of spectra have revealed the electronic structures and the ionization potentials of atoms and ions; studies of hyperfine-structure of spectral lines have yielded data on the mech., magnetic, and elec.-quadrupole moments of at. nuclei. The fine structure analyses of 504 spectra of 84 elements and the nuclear moments for 184 isotopic species are given.

3775. MEGGERS, W. F.
Multiplets and Terms in Technetium Spectra.
J. Research Natl. Bur. Standards, **47**, 7–14 (1951) (Research Paper No. 2221).
C. A., **46**, 3395f (1952).

Multiplets and terms of the quartet, sextet, and octet systems are reported for the first spectrum of Tc. The combinations of 20 terms composed of 63 at. energy levels account for 200 Tc I lines and 66% of the total observed intensity summed for 1300 lines. The ground state of neutral Tc atoms is represented by $4d^5\ 5s^2\ {}^6S_{21/2}$, and the first metastable state by $4d^6\ 5s^6D_{41/2}$ only 2573 cm.$^{-1}$ higher. A Rydberg series of ${}^8S$ terms yields absolute term values from which a Ritz-corrected limit of 60070 cm.$^{-1}$, or ionization potential of 7.45 e. v., is derived. In the 2nd spectrum of Tc the principal S and P terms of the quintet and septet systems are identified and fixed relative to each other. Evidence is presented that $4d^6\ {}^5D$ represents the normal state of Tc^+ ions, but to confirm this further observations of the Tc II spectrum are necessary.

3776. MEGGERS, W. F.
The Spectrochemistry of Technetium and Promethium.
Spectrochim. Acta, **4**, 317–26 (1951).
C. A., **46**, 2956i (1952).

For spectrochem. detection or detn. of technetium the wavelengths and relative intensities of 407 lines are given. The wavelengths range from 8829.80 to 2298.10

Å., and the intensities from 1000 to 10. Excitation energies of 133 of these Tc lines are known. For spectrochem. detection of promethium the wavelengths and relative intensities of 272 lines are given. The wavelengths range from 6811.28 to 2632.00 Å., and the intensities from 100 to 10.

3777. MEGGERS, W. F., SCRIBNER, B. F., AND BOZMAN, W. R.
Absorption and Emission Spectra of Promethium.
J. Research Natl. Bur. Standards, **46**, 85–98 (1951) (Research Paper No. 2179).
C. A., **45**, 3714f (1951).

Five mg, Pm sepd. from fission products at the Oak Ridge Natl. Lab., were lent by the U. S. At. Energy Commission for this investigation. The absorption spectrum of this sample in soln. was plotted between 3500 and 10,000 A.; the principal bands have wavelengths 494.5, 548.5, 568.0, 685.5, 735.5 mμ (±0.5 mμ). Small portions of the sample were dried on Cu electrodes employed in photographing a.-c. arc and spark spectra with a concave grating of 22-ft. radius. Excepting Sm, into which Pm decays, no other rare earths could be detected in this sample, but common chem. contaminants were troublesome. Between 2200 and 6900 Å. the wavelengths and relative intensities of more than 2200 new spectral lines were detd., but it was not possible to differentiate Pm I and Pm II lines with the light sources employed. The strongest Pm lines have wavelengths 3892.16, 3910.26, 3919.09, 3957.74, and 3998.96 ± 0.02 Å. Hyperfine structure is believed to be present in some Pm lines, indicating that the Pm nucleus possesses mech. and magnetic moments. Confirming the findings of the Oak Ridge Natl. Lab., both the absorption and the emission spectrum identify this fission product as a new element of rare earth type; they provide positive proof that the element with at. no. 61 has been discovered.

3778. MEHLICH, A., REITEMEIER, R. F., AND MASON, D. D.
Report on (Determination of) Exchangeable Potassium in Soils.
J. Assoc. Offic. Agr. Chemists, **34**, 589–95 (1951).
C. A., **45**, 10454a (1951).

The effect of extn. techniques with NH_4OAc on exchangeable K measured with a flame photometer was studied collaboratively. Conclusions: (*a*) For soils of low to medium exchangeable K, variable factors in extn. with NH_4OAc, such as concn., period of contact, vol. of extractant, and shaking provide only minor effects on the quantity of K extd.; (*b*) for soils of high exchangeable K, increases in period of contact and vol. of extractant effect measurable increases in the amt. of K extd.; (*c*) removal of org. matter from the ext. prior to photometric detn. of K is not justified; (*d*) the addn. of Mg to the ext. prior to or following the extn. is in general unnecessary; (*e*) different analysts using the same extn. procedure ext. substantially equal amts. of K from a soil; and (*f*) the variation in results by different analysts and analytical procedures on exts. which have been shown to be quite uniform is so great that the reasons for lack of agreement should be investigated.

3779. MELOCHE, V. W.
A Review of Flame Photometry.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 3–12 (1951).
C. A., **47**, 6758c (1953).

40 references.

3780. MENZIES, A. C.
Modern Trends in Spectroscopy
J. Roy. Soc. Arts, **99**, 283–302 (1951).
C. A., **45**, 5509c (1951).
Cf. *C. A.*, **44**, 4334i.

3781. MENZIES, A. C., AND DOWELL, J. H.
Spectrograph with Concave Diffraction Grating.
German Patent 815,111, Sept. 27, 1951 (Cl. 42h, 20_{01}) to Hilger & Watts Ltd.
C. A., **47**, 410a (1953).

By adding a plane or cylindrical mirror to the slit, grating, and plate holder comprising the Eagle mounting of a concave grating, the space required is reduced and the spectral range is increased.

3782. MINGUZZI, C. AND TELLURI, I.
Spectrographical Determination of Nickel, Cobalt, Copper, and Manganese in Italian Pyrites.
Rend. soc. mineralog. ital., **7**, 48–50 (1951).
C. A., **47**, 2084a (1953).

The max. amts. of Mn, Co, Ni, and Cu (given as oxides) in 47 samples of Italian pyrites were nearly 100, 4000, 300, and 10 g. per metric ton. In sedimentary pyrites Mn was slightly higher, Ni considerably higher, and Co considerably lower than in magmatic samples.

3783. MITCHELL, R. L.
Spectrographic Determination of Trace Elements in Rocks, Minerals, and Soils.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 1042–7 (1951).
C. A., **45**, 5348c (1951).

The total content of trace elements in rocks, minerals, and soils can be detd. by a semiquant. cathode layer arc spectrographic technique. For more accurate detns., it is necessary to make use of a variable internal standard by which the trace elements are compared with Fe. This procedure is combined with chem. concn. in the analysis of soils and plants. The concn. technique involves the use of 8-quinolinol, tannic acid, and

thionalide and serves to recover γ quantities of most trace elements except the alkalies, alk. earths, and phosphate. 10 references.

3784. MITCHELL, R. L.
Trace Constituents of the Soil.
Proc. 11th Intern. Congr. Pure Applied Chem., London 1947, **3**, 157–64 (1951).
C. A., **45**, 8690c (1951).

A brief survey is presented of the trace elements in the soil as detd. by spectrographic analysis of the rocks of skaergaard intrusion of eastern Greenland and of certain soils of Scotland. The origin of trace elements such as Co, Ni, V, Cr, Pb, and Mo is given together with their significance in the soil as related to the parent material found. The knowledge of the trace elements present in the soil is valuable in the general fertilizing of the crops.

3785. MITTELDORF, A. J.
Drying Spectrographic Electrodes Directly on the Arc Stand.
Anal. Chem., **23**, 546 (1951).
C. A., **45**, 6061b (1951).

A side electrode is used to strike an arc which generates heat for drying the lower cup electrode in the arc stand of an A.R.L. spectrograph. By this method Ca and Mg as well as Si contamination can be reduced to such an extent that the limiting source of contamination is the electrodes themselves.

3786. MITTELDORF, A. J.
The Emission Spectrograph in Agriculture and Biology.
Applied Spectroscopy, **6**, No. 1, 21–4 (1951).
C. A., **46**, 2730g (1952).

Examples are given of the spectrographic analysis of soils for B, Co, Cu, Mo, and Zn, of sample cuts of beef, veal, lamb, and pork for small quantities of metals, and of cobalt in various biol. materials.

3787. MITTELDORF, A. J. AND CESTARO, J. P.
Index for Identifying Spectrograms Viewed on a Comparator.
Anal. Chem., **23**, 1055 (1951).
C. A., **45**, 9371e (1951).

Consecutive nos. spaced at the same distance as that between the consecutive spectrograms on the spectrogram plate are engraved on a Lucite block. This block is fastened to the comparator in such a way that the nos. move with the spectrogram plate so that each spectrogram is identified by its no. at all times.

3788. MOBERG, M. L., WAITHMAN, V. B., ELLIS, W. H., AND DUBOIS, H. D.
Determination of Calcium in Lubricating Oils by Flame Spectrophotometer.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub. No.* **116**, 92–4, discussion 94–6 (1951).
C. A., **47**, 7767h (1953).

A simple flame photometer method is described for the rapid routine detn. of Ca in lubricating oils and additive concentrates. Concns. as low as 0.01% can be detd. with an accuracy comparable with that of ASTM Methods D 811 – 48.

3789. MONFILS, A., OTTELET, I., AND ROSEN, B.
The Hollow Cathode in Spectroanalysis.
Ind. chim. belge, **16**, 675–6 (1951).
C. A., **46**, 4913i (1952).

For the purpose of metallurgic analysis at temps. of 2000° two types of hollow cathode are described. The crucible cathode is made of pure graphite, wall thickness 0.1 mm.; it is supported by some form of this graphite membrane to give it proper heat insulation. Cathode and anode are arranged vertically.

3790. MONVOISIN, J. AND MAVRODINEANU, R.
A Simple Apparatus for Flame Spectrography.
Spectrochim. Acta, **4**, 396–9 (1951).
C. A., **46**, 2347e (1952).

The method of using sparks to introduce particles of metal into a flame has been developed and applied to the quant. analysis of iron alloys. A special air-acetylene burner has been devised for this. The simple spectra produced allow a spectrograph of small dispersion to be used for ferrous as well as nonferrous alloys.

3791. MOSHER, R. E., BIRD, E. J., AND BOYLE, A. J.
Determination of Calcium, Aluminum, and Iron in Magnesite. Spectrographic Rotating-Electrode Solution Method.
Anal. Chem., **23**, 1514–16 (1951).
C. A., **46**, 58a (1952).
Cf. *C. A.*, **44**, 7183d.

A rotating disk of C is partially immersed in the soln. to be analyzed. As the disk rotates some of the soln. on the surface of the electrode is brought under the influence of high voltage, spark excitation. Very good recoveries of known quantities of Ca, Fe, and Al were obtained in the presence of considerable Mg.

3792. MOSHER, R. E., ITANO, M., BOYLE, A. J., MYERS, G. B., AND ISERI, L. T.
The Estimation of Calcium in Human Plasma by Flame Spectrophotometry.
Am. J. Clin. Path., **21**, 75–8 (1951).
C. A., **45**, 2533g (1951).

Pipet 2.0 cc. of heparinized plasma into a 50-cc. beaker and add 6 cc. of a 3:1 HNO_3-$HClO_4$ mixt. Evap. on a hot plate to incipient dryness (fumes of $HClO_4$). Cool, add 2 drops of concd. HCl and 1 or 2 cc. of distd. water, and shake till dissolved. Transfer to a 15-cc.

centrifuge tube. With 1 drop of methyl red indicator, neutralize with $(NH_4)_2HPO_4$ (1.3 g. in 250 cc. of distd. water), mix and place in hot water till coagulated. Centrifuge, decant, and drain 30 sec. on filter paper. Add 1 drop of concd. HCl, dil. to 10 cc. with NaCl (40 mg. per l.). Examine by flame spectrophotometer. The method is rapid and accurate.

3793. MURATA, H.
Spectrochemical Determination of Lead in Small Quantities of Blood.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 863–5 (1951).
C. A., **46**, 6696c (1952).

Pb in small quantities of liquid, such as blood or urine, was detd. by an intermittent a.-c. arc method with Bi as the internal standard. The lines used were Pb 2833 and Bi 2898 A. The sample (0.02 cc.) was placed on the flat end of C electrode heated to 70°, evapd., and heated to 110°, and the arc was ignited. The standard soln. contained 0.1–1000 γ/cc. Pb and 300 γ/cc. Bi. One γ/cc. Pb was detd. The continuous d.c. arc and spark method did not give good results. About 30 γ Pb was found in 10 cc. of the blood of healthy Japanese persons by this method. This value is higher than the value detd. by dithizone method.

3794. MURATA, H. AND WATASE, T.
Solution Methods for Spectrographic Analysis, I. Determination of Arsenic.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 271–3 (1951).
C. A., **46**, 853g (1952).

Two simple methods of quant. spectrochem. analysis of As in tiny aq. samples are presented. In the first method the sample soln. is applied continuously by a capillary tube to the upper C electrode whose lower end is cut like a wedge and lies at about 22.5° from the vertical axis. The lower electrode is a flat-top C. The second is a modified Scheibe-Rivas' method (*C. A.*, **30**, 6302[7]). One drop of kerosine is put on the electrode, the sample is applied and the mixt. dried at 110°. In both methods Cd is added as an internal standard and As 2349.8 and Cd 2265.0 lines excited by spark are compared. The illumination of the spark gap by a Hg lamp is very effective and increases sensitivity.

3795. MYERS, A. T.
Improved Cutting Tool for Spectroscopic Electrodes.
Anal. Chem., **23**, 209–10 (1951).
C. A., **45**, 3204c (1951).

A holder for use on a lathe is described and illustrated. This carries outside cutting tools, pilot cutter, and counter bore for shaping spectroscopic electrodes to any desired form.

3796. NAGATA, M.
Spectrochemical Analysis of Minute Quantities of Metals in Plant Materials. II.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 344–50 (1951).
C. A., **46**, 1109a (1952).
Cf. *C. A.*, **45**, 3043f.

Results of spectrochem. analyses of ashes of tea leaves are given. As minor constituents Ti, Mn, P, Ba, Sr, V, Ni, W, Cu, Sn, Pb, Mo, Ge, Be, Ag are detected.

3797. NAISH, J. M.
Multiplier Photocell Attachment for Use with Prism Spectrographs.
J. Sci. Instruments, **28**, 138–40 (1951).
C. A., **45**, 7874e (1951).

A Hilger Littrow or Medium spectrograph is converted to a simple form of direct-reading spectrometer by providing a pair of integral photocell slit assemblies mounted to slide in a modified plate holder appropriate to the spectrograph.

3798. NĚMEC, D.
Minor Elements of Tourmalines, Muscovites, and Lepidolites from West Moravian Pegmatites.
Acad. tèchque sci., Bull. intern., Classe sci., math., nat., et méd., **52**, 425–36 (in English) (1951).
C. A., **49**, 8752a (1955).

Qual. spectrographic analyses are given for 39 tourmalines (I), 7 muscovites (II), 6 lepidolites (III), and 5 apatites (IV), and *ns* are given for the tourmalines. Li, Sn, Cu, Ag, Cr, Ti, V, Ga, Ge, Be, Mn, and Sr were found in I, II, and III; Zn, Ba, and Pb in I and II; Co, Ni, Sb, and Bi in I; Rb and Cs in III; Tl in II and III; Sr, Pb, Mn, and Cu in IV. The Li content of II is higher than that of I of the same stage of crystn. 73 references.

3799. NEWBOUND, K. B. AND FISH, F. H.
Spectroscopic Study of Small Samples in a Hollow-Cathode Discharge.
Can. J. Phys., **29**, 357–61 (1951).
C. A., **46**, 8957i (1952).

A H_2O-cooled hollow-cathode discharge tube is described contg. Al electrodes connected with a gas-circulating and purification system. A sample contg. less than 10 γ of an element can be used to study the hyperfine structure of the principal lines in an exposure of a few hours. The useful life of the sample in the discharge is about 10 hrs., and up to 80% of the sample can be recovered.

3800. NUCIARI, T.
The Spectrographic Analysis of High-Purity Aluminum.
Alluminio, **20**, 227–30 (1951).
C. A., **46**, 1385d (1952).

Better exptl. conditions for detg. by spectrographic analysis the impurities Fe, Si, and Cu result from work with top electrodes and

condensed spark excitation. The analytical results give a fair reproducibility.

3801. OBERLÄNDER, H.
Quantitative Spectral Analysis of Platinum Metals.
Heraeus Festschr., **1951**, 169–74
C. A., **48**, 3844g (1954).

Homologous, i.e., close, pairs of lines in the respective spectra for the spectral detn. of traces (0.005–1%) and larger amts. (1–32%) of Au, Pd, Rh, Cu, Fe, Ir, Ag, and Ni in Pt are tabulated in accordance with the method suggested by Gerlach (*C. A.*, **19**, 2163) and developed by Schweitzer (*C. A.*, **21**, 3172).

3802. OBOLENSKAYA, L. I.
Determining Potassium and Sodium in Soils by the Flame Photometer.
Pochvovedenie, **1951**, 420–5
C. A., **46**, 3195a (1952).

A description of the Rusanov photometer (*Zavodskaya Lab.*, **16**, 447–53 (1950)) and methods of using it are given as the most convenient and speedy for detg. K and Na. The method was used in detg. the exchangeable K and Na in chernozem and podzol soils. To eliminate the interfering Ca ion NH_4 oxalate was added to the NH_4 acetate-extg. soln.

3803. ODUM, H. T.
Strontium Content of Sea Water, Celestite Radiolaria, and Strontianite Snail Shells.
Science, **114**, 211–13 (1951).
C. A., **45**, 8668c (1951).

Reported values for Sr in sea water range from 7.0 to 50 mg./l. O. made 235 detns. of the Sr/Ca ratio on 160 samples of Atlantic Ocean water (Long Island Sound, Middle Atlantic Ocean, Gulf Stream, etc.). Detns. were made by flame spectrophotometric methods on single and double oxalate pptns. The at. ratio Sr/Ca obtained is 0.00923, equiv. to 8.10 mg./l. Sr in salinity of 35 parts/mille, a value lower than given in some reference books. Thus, Sr is a conservative element in sea water varying with salinity. The total variation of Sr/Ca after removal of the analytical error is 8.4% for 95% of a group of analyses. Published Ca/Cl and Mg/Cl have a similar variation. Examn. of a plankton sample of a radiolarian (probably *Acanthometra pellucidum*) by gravimetric, spectrophotometric, and x-ray powder pattern methods showed Ca and Sr 19.4, SO_4 36.9, R_2O_3 1.1, SiO_2 8.7, loss 33.9 av. % of ash. The diffraction pattern was identical with that of celestite. O. concludes that the chief crystal form present in this radiolarian is celestite. The physiology of deposition of celestite is obscure. In some standard books the radiolarian skeleton is described as consisting of $SrCO_3$. Expts. with snails (*Physa*, species not given) raised in solns. of varying Sr concn. showed the shells could contain more than half strontianite (I); the Sr/Ca ratio was about 0.33 of that in the culture medium. X-ray diffraction studies of high Sr shells indicated the presence of small crystals of aragonite and I and not an amorphous intermediate of a substitution series. Similar high Sr concns. have been induced in other organisms. 24 references.

3804. OER, A. V. AND HÖFERT, H. J.
Method for the Flame Photometric Determination of Sodium, Potassium, and Calcium in Blood Serum.
Arch. exptl. Path. Pharmakol., **214**, 109–20 (1951).
C. A., **47**, 2240c (1953).

A method is described for detg. Na, K, and Ca simultaneously in blood serum by flame photometry, using an appropriate light-absorption filter for each element. The procedure for calibration with standard solns. and for computing the resp. concns. is described.

3805. OLSACHER, J., CHAUDET, A., AND DUCLOUX, E. H.
Description of Córdoba Meteorites.
Bol. acad. nacl. cienc. Córdoba, **39**, 261–73 (1951).
C. A., **48**, 7503c (1954).

Two light-gray chondrites are in the mineral collection of the University of Córdoba. Descriptions and sketches are given of the different types of chondrules. One meteorite fell in 1902. One portion of 780 g. contained forsterite, enstatite, glass, Ni-Fe, cohenite, pearlite, and troilite. Chem. analysis gave SiO_2 37.10, Al_2O_3 4.83, Fe_2O_3 1.14, FeO 4.21, MnO 0.04, MgO 26.00, CaO 2.80, K_2O 0.19, Fe 19.00, Ni 1.41, S 2.55, and Co, Na_2O, P, SO_3 traces. Pt, Pd, Cu, and Ag were found spectrographically. Sp. gr. was 3.88. The 2nd meteorite fell September, 1930. Forsterite, enstatite, glass, Ni-Fe, and troilite were found. Chem. analysis gave SiO_2 34.98, Al_2O_3 5.56, Fe_2O_3 1.20, FeO 4.38, MnO 0.04, MgO 22.10, CaO 2.50, K_2O 0.13, Fe 24.93, Ni 1.36, S 2.40, and Co, Na_2O, P, SO_3 traces. Pt, Pd, Ge, Cu, and Pb were found spectrographically. Sp. gr. was 3.85.

3806. OSBORN, G. H. AND JOHNS, H.
Rapid Determination of Sodium and Potassium in Rocks and Minerals by Flame Photometry.
Analyst, **76**, 410–15 (1951).
C. A., **45**, 8393h (1951).

By working with suitably dil. solns. in the presence of excess phosphate, the graph of flame intensity *vs.* Na or K intensity is sufficiently linear to permit analysis by a direct addn. method. Most of the rocks examd. were decompd. by mineral acid but samples of tourmaline, beryl, biotite, or topaz were best heated with $CaCO_3+NH_4Cl$, the melt was extd. with dil. acid, SiO_2 removed and an aliquot of the soln. taken. If $(NH_4)_2HPO_4$

is added, the presence of excess Ca^{++} does no harm. If more than 0.5% Na is present, as little as 50 mg. of sample is sufficient. The results obtained with the flame spectrometer agree well with those obtained by the much more tedious J. L. Smith method (*Am. J. Science* (2), **50**, 269 (1870)). Three days are required for that method but only 1 hr. is needed by the new procedure.

3807. OWEN, C. E., DELANEY, J. C., AND NEFF, C. M.
The Spectrochemical Analysis of Air-Borne Dusts for Beryllium.
Am. Ind. Hyg. Assoc. Quart., **12**, 112–14 (1951).
C. A., **45**, 9419i (1951).

The concn. of Be or Be compds. in air can be detd. by collecting samples on Whatman 41 filter paper by filtration or electrostatic pptn., igniting or wet-ashing the paper and sample, adding 2 ml. HCl, evapg. nearly to dryness, cooling, adding 2.5 ml. concd. H_2SO_4, heating to fuming, reducing to 0.5 ml., transferring to a 5 ml. volumetric flask contg. 20 p.p.m. Mo as internal standard, and exciting in porous cup electrodes (Cf. Feldman, *C. A.*, **43**, 8945b) and photographing the spectra in the 2480–3700 Å. region with a 50 μ slit.

3808. OWEN, L. E.
Gas-Transport Electrodes.
J. Optical Soc. Am., **41**, 709–11 (1951).
C. A., **46**, 336d (1952).

The use of a hollow electrode form with the employment of a gas stream to introduce a sample into a spectral excitation column is discussed. Three uses are proposed: (*1*) the direct introduction into the excitation gap of contaminated gas samples such as dust-laden air, (*2*) the direct introduction of special atms. into an excitation column to utilize their effects on spectral excitation, (*3*) the gas transportation of atomized solns. into an excitation gap.

3809. OWEN, L. E. AND ELLENBURG, J. Y.
Spectrochemical Analysis of Lithium.
Anal. Chem., **23**, 1823–5 (1951).
C. A., **46**, 6033h (1952).

In a study of the corrosion effects of molten Li upon metallic surfaces, it was necessary to analyze Li matrices for Be, Cr, Co, Fe, Ni, Nb, Mn, Mo, Ta, Ti, U, V, W, and Zr. Most of these occurred in the range 0.0001–0.1%. A scheme utilizing the porous electrode was devised with Pt as internal standard. Samples were received in metallic capsules of either stainless steel or Armco Fe. These were opened by special techniques and EtOH or H_2O were used, resp., to dissolve Li. The analytical elements, in finely divided elemental state, were filtered off on filter-paper discs; these were washed, wet-digested, and made to a sample vol. of 10 ml. Be, Cr, Fe, Ni, Nb, and Mn have appreciable soly. in LiOH and require addnl. chem. sepn. either as sulfides or 8-quinolinolates. A simplified procedure for Be is detailed. Ta and W were not found in sufficient concn. to respond to the porous electrode technique, and a special dry-arc procedure, with Cu as internal standard, is detailed for these.

3810. OWEN, L. E. AND ELLENBURG, J. Y.
Dimensioning Biological Samples for Spectrochemical Analysis.
Bull. Soc. Applied Spectroscopy, **5**, 19–20 (1951).

Biological materials are disintegrated in a Waring Blendor in the presence of alcohol or acetone using a ratio of 10 g. of tissue to 40 ml. of liquid, and the resulting slurry is filtered. The collected solids are dried in a vacuum oven giving a dry product that may be stored without decomposition or dissolved readily in sulfuric and nitric acids for analysis. For the determination of Be in human tissues the filtrate from the slurry could be discarded but in other cases it may be necessary to dry the filtrate and to combine residue with the bulk of the sample.

3811. PAGLIASSOTTI, J. P. AND PORSCHE, F. W.
Spectrographic Determination of Phosphorus in Lubricating Oil by Solution Excitation.
Anal. Chem., **23**, 198–200 (1951).
C. A., **45**, 4029b (1951).

A spectrographic detn. of P in lubricating oils is presented; a soln. excitation app. is used in which the lower electrode is a rotating graphite disk partially submerged in the oil sample (Cf. M. Pierucci and Barbanti-Silva, *C. A.*, **36**, 6898[7]). The oil sample is mixed with an internal standard contg. 0.1% Mn and 0.9% Li both as naphthenates. A graphite disk, 0.125 in. in diam., is used for each new sample. The speed of rotation is 7.5 r.p.m. A *N* atm. is maintained around the gap. The av. deviation of the method on one single sample contg. 0.0380% P was 0.0010%, the max. deviation was 0.0021%.

3812. PAGLIASSOTTI, J. P. AND PORSCHE, F. W.
Determination of Lubricating-Oil Additives.
Anal. Chem., **23**, 1820–3 (1951).
C. A., **46**, 6370f (1952).

Additives which improve the quality of lubricating oils may contain one or more of the elements, P, K, Ba, Ca, and Zn. The present technique improves upon that previously described (introducing the oil into the spectrographic spark gap by means of a rotating immersed electrode, *C. A.*, **45**, 4029b) by employing Ni as internal standard and Mg as a spectrochem. buffer. The buffer is prepd. by reaction of MgO with 2-ethylhexoic acid and dilg. with Me Et ketone. Procedural details for oils or additive concentrates are given, along with best analytical

line pairs for each element sought. The Mg buffer effectively eliminates interinfluence among the various analytical elements. Accuracy and precision are good and geographical source and viscosity are without effect.

3813. PARVIAINEN, S., SOIVA, K., AND EHRNROOTH, C. A.
Sodium and Potassium Content of Erythrocytes and Blood Plasma in Toxemias of Late Pregnancy.
Gynaecologia, **131**, 233–41 (1951).
C. A., **45**, 10374e (1951).

Detn. of Na and K content of plasma and erythrocytes by flame photometer showed Na higher and K lower during toxemia than during normal pregnancy. Expressed as milliequivs./l., plasma of normal pregnancy gave Na 141.0, K 4.88, and Na/K 29.0; in untreated toxemia, Na 146.2, K 4.68, and Na/K 31.2. Erythrocytes in normal pregnancy gave Na 16.6, K 96.7, and Na/K 0.17; in untreated toxemia, Na 22.2, K 90.3, and Na/K 0.25.

3814. PASVEER, W.
Spectrographic Calculations with an Aligned-Point Calculator.
Congr. groupement avance. méthodes anal. spectrograph. produits mét., **14**, 117–53 (1951).
C. A., **46**, 6438e (1952).

Construction of a nomographic calculator for quant. spectrographic analysis is described.

3815. PATON, R.
Determination of Magnesium in Cast Iron. I. Spectrographic Method.
Fonderie, **1951**, 2605–8
C. A., **48**, 7488c (1954).

A Jobin-Yvon medium-dispersion spectrograph was used. Details are given of specimen prepn., selection of rays, conditions of excitation, aperture, filter, exposure, and treatment of the photographic plate. The method is simple and accurate but requires 2 hrs.

3816. PATTERSON, G. D., JR., AND MELLON, M. G.
Automatic Operations in Analytical Chemistry.
Anal. Chem., **23**, 101–15 (1951).
C. A., **45**, 2361c (1951).

Review with 483 references including a brief discussion of photographic and photoelectric methods of emission spectroscopy, and of X-ray fluorescence.

3817. PEARSON, T. H. AND IHDE, A. J.
Chemistry and the Spectrum Before Bunsen and Kirchhoff.
J. Chem. Education, **28**, 267–71 (1951).
C. A., **45**, 7393d (1951).

A history of early investigations of the spectrum. 48 references.

3818. PICKETT, E. E. AND TODD, G.
Suppression of Line Intensities by Perchloric Acid.
J. Opt. Soc. Amer., **41**, 361 (1951).
C. A., **48**, 7095i (1954).

The necessity for the removal of perchlorate from biol. samples prior to spectral analysis is demonstrated by results showing the effect of varying amts. of perchlorate and fixed concn. of Fe, Cu, and Mn. In all cases line intensities are suppressed by the presence of $HClO_4$ although results are only qual. in nature.

3819. PIERUCCINI, R.
Spectrographic Investigations on the Meteorite of the Zone of Bur (Somaliland).
Chimica (Milan), **6**, 189–91 (1951).
C. A., **45**, 7925b (1951).

The meteorite is lythoidchondritic and belongs to the olivineenstatite type. The following elements were identified: B, Na, Mg, Al, Si, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ge, As, and Ba.

3820. PIERUCCINI, R.
Determination of Spectroscopic Traces of Nickel and Cobalt After Extraction with Ferrous Sulfide.
Mikrochemie ver. Mikrochim. Acta, **36/37**, 522–36 (1951).
C. A., **45**, 5063a (1951).

To the soln. add 16.8 mg. of pure Fe, make basic and sat. with H_2S. Dissolve the ppt. of FeS, with which NiS and CoS are copptd., in a little aqua regia and evap. the soln. to 1 ml. Transfer to pure C electrodes and look for the Co line at 3044.0 Å. and the Ni line at 3042.6 Å. or for the Co line at 3453.5 Å. and the Ni line at 3492.9 Å. Twenty-two samples of mesozoic hornblendes and limestones from the northern Tuscan Appenines contain both Ni and Co, as did some supposedly pure $CaCO_3$. It would not have been possible to detect the Ni and Co by direct sparking of the minerals.

3821. PIPER, E. AND HAGEDORN, H.
Flame-Photometric Potassium Determination in Mixed Fertilizers of Thomas Meal and Potassium Salts.
Arch. Eisenhüttenw., **22**, 299–301 (1951).
C. A., **46**, 2223b (1952).

The flame-photometric method was found to be a very rapid and exact method for the detn. of K in the mixts. or in K-salts alone; it consists in atomizing a soln. of the material in an H_2C_2-compressed air flame, the light of which is projected through a condenser and red-filter onto an alk. photocell. Contents of up to 48% K_2O could be detd. in 5 min. with sufficient accuracy.

3822. PUENZIEUX, J. P.
Spectrographic Analysis of Aluminum, Zinc, and Silicon Alloyed with 90% Magnesium.

Helv. Chim. Acta, **34**, 615–28 (in French) (1951).
C. A., **45**, 5562f (1951).

A comparison of the chem. and spectrum analyses of 23 samples of Mg alloyed with 9 to 10% Al, 0.4 to 0.6% Zn, 0.2 to 0.25% Mn, and traces of Si shows that the amts. detd. spectrographically are systematically lower than those detd. by chem. methods. It is probable that the differences arise from the fact that the material analyzed by the two methods was not selected from the same parts of the samples. The method of external standards was used for the spectrum analyses, the calibration curves being based on well-analyzed standards contg. the alloying constituents in graded amts. in the above ranges, the total amts. of each sample being approx. 10%. The spark excitation was operated with a synchronous interrupter in the secondary circuit similar in principle to Feussner's. Repeated tests at intervals of several weeks showed that the calibration curves were not strictly reproducible but showed deviations of approx. 3% for Al and 7% for Zn. The source of these errors has not been located. Calibration curves from standards of the same chem. analysis but prepd. by different casting and cooling methods, by which they acquire different cryst. textures, also show marked differences.

3823. PURKINA, R. S. AND TAGANOV, K. I.
Spectrum Analysis of Several Catalysts.
Trudy Vsesoyuz. Nauch.-Issledovatel. Inst. Khim. Pereraboṭki Gazov (KHIMGAZ), **6**, 101–9 (1951).
C. A., **49**, 9437c(1955).

The detn. of Na (0.03–2% by wt.) in Al_2O_3 catalyst by combustion of the sample in an activated a.-c. arc, and the detn. of K in an Fe catalyst are described.

3824. RAMSAY, J. A., FALLOON, S. W. H. W., AND MACHIN, K. E.
An Integrating Flame Photometer for Small Quantities.
J. Sci. Instrum., **28**, 75–80 (1951).

A relatively simple apparatus is described in which a small sample is dried on a platinum wire which is then introduced mechanically into an air-coalgas flame, using a modified Meker type burner. Selected lines in the spectrum, obtained by means of a spectrometer with a 60° prism of carbon disulfide, fall on a photomultiplier tube. This is connected to a Miller integrator and measurements are made with a 250 microammeter. The apparatus was tested for the determination of thallium and sodium. It is capable of measuring the sodium present in less than 10 ml. of serum without serious loss of accuracy as compared with other methods.

3825. REYNOLDS, J. G.
Some Criteria for Commercial Spectrometers. II. Comments by Manufacturers.
J. Inst. Petroleum, **37**, 588–95 (1951).
C. A., **46**, 343i (1952).

Comments are presented by British and American manufacturers of optical equipment and the author relative to desirable details of com. spectrometers.

3826. RICARD, R.
Effect of Carbon on the Spectrochemical Analysis of Refractory Materials.
Compt. rend., **233**, 953–4 (1951).
C. A., **46**, 2961b (1952).

The relative intensities of the lines obtained by exciting a refractory substance on a graphite electrode are not the same as lines obtained by exciting an electrode of a synthetic sample of the refractory. When powd. graphite is added to the synthetic prepn., a marked increased of intensity is observed for some lines of metallic oxides in the refractory. In an enamel contg. Al and oxides of Sb and Mg addn. of graphite to the analytical sample greatly increases the strength of the Al and Mg rays, while those of Sb remain nearly const.

3827. RICARD, R. AND DUFOUR, A.
The Spectra of Arcs Between Aluminum Electrodes in Air and in Hydrogen.
Compt. rend., **233**, 370–2 (1951).
C. A., **46**, 1348h (1952).

The spectra of com. Al show striking differences when observed in arcs under identical operating conditions in air and in H. Lines due to the impurities Fe, Si, Cu, V, Mn, Ga, and Mg are conspicuous in the arc-in-air spectrum. With the arc in H the Al lines appear somewhat sharper but with the same intensities as in air, while the lines of Fe and Si are greatly weakened and those of Cu and V are suppressed. Lines of Mn and Ga are slightly strengthened, however, while those of Mg are very much enhanced. The lines of Zn, absent from the arc in air, are very strong in H. It is concluded that the arc in air does not present the optimum conditions for the spectrochem. analysis of com. Al.

3828. RICARD, R. AND DUFOUR, A.
Emission Arc Spectra in Various Atmospheres.
Congr. groupement avancement méthodes anal. spectrograph. produits mét., **14**, 197–200 (1951).
C. A., **46**, 7426a (1952).
Cf. *C. A.*, **46**, 1348h.

The brilliant arc formed between metallic electrodes in a controlled atm. is detd. for Cu and Al. The atms. used are illuminating gas, CO_2, pure N, pure H, and H satd. with benzene vapor. Spectra are recorded with a medium-type quartz spectrograph in the region of 2250–4070 A. The arc between Cu electrodes is stable in CO_2 and in air, less

stable in illuminating gas or the H-benzene mixt., unstable in H alone. The arc emission in carbonic acid gas is more intense than in air. For Al an inversion of very intense rays is observed for a mixt. of H and benzene and in artificial gas, intense in N and H, less intense in air, and essentially zero in carbonic acid gas.

3829. ROBINSON, A. M. AND OVENSTON, T. J. C.
Simple Flame Photometer for Internal-Standard Operation and Some New Liquid Spectrum Filters.
Analyst, **76**, 416–24 (1951).
C. A., **45**, 8356b (1951).

A flame photometer, based on a Dutch design, was built primarily for operation by the internal-standard technique. Two beams, directed simultaneously through the standard and sample spectrum filters, fall on the barrier-layer of photocells whose outputs are balanced potentiometrically by a null-point method. The transmission characteristics of some new spectrum filters, made by combining layers of solns. of common substances, are given and in some cases compared with filters of glass, of gelatin or based on interference.

3830. RODRIGUEZ, J. C.
Mineral Nutrition of the Two-Spotted Spider Mite, Tetranychus Bimaculatus.
Ann. Entomol. Soc. Am., **44**, 511–26 (1951).
C. A., **46**, 2701f (1952).
Cf. *C. A.*, **43**, 5892c.

Tomato plants were grown in nutrient solns. contg. a series of concns. of minerals; mites were allowed to develop on the plants. Criterion of response of the mites to their diet was the no. of mite progeny developing in a given period of time. The standard nutrient soln. contained in molar concns.: KH_2PO_4 0.000645; KNO_3 0.005; $Ca(NO_3)_2$ 0.005; $MgSO_4$ 0.0021. Fe was present as magnetite in the gravel medium and a complete minor element soln. (Cf. Sayre, Gammon, and Converse. *U. S. Dept. Agr. Ann. Rept. Div. of Cereal Crops and Diseases, B.P.I.S.A.E.* Sept., 1941) was present at the same concn. in all expts. Of the major elements, N was tested at 4, P at 3, S at 4, K at 4, Ca at 3, and Mg at 3 concns. Leaflets taken from each plant were dried, ground and analyzed for N and S by the usual methods for P, K, Ca, Mg, Na, Fe, B, Mn, Si, Al, and Cu in the ash by a spectrographic method which is briefly outlined.

3831. ROSEN, B.
New Development in the Application of a Hollow Cathode Discharge Tube Designed for the Quantitative Determination of Oxygen in Metals.
Bull. Soc. Applied Spectroscopy, **5**, No. 4, 26–27 (1951).

An improved all-metal hollow cathode discharge tube is described. (Cf. Rosen, Reference **3531**, Part III of this Index, *C. A.*, **46**, 6029e (1952)).

3832. ROUIR, E. V. AND VANBOKESTAL, A. M.
Spectrographic Analysis of Small Quantities of Aluminum in Tin-Bronzes.
Congr. groupement avance. méthodes anal. spectrogph. produits mét., **14**, 15–23 (1951).
C. A., **46**, 9462f (1952).
Cf. *C. A.*, **46**, 2959a.

The technique in which a spark is flashed through the liquid sample was used to prep. spectrographic working curves for concns. of Al between 0.001 and 0.1%. Al in tin-bronze was detd. to within 5% by using Al 3961.52 and Cu 4022.65 A.

3833. ROUIR, E. V. AND VANBOKESTAL, A. M.
Complete Analyses of Copper Alloys by Spectrography of Their Solutions.
Spectrochim. Acta, **4**, 330–7 (1951).
C. A., **46**, 2959c (1952).

For the analysis of brass and bronze a new method is described with a rotating disk of graphite which dips in the soln. under test and carries some around to the multisource spark. The precision is increased so that Cu as well as the usual elements Sn, Pb, Zn, Ni, Fe, Al, and Mn can be detd. in the solns. with a mean error of 1.5% of the element under test. Soln. recipes and wave lengths of analysis lines are given for different alloys.

3834. ROUX, E, AND HUSSON, M.
Spectrographic Determination of Mineral Elements in Soils and Plants.
Ann. inst. nat. recherche agron., Ser. A. Ann. agron., **2**, 154–60 (1951).
C. A., **47**, 997g (1953).

A general description is given of spectrographic analysis.

3835. RYSSING, E.
Flame Photometer Determination of Potassium and Sodium.
Scand. J. Clin. Lab. Invest., **3**, 17–32 (1951).
C. A., **45**, 9589g (1951).

A detailed discussion on the operation of an internal standard (Li) type of flame photometer (diagrammed). The topics discussed include, function of the atomizer, effect of viscosity and surface tension, flame and cell characteristics, the prepn. of standard solns. and curves, interferences of various ions and substances, and precautions. In 40 normal subjects plasma K was 14–19.6 mg. % and Na 323–336 mg. %.

3836. SAITO, K.
Spectrochemical Analysis of Germanium by the Intermittant Arc.

J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 447–9 (1951).
C.A., **46**, 1915f (1952).

The semiquant. detn. of Ge in minerals by the intermittent d.-c. arc was studied. Silicate was dild. with an equal amt. of NaCl and applied to the C electrode. The most sensitive lines were 2651.1 and 3039.1 A. and 0.001% Ge could be estd.

3837. SAITO, K., SHIMOGAWARA, T., AND MORINAGA, K.
An Interrupted Arc Source with the Aid of a Direct-Current Interrupter.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 269–71 (1951).
C.A., **46**, 1371d (1952).

An interrupted d.-c. arc source having a circuit similar to that of Pfeilsticker (*Z. Elektrochem.* **43**, 719 (1937)) is constructed. The interrupter is made of 2 cam plates and is driven by a d.-c. elec motor.

3838. SAKSELA, M.
Late-Hydrothermal Deposits in the Sulfide Ore of Otravaara, Eastern Finland.
Compt. rend. soc. géol. Finlande, **24**; *Bult. comm. géol. Finlande*, **154**, 115–22 (in German) (1951).
C. A., **46**, 3914d (1952).

Three late stages of metamorphism in the Otravaara ore caused brecciation and produced chiefly quartz, calcite, plagioclase, and mica. Sphalerite, pyrrhotite, pyrite, and galena were also deposited from late-hydrothermal solns. The Ca probably came from the surrounding rocks, being dissolved in early metasomatic processes preceding the deposition of the main body of sulfide minerals. Semiquant. spectrochem. analysis of sphalerite gave, in %, Sb. 0.01; Ni 0.01; Co 0.01; Cu 0.03; Ag 0.0003, Pb 0.1; As, Bi, Hg, Te absent; and of galena, Bi 0.1; Ag 0.01; Cu 0.01; Sb 0.03. The petrography of the late-hydrothermal rocks is described.

3839. SALTMAN, W. M. AND NACHTRIEB, N. H.
Spectrographic Determination of Impurities in Gallium Chloride Solutions.
Anal. Chem., **23**, 1503–5 (1951).
C. A., **46**, 856g (1952).

A method is given for detg. the following metals in Ga metals and salts; Al, Ca, Cr, Fe, Ge, In, Mg, Pt, V, Zn, Pb, Sn. The metals are sepd. by extn. of a 6 *N* HCl soln. of $GaCl_3$ with isopropyl ether. A Cu-spark method with Mo as internal standard is used; working curves are shown. The sensitivity limit in all cases is less than 1 γ. The recovery of Fe is low because of ether extn. of chloroferric acid.

3840. SARNOWSKI, R. E. AND POEHLMAN, W. J.
Spectrochemical Determination of Magnesium in Ductile Cast Iron—Aspects of Sampling and Metallurgical Control Techniques.
Applied Spectroscopy, **6**, No. 1, 25–9 (1951).
C. A., **46**, 2955f (1952).

The spectrograph is admirably suited for the analysis and control of Mg cast Fe. A soln. method and standards were used. Analysis lines Mg 2802.70 and Fe 2788.11 Å. were used for 0.0015–0.06% Mg, and Mg 2852.13 and the same Fe line for 0.05–0.30% Mg. The results are closely correlated with heat treatment, tensile strengths, elongation, and other properties.

3841. SAUNDERSON, J. L., CALDECOURT, V. J., AND PETERSON, E. W.
Photoelectric Instrument for Direct Spectrochemical Analysis by the Internal Standard Method.
U. S. Patent 2,577,814 and U. S. Patent 2,577,815, Dec. 11, 1951.
C.A., **46**, 2353g (1952).

Light from the sparking electrodes is collected by electron multiplier photocells, the current is stored in condensers, released through resistors, and amplified to operate a recorder. By use of a timing system the recorded mark is a direct function of the concn. of the unknown sample as compared to an internal standard and can be calibrated directly. The invention makes possible rapid and automatic spectrochem. analyses.

3842. SAWYER, R. A.
Experimental Spectroscopy.
Prentice-Hall, New York, N. Y., 2nd ed., (1951), 358 pp.
C. A., **45**, 5026i (1951).

The first edition of this, book published in 1944, has been revised and expanded to include both interesting and important new material. Particular attention has been given to the chapters on apparatus and methods of infrared spectroscopy, the spectroscopy of the vacuum ultraviolet, and spectrochemical analysis.

3843. SCALISE, M.
Spectrographic Analysis of Cast Irons.
Met. ital., **43**, 471–5 (1951).
C. A., **46**, 10044g (1952).

A method is described for the spectrographic analysis of cast irons with the use of a spectrograph having a med.-dispersion prism. The elements examd. and the corresponding concn. ranges were those found in the more common cast irons: Si, 1.00–3.50; Mn, 0.01–2.00; Cr, 0.05–1.00; Ni, 0.10–2.00; Mo, 0.05–1.00; and V, 0.05–0.40%. The following factors were established: stabilization time of the various elements and the exposure time, the sensitivity of the detn., and the precision of the analysis. The method presents an economical advantage over chem. methods, and its degree of precision is satisfactory for control purposes.

3844. SCHATZ, F. V.
The Spectrochemical Determination of Zinc, Lead, and Iron in Copper and Copper Alloys.
J. Inst. Metals, **80**, 77–83 (Paper No. 1326) (1951)
C. A., **45**, 10130e (1951).

Description is given of a method for routine works control. Zn and Pb are dets. in brasses with a 1.18% max. error, and the impurities, Pb and Fe are detd. down to 0.005% or less.

3845. SCHÖNTAG, A.
Dependence of Spectral-Line Position on Spectrograph Temperature and Its Effect on Qualitative and Quantitative Analysis.
Z. wiss. Phot., **46**, 99–105 (1951).
C. A., **47**, 4240b (1953).

S. analyzes line shifts in spectra and attributes the cause to the effects of temp. changes on the optical system and metal construction of the spectrograph. Difficulties presented by these shifts are discussed in view of their effects on qual. and quant. analyses. The intensity ratio of two lines can vary by as much as 10% for a change in room temp. of 4°. This error amts. to more than the plate and photometric errors combined.

3846. SCHÖNTAG, A.
Curvature of a Photographic Plate in the Plateholder as a Source of Error in Quantitative Spectral Analysis.
Z. wiss. Phot., **46**, 182–7 (1951).
C. A., **47**, 4231g (1953).

The intensity ratio of line pairs varied when measured at different latitudes on the photographic plate. This variation displayed a regular departure from a single value and is attributed to a transverse curvature of the plate. The curvature was measured and the effects of humidity and plate width studied. A correction factor, obtained by measuring a neighboring line pair, is suggested as a means of increasing the accuracy of the analytical procedure.

3847. SCHRENK, W. G. AND CLEMENTS, H. E.
Influence of Certain Elements on Line Intensity in the Direct-Current Arc.
Anal. Chem., **23**, 1467–9 (1951).
C. A., **46**, 851d (1952).

"Extraneous elements" complicate spectrographic analyses by enhancement or repression of the line intensities of the test elements. The elements involved in the study may be listed with respect to their effects on each other as follows: Sn, K, Co, Ca, P. Any element will depress the intensity of lines of elements to its right and enhance the lines of elements to its left. Internal standards are not ideal in all cases. The use of 35 mg. of Li tartrate per ml. of test soln. is effective as a spectroscopic buffer to minimize the effect of extraneous elements.

3848. SCHRENK, W. G., LENTZ, C. F., AND GLENDENING, B. L.
Determination of Calcium with the Flame Photometer as an Excitation Source for the Spectrograph.
Trans. Kansas Acad. Sci., **54**, 420–5 (1951).
C. A., **46**, 3898b (1952).

The Beckman flame spectrophotometer used in conjunction with a spectrograph proved to be suitable for the detn. of Ca.

3849. SCHROLL, E.
Trace-Element Paragenesis (Micropara-genesis) of the Galenas of the East Alps,
Anz. meth.-naturw. Kl., Österr. Akad. Wiss., **1951**, 6–12.
C. A., **47**, 5313 (1953).

The content of Ag, As, Sb, Bi, Tl, and Sn, detd. by means of spectrochem. analysis, is given for 46 galenas from the East Alps. The highest contents are, in g./ton, Ag > 10,000, As 5000 Sb > 10,000, Bi > 10,000, Tl 100, Sn 300. The Sb and Bi contents depend on the Ag content, high As contents are observed nearly exclusively in Ag-poor galenas, and Tl is assocd. with As, Sb, and Bi. Application of regional viewpoints reveals several regularities between the trace-element content and the stratigraphy and lithology of the samples investigated. The relationships between the trace-element content and temp. of formation of the galenas are discussed.

3850. SCHÜLER, H. AND REINEBECK, L.
New Spectra in the Glow Discharge with Benzene Vapor.
Z. Naturforsch., **6a**, 160–5 (1951).
C.A., **45**, 8345f (1951).
Cf. *C. A.*, **44**, 10505; **45**, 6042e.

3851. SCOTT, R. K., MARCY, V. M., AND HRONAS, J. J.
The Flame Photometer in the Analysis of Water and Water-Formed Deposits.
Am. Soc. Testing Materials, Symposium on Flame Photometry, *Spec. Tech. Pub.* No. **116**, 105–14, discussion 115–16 (1951).
C. A., **47**, 7703a (1953).

Detns. were made of alkalies in raw water, feed water, boiler water, condensate, and various water-formed deposits with Perkin-Elmer and Beckman type flame photometers. Comparison of the results obtained with the results of gravimetric procedures indicated sufficient accuracy by flame photometry for use in routine analysis.

3852. SCRIBNER, B. F. AND BALLINGER, J. C.
Spectrochemical Analysis of Bronze by a Porous-Electrode Method.
J. Research Natl. Bur. Standards, **47**, 221–6 (1951) (Research Paper No. 2246).
C. A., **46**, 3903b (1952).

A modification of Feldman's porous elec-

trode method is described for the spectrochemical analysis of bronze (3 Sn, 3 Zn, 2 Pb, 2 Ni, 90 Cu). A 1-g. sample of bronze drillings is dissolved by the addition of 4 ml. of hydrochloric acid and 16 ml. of nitric acid, and after dilution to 40 milliliters with water, 0.3 ml. of the solution is transferred to the hollow electrode for spark excitation. The analysis is made with reference to standard solutions prepared in a similar manner. Studies of the effect of electrode shape on the reproducibility of excitation led to the adoption of a porous electrode having a tip in the shape of a truncated cone. With this electrode the precision was greater by a factor of 1.2 to 2.1 over that obtained with a flat-tipped electrode. The precision of the method, determined as the coefficient of variation of a group of duplicate runs on 50 samples, ranged from 1.6 per cent for nickel to 4.3 per cent for lead. On the average, the results of routine spectrochemical determinations agree with the results of chemical determinations on the same samples to within ± 5 per cent.

3853. SCRIBNER, B. F. AND CORLISS, C. H.
Emission Spectrographic Standards.
Anal. Chem., **23**, 1548–52 (1951).
C. A., **46**, 1383a (1952).

The preparation and analyses for homogeneity of iron-; aluminum-; and tin-base spectrographic standards at the National Bureau of Standards are described. Some effects of inhomogeneity, variation in rod size, and choice of spectral line on spectrographic results are presented. By proper design of the experiment as shown for studies of tin alloys, spectrographic tests of homogeneity may be simplified and the results made more significant. Analyses of standards for certification of composition are usually made by chemical methods. Under proper conditions, however, determination of minor constituents may be made spectrographically relative to reference samples synthesized in solution from pure metals or salts.

3854. SEAY, W. A., ATTOE, O. J., AND TRUOG, E.
Elimination of Calcium Interference in Photometric Determination of Sodium in Soils and Plants.
Soil Sci., **71**, 83–90 (1951).
C. A., **46**, 675c (1952).

The presence of Ca in soil and plant exts. interferes with the detn. of Na by the flame photometer. This can be corrected by decreasing the Na results by 7 lb. for each 1000 lb. of Ca present. The interference can be eliminated by adding 0.5 g. of NH_4 oxalate crystals to each 30 g. of soil before extn.

3855. SHAW, C. W. AND HOLLEY, H. L.
Sodium and Potassium Concentration in Human Cerebrospinal Fluid. I. Normal Values.
J. Lab. Clin. Med., **38**, 574–6 (1951).
C. A., **46**, 6688f (1952).

The Na and K concn. in normal human cerebrospinal fluid was detd. by using flame photometry and standard chem. methods. Agreement was good between the 2 procedures and with the literature.

3856. SHENSTONE, A. G. AND WILETS, L.
Third Spectrum of Copper (CuIII).
Phys. Rev., **83**, 104–8 (1951).
C. A., **45**, 8350a (1951).

An analysis of the 2nd spark spectrum of Cu is given. The identified levels include all those due to $3d^9$, $3d^84s$, $3d^84p$ except the ^2S and ^2P based on $3d^81S$. The 6 levels $3d^8(^3F)5s$ $^4F,^2F$ were found and allow the calcn. of an ionization potential of 37.08 v. A no. of levels of $3d^84d$ are present also, but $3d^74s^2$, which should be lower, was not found.

3857. SHERMAN, J.
Statistical Analysis.
Physical Methods in Chemical Analysis, Vol. II (Ed. by W. G. Berl).
Academic Press Inc., New York, N. Y. (1951), pp. 502–89.

This treats of statistical analysis applied to spectrographic measurements (pp. 502–566), with numerical examples (pp. 566–589) and a list of 13 references (p. 589).

3858. SINGH, J.
Spectroscopic Study of a Condenser Spark Between Copper Electrodes in Illuminating Gas, Air, and Carbon Dioxide at Various Pressures. II.
Indian J. Phys., **24**, 321–30 (1951).
C. A., **45**, 6922 b (1951).
Cf. *C. A.*, **41**, 4714g.

By using a medium Hilger quartz spectrograph the spectra at various portions of a condenser spark in illuminating gas, air, and CO_2 were detd. at pressures of 1 to 20, 3 to 40, and 3 to 32 cm. of Hg, resp.

3859. SLOCUM, W. H.
Spectrochemical Analysis.
Instrumentation, **5**, pp. 28–30 (1951).

A statement of the fact that quantitative spectrochemical analysis saves time and raw materials, and minimizes rejects in chemical and metallurgical processes; it includes a brief description of the Bausch & Lomb densitometer with Electronik recording potentiometer.

3860. SMALES, A. A.
Determination of Strontium in Sea Water by a Combination of Flame Photometry and Radiochemistry.
Analyst, **76**, 348–55 (1951).
C. A., **45**, 7466g (1951).

A measured quantity of Sr^{89} is added to the sample and the fraction of the total Sr that is copptd. with $BaSO_4$ on addn. of $BaCl_2$ is measured by the decrease in the activity of

the filtrate and also by estg. by flame photometry the quantity of Sr that must be added to the filtrate in order to re-adjust the Sr emission to the value prior to the pptn. The values obtained by the 2 procedures agree well. In 6 samples of sea water examd., 9–11 p.p.m. of Sr were found. The results indicate an av. of 10 p.p.m. whereas the previously-accepted value was 13–13.5 p.p.m.

3861. SMIT, J., ALKEMADE, C. T. J., AND VERSCHURE, J. C. M.
Development of the Flame-Photometric Determination of Sodium and Potassium in Blood. I.
Biochem. et Biophys. Acta, **6**, 508–23 (in English) (1951).
Chem. Weekblad **47**, 23–5 (1951).
C. A., **46**, 11302i (1952).

An app. is described for the flame-photometric detn. of alkali elements in an air-CH:CH flame with a burner (Cf. van der Held and Heierman, *C. A.*, **30**, 2843[1]) and an atomizing spray. The spectral lines are selected by means of filters, and the intensity is detd. from the galvanometer deflection produced by the current from a Cs–Cs_2O phototube. Serum should be deproteinized with 5% Cl_3CCOOH. Added Na and K were recovered 96 and 97%, resp. Several org. solvents enhance atomization, and therefore, the galvanometer deflection. The possible sources of error and their magnitude are discussed.

3862. SMITH, D. M.
Spectrographic Analysis of Pure Metals.
Met. ital., **43**, 121–8 (1951).
C. A., **45**, 6955c (1951).

Spectrographic methods, equipment, excitation sources, and literature data for the detn. of impurities in Al, Cu, Pb, Mg, Ag. Au, Pt, and Zn are reviewed. Qual. and semiquant. trace analysis are discussed. Stigmatic spectra were used in studying the spectral characteristics of a Hilger constant d.-c. arc, and by correlating arc voltages with successive stigmatic spectra a tentative explanation of the mechanism of the Ag-globule arc is advanced.

3863. SMITH, I. L., YEAGER, E., KAUFMAN, N., HOVORKA, F., AND KINNEY, T. D.
Application of Emission Spectroscopy to Medical Problems. I. Spectrographic Techniques.
Arch. Path., **52**, 321–31 (1951).
C. A., **46**, 4041a (1952).

A review with a large bibliography.

3864. SOBOLEV, N. N., MEZHERICHER, E. M., AND RODIN, G. M.
Dependence of the Intensity of Spectral Lines on the Concentration of the Element in the Flame.
Zhur. Eksptl. Teoret. Fiz., **21**, 350–66 (1951).
C. A., **46**, 4359i (1952).

See *C. A.*, **45**, 4134d.

3865. SOMMER, A. J.
Uses and Abuses of the Flame Photometer.
Am. J. Med. Technol., **17**, 276–82 (1951).
C. A., **46**, 8181f (1952).

Some of the practical difficulties encountered in the operation of a flame photometer are discussed, such as the gas pressure, the purity of the distd. water, and the collection of blood samples. Heparinized plasma can be used for the detn. of Na and K, but serum is preferred, provided the red cells are removed by centrifugation within a half hr. after the taking of the blood. High K values are obtained when the serum is allowed to remain in contact with the red cells for any length of time, but the Na concn. is not affected.

3866. STONE, I, GRAY, P. P., AND KENIGSBERG, M.
Flame Photometry-Sodium, Potassium, and Calcium in Brewing Materials.
Am. Soc. Brewing Chemists, Proc., **1951**, 8–20.
C. A., **48**, 4175c (1954).

A Beckman flame spectrophotometer is used. Calibration is done by flaming solns. contg. increments of the element under consideration and plotting curves of percentage transmission at characteristic wave lengths *vs.* concn. in p.p.m. The effects of naturally occurring other constituents in materials under examn. are compensated for by using solns. for calibration contg. such compds. For beer, the "background" soln. contains beer dextrin 4%, EtOH 4.5%, P_2O_5 740 p.p.m. (as $NH_4H_2PO_4$), SO_3 210 p.p.m. (as $(NH_4)_2SO_4$), Mg 100 p.p.m. (as $MgCl_2$), Ca 50 p.p.m. (as $CaCl_2$), Na 50 p.p.m. (as NaCl), K 400 p.p.m. (as KCl). Na, K, or Ca is omitted from solns. used for detn. of the same. For wort, 7% maltose is added to the above. Characteristic analyses are given for 39 American and 12 foreign beers. Variation in compn. during processing of beer through 7 stages is given. Na and Ca concns. are essentially unchanged. K concn. is reduced approx. 45% during fermentation.

3867. STRASHEIM, A. AND HUGO, T. J.
Spectrographic Analysis of Type Metal.
J. S. African Chem. Inst. [*N. S.*], **4**, 103–8 (1951).
C. A. **47**, 5294f (1953).

Type metal is analyzed completely by a spectrographic method, suitable for quality control, within 2% for Pb, Sn, and Sb.

3868. SYKES, W. S. AND MANTERFIELD, D.
Spectrographic Determination of Alumina in Silica Brick.
Metallurgia, **44**, 267–70 (1951).
C. A., **46**, 3455i (1952).

The method involves fusing a sample of powdered brick with a fusion mixt. consisting of 49.25% Na_2CO_3, 49.25% borax, and 1.5%

Nb_2O_5, the last being used as an internal standard. A short graphite electrode dipped into the molten fusion will have an adhering tip which contains the brick and internal standard in solid soln. A counter electrode of graphite is used. The electrode bearing the sample is preheated to about 800° before dipping into the molten fusion. The fused material will adhere tightly to the electrode forming a solid tip of uniform thickness. As many as 6 electrodes can be tipped from a single fusion. For each exposure, 1 tipped electrode is used with a counter electrode of graphite. An intermittent a.-c. arc is used for excitation and a Hilger Large Quartz Spectrograph is employed. Source to slit distance is 39 cm., wave-length setting 2700–4400 Å., slit width 0.015 mm., slit length 2.5 mm., current 4 amp., analysis gap 2 mm., exposure 60 sec., and the plate is an Ilford-Thin-Film Half Tone. Plate calibration and method of detg. the characteristic curve are discussed.

3869. THIERS, R. E.
The Step-Sector in Spectrochemical Analysis.
J. Optical Soc. Am., **41**, 273–6 (1951).
C. A., **45**, 5054c (1951).

Expts. were performed to discover whether or not the use of the step-sector is a valid method of film calibration for spectrochem. analysis. For the films tested, *viz.*, Eastman Spectrum Analysis No. 1, Spectrum Analysis No. 2, I-L, 103-F, 1-N, and III-F, the calibration curve was a valid one if the sector was run at speeds greater than about 40 flashes per exposure. Schwarzschild coeffs. were calcd. for the above films under the conditions of the expt.

3870. THIERS, R. E.
A Punch-Card System for the Bibliography of Analytical Chemistry.
Virginia J. Sci. (*N. S.*), **2**, 28–45 (1951).

This system provides for inclusion of spectrographic and flame photometric methods among others.

3871. THIERS, R. E. AND YOE J. H.
Modification of the Applied Research Laboratories 2-M Spectrograph for d.-c. Arc Methods.
Bull. Soc. Applied Spectroscopy, **5**, 8–11 (1951).

Modifications were made of an Applied Research Laboratories 2-meter spectrograph and associated equipment to improve performance in the d-c arc determination of trace elements. The modifications included: focal plane step sector, projection of arc image on wall, Hansen lens system to improve uniformity of line tensity, igniter for arc, and water cooling for electrode holder.

3872. TIMMA, D. L.
Application of the Spectrochemical Series.
Bull. Soc. Applied Spectroscopy, **5**, No. 3, 4–10 (1951).

The introduction of extraneous elements into a sample in an arc discharge results in depression or enhancement of the intensities of spectral lines of other elements in the sample. These effects were investigated and elements are arranged in order of the magnitude of the effects with numerical factors (*f*) assigned to the elements. This series agrees fairly well with one based on considerations of boiling points and excitation potentials of the elements.

3873. TOISHI, K.
Spectrochemical Analysis of Minute Quantities of Elements.
Repts. Sci. Research Inst. (*Japan*), **27**, 93–9 (1951).
C. A., **46**, 6029b (1952).

The max. sensitive wavelengths and crit. sensitivity of Mn, Sr, Cu, Zn, Cd, Li, Tl, Pb, Ni, Pt, and Au (as chlorides, except $TlNO_3$) were detd. spectroscopically with a spark between 2 pure Ag. electrodes.

3874. TOMKINS, F. S. AND FRED, M.
A Photoelectric Setting Device for a Spectrum Plate Comparator.
J. Optical Soc. Am., **41**, No. 9, 641 (1951).

A device for making comparator settings by photoelectric scanning of spectrum line images is described. The fiducial position is determined by matching mirror image oscilloscope traces of the line contour. This method combines the advantages of increased speed, precision, objectivity of setting, and decreased eye and nervous strain on the operator. The device is readily adaptable to comparators of the fixed microscope-moving plate type, and conversion from photoelectric to visual setting can be accomplished in a few minutes.

3875. TÖRÖK, T.
Determination of Impurities in Aluminum and Its Alloys.
Acta Chim. Acad. Sci. Hung., **1**, 289–318 (in German) (1951).
C. A., **48**, 9260g (1954).

Criteria are presented for the selection of best spark or arc excitation conditions and line pairs for the detn. of Cu, Zn, Ti, V, Cr, Mn, Na, and Mg. Quenched electrodes are used throughout. Lower limits are established for the individual elements, and interfering lines are discussed. Calibration curves are shown, and detailed directions are included for their prepn. Av. error over the linear portion of the curves is ±3–5% with spark excitation and ±5–10% with an interrupted arc. Errors at the lower limits are approx. twice as great.

3876. TUFTY, B. J.
Direct-Reading Spectrograph.
Iron Age, **167**, No. 23, 104–5 (1951).

C. A., **45**, 5980b (1951).

A new French spectrograph is described. This instrument gives a direct reading as well as a printed record in a calibrated drum chart. Photoelec. cells replace the usual photographic plate.

3877. TWYMAN, F.
Metal Spectroscopy.
Charles Griffin & Co., Ltd., London (1951) 569 pp.
Reviewed by J. R. Churchill in *Anal. Chem.*, **23**, 1189 (1951).

This book covers the history, apparatus, procedures and literature especially on the analysis of metals, but also of gases. One chapter is given to X-Ray spectrochemical analysis. The more recent trends are considered in a separate chapter. This is of particular interest for nonroutine testing.

3878. VALLANTIN, B. AND HERVÉ, R.
Quantitative Spectrographic Analysis of Nickels for Cathodes of Electronic tubes.
Congr. groupement avancement méthodes anal. spectrog. produits mét., **14**, 183–93 (1951).
C. A., **46**, 9464i (1952).

Working curves for concns. of 0.01 to 0.5% of Mn, Mg, and Ca were made up from synthetic standard solns. for the spectrographic analysis of special Ni used for cathodes. Good sensitivity for these metals and good reproducibility was obtained with a Pfeilsticker alternating arc.

3879. VANSTONE, F. H.
Quantitative Method of Flame Spectrographic Analysis.
Ann. Rept. East Malling Research Sta., Kent 1951, 122–5 (1951).
C. A., **48**, 6902a (1954).
Cf. *C. A.*, **46**, 7152b.

The flame method described previously is modified. The ashed plant material is mixed before burning with an internal standard powder consisting of cellulose powder 56.9, NH_4Cl 19, $BeCl_2$ 15.8, $CdSO_4$ 2.9, and PbOAc 5.4%. The lines of certain elements are seriously suppressed by the presence of other elements; this is compensated for by choosing as internal standard an element which is affected in the same way as the element under detn. The method has been applied to K Ca, Mg, Fe, Mn, and Cu.

3880. VERBESTEL, J. BERGER, A., AND PIROTTE, J.
Spectrochemical Examination of Rust by the Method of Internal References.
Congr. groupement avance. méthodes anal. spectrog. produits mét., **14**, 221–4 (1951).
C. A., **46**, 7471g (1952).

Internal standards are used in the spectrochem. analysis of rust. The amt. of each constituent present is given by $\theta - P_\gamma/P$, and $\theta' P_\gamma/P_r$, where P_γ = wt. of a certain element in the sample, P = wt. of the sample, P_r = wt. of the reference material. P_γ and P_r can be obtained without weighing the samples by a detn. of the light absorption for different wavelengths.

3881. VERKERK, B.
A Possible Extension of the Density-Difference Method of Spectrographic Analysis.
J. Optical Soc. Am., **41**, 1017–22 (1951).
C. A., **46**, 2951h (1952).

The d. transformation according to Seidel, $Dt = \log[(d_0/d) - 1]$ results in a calibration curve that is nearly straight in the wavelength region normally used in spectrographic analysis. The properties of the "transformed d. curve" were studied in detail and by choice of favorable conditions the remaining curvature is negligible. This offers the possibility to extend the d. difference method to the (H and D) d. range 0.1–2.

3882. VERNON, R. O.
Geology of Citrus and Levy Counties, Florida.
Florida Geol. Survey, Geol. Bull., No. **33**, 256 pp. (1951).
C. A., **46**, 3916b (1952).

Deposits of hard-rock phosphate, limestone, and dolomite are described with complete chem. and spectrographic analyses of 5 samples of phosphate and chem. analyses of a dolomite.

3883. VOGL, M. F.
The Vanadium Content of Wehrlites from Szarvaskö.
Földtani Közlöny, **80**, 168–80 (1951).
C. A., **45**, 8415g (1951).

Spectrographic analysis of 32 samples from the Denevér shaft showed V contents of 0.08–0.25% (av. 0.14%).

3884. VUORINEN, J. AND MÄKITIE, O.
Determination of Calcium Direct from Soil Extract by Means of Spectrophotometer with Flame Attachment.
Suomen Kemistilehti, **24B**, 7–14 (in English) (1951).
C. A., **47**, 1881i (1953).

A routine method was set up by which samples of soil ext. can be analyzed for Ca at the rate of 60 per hr. Soil samples are extd. with an aq. soln. 1 N in AcOH and 0.5 N in NH_4OH, by using 10 times the sample wt. and shaking for 1 hr. before filtering. The filtrate is analyzed direct in a Beckman DU spectrophotometer with the original flame attachment, by using air at 1.1 atm. pressure, O_2 at 25–30 cm. H_2O pressure, and a mixt. of manufd. gas and propane at 6 cm. and 1.5 cm. H_2O, resp. The Ca band at 554 mμ is used for the measurement, the results being read from an empirical curve detd. from standard solns. including an av. amt. of interfering ions. It was found that presence of Al_2O_3 or MgO causes a neg. error in the Ca values, as does P_2O_5, whereas K_2O and Na_2O

cause a pos. error. The standard solns. therefore included av. amts. of interfering substances as found in Finnish arable soils, thus, in p.p.m., 40 Al_2O_3, 100 MgO, 10 Na_2O, and 3 P_2O_5. Compared with the chem. detn. of Ca this method yields ample accuracy for the purpose.

3885. WARK, W. J.
Spark Analysis of Semi-Microsamples.
J. Optical Soc. Am., **41**, 465–7 (1951).
C. A., **45**, 8391h (1951).

A new method of mounting semi-microsamples in graphite electrode briquets for spectrographic analysis is described. The method is very flexible and is particularly adapted to those procedures involving limited samples. The method can be applied to arc or spark techniques without modification.

3886. WEICHSELBAUM, T. E.
Spectrophotometric Analyzer.
U. S. Patent 2,562,874, July 31, 1951.
C. A., **45**, 9931b (1951).

Improvements in the app. of U.S. Patent 2,532,687, primarily concerning the oxyacetylene lamp.

3887. WEXLER, S.
Sample Temperature in the Carrier-Distillation arc.
Anal. Chem., **23**, 1166–7 (1951).
C. A., **46**, 54i (1952).

In the d.-c. arc method for the detn. of impurities in U_3O_8 the addn. of 2% Ga_2O_3 raised the temp. of the charge in the graphite 200–300° above the 1100° obtained with U_3O_8 alone. A Pt-Rh *vs.* Pt thermocouple was placed in the U_3O_8 charge for the temp. measurement. The results were compared with values obtained on the optical pyrometer.

3888. WILLARD, H. H.
Instrumental Methods of Analysis.
D. Van Nostrand Co., New York, N. Y., 2nd ed. (1951), 344 pp.
C. A., **45**, 4607a (1951).

Sections are included on flame photometry and spectrography. The discussions are well illustrated with photographs of equipment.

3889. WILLIAMSON, D. E. AND ROBINSON, D. Z.
Computing Machines for Spectrochemical Analysis.
Anal. Chem., **23**, 1590–3 (1951).
C. A., **46**, 788d (1952).

Rapid spectrochemical analysis requires the development of automatic equipment capable of giving answers in a matter of minutes. In multicomponent mixtures in which the concn. of the standard cannot be considered constant, the problem is complicated by the necessity of solving the atomic dilution equations. One example is the computer embodied in the direct reading spectrometers to det. the log of the ratio of two concns. A direct reading dilution computer is then used to solve the simple atomic dilution equations directly. Instruments for spectrochemical analysis have heretofore been considered as individual tools that may be used singly or in combination for research or for production control. The current demand for rapid, push-button operation requires combining these components into a single instrument. This paper analyzes the direct reading spectrometer and direct reading dilution computer (both supplied by Baird Associates, Inc.) for their role in rapid spectrochemical analysis.

3890. WILSKA, S.
Sensitivity of Direct Spectral Analysis of Solutions.
Acta Chem. Scand., **5**, 890–7 (in English) (1951).
C. A., **46**, 10040h (1952).

The porous-cup electrode method of Feldman (Cf. *C. A.*, **43**, 8945b) was used with a Zeiss quartz spectrograph, over the range of 2200–4600 A. The following sensitivities were obtained: 0.02–0.1 p.p.m., Ag, Be, Mn; 0.1–1 p.p.m., Al, Ba, Bi, Cd, Co, Cr, Cu, Fe, Mo, Pt, Sr, V, Zr; 1–10 p.p.m., As, Ce, Ga, Hg, La, Li, Ni, P, Pb, Sb, Sn, Te, Tl, W, Zn; 10-30 p.p.m., Au, Na, Th. The most sparklike conditions of excitation produce the greatest sensitivity but the relative intensities of lines are often different from those given in wavelength tables. The technique used here is the best for most elements except alkalies. In the latter case, flame excitation is preferable.

3891. WILSKA, S.
Quantitative Spectral Analysis of Trace Elements in Water.
Acta Chem. Scand, **5**, 1368–74 (in English) (1951).
C. A., **47**, 2405c (1953).

The application of the porous-cup electrode technique for the direct spectral analysis of solns. (Wilska, *C.A.*, **46**, 10040h) is described with reference to the trace analysis of water. Ca and Mg compds. were used as internal standards. It was also detd. that Pt was an ideal internal standard because it has a reasonable no. of contamination-free lines covering a wide wavelength range and it is absent from Finnish waters. A concn. of 30 p.p.m. of Pt was optimum. The following min. concns. were capable of detn. in the original water samples: Al 0.5, Ba 0.05, Cd 0.01, Co 0.05, Cu 0.01, Cr 0.05, Fe 0.05, Mn 0.001, Ni 0.5, Pb 0.5, Sr 0.07, and Zn 0.6 p.p.m. The av. percentage deviation from the mean intensity ratio (analysis line/internal standard line) varied from 1.49% (Cd) to 4.35% (Mn). The use of the method to det. adsorption isotherms is mentioned.

3892.. WYSS, V.
Spectrographic Determination of Lead in the Teeth of Normal Individuals and of Individuals Exposed to Lead Poisoning.
Rass. med. ind., **20**, 40–7 (1951).
C. A., **45**, 8642d (1951).

The results of the detn. of Pb in the teeth of normal individuals and of metal workers are reported. Although Pb was present in the teeth of all persons examd., the mean quantity of Pb was 27 mg. per g. of dental ash in normal persons, and 58 mg. per g. of ash in metal workers. An explanation of this difference is given. The results are compared with those found by other authors and found to be in accord. A comparison of the quantities of Pb in the bone and in other parenchymatous tissues shows that teeth as bone have the function of storing Pb circulating in the blood.

3893. YAMAGATA, N.
Geochemical Studies on Rare Alkalies. III.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 154–7 (1951).
C. A., **46**, 3683g (1952).
Cf. *C. A.*, **46**, 1109a.

The rare alkali contents of 19 hot springs near Mt. Zao in the Tohoku district were detd. spectrographically. The at. ratio of Na:K:Li:Rb:Cs was 100:3.0:0.09:0.002: 0.003 for all but 2 highly acidic springs.

3894. YAMAGATA, N.
Geochemical Studies on Rare Alkalies. IV.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 157–61 (1951).
C. A., **46**, 3683h (1952).
Cf. *C. A.*, **46**, 1109a.

The rare alkali contents of 37 hot springs near the Kusatsu Shirane volcano were detd. spectrographically. The mean at. ratio of Na:K:Li:Rb:Cs was 100:24.0:0.2:0.01: 0.003.

3895. YAMAGATA, N.
Geochemical Studies on Rare Alkalies. V.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 247–9 (1951).
C. A., **46**, 1190c (1952).
Cf. *C. A.*, **45**, 6781g; **46**, 1109a.

The rare alkali contents of 13 hot springs in Wakayama and Nara Prefectures are detd. spectrographically. The contents are generally low except in the Shionoha Spring in Nara Prefecture which contains Li 4, Rb 0.4, and Cs 0.3 mg./l.

3896. YAMAGATA, N.
Geochemical Studies on Rare Alkalies. VI. Distribution of Rare Alkalies in Plants.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 299–301 (1951).
C. A., **46**, 1108i (1952).
Cf. *C. A.*, **46**, 1190c.

The distribution of rare alkalies in various plants is studied.

3897. YAMAGATA, N.
VII. Rare Alkali Contents of Japanese Rivers.
J. Chem. Soc. Japan, Pure Chem. Sect., **72**, 530–2 (1951).
C. A., **46**, 3683h (1952).
Cf. *C. A.*, **46**, 1109a.

Thirteen samples of main river water in Japan were studied. Na and K were detd. gravimetrically and Li, Rb, and Cs were estd. semiquantitatively by spectrochem. methods. The results were Na 1.86–6.87 mg., K 0.47–3.11 mg., Li 0.2–2 γ, Rb 0.3–2 γ, and Cs 0.05–0.2 γ/l.

3898. YAMAZAKI, K. AND KURODA, T.
Spectrochemical Determination of Iron in Clays for Ceramic Uses.
J. Ceram. Assoc. Japan, **59**, 93–5 (1951).
C. A., **45**, 9822h (1951).

Iron was spectrochemically detd. by the length-of-line method, with use of a d.-c. arc and a logarithmic sector. Lines 3008.1, 3020.6, 3025.6, and 3037.5 Å. of Fe were compared with Al 3082.15. The covered range of Fe content is 0.1–3.0% Fe_2O_3. The variation from 23 to 38% of alumina content used as the internal standard did not affect the results. Results are precise to within about 10%.

3899. YAVNEL, A. A.
Spectrographic Analysis of the Mineral Composition of the Sikhote-Alinsk Meteorite.
Izvest. Akad. Nauk Kazakh. S.S.R., No. **104**, *Ser. Astron. i Fiz.*, No. **5**, 31–56 (1951).
C. A., **48**, 2518a (1954).

A detailed account of the procedures used for the analysis is given. The Ni and Co are found largely as Fe lattice substituents in kamacite. In schreibercite the high content of Ni is explainable by formation of Fe_3NiP. Cu is distributed among kamacite, schreibercite, and troilite, and is absent in chromite. Ge is found as admixt. in all the minerals. Mg is mainly concd. in the chromite. Cr is found mainly in chromite, but also in troilite (1%) as sulfide. Mn, V, and Ti are concd. in the chromite. Al and Si are low concn. admixts. to all minerals and are found in least amts. in kamacite.

3900. YAVNEL, A. A.
Spectrographic Determination of Admixtures of Noble Metals in the Sikhote-Alinsk Meteorite.
Izvest. Akad. Nauk Kazakh. S.S.R., No. **104**, *Ser. Astron. i Fiz.*, No. **5**, 57–70 (1951).
C. A., **48**, 2533c (1954).

The content of noble metals (Ag, Au, Pt, Pd, Ru, and Rh) is higher in the meteorite of the Fe type than in the rock meteorites and in the elements of earth's crust. Gener-

ally increased Ni content in the meteorite also leads to higher concn. of the noble metals. In descending order of abundance in the meteorite are: Pd, Ag, Ru, Pt, Au, and Rh.

3901. YOUNG, J. F.
Analyzing Stabilized Stainless Steel.
Iron Age, **168**, No. 2, 91–2 (1951).
C. A., **45**, 7916h (1951).

Chem.-spectrographic analysis of Ta-Nb line intensity ratio is at least as accurate as any other routine method. It is also faster than point-to-plane technique and does not require stainless steel standards. Ta and Nb are sepd. as pentoxides and the Ta-to-Nb ratio is detd. spectrographically. Nb is detd. concurrently with the other elements in stainless steel spectrochemically. In this method, the oxides are pptd. only once and SiO_2 is not volatilized.

3902. ZOELLNER, H.
Flame Photometers for Alkali Determination.
Glas-Email-Keramo-Tech., **2**, 290–4 (1951).
C. A., **46**, 5c (1952).

The accuracy of the K, Na, Li detn. with modern flame photometers is given as ±2 to 0.5% of the value concerned. The present article is a crit. comparison of two instruments produced in Germany. The advantages and disadvantages are discussed in detail. The sensitivity of the Multiflex galvanometer is often not satisfactory; mirror-reading galvanometers are preferred. The special Schott glass filters are for many purposes profitably replaced by interference filters (from Schott-Schwandorf). For geochem. purposes, the sensitivity of the galvanometer readings can be increased by electron-tube amplifying. Se photocells are sufficiently sensitive for the detn. of K and Rb in silicate analysis, and have the advantage of very low inertia, and approx. linear proportionality of intensity. A table is given of the most important special wavelengths for flame photometric alkali detns.

3903. ZOELLNER, H.
Factors Influencing the Accuracy of Flame Photometric Alkali Determinations.
Glas-Email-Keramo-Tech., **2**, 378–81 (1951).
C. A., **46**, 3446g (1952).

The effects of simultaneously present elements in the radiant flame is not strong enough to introduce errors if the admixed alkali (e.g. K) is less than 3 times the concn. of Na to be detd. For a 4-fold K concn., a correction of ±2.2% must be applied, for a 10-fold K concn. ±9.2%. The methods of A. Schinkmann (*Silikat-Tech.*, **2**, 163–6 (1951)) are in this case particularly suitable, especially if Li is also present. Although L. Lundegardh in his investigations did not find any changes of the alkali detns. by variable anions, it is recommended to avoid sulfate formation entirely during the analytical process and to decomp. silicates by HF + HCl. If the light filters of the photometer are not strictly monochromatic, the effects of neighboring wavelengths are likely to cause trouble. It is difficult to apply corrections for such effects, especially if Se photocells are used. For precision measurements, the filtering of yellow Na lines through a 15-mm. thick $CuSO_4$ soln. (75 g. $CuSO_4 \cdot 5H_2O$ in 1 l.) is not sufficient. It is essential that for spraying-dispersion the exptl. and calibration solns. have the same temp. and d.; it is entirely unsuitable to use warm solns. from freshly decompd. samples. The acidity or basicity must also be approx. the same for both; the acid excesses should be the same kind of acid, e.g. HCl. Instrumental factors are detd., e.g. in the flame temp., given by the fuel gas used (propane is uniformly preferred). Its pressure must be controlled with a high accuracy, e. g., by the inclined manometer type. The accuracy for Na and K detns. is greatest for concns. of Na_2O and K_2O of 0.001–0.1% in the soln. For the calibration and a sufficiently great accuracy, the "internal standard method" is recommended, with relative measurements, e.g., controlled addns. of LiCl to a (Li-free) alkali chloride soln. in the calibration; the abs. intensities are not used, but rather the relative intensities log (y_{Li}/y_{Na}) and log (y_{Li}/y_K) (Cf. Eubank and Bogue, *C. A.*, **44**, 8611i). 27 references.

3904. ZOGG, R. E.
Metal Analysis of Cracking Catalysts with the Emission Spectrograph.
Bull. Soc. Applied Spectroscopy, **5**, No. 3, 21–23 (1951).

A method is described for the determination of Ni and V in oil cracking catalysts, using a mixture of catalyst and graphite compressed into pellets and excited with an overdamped discharge from a Multisource Unit. Results are within ±10 per cent of those obtained by polarographic analysis.

1952

3905, AHRENS, L. H.
Spectrochemical Analysis as a Tool in Geochemistry.
Appl. Spectroscopy, **6**, No. 5, 11–13 (1952).
C. A., **47**, 3198e (1953).

The spectrograph applied to geochem. research at M.I.T. has demonstrated (1) that the K/Rb ratio is const. in all common rock types and in meteorites, (2) that the abundance of radioactive K^{40} in dunite is actually about $^1/_{30}$ that resulting from chem. detns., and (3) that the min. age of the earth is

measured by the Rb^{87}/Sr^{87} ratio is 2×10^9 yrs.

3906. AHRENS, L. H., PINSON, W. H., AND KEARNS, M. M.
Association of Rubidium and Potassium and their Abundance in Common Igneous Rocks and Meteorites.
Geochem. et Cosmochim. Acta **2**, 229–42 (1952) (in English).
C. A., **46**. 9035a (1952).

Spectrographic analyses of common igneous rocks, such as granite, diabase, basalt, gabbro, and ultramafics, show that the K/Rb ratio is virtually unchanged from rock type to rock type. In crustal igneous rocks the percentage ratio K:Rb averages 90. The content of K for New England granites varies from 1.8 to 5%, av. 3.35%. The av. for basalt, gabbro, and diabase is 0.9%. On the basis of 2 parts granite to 1 part basalt the approx. compn. of crustal igneous rocks, their av. K content is 2.7%. Rb ranges from 0.02 to 0.09%, av. 0.052%, in New England granites. If the granite-basalt ratio is 2:1, the Rb abundance is 0.035% for igneous rocks. K and Rb were also detd. in 26 stony meteorites comprising 21 chondrites, olivine from a pallasite, one chaldnite, and 3 tektites. In chondrites the concn. of K ranges from 0.05 to 0.13% av. 0.09%. The abundance of Rb in chondrites is 0.0009%. The mean ratio of K/Rb in chondrites is 100. The av. heat generated by K^{40} in the earth's crust (33 km. depth, 2.6% K) is 0.32×10^{20} cal./yr; in a dunite mantle (2900 km., 0.03% K), 0.35×10^{20} cal./yr. If the ultramafics are considered to be representative of the mantle and if the K content of 0.004%, as found in this work, represents the correct magnitude, then the total heat generated by K^{40} in the mantle is small compared to that generated in the crust. The production of heat from K^{40} in the crust is $^1/_6$ that from the U + Th series. Based on 0.004% K in the mantle, the production of A^{40} in the mantle becomes small compared with that in the crust.

3907. ALEXANDER, G. V. AND NUSBAUM, R. E.
Emission Spectrographic Analysis of Organic Solids for Inorganic Constituents.
Anal. Chem., **24**, 793–5 (1952).
C. A., **46**, 7473g (1952).

A method is given for analyzing org. solids without previous ashing for Na, K, Ca, Mg, Ba, and Fe in the range of 0.02–6% and of P in the range of 2–18%. It consists in drying, grinding, and weighing the org. sample. To this is added 4 parts of a $LiCO_3$-V_2O_5 internal standard mixt. This mixt. is packed into a platform-type graphite electrode described by Hasler, *et al.* (*C. A.*, **37**, 2301[2]). Repeat observations on a single sample show an av. standard deviation of 4.7% except for P, in which case it is 9.9%. The method has proven satisfactory for the analysis of mono- and polysaccharides and their derivs.

3908. ALKEMADE, C. T. J.
Flame and Atomizer.
Chem. Weekblad, **48**, 699–703 (1952).
C. A., **47**, 2003i (1953).

A general characterization of flames and atomizers with regard to their application in flame photometry.

3909. ALKEMADE, C. T. J., SMIT, J., AND VERSCHURE, J. C. M.
A Further Contribution to the Development of the Flame-Photometric Determination of Sodium and Potassium in Blood Serum.
Biochem. et Biophys. Acta, **8**, 562–70 (in English) (1952).
C. A., **47**, 168d (1953).

A new type of flame photometer is described to improve the detn. of Na and K in blood serum. Interference effects are avoided and sample consumption is reduced by using a flame of lower temp. (propane gas and air), a spray with higher yield, and a photo-multiplier connected directly to an a.-c. galvanometer. The accuracy and sensitivity are unchanged.

3910. ARREGHINI, E. AND SONGA, T.
The Sensibility of Spectral Detection of Impurities in Lead.
Spectrochim. Acta **5**, 114–23 (1952).
C. A. **47**, 1001a (1953).

By means of spark spectra of synthesized and chemically analyzed samples the limits of detection of impurities (Ag, As, Au, Bi, Cd, Cu, Hg, Ni, Pt, Sb, Sn, Te, Tl, and Zn) in Pb have been detd. These limits range from 0.00003% for Ag to 0.01% for Te. Considerable differences in the limits of detection of the various elements are correlated with heats of vaporization in one group of elements, and the low sensitivity of some is probably due to the location of the ultimate lines in the extreme ultraviolet.

3911. ASTOIN, N., VODAR, B., AND MARTIN, J.
An Externally Controlled Apparatus which Permits Several Spectra to be Photographed with the Same Film.
J. phys. radium, **13**, 108–9 (1952).
C. A., **46**, 5973h (1952).

An app. is described for photographing, on the same film, 8 spectra 1.5 mm. high and sepd. by 0.5 mm.

3912. AUBREY, K. V.
Germanium in British Coals.
Fuel, **31**, 429–37 (1952).
C. A., **46**, 11628h (1952).

The Ge content of some 200 British coals from all main coalfields have been detd. by spectrographic analysis of the ashes.

The conclusions from these results are discussed. The av. Ge content of these coals, about 7 p.p.m., is of the same order as the content of most sedimentary rocks. Apart from the coals derived from the South Wales coalfield tending to have low Ge contents, there is no evidence of a marked regional variation in av. Ge. content. The bulk of the Ge in British coals appears to be present in intimate assocn. with the org. matter of the coal rather than with the adventitious mineral matter.

3913. AYRES, G. H. AND BERG, E. W.
Spectrographic Determination of Palladium, Platinum, Iridium, and Rhodium.
Anal. Chem., **24**, 465–9 (1952).
C. A., **46**, 6034f (1952).
Cf. *C. A.*, **46**, 3452h.

Pd can be sepd. from all other Pt metals by pptn. with dimethylglyoxime. To study the sharpness of this sepn. spectrographic methods were employed for the analysis of the Pd ppt. with dimethylglyoxime for a comparison of the amt. of Pd found with the amt. of Pd taken, and the analysis of the filtrate for Pt, Ir, and Rh for a similar comparison. The porous-cup-electrode technique and 180-sec. exposure were used. The Co 3354.4 line was used as the internal standard for all 4 Pt metals. The lines used for the detn. of the Pt metals were: 3242.7 for Pd, 2380.3 for Pt, 3220.7 for Ir, and 3323.1 for Rh. Description of the prepn. of the standard solns. of the Pt metals and the $CoCl_2$ soln., prepn. of the graphite electrodes, exposure, film development, and other exptl. details follow. The variation of the concn. of one element had no effect on the intensity ratios of the other Pt metals and the introduction of 10% by vol. of 1% soln. of dimethylglyoxime in 95% alc. and an HCl content up to 10% had no adverse effect on the intensity ratios. The working curves plotted from exptl. data were linear.

3914. BAISTROCCHI, R.
Orientative Spectrochemical Research on Some Italian Antique Bronzes.
Spectrochim. Acta, **5**, 24–9 (1952).
C. A., **47**, 929a (1953).

Qual. spectrochem. analyses were made by comparing the arc spectra of bronzes and patinas dating from the 6th century B. C. to the 15th century A. D.

3915. BARDÓCZ, Á.
Light Sources for Spectrum Analysis.—I. Interrupted Arc Source for Spectrum Analysis.
Acta Phys. Acad. Sci. Hung, **1**, 247–60 (1952) (in English).
C. A., **46**, 9893i (1952).

A novel means of producing an igniting voltage for an arc source using a low-voltage controlled circuit is discussed. By using a 4-cam camshaft interrupter rotating at 1500 r.p.m. and an effective voltage of 380 v. in series with a 400-ohm resistor, a 0.05-microfarad capacitor is alternately charged and then discharged through the primary of a Tesla coil, the secondary of which discharges across the arc gap. The arc circuit, connected to the same arc gap, is blocked from high-frequency currents by means of a series of capacitors and inductance coils in a conventional manner. Construction of a suitable low-loss Tesla transformer is discussed and illustrated. Circuit diagrams of and oscillograms produced by the app. are given. A general discussion of arc sources and ignition devices (with 40 references) is offered.

3916. BARDÓCZ, Á.
Light Sources for Spectrum Analysis.—II. Electronically Controlled Alternating-Current Operated Direct-Current Interrupted Arc Sources.
Acta Phys. Acad. Sci. Hung., **2**, 265–76 (1952).
C. A., **48**, 4h (1954).

A spectrographic arc source with controlled variable rhythm ignition is described. A pulse generator signals the grid of a thyratron which, in turn, controls the operation of a Tesla transformer. See also: Bardócz, Á. Electronically controlled a.-c. Interrupted Arc Source for Spectrographic Purposes, *J. Opt. Soc. Am.*, **42**, 357–9 (1952).

3917. BARNEY, J. E. II AND KIMBALL, W. A.
Determination of Iron in Used Lubricating Oils.
Anal. Chem., **24**, 1548–50 (1952).
C. A., **47**, 1368g (1953).

Fe is detd. rapidly in used lubricating oils in a d.-c. arc. A spectroscopic buffer consisting of Ca naphthenate, linseed oil, and a mixt. of mono- and dioctyl naphthenate and an internal standard of Co naphthenate are employed. The sample and buffer are ashed in the electrode cup, then arced to completion. The range is from 0.001 to 0.1% Fe with a precision of about 10%. When many routine analyses are made a net time of $^1/_6$ man-hour/sample is required.

3918. BARTOLI, L. AND BECCHIO, C.
The Principal Sources of Error in Measurements made with an Applied Research Laboratory's Quantometer.
Spectrochim. Acta, **5**, 184–200 (1952).
C. A., **47**, 996b (1953).

A complete analysis of measurements made in the earlier stage of using an A.R.L. quantometer adapter for steel analysis is described, in terms of the standard deviation of the error from various sources. The contributions made to the error by the recording channels, the source, the method of calibration, and the degree of homogeneity of the samples are discussed separately. Mean standard deviations are reported for Si,

Mn, Cr, Ni, and Cu in steel. The quantometric and chemical analyses obtained in routine work are compared graphically.

3919. BAUSERMAN, H. M. AND CERNEY, R. R., JR.
Adaption of the Spectrophotometer to the Analysis of Water.
Proc. Am. Soc. Sugar Beet Technol., **7**, 681–7 (1952).
C. A., **49**, 9199f (1955).

Techniques are outlined for the use of the Beckman model DU spectrophotometer and its flame attachment for analyses of Na and Ca, K, Mg, SO_4^{--}, Cl^-, NO_3^-, NH_3, and phosphates. The methods are simple, time saving, use a smaller amt. of sample, and are more accurate than previous methods. 19 references.

3920. BENNETT, W. H. AND ROBERTS, R. O.
Detection of Traces of Gold in Rocks.
Colonial Geol. Mineral Sources (London), **3**, 61–4 (1952).
C. A., **47**, 3176f (1953).

Spectroscopic examn. of igneous rocks of Borneo revealed a Au content of less than 30 mg./ton. Preliminary concn. involved collection of Au during fire assay into a Ag bead which was then placed in a d.-c. arc. The limit of detection is 1 γ.

3921. BENUSSI, L. AND CAROLI, A.
The use of Direct-Reading Spectrochemical Analysis by Means of the Quantometer for Production Control of Special Steels.
Spectrochim. Acta, **5**, 97–113 (1952).
C. A., **47**, 997e (1953).

In the routine foundry control of steel of various types by the Applied Research Laboratory's quantometer, the importance of preliminary work on the choice of lines and channels and the method of grouping steel types is discussed. Detailed examples are given of the possible errors from various sources, such as displacement of the frames in the quantometer and variation of the discharge conditions. The spark finally chosen on account of max. reproducibility does not give the best uniformity of integrating times. For various types of steel, long comparison of spectral and chem. analyses has led to the adoption of arbitrary correction factors for each element in each steel type; tables to illustrate this are given. The advantages obtained by quantometer control are stressed.

3922. BERGER, A.
The Microanalysis of Ferrous Alloys.—I. Microanalytical Examination of Wrought Iron.
Bull. centre belge étude et document. eaux Liège), No. **18**, 250–9 (1952).
C. A., **47**, 11077b (1953).

The Ni/Fe ratio was detd. on 70 samples taken in series over a section of wrought iron 3 mm. long. A zone very resistant to corrosion showed a higher Ni/Fe ratio than nonresistant zones. In other samples a resistant zone showed a lower P/Fe ratio than a quickly corroded zone.

3923. BERGER, A.
The Microanalysis of Ferrous Alloys.—II. The Spectrographic Method.
Bull. centre belge étude et document. eaux (Liège), No. **18**, 260–70 (1952).
C. A., **47**, 11077c (1953).

The methods used in the previous work are described in detail (Cf. *C. A.*, **45**, 6965g).

3924. BERNSTEIN, R. E.
Correction of Sources of Error in the Estimation of Sodium, Potassium, and Calcium in Biological Fluids and Tissues by Flame Spectrophotometry.
Biochem. et Biophys. Acta, **9**, 576–7 (1952).
C. A., **47**, 2245d (1953).

The delivery of a const. amt. of element to the burner in unit time, correction of interferences produced in the flame, and accurate isolation of emission for measurement are required for accurate analysis. Means of controlling these factors are presented. The use of an internal standard procedure yields the most accurate results in biol. fluids.

3925. BERNSTEIN, R. E.
The Determination of Potassium and Sodium in Biological Fluids by Flame Spectrophotometry.
S. African J. Med. Sci., **17**, 101–16 (1952).
C. A., **47**, 7014h (1953).

Methods of K and Na estn. in whole blood, plasma, urine, gastrointestinal secretions, and different extracellular fluids by flame spectrophotometry have been developed. Problems of sample storage have been clarified. The prepn. of specimens for atomization has been by diln., with CCl_3COOH pptn. of protein where necessary. Wet-ashing procedures to digest proteins were not satisfactory. Precautions for the control of atomization and flame variables in the Perkin-Elmer flame spectrophotometer are outlined. The delivery of a const. vapor intake into the burner was found to be crit. for accurate and reproducible emissions in the flame. The optimum conditions of operations must be detd. for each individual instrument. Measurement of light intensity ratios by the incorporation of the internal standard, Li in all soln., eliminated or considerably reduced sources of atomization and flame interference for abs. measurements of K and Na emissions. Statistical analysis revealed more accurate results and recoveries in dild. or dry-ash samples by internal-standard flame estn., compared with direct flame photometry and chem methods. The av. standard deviation for replicate estns. and recoveries of added K and Na by internal-standard flame analysis was 1.9 and 1.3% for K and

Na in all fluids. The same errors occurred for plasma K and Na detns. 45 references. Cf. *C. A.*, **47**, 2245d.

3926. BERNSTEIN, R. E.
The Potassium, Sodium, and Calcium Contents of Gastric Juice.—I. Normal Values.
J. Lab. Clin. Med., **40**, 707–17 (1952).
C. A., **47**, 3426g (1953).

Samples of gastric juice (I) obtained from 50 healthy, resting, fasted males through a nasogastric tube at 10–15 min. intervals up to 3 hr. contained 0–66 (32, av.) meq./l. free HCl; 18.7–69.5 (49) Na; 6.4–16.6 (11.6) K; and 2.0–4.8 (3.6) Ca. The interference of HCl in the spectrophotometric flame analyses, a comparison of the flame and chem. analytical methods and the effects of histamine, insulin, alc.-histamine, and adrenaline on the gastric secretion of electrolytes are reported. Li was used as an internal standard to compensate for the depression due to interionic action and the presence of HCl. A variable contamination of I occurred due to swallowed saliva or postnasal secretions.

3927. BERTA, R. AND PALISCA, A.
Spectrographic Analysis of Cast Iron.
Spectrochim. Acta, **5**, 87–96 (1952).
C. A. **47**, 1000g (1953).

In routine spectrochem. analysis of cast iron for foundry control a spark source and spectrograph of medium dispersion were used. Difficulties were encountered in obtaining accurate results for Si, these were eliminated by improving the method of casting and prepg. the samples; the best results were obtained with two cast pencils of the sample and not with a disk and counterelectrode. The standard deviation of the precision of replicate analyses is below 2% for Si and Mn, about 5% for Cu, Mo, and other elements. The mean differences between chem. and spectrographic analysis are also discussed.

3928. BERTHOLD, R.
Laboratory Equipment and Measuring Instruments Exhibited at the Tenth Exposition for Chemical Equipment (ACHEMA), May 1952 in Frankfurt a.M. (Ger.) Optical apparatus.
Chem.-Ing.-Tech., **24**, 682–6 (1952).
C. A., **47**, 4137e (1953).

Microscopes, electron microscopes, refractometers and polarimeters, photometers and colorimeters, spectrographs, monochrometers and spectrophotometers, and specialties such as filters and light sources are described.

3929. BERTON, A.
Analysis of Dusts and Aerosols of Toxic Minerals by Emission Spectrography.
Arch. maladies profess. méd. travail et sécurité sociale, **13**, 491–5 (1952).
C. A., **47**, 4019e (1953).

Dusts or aerosols were collected by drawing air through filter paper. A strip cut from the paper was moved through an elec. spark. Quant. analysis was done from the emission spectrum as previously described (Cf. *C. A.*, **43**, 6104g). For sufficient accuracy on a strip 8 × 0.5 cm., 50 l. air is sampled for detg. Cr, Cd, and Pb, 10 l. for Mn, and 1000 l. for Hg and Be. The precision of the method is ±10 to 15%. The method is not suitable for silicates.

3930. BERTRAND, G. AND BERTRAND, D.
The Rubidium Content of Seeds.
Ann. inst. Pasteur, **82**, 661–7 (1952).
C. A., **46**, 11332h (1952).

By means of spectrographic analysis Rb was detd. in 93 samples of plants comprising 88 different species. From 0.60 to 45.7 mg. Rb/kg. dry tissue was found. Rye contained the lowest and coffee tree the highest content.

3931. BERTRAND, G. AND BERTRAND, D.
Rubidium in Seeds. II.
Compt. rend. acad. agr., France, **38**, 66–8 (1952).
C. A., **47**, 3937c (1953).

On a dry-wt. basis the Rb content of 43 seed samples varies from 2.1 to 30.8 p.p.m. The mean, 9.36, agrees favorably with that of 46 samples analyzed earlier. Chem. analysis of 93 samples representing 88 species show that the Rb concn. is high in crucifers and the papillonaceous seeds and relatively low in the labiates and grasses.

3932. BERTRAND, D.
The Distribution of Lithium in the Phanerogams.
Compt. rend., **234**, 2102–4 (1952).
C. A., **46**, 8727b (1952).

Li was detd. in samples from 68 families of the higher plants, and averages are reported for 12. Families poor in Li, 0.47–1.07 p.p.m., included the Gramineae and Liliaceae. Four families were rich in Li, 1.80–7.96 p.p.m.

3933. BLACK, I. A.
Application of the Seidel Transformation to the Determination of Intensity Ratio by Blackening-Curve Separation.
Spectrochim. Acta, **4**, 519–24 (1952).
C. A., **46**, 8526b (1952).

In spectrochem. analysis the method of step-sector photometry for the detn. of spectral-line intensity ratios, in which blackening curves are drawn for both analysis and internal standard lines, and ratios obtained by measuring the sepn. of these curves at a standard d., possesses several theoretical advantages over other photometric procedures but has the practical drawback of being somewhat tedious. Methods for shortening

the work required to obtain blackening-curve sepns. at a low constant d. are discussed. By employing Seidel ds., blackening curves are obtained sufficiently straight for accurate sepns. to be derived by plotting 2 points on each curve and joining these points by a straight line, thus reducing the no. of microphotometer readings required and eliminating curve fitting. A simple method of plotting Seidel ds. directly from galvanometer readings by means of a suitably graduated scale is described and this, in conjunction with a special scale for measuring line-to-background sepns., shortens the method and renders the use of math. tables unnecessary, even when a background correction is required.

3934. BLACK, W. A. P. AND MITCHELL, R. L.
Trace Elements in the Common Brown Algae and in Sea Water.
J. Marine Biol. Assoc. United Kingdom, **30**, 575–84 (1952).
C. A., **46**, 6708b (1952).

Some common Scottish Laminariaceae and Fucaceae were analyzed spectrographically for Co, Ni, Mo, Fe, Pb, Sn, Zn, V, Ti, Cr, Ag, Rb, Li, Sr, Ba, Mn, and Cu. Variations in content of these elements in different species from the same habitat and seasonal variations in the same species were observed. The trace elements are more concd. in the perennial stipe than in the attached frond of Laminariaceae and are generally less than in the Fucaceae. Sea-water samples were also analyzed for Co, Ni, Mo, Pb, Sn, Zn, V, Ti, Cr, Ag, Sr, Ba, Mn, and Cu. Concn. factors, showing the extent to which marine algae can accumulate trace elements, ranged from 2–15 for Mo to 90–10,000 for Ti.

3935. BOLTZ, D. F.
Selected Topics in Modern Instrumental Analysis.
Prentice-Hall, New York, N. Y. (1952). 470 pp.
C. A., **47**, 3190a (1953).

This book has been prepared as a text for seniors and first-year graduate students in chemistry. Fundamental principles, construction and operation characteristics of typical instruments, and their practical applications in chemical research and analysis have been emphasized in ten chapters, each of which deals with a different physical type of chemical analysis. Six chapters involve radiation spectra, viz.—Fluorometric Analysis (36 pp. by C. E. White), Spectrophotometric Analysis (54 pp. by D. F. Boltz), Spectrochemical Analysis (75 pp. by J. R. Churchill), Opticometric Methods of Analysis (45 pp. by D. F. Boltz), Analytical Applications of X-Ray Diffraction (74 pp. by E. J. Bicek) and Raman Spectroscopy (28 pp. by D. R. Long). The chapter on Spectrochemical Analysis briefly discusses the selection of equipment, excitation sources, the spectrograph techniques of excitation, routine quantitative analysis of metals, quantitative determination of a trace element in a metal, and photoelectric photometers.

3936. BOUCHET, P. J.
Use of Stigmatic Spectrography in Metallurgical Analysis.
Rev. mét., **49**, 177–84 (1952).
C. A., **48**, 6901i (1954).

The image of an intermittent d.-c. arc between metallic electrodes is projected on the slit of a stigmatic large Littrow quartz spectrograph and the photographic opacity of spectral line images is measured from cathode to anode. Some spectral lines produce uniform opacity while others show decreasing opacity from cathode to anode. This distribution of intensity varies with chemical composition and thus provides a method for detn. of composition. One may measure at the same point in an arc the opacity ratio of an analysis line to a line of another element (internal standard), or measure the opacity ratio of an analysis line at two different points in an arc (double internal standard method). The application of these methods is illustrated in working curves for the detn. of Mn and Cr in nickel-chrome alloys, of Ni in ferronickels, and of Ta-Nb mixtures.

3937. BREALEY, L., GARRATT, D. C., AND PROCTOR, K. A.
Application of Emission Spectrography to Pharmaceutical Analysis.
J. Pharm. and Pharmacol., **4**, 717–28, discussion 728–9 (1952).
C. A., **47**, 1333g (1953).

A crit. discussion of specific applications, particularly flame photometry and the "porous-cup" method.

3938. BRECKPOT, R. AND JUCHNIEWICZ, B.
Spectrographic Control of Acid Open-Hearth Furnace Operations.
Mem. centre nat. recherches mét., Sect. Hainaut, No. **2**, 5–14 (1952).
C. A., **48**, 12000g (1954).

Operations in a 25-ton exptl. furnace are described. Ores from 3 parts of France are used. Conditions and isochronal curves for detg. Li, Na, K, Rb, Cs, Ca, Ga, Cu, Ag, Pb, Cr, Mn, and Fe between 2100 and 9000 A. are given.

3939. BRIT. STANDARDS INST.
Methods for the Sampling of Ferrous Metals and Metallurgical Materials for Analysis. I. Iron and steel.
Brit. Standards Inst., London, S.W. 1.
Brit. Standard **1837**: (1952), Pt. 1, 17 pp.
C. A., **46**, 9461i (1952).

Methods are described for obtaining test ingots from liquid metal and drillings or millings from these, and drillings from pig,

iron, cast and wrought iron, and steel.

3940. BRODY, J. K.
Some Applications of Photomultiplier Tubes to Spectrographic Analysis.
J. Optical Soc. Am., **42**, 408–15 (1952).
C. A., **46**, 7925e (1952).

A mounting for photomultiplier tubes in a Baird 3-meter grating spectrograph is described. Leeds and Northrup exptl. preamplifiers and ratio recorder are used with the photomultipliers, either of which can be moved to scan spectral lines whose relative intensities indicate concns. This equipment has been used in 3 analytical problems: the detn. of Li by volatilizing solns. in a flame U^{235} and U^{238} isotopic detns. with hollow cathode and with Cu spark sources, and the detn. of Sc with the Cu spark. Calibration of the Li and Sc analyses was based on synthetic standards, and of the U samples on one previously analyzed by the mass spectrograph. The av. difference between spectrographic and chem. detns. of Li was 0.6%, and the av. deviation of optical spectrographic detn. of U^{235} from the mass spectrographic results was about 0.3%.

3941. BROIDA, H. P. AND MORGAN, G. H.
Optical Spectrophotometric Analysis of Hydrogen-Deuterium Mixtures in the Presence of Air.
Anal. Chem., **24**, 799–804 (1952).
C. A., **47**, 6307c (1953).

The detn. of H-D mixt. is described by using electrodeless discharge, at 150 Mc., and a recording monochromator. The observed D/H line intensities for the Balmer lines are represented by an empirical formula $D/H = D_2/H_2(1 - ap + bp^{-1})$ where D_2 and H_2 are the concn. of these elements in the sample and D/H is the observed line intensity ratio, p is the pressure in the discharge and a and b are consts. to be found from the exptl. curves. Added air had little effect on line intensities. Effects of flow rate, size, and cooling of the discharge tube, depth of discharge observed, and slit width are discussed.

3942. BROIDA, H. P. AND MOYER, J. W.
Spectroscopic Analysis of Deuterium in Hydrogen-Deuterium Mixtures.
J. Optical Soc. Am., **42**, 37–41 (1952).
C. A. **46**, 3902a (1952).

Gaseous D contg. 0–15% H was rapidly analyzed spectroscopically to within 0.1% of the D content. A 150-Mc. electrodeless discharge in flowing gas was used. The spectrum was dispersed by a 75-cm. grating monochromator and the intensities of Balmer lines were compared by scanning with an electron-multiplier phototube, amplifier, and recorder. Investigations were carried out to det. the effect of changes in pressure, flow rate, intensity of the discharge, and added air impurity on the measured relative intensities of the isotope lines.

3943. BRUCELLE, G.
The Influence of the Energy in the Discharge on the Emission of Spectral Lines.
Spectrochim. Acta, **5**, 11–17 (1952).
C. A., **47**, 961i (1953).

The increase in the energy in the discharge of a controlled spark unit with the increase in capacity and voltage corresponds to the emission in the spark of ionized lines of greater excitation potential. An increase in the current of the arc gives the same result. One practical application of this is the quant. analysis of traces down to 0.01% in steel. The source is a stabilized arc obtained from a combined *France* and *GAMS* generator, both these being units made by Durr. The analysis is made mainly with arc lines but the use of spark lines is equally possible. In fact, the emission of analytical lines which are just strong enough to estimate depends on the dE/dt value and is, therefore, more likely to take place in the stronger arc-like discharge.

3944. BRUSA, A., SCOTTI, E., AND GHIRARDI, L.
The Qualitative and Quantitative Determination of Thorium in the Brain of Subjects Injected with Thorotrast for X-ray Examination.
Arch. ital. anat. embriol., **57**, 162–9 (1952).
Biol. Abstr., **27**, 1526 (1953).
C. A., **49**, 7740f (1955).
Cf. *C. A.*, **46**, 5207a.

Traces of Th were found in all cases (5 tumors and 2 postmortem brains) by radiographic examination of sections. The amt. of Th estd. by the Geiger-Müller autoscalar and by spectrography, 6 days after injection of 24 ml. of thorotrast (= 6 g. of ThO_2), gave the following results: 0.138 g. of ThO_2 in the brain; 0.057 g. of ThO_2 in the spleen.

3945. BRUSTIER, V., CORNEC, P., AND TRICHÉ, H.
Spectrographic Determination of Lead in Blood.
Compt. rend., **234**, 2367–9 (1952).
C. A., **46**, 9147e (1952).

The spectrogram of powd. dried blood contg. $SnCl_4$ as an internal standard is compared with that of a standardized powder contg. known amts. of Pb (50, 100, and 200 γ/100 ml.), the internal standard, graphite, and all the blood cations. The Pb contaminants of the synthetic soln. contg. the blood elements are eliminated by co-pptn. of PbS with HgS. An a.-c. arc is used to excite the high frequencies. The method is accurate to within 5–10%. The upper limit of normal Pb concn. in the blood is 70 γ/100 ml.

3946. BUCCHERI, A. AND GALHA, J.
Spectrochemical Determination of Silver in Galena.
Anais Assoc. brasil. quím., **11**, 113–21 (1952).
C. A., **51**, 10305b (1957).

A practical and precise method is presented for the detn. of the Ag content of samples of galena contg. 0.04–0.18% Ag. The powd. galena is mixed to a paste with glycerol and placed on a graphite electrode with Bi as a reference. The method is as precise as the standard gravimetric procedures.

3947. BUCCHERI, A. AND SANTINI, P.
Spectrochemical Control in the Silica Refractory Industry.
Anais assoc. brasil, quím., **11**, 105–11 (1952).
C. A., **51**, 10861g (1957).

A rapid and precise method is presented for control of raw materials and finished products in the silica refractory industry. Standards of Fe, Al, Ti, Ca, and Mg were prepd. The sample to be tested was placed in a cavity in a graphite anode. Si was used as the reference. The results are highly reproducible and well suited for routine analyses.

3948. BÜCKERT, H.
A New Measuring Apparatus for Spectrochemical Analysis.
Spectrochim. Acta, **4**, 476–81 (1952).
C. A., **46**, 8525g (1952).

A new spectrum comparator manufd. by Optica of Milan is described. It can be used for inspection or measurement of spectra by projection at 14 or 21 diams. One or 2 films or plates can be examd. at the same time. The same app. can be used as a measuring micrometer or nonrecording densitometer, or it can be adapted as a recording densitometer which shows blackening as a function of wavelength on paper 25 cm. wide.

3949. BÜCKERT, H.
A New Arc Apparatus.
Spectrochim. Acta, **4**, 525–32 (1952).
C. A., **46**, 8526d (1952).

In spectrochem. analyses with arc sources, accuracy is dependent on constancy and reproducibility of the elec. conditions. After reviewing the advantages of the interrupted arc and the requirements for its construction and operation, an arc app. is described which provides, in addn. to continuous a.-c. and d.-c. arcs, an interrupted arc with 20 different ratios of burning time to resting time.

3950. BÜCKERT, H.
Some Improvements in Apparatus for Spectrochemical Analysis.
Spectrochim. Acta, **5**, 5–8 (1952).
C. A., **47**, 357b (1953).
Cf. *C. A.*, **46**, 8525g.

The latest models of controlled-spark generators work with a capacity ranging from 10,000 to 12,000 $\mu\mu F.$, as compared with the 3000 to 6000 $\mu\mu F.$ obtainable from pre-war models. This and other improvements make it possible to obtain more dependable results in a shorter time in quant. analysis. In the interrupted arc the current has been raised to 15 amp ; special mech. and elec. devices have been developed through which the burning and rest time can be varied from 0.05 to 5.5 sec. Reproducibility of results is not inferior to that obtainable with spark generators. The Double-Projector makes it possible to view close to each other, or even to superimpose, two spectra from sep. plates, this makes possible rapid, dependable qual. analysis. A very high degree of sensitivity has been reached with microphotometers owing to the adoption of modern types of photoelec. cells. In spectrographs a high degree of dispersion is required in the analysis of alloy steels and of several other ferrous materials. An improvement in this field has been achieved by a curved-surface prism in which the high dispersion is assocd. with a marked luminosity, extreme sharpness, and complete absence of ghost spectra and scattered light.

3951. BURRIEL-MARTÍ, F. AND RAMÍREZ-MUÑOZ, J.
Standardization of the Purity of Chemical Products for Analysis. I. Purification of Uranyl Acetate.
Anales real soc. españ. fís. y quím., **48B**, 109–12 (1952).
C. A., **47**, 2081e (1953).

Purification was attempted by pptn. with H_2S, $(NH_4)_2S$, and NH_4OH, and by recrystn. The products were spectrally compared with synthetic samples of known Na content. Poor results were obtained by double recrystn. The recommended method consists of several pptns. with NH_4OH, washing, and redissolving in HOAc. The salt was crystd. from soln calcined, extd. with H_2O, dissolved in HNO_3, and the soln. evapd. with hydrogen peroxide. The resulting oxide was dissolved in HOAc and recrystd. $(NH_4)_2S$ was also useful. The ppt. was washed with dil. NH_4Cl and the process continued as above. These prepns. were used successfully for the detn. of Na. 15 references.

3952. BURRIEL-MARTÍ, F., RAMÍREZ-MUÑOZ J., AND FERNÁNDEZ-CALDAS, E.
Inhibiting Effect of Aluminum on the Masking of Barium by Vanadate Ions During Analysis.
Anal. Chim. Acta, **6**, 197–207 (in English) (1952).
C. A., **46**, 7462a (1952).
Cf. *C. A.*, **44**, 9864a.

The adsorbing power of $Al(OH)_3$ for vanadate ions, which has been studied in earlier works, is used to avoid the masking of Ba^{2+} resulting from the presence of vanadate ions in test material of qual. analysis, where the latter hinders the detection of Ba at the corresponding point during the systematic analysis. Various exptl. conditions were studied at concns. corresponding to those of the macro-, semimicro-, and microanalytical type. Quant.

spectrographic techniques were applied at the lower concns., with the copptn. process.

3953. BUTLER, J. R. AND LERICHE, H. H.
A Spectrographic Modification of the Variable Internal-Standard Method.
Spectrochim. Acta, **4**, 435–8 (1952).
C. A., **46**, 8565g (1952).

A spectrographic method is described for the simultaneous detn. of a trace element and its variable internal standard with particular reference to Fe and the cathode layer arc. The spectrogram from a burn of the sample mixed with carbon is compared with one from a burn of the sample mixed with a known carbon-Fe_2O_3 mixt., and it is shown how the results from these 2 spectrograms indicate the original Fe and minor-element contents of the sample.

3954. CALKER, J. VAN AND WIENECKE, R.
Zinc, the Third Alloying Partner in a Spectrographic Investigation of the Aluminum-Magnesium System.
Z. angew, Physik, **4**, 210–15 (1952).
C. A., **46**, 11020e (1952).

In the spectrographic examn. of the Al-Mg system, the intensity ratio Al/Mg is found to be systematically dependent on the percent addn. of Zn. The influence differs with each Al line and is considerably less for lines produced with the spark than for the arc lines. The discharge character varies for arc and spark lines according to the Zn content. Alloys composed of Al+1% Mg+n% Zn, where n varies from 0 to 20%, are prepd., and the discharge is conducted in both A and air.

3955. CAMARA-BESA, S. F.
The Serum Sodium and Potassium Values in Normal Filipino Students.
Acta Med. Philippina, **8**, 151–6 (1952).
C. A., **47**, 181h (1953).

The mean serum values of normal Filipino students, aged 17–24 years, were 147 meq. of Na per 1. (range 137.4–156.5) (91 students) and 4.7 meq. of K per 1. (range 3.9–5.5) (85 students). These serum-Na values showed a wider range and a higher mean than the American figures, while the serum-K values were nearly the same as the American values. The precautions necessary in the prepn. of the glassware, in obtaining the samples, and the internal-standard method of flame photometry for the detn. of serum Na and K are described.

3956. CARDELL, J.
Quantitative spectrochemical analysis of solutions containing barium and strontium.
Appl. Spectroscopy, **6**, No. 4, 11–13 (1952).
C. A., **46**, 11014g (1952).

The use of an open-cup graphite electrode for the spark analysis of solns. has been developed and applied to the detn. of Ba and Sr on an anode or grid of a vacuum tube.

3957. CASTRO, R AND LOUDE, R.
Spectrochemical Analysis of Steel Slags.
Spectrochim. Acta, **4**, 496–512 (1952).
C. A., **46**, 8566c (1952).

In order to facilitate the spectrochem. analysis of steel making slags, standard samples were prepd. by sintering mixts. of the constituents in definite proportions. These sintered standards give similar spectra to those obtained from fused slags of the same compn., and have made it possible, therefore, to explore the effect of interfering elements on others and to complete a range of standard samples corresponding to the normally made slags. Two methods of carrying out the spectrochem. analysis are described; in each case the samples are made of pressed pellets of a mixt. of the slag with Ni powder. For the so-called perrin lime-Al_2O_3 slags a medium spectrograph and controlled spark are used while for the usual steelmaking slag a high dispersion spectrograph and rectified intermittent arc are used. Finally a method for the spectrochem. estn. of F in slags, with a d.-c. arc, is described.

3958. CAVEL, A. J.
Determination of Potassium in Soil Extracts with a Flame Photometer.
Analyst, **77**, 537–9 (1952).
C. A., **47**, 807i (1953).

The available K_2O in each of 71 heavy, 94 medium, and 69 light soils was detd. colorimetrically with the flame photometer. Ten g. of soil was shaken with 50 ml. of Morgan's reagent (10% NaOAc in 0.5 N AcOH) and the suspension filtered through paper. The K_2O in the filtrate was estd. in the flame photometer at 7660 and 7690 A. and colorimetrically by pptg. the K as $K_2AgCo(NO_2)_6$ and converting the Co to the blue color developed by Vogel's test. Of all soils tested, the results seldom varied by more than 5% of the actual quantity of K present.

3959. CHINNAPPA, K. V.
A Simplified Procedure for the Determination of Index Point and Index Line in the Step-Filter Technique of Spectrographic Analysis.
Trans. Indian Inst. Metals, **6**, 339–41 (1952).
C. A., **48**, 10477c (1954).

In the step-filter technique (Cf. Scheibe and Schöntag, *C. A.*, **29**, 5774[5]) the normal procedure is to det. K_0(index point) and K_m(index line) for each plate and average from as many plates as possible. In this simplified procedure, K_m and K_0 are evaluated from the plot of log concn. in percentage against $[\sum_1^n \Delta D / \sum_1^n \Delta D_n]$ where ΔD is the d. difference between the analysis line and the internal standard,

ΔD_m the d. difference between steps, and n is the no. of plates.

3960. CHINNAPPA, K. V.
A Method for the Spectrographic Analysis of Alloys Having Special Compositions.
Trans. Indian Inst. Metals, **6**, 342–3 (1952).
C. A., **48**, 11242f (1954).

The intensity ratio of the analysis line to that of the internal standard should be approx. 1 to keep plate errors to a min. In special steels, where differences in compn. are high, this ratio may be so large that another internal standard must be choosen. A modified method consists of detg. the value of $[\Delta D/\Delta D_m]$ for the reference sample, where ΔD is the d. difference between the analysis line and the internal standard, and ΔD_m the d. difference between steps in the step-filter method. On a plot of concn. vs. $[\Delta D/\Delta D_m]$ the standard curve is plotted, and a working curve for a different type of material is drawn parallel to it through the point which represents the reference sample for that type of material.

3961. CHOLAK, J. AND HUBBARD, D. M.
An Improved Method for Beryllium Analysis in Biological and Related Materials.
Am. Ind. Hyg. Assoc. Quart., **13**, 125–8 (1952).
C. A., **46**, 10251d (1952).
Cf. *C. A.*, **42**, 2300b.

Beryllium can be isolated free from interfering ions, from tissue, and urine samples suitable for spectrographic analysis by following dry ashing with treatment with H_2SO_4 and HNO_3, dissolving of all sol. salts, evolution of excess H_2SO_4 and HNO_3, cooling, dissolving in distd. H_2O, removing $CaSO_4$ ppt., adjusting pH to 4.5, adding $MeCO(CH_2)_2COMe$, stirring, adding C_6H_6, sepn. and discarding of aq. layer, adding 5 N HCl, and stirring. The resultant soln. is suitable for addn. of buffer and prepn. for spectrographic analysis.

3962. CHURCHILL, J. R.
Analytical Determination of Mercury on Aluminum Surfaces and in Aluminous Corrosion Products.
Corrosion, **8**, 430 (1952).
C. A., **47**, 2083d (1953).

Chem. methods fail to remove Hg completely from an Al surface. The sample is removed from the Al surface by scraping a measured area to a depth of 0.001 or 0.002 in. with a sharp knife. These scrapings are dissolved in a mixt. of HCl and HNO_3. Sufficient Cu is added to bring the total up to approx. 10 mg. The soln. is treated with H_2S, to ppt. the Hg, Cu, and certain other heavy metals as sulfides. The soln. is filtered through hard-surfaced filter paper and the filter dried at room temp. The dried ppt. is removed from the paper and placed in the cavity of a graphite electrode; this electrode is a graphite rod 1 in. long, $^1/_4$ in. in diam., with a cavity $^3/_{16}$ in. in diam. and $^3/_{16}$ in. deep. The electrode is used as the anode of a 12 amp. d.-c. arc. The spectrum is recorded by means of a conventional prism or grating spectrograph with an exposure of 15 sec. Identification and estn. are based on the intensity of Hg 2536.5 A. by comparison with standards prepd. by co-pptg. known amts. of Cu and Hg. Results are usually reported as γ/unit area of the original test specimen. The limit of detection is of the order of 0.1 γ in the total area sampled. Sensitivity is impaired by the presence of major quantities of Cu or other elements which form ppts. in acid solns. on treatment with H_2S.

3963. CHURCHILL, W. L., AND GILLIESON, A. H. C. P.
A Direct Spectrographic Method for the Monitoring of Air for Minute Amounts of Beryllium and Beryllium Compounds.
Spectrochim. Acta, **5**, 238–50 (1952).
C. A., **47**, 1318a (1953).

The development of a direct spectrographic method for detn. of contamination of air by particles of Be or its compds. is described. The air under examn. is sucked, by an Edwards type 1 vacuum pump, through a spark between Cu electrodes into a specially designed glass spark chamber, and the light from the spark passes through a compact, reflection-grating monochromator designed for the purpose. For the estn. of Be, the light from the Be spark line at 3130.416 Å. passes through the exit slit on to a photomultiplier (RCA IP 28 or Mazda 27 M 3), and the amplified photomultiplier current operates a chart recorder. The spark is fed by a standard Hilger spark unit, and the whole app. is mounted on a small trolley to form a mobile monitor. The limit of detection corresponds to about 0.5 γ Be/cu. m., and the instrument has a range, at max. sensitivity, up to 20 γ/cu. m. Of the two possible interferences from common elements, Fe has been shown to be ineffective and Hg interference can be eliminated by accurate setting on the lower wavelength Be line. Methods of integration of the record, which are being developed, are described.

3964. CLEARMAN, H. E.
The Arc Spectra of Boron, Indium, Thallium, Lead, and Bismuth.
J. Optical Soc. Am., **42**, 373–9 (1952).
C. A., **46**, 7425h (1952).

The source was a d.-c. arc in pure N at 1 atm. pressure. The spectra were photographed with a two-meter grating vacuum spectrograph with a reciprocal dispersion of 4.3 Å./mm. Measured wave lengths and estd. intensities are reported for lines in the extreme ultraviolet between 2175 Å. and 1300 Å. The no. of observed lines is 39 for B I, 5 for In I, 8 for Tl I, 16 for Pb I, and 103 for

Bi I. An analysis of these observations greatly extended the spectral terms of B I and Bi I, and revealed some new at. energy levels in In I, Tl I, and Bi I.

3965. COLLIER, H. B. AND BARSCHEL, R.P.
Adaptation of Photomultiplier Photometer to Beckman DU Spectrophotometer.
Anal. Chem., **24**, 1030–1 (1952).
C. A., **46**, 8968e (1952).

The phototubes, amplifier, and meter of the Beckman are replaced by the Model 520 M line-operated photomultiplier photometer of the Photovolt Corp. This gives increased sensitivity and permits the use of narrower slit widths in flame photometry and reflectance measurements. Other advantages are the use of standard radio tubes rather than Beckman amplifier tubes, the absence of dry batteries, and the ability to cover the whole visible spectrum with one phototube. However, readings can be estd. only to 0.25% as compared to 0.1% on the Beckman scale. A table is given illustrating the linearity of response of transmittancy readings of sodium chromate solns. Another table shows the increase in sensitivity of transmittance and reflectance readings. Reflectance sensitivity increase is 5 times at 700 mμ and 138 times at 600 mμ. A table is given showing increase in sensitivity of flame photometry readings. The precision and accuracy of the flame photometric detns. and the effect of other factors are now being studied.

3966. COLLINS, G. C. AND POLKINHORNE, H.
Investigation of Anionic Interference in Determination of Small Quantities of Potassium and Sodium with New Flame Photometer.
Analyst, **77**, 430–6 (1952).
C. A., **48**, 8118d (1954).

The design, construction, and performance of a new com. flame photometer are described with particular reference to the interference of the commoner inorg. anions in the detn. of small amts. of K and Na. Anionic interference occasioned by the presence of either an acid or its NH_4 salt suppresses the emission of the element being detd., suppressing *K* to a greater extent than Na. For each anion there is a limiting concn. above which interference occurs. Of the commonly occurring anions PO_4^{3-} causes the greatest interference and, in comparison with *N* PO_4^{3-} the approx. limiting concn. for other anions are as follows: for K detns. *N* PO_4^{3-}, 6.2 *N* Br^-, 8*N* Cl^-, 134*N* SO_4^{2--}, 400*N* NO_3^-; for Na detns. *N* PO_4^{3-}, 2*N* Br^-, 6*N* Cl^-, 29*N* SO_4^{2-}, 100 *N* NO_3. Anionic interference apparently results from a reduction in the no. of free metal ions by their combination with ionized anion.

3967. CONWAY, J. G. AND MOORE, M. F.
Spectrographic Analysis of Radioactive Materials.
Anal. Chem., **24**, 463–4 (1952).
C. A., **46**, 6029c (1952).

An arc-spark chamber has been built mounted in a gloved box which confines the contaminated atm. to the vicinity of the discharge. Tests indicate that the radioactivity released during the use of the equipment is sufficiently removed to eliminate the health hazard.

3968. CONWAY, J. G. AND MOORE, M. F.
Applying Spectrochemical Analysis to 2 *M* Perchloric Acid.
Anal. Chem., **24**, 610 (1952).
C. A., **46**, 6030i (1952).

The main difficulty in the spectrographic analysis of $HClO_4$ solns. is the chem. reaction between the electrodes and the acid. Pt or Au electrodes are prohibitive in cost. Electroplating a thin film of Au at the end of a machined Cu electrode was tried, but even the best plated electrodes had small pinholes. Several acid-resistant paints were found satisfactory, the best of which is a vehicle from a paint known as Prufcoat. A freshly machined Cu electrode is dipped into the paint, dild. with benzene, and dried. The dried electrodes are placed in a Cu block and the samples and standards are discharged onto the protective coat. Drying in a vacuum desiccator follows and the dried electrodes are kept in the desiccator until ready for use. Once dry they are sparked by the Cu-spark method. The protective coat increases the background to some extent.

3969. CORNAND, P., DOORSELAER, M. VAN, and GILLIS, J.
Spectrographic Determination of Small Amounts of Bismuth in Lead by Using Briquetted Oxide Samples.
Spectrochim. Acta, **5**, 319–21 (1952).
C. A., **47**, 8579d (1953).

A method is described for the spectrographic detn. of small amts. of Bi in Pb (up to 1%). Briquetted samples of oxides and graphite and a stabilized d.-c. arc discharge are used. Pellets, very easy to manipulate and assuring a very close elec. contact with the holder, are prepd. by pressing the graphite-oxide mixt. on a brass support of the same diam. The method is very sensitive and reproducible and can be successfully applied when pure Pb or Pb salts, which can be converted into oxides, are to be analyzed.

3970. CUTTING, T. A.
Practical Spectroscopy.
Wm. Heinemann, London, England (1952). 220 pp.
C. A., **47**, 4208a (1953).

Identical with *Manual of Spectroscopy*, published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn, N. Y., 1949, and reviewed in *Anal. Chem.*, **22**, 199 (1950) as follows: "This manual, the author says,

"has been written to assist those who wish to analyze ores, minerals, alloys and inorganic elements, or wish to teach others to do so." The contents suggest that any amateur mineralogist can find $10,000 worth of uranium with a $2.50 spectroscope. The history and theory of spectroscopy are presented in 6 scant pages, light sources in 11, spectroscopes in 38 and spectroscopic analysis in 30. The next 85 pages deal with elementary mineralogy and visible spectral lines of 70 elements, including such non-spectroscopic material as the discovery, sources, uses, properties, and prices of elements. (The paragraphs on illinium and masurium are obsolete, and the price of xenon is grossly inflated at $600 per liter). The last 38 pages give approximate wavelengths and intensities of strong lines selected from "M.I.T. Wavelength Tables." A bibliography of 16 items contains 8 works on mineralogy (from 1907), a manual of clinical therapeutics, and the Smyth Report, but ignores all spectroscopic publications since 1939. Obviously, this will not be of use to anyone except possibly the tyros for whom it was written." (The bibliography of the 1952 printing contains only 13 items.)

3971. DANIELSSON, A. AND PETERSSON, S.
Intensity Differences of Copper Lines Depending on Impurity Contents. I. A Statistical Study of Anode Copper.
Appl. Spectroscopy, **6**, No. 4, 27–31 (1952).
C. A., **46**, 11066a (1952).

During routine spectrochem. control of impurities in anode Cu and wire bars, differences in Cu-line intensities depending on changes in minor impurity contents were observed. A statistical investigation of this phenomenon was made. The base for this statistical investigation is 400 plates and corresponding analytical records from routine spectrochem. work. For the excitation condition used, namely an interrupted arc, a regression equation for the dependence of Cu-line intensity on impurity amts. was calcd. according to the method of least squares. Differences in thermal cond. depending on impurity contents are regarded as the main cause for this phenomenon. This interpretation is confirmed by further investigations.

3972. DEÁN GUELBENZU, M., LÓPEZ DE AZCONA, J. M. L., AND SANTOS RUIZ, A.
Oligoelements in Normal and Pathological Human Tissues. III. Stomach.
Rev. españ. fisiol., **8**, 117–21 (1952).
C. A., **47**, 11500g (1953).

Semiquant. spectrochem. analysis of the ash of tissues from 6 stomachs and 1 sample of gastrocolic epithelium showed: Ba, 10^{-4} (of a unit of ash); Cu, $\geqq 10^{-4}$; Fe, $> 10^{-3}$; Mn, $> 10^{-4}$; Ni, $10^{-3}-10^{-4}$; Si, $10^{-1}-10^{-2}$; Ti, $< 10^{-4}$ with some variation; Co, 10^{-5} (limit of sensitivity); Li, $10^{-3}-10^{-4}$; Mo, 10^{-5} (approx.). Cf. *C. A.*, **47**, 7085d.

3973. DEMORTIER, G. AND HOECK, G. VAN
Application of Flame Spectrophotometry in Agriculture. Determination of Potassium, Sodium, and Calcium in Soil Extracts.
Bull. inst. agron. et stas. recherches Gembloux, **20**, 57–65 (1952).
C. A., **48**, 10276a (1954).

The interfering effects of K, Na, and Ca on one another when detd. by flame photometry are obviated by the use of radiation buffers (Cf. West, *et al.*, *C. A.*, **44**, 8025i). The procedure is described in detail.

3974. DMITRIEFF-KOKLINE, A.
Improvement in the Beckman Flame Spectrophotometer (Model "DU").
Ann. Ass. canad.-franc. Avanc. Sci., **18**, 86–91 (1952).
C. A., **47**, 7830f (1953).

Improvements of the alc. manometer, the vaporization chamber, and the pulverizer increase the reproducibility of the measurements by 30–50%. Directions for the prepn. of solns. are given, and results are shown on 4 graphs.

3975. DOMANGE, L.
Flame Photometry.
Ann. fals. et fraudes, **45**, 276–88 (1952).
C. A., **47**, 395i (1953).

A discussion of theory, equipment, and uses.

3976. DUBBS, C. A.
Increased Sensitivity for the Perkin-Elmer Flame Photometer. Use of Fine-Spray Hot-Chamber Aspiration.
Anal. Chem., **24**, 1654–6 (1952).
C. A., **47**, 11817a (1953).

The fine-spray, hot-chamber aspiration system, which is shown and described in this paper, is a copy of that supplied with the original Beckman flame attachment (Gilbert *et al.*, *C. A.*, **44**, 7592g) modified slightly to permit convenient installation within the Perkin-Elmer cabinet. The sample soln. is drawn up through a fine-bore capillary and completely atomized as a fine spray which vaporizes within the hot chamber to give an aerosol of very fine particles which is swept into the burner.

3977. DUNN, A. L., HUMOLLER, F. L., AND MCINTYRE, A. R.
Switching System for Beckman Absorption-Flame Spectrophotometer.
Anal. Chem., **24**, 229 (1952).
C. A., **46**, 4372b (1952).

A simple method for switching which utilizes easily obtained elec.-instrument parts is described and illustrated. By using this system it is possible to switch easily from the 2000-megohm resistor used for absorption spectrophotometry to the 10,000-megohm resistor used for flame photometry.

3978. EICHHOFF, H. J. AND GEIL, H.
Spectrochemical Determination of Boric Acid in Urine.
Biochem. Z., **322**, 494-6 (1952).
C. A., **46**, 10262e (1952).

Dil. urine to about a 0.02% B_2O_3 concn., place in a quartz vessel, add enough Na silicate soln. adjusted to pH 13–14 with NaOH to give the mixt. a concn. of 4 mg. Si per ml. The concn. ratio of B_2O_3/Si is detd. spectrochemically (Si I 2435.1 and B I 2497.7 Å.) The B_2O_3 content of urine down to 0.005% can be measured with an error of ±8%.

3979. ELVEHJEM, C. A. AND BURNS, C. H.
Sodium Content of Commercial Spices.
J. Am. Med. Assoc., **148**, 1033 (1952).
C. A., **46**, 4697f (1952).

Analyses of 58 spices reveal low values, most of which were below 0.05% and practically all were below 0.10%. The most common range was 0.01–0.02% Na. Several spices (dehydrated celery flakes, parsley flakes, mace, ground allspice) had values ranging from 0.12 to 2.3%, but generally, in view of the small amt. of spice used, the contribution of spices to the Na content of the food is insignificant. A Perkin-Elmer Model 52A Flame Photometer was used for the analysis. Ashed samples were introduced in 25 ml. of 1% nitric acid containing 400 ppm. of lithium which serves as an internal standard for the flame photometer.

3980. EMERY, R. ST. J.
An Apparatus for Quantitative Spectrographic Analysis in Controlled Atmospheres.
Spectrochimica Acta, **4**, 513 (1952).

An apparatus is described enabling small samples of metal to be analyzed spectrographically in an selected single gas or mixture of gases. The apparatus may alternatively be used for analysis at reduced pressures.

3981. EULER, J.
The Heat Conductivity of Artificial Graphite Rods at Temperatures Between 3300 and 3700°K.
Naturwissenschaften, **39**, 568–9 (1952).
C. A., **48**, 1130d (1954).

The temp. gradient inside graphite arc electrodes was estd. from stereophotography of exposed cavities in the graphite appearing in the arc crater. Values were detd. on 2 electrographitized carbons (Ringsdorff spectral carbon I and II). At room temp. the heat cond. was 0.57 and 0.28 cal. per cm. degree, resp., for I and II. At high temps. the values were identical for the 2 species: 0.2 cal. per cm. degree at 3150° abs. decreasing gradually to 0.1 at 3545°, 0.057 at 3700° abs. This drop is probably due to a loosening of the structure. Above 3700° and up to 4000° the heat cond. decreases to about 0.006 cal. per cm. degree; there is at 3700° a melting or transition point for C.

3982. FASSEL, V. A., COOK, H. D., KROTZ, L. C., AND KEHRES, P. W.
Quantitative Spectrographic Analysis of the Rare Earth Elements. IV. Determination of Cerium, Praseodymium, and Neodymium in Lanthanum. V. Determination of Lanthanum, Praseodymium, and Neodymium in Cerium. VI. Determination of Lanthanum, Cerium, and Neodymium in Praseodymium. VII. Determination of Praseodymium in Neodymium.
Spectrochim. Acta, **5**, 201–9 (1952).
C. A., **47**, 999a (1953).
Cf., *C. A.*, **43**, 2889a.

The great similarity in the chem. properties of the rare earths precludes the use of chem. methods for the analysis of mixts. of these elements except in a few cases where changes in oxidation state may be effected. Although many of the rare earths can be detd. spectrophotometrically, the absorbancy of the bands is not sufficient for measuring concns. below several per cent. In this paper, emission spectrographic methods are described for the detn. of these rare earths usually assocd. with purified La, Ce, Pr, and Nd. The procedures are based on d.-c. carbon arc excitation of rare earth oxide-graphite mixts. The unique similarity in the vaporization rate among the rare earths discussed in this paper, and the use of internal standard line pair components possessing similar excitation characteristics provide a high degree of internal standard compensation for the excitation variables inherent in d.-c. arc sources.

3983. FISCHER, J. AND ZETTLER, H.
Experiences with the Flame Photometer of Riehm-Lange.
Chem.-Ing.-Tech., **24**, 146–8 (1952).
C. A., **46**, 4861e (1952).

A critical study of the use of the flame photometer with data and recommendations.

3984. FITZER, E.
Advances in Technical Emission Spectrum Analysis. I. General. II. Direct Reading Spectrometer.
Österr. Chem.-Ztg., **53**, 1–9, 34–9 (1952).

3985. FITZER, E.
Advances in Technical Emission-Spectrum Analysis. III. The Practical Application.
Österr. Chem.-Ztg., **53**, 59–63 (1952).
C. A., **46**, 6028i (1952).
Cf. *C. A.*, **46**, 4416h.
10 references.

3986. FLEISCHER, M., MURATA, K. J., FLETCHER, J. D., AND NARTEN, P. F.

Geochemical Association of Niobium and Titanium and its Geological and Economic Significance.
U. S. Geol. Survey Circ., **225**, 1–13 (1952).
C. A., **47**, 1014h (1953).

Many new spectrographic detns. of the Nb content of rocks, ores, and minerals are given. Nepheline syenites and similar rocks are highest in Nb content of all rocks, and bauxites derived from them are similarly high in Nb; those of Arkansas contain 0.02 to 0.1, av. 0.045% Nb (46 samples). In the treatment of bauxite, the Nb is concd. in the black sands, the red muds, and the brown muds. Heavy mineral and magnetic sepns. of the black sands from Ark. bauxite gave an ilmenite-rich fraction (2–3% of the black sands) contg. 40–50% TiO_2 and 0.5–0.8% Nb. New detns. show that the Nb content of Ti minerals depends on the type of geol. occurrence; the Nb content is lowest in minerals from gabbroic rocks, highest in Ti minerals from alkalic rocks or from granitic pegmatites. Research is urged on the possible recovery of Nb by chlorination of Ti minerals and of concentrates from bauxite residues.

3987. FLOUNDERS, J. L.
Two-Line-Pair Nomograph for Nonparallel Working Curves in Spectrographic Evaluation.
J. Appl. Chem. (London), **2**, 295–6 (1952).
C. A., **47**, 44e (1953).

Nomographic evaluation of the two-line-pair method of spectrographic analysis (Cf. Sanders, *C. A.*, **43**, 961f) is here extended by a simple geometric construction to include nonparallel working curves such as are obtained when a neutral filter is used.

3988. FOOTE, P. D.
Optics in the Oil Industry.
J. Opt. Soc. Amer., **42**, 886–97 (1952).
C. A., **47**, 2466g (1953).

The employment of optical principles and equipment is vitally important in many operations of the petroleum industry. At the present time the greatest concn. of optical applications is in spectroscopy. Emission spectroscopy is widely used in almost all operations for rapid reliable analyses of materials for metallic or inorg. elements. These applications range from the measurement of metallic elements present in crude oil to the solving of customer complaints where there is a relation between poor performance and the presence of impurities. The techniques of infrared and ultraviolet absorption spectroscopy are quite widely used, etc.

3989. FORD, O. W.
Report on Potash in Fertilizers.
J. Assoc. Offic. Agr. Chemists, **35**, 674–9 (1952).
C. A., **47**, 2918f (1953).
Cf. *C. A.*, **45**, 10460e.

Five samples of fertilizer of known compn. prepd. in the lab. were analyzed by 26 collaborators with 3 methods: (1) the A.O.A.C. method (A.O.A.C. *Methods of Analysis*, 7th Ed. (1950) Sect. 2.40 (*a*), (*C. A.*, **45**, 2824e)); (2) the Perrin method slightly modified (*C. A.*, **44**, 1215a); and (3) the flame photometer method. The results obtained are in good agreement. The av. of the K_2O values obtained by each method is slightly higher than theory: method 1, 0.14% higher; method 2, 0.10% higher; and method 3, 0.09% higher.

3990. FORE, H. AND MORTON, R. A.
Manganese in Bone.
Biochem. J., **51**, 598–600 (1952).
C. A., **46**, 10358d (1952).

Mn is essential to prevent perosis, and it may be significant in normal bone formation. Detns. of the Mn content of bones (spectrographic or periodate oxidation) show that in the ox femur this is of the order of 0.27 to 0.52 p.p.m., depending on whether the bone is compact or cancellous, or independently of the bone type it is 1.4 p.p.m. on the ash basis. It is questionable if any Mn is present in the water-sol. alk. phosphatase, but a small proportion of the Mn is found in organic combination.

3991. FORE, H. AND MORTON, R. A.
Manganese in Rabbit Tissues.
Biochem. J., **51**, 600–3 (1952).
C. A., **46**, 10358e (1952).

This is an attempt to det. the Mn concn. in all tissues of a single animal. Starting with the highest detn. of 2.4 p.p.m. for the pituitary (or, according to data reported in the literature, of 3.5 for long bones) the concns. range to the lowest of 0.6 p.p.m. in the ovaries. In some of the tissues relatively rich in Mn much of it is in dialyzable form. The idea is developed that Mn, which is involved in cell metabolism, is attached to the cell-wall protein.

3992. FORE, H. AND MORTON, R. A.
Manganese in Eye Tissues.
Biochem. J., **51**, 603–6 (1952).
C. A., **46**, 10358f (1952).

The Mn content of different parts of ox eyes was detd. and found to range from a high in sclera and conjunctiva to a min. (about 1 p.p.m.) in vitreous humor. In the eye the Mn is nondialyzable and is not specifically concerned in the visual process.

3993. FREDERICKSON, L. D., JR.
Circular Slide Rule for Calculating Spectral Intensities.
Anal. Chem., **24**, 2019 (1952).
C. A., **47**, 9066b (1953).

A rugged, simply operated, easily constructed circular slide rule designed for calcns. in quant. emission spectrography is described. Accuracy is equivalent to a large

calcg. board. Several calibration scales can be included in a single instrument.

3994. FREYTAG, H. E.
Flame Photometric Determination of Rubidium.
Z. anal. Chem., **136**, 161–77 (1952).
C. A., **46**, 9465f (1952).

Continuing the work of Wilberg (*C. A*, **45**, 1907e), detns. of Rb in physiol. studies are now being made regularly with the Zeiss Flame Photometer, with the aid of suitable light filters. Because of interference by Li and by K, the method is not simple and the original paper should be consulted.

3995. FURRER, H. AND HÜGI, T.
A Telemagmatic Vein in Nummulite Limestone at Trubeln, West of Leukerbad, Canton Wallis.
Eclogae Geol. Helv., **45**, 41–5 (1952).
C. A., **47**, 1013b (1953).

The vein consists largely of quartz, with biotite, fluorite, calcite, plagioclase, apatite, zircon, and tourmaline. A chem. and spectrographic analysis of the vein is given; the high Li content (500 p.p.m.) is notable. Calcite of the vein contained 0.8% Sr.

3996. GAMBLE, L. W. AND KLING, C. E.
The Spectrographic Determination of Metallic Constituents in Petroleum Ash.
Spectrochim. Acta., **4**, 439–45 (1952).
C. A., **46**, 8835d (1952).

With the advent of fluid catalytic cracking the inorg. constituents in petroleum have become of great significance to the petroleum industry because small amts. of certain metals are deleterious to catalyst activity. Arc spectra of powdered samples on C electrodes and a grating spectrograph were used for the detn. of Fe, Al, Si, Mn, Mg, V, Ni, Na, and Ca in petroleum ash. A spectroscopic buffer of nine times as much Li carbonate as sample was used, and the method was calibrated with synthetic standards. Li lines 2562.5 and 2741.3 A. served as internal standards. The wavelengths of analysis lines and ranges of concn. of metallic oxides are tabulated.

3997. GATTERER, A.
The Suitability of Grating and Prism Spectrographs for Spectrochemical Work.
Spectrochim. Acta, **5**, 30–5 (1952).
C. A., **47**, 996h (1953).

For a spectrograph which is to be used for chem. analysis, G. discusses the spectral range, linear dispersion, resolving power, speed, flatness of field, astigmatism, etc. The mech. qualities are also discussed and an evaluation is given as to what extent the grating and prism spectrographs fulfil these requirements. G. recommends gratings for quant. work, but prisms where the greatest certainty is needed in qual. analysis. A description is given of a large grating spectrograph which seems very suitable for ordinary spectrochem. work.

3998. GAZZI, V.
Enhancement in Qualitative Spectrochemical Analysis.
Spectrochim. Acta, **5**, 42–51 (1952).
C. A., **47**, 996f (1953).

Attention is drawn to published evidence on the enhancement of some spectrum lines by other elements present, and its importance in qual. analysis. This is illustrated by reports on the lines of minor impurities observed in the spectra of graphite with and without certain Zn and Na salts.

3999. GENTRY, C. H. R. AND MITCHELL, G. P.
Spectrochemical Analysis of Tungsten.
Metallurgia, **46**, 47–51 (1952).
C. A., **46**, 9466f (1952).

The technique applied is essentially a method of fractional distn. in the arc involving conversion of the sample to a form of low volatility, addn. of a little selected volatile carrier, and partial distn. of the mixt. in a d.-c. arc under carefully controlled conditions. The sample is ignited to WO_3 in O. Approx. 0.2 g. of the sample is mixed with an equal quantity of the base mixt., which consists of graphite contg. 6% AgCl as carrier and 0.1% Co as nitrate which serves as internal control. The mixt. is placed in the electrode cavity. The Hilger large Littrow quartz spectrograph is used. An Ilford thin-film halftone is used over the wavelength region 2700–4100 Å., and an Ilford long-range spectrum plate with a waveband of 3300–8000 Å. is used for Na and K only. The arc stand is set so that the source is 38 cm. from the slit, with a lens so placed that it throws an image of the source at or near the collimating lens. This insures uniform intensity along the length of the spectrum line. A 2-step rotating sector is placed between the source and the lens in order that each spectrum shall consist of 2 parts, the one representing the total light intensity received at the plate and the other 10% of this. In this manner certain elements, particularly Cu and Si, can be detd. in the main analysis. Current during arcing is generally maintained at 10 amp. For the main analysis a preburn period of 5 sec. is allowed prior to 25-sec. exposure, while for alkalies a direct burning time of 25 sec. is used. Photometry of the exposed plates is made on a Hilger densitometer. Ni, Fe, Sn, Cr, Cu, Al, Mo, Si, and Na (in the higher % range) are detd. on the half-tone plate. Under normal conditions of analysis, Cu and Si are extremely sensitive and the lines of these elements are photometered in the reduced step of the recorded spectrum and compared with a line in the first step of the spectrum. A sep. exposure is made for Na and K. In the case of Ca and As a visual examn. of the sensitive lines is made if required.

4000. GERBER, W. O., JR.
Direct Synthesis of Spectrochemical Standards by Powder Metallurgy.
Applied Spectroscopy, **6**, No. 3, 5–13 (1952).
C. A., **46**, 6988e (1952).

One of the most important requirements in spectrochem. analysis is the availability of standards. To avoid the wet chem. analysis of standards, a procedure was developed for synthesizing such standards by mixing pure metal powders, briquetting under high pressure, and either sintering or melting these electrodes in a protecting atm. by high-frequency inductive heating. Comparisons are given between synthetic standards of Al in Fe and Bureau of Standards solid or chipped samples and a Battelle Memorial Institute Standard, between sintered pellets of W, Nb, Mo, and Si in a simulated 19-9 DL alloy and chemically analyzed solid samples, between melted pellets of W, Nb, and Mo in S-816 Co-base alloy and chemically analyzed solid samples, and between unsintered, unmelted briquets of Al powder contg. Ti and Mn and Alcoa standards. This method is not recommended for the standardization of elements which are easy to analyze by wet methods, but provides a quick way of setting up an analytical control method for entirely new compns. which are difficult to analyze.

4001. GERBER, W. O., JR.
Faster Preparation of Spectrochemical Standards.
Gen. Elec. Rev., **55**, No. 3, 58–60 (1952).
C. A., **46**, 11014h (1952).

Metallographic standards for spectrochem. use were prepd. by thorough mixing of proper proportions of the pure metal powders and pellet-pressing at 2.5×10^5 lb./sq. in. into pellets 0.25 in. diam. and 0.125 in. thick. Some were sintered before use, by arcing in the spectrograph, and others were melted by high-frequency currents. Fe-0.001 to 0.03% Al alloys were easily made as well as complex alloys such as 19–9 DL alloy, contg. Cr 19, Ni 9%, W, Nb, Mo, Ti small amts. and the rest Fe.

4002. GIAVINO, A.
Some Aspects of the Calibration of a Quantometer.
Spectrochim. Acta, **5**, 52–62 (1952).
C. A., **47**, 922f (1953).

The principles of spectrochem. calibration are outlined, and the analogy of photographic and Applied Research Lab. quantometric calibration methods is discussed. The usual calibration method with two standard samples, and a method that uses a standard lamp are described. Another proposed method would use a step wedge; it has not been tried.

4003. GILLIS, J.
Logarithmic Diagrams in Trace Analysis.
J. Chem. Education, **29**, 170–6 (1952).
C. A., **46**, 8565e (1952).

It is possible by means of the ordinary binary and ternary percentage diagrams, as they are ordinarily used in physical chemistry, to represent graphically the influence of interfering substances on the identification limit of a given test, if the amount of the attendant substance is of the order of 0.1 to 100 per cent. However, if parts per million are to be considered, the ordinary diagrams must be replaced by bilogarithmic diagrams. The cologarithmic diagrams become sensitivity diagrams if they are used to represent quantitatively the influence of interfering substances on a given analytical test. Cf. *C. A.*, **46**, 53d.

4004. GILLIS, J.
Spectrochemical Solution of Rapid Industrial Analysis Problems.
Ind. chim. belge, **17**, 134–42 (1952).
C. A., **46**, 10040e (1952).
See C. A., **46**, 53g.

Spectrochemical methods are mentioned by means of which the University of Gand solved the following typical industrial problems: rapid detn. of the principal constituents of high-temp. alloys and clays, rapid analyses of tin-base alloys, bronzes, and stainless steels, and analysis of major elements in sugar-beet ashes. Absorption as well as emission spectroscopy, can be applied to many industrial problems.

4005. GILLIS J., HOUT, J. E., AND KEMP, N.
Spectrochemical Determination of Fluorine in Slags.
Rev. universelle mines, **8**, 284–8 (1952).
C. A., **46**, 9468e (1952).

The sample is placed in a hollow graphite anode satd. with $CrCl_2$, the cathode is also graphite. Best reproducible results were obtained with a d.-c. of 9 amp. The sample is 1 g. slag +0.1 g. CuO. The detn. is made by measuring the ratio of the intensity of the CaF_2 band at 5298.6 Å. to that of the Cu line at 5105.5 Å. as a standard. As little as 0.05% F can be detected in slags with an error of 8–10% for contents over 1% and with an error of 15–20% for lower F contents. The technique is described in detail.

4006. GINZBURG, A. I. AND KRUGLOVA, N. A.
Mn Triplite from Pegmatites of the Turkestan Range.
Trudy Mineralog. Muzeya, Akad. Nauk S.S.S.R., No. **4**, 132–6 (1952).
C. A., **49**, 15653b (1955).

The spectral analysis shows strong lines of Ca, Mn, and P, rather strong lines of Al, Mg, Fe, and Si; a weak Zn line, and a trace of Ti.

4007. GOLDSPIEL, S. AND BERNSTEIN, F.
Controlled Atmosphere Excitation as Applied to the Spectrographic Analysis of

Aluminum Alloy Chips.
Appl. Spectroscopy, **6**, No. 4, 38–50 (1952).
C. A., **46**, 11019h (1952).

An atm.-controlled excitation chamber which can be readily handled in spectrographic production analysis was developed and constructed. This device is being investigated for use in the analysis of Al alloys in chip compacts sample form, to permit the analysis of chips with accuracies comparable to those now obtained by the use of solid samples. Desirability of controlled atm. techniques is indicated by the poor reproducibility obtained in the sparking of compacted chips in air, which can be attributed to the formation of refractory interfaces of variable thermal and elec. resistance. Some data accumulated with Al alloy compacted chip samples in atms. of A, He, and air are presented, and some effects of atm. on reproducibility under various excitation conditions are discussed. Preliminary results of trials indicate decided improvement in reproducibilities are possible with A, judged from time-of-wait curves.

4008. GOLDSPIEL, S. AND CANNER, I.
A Working Curve Calculator for Quantitative Spectrographic Analysis.
Appl. Spectroscopy, **6**, **3**, 23–27 (1952).

(1) This paper describes a simple pocket size spectro-analytical calculator developed in the authors' laboratory for the rapid and direct conversion of spectral line blackenings to percentage constituents. This calculator speeds up production control analysis and is considered convenient for trial of spectro-methods in process of development. It is prepared in the form of a handy slide rule in which the emulsion calibration plot is replaced by a scale. While the calculator can be drawn up for any method, the scales illustrated are for low alloy steels and for aluminum Alcoa types A51S, 52S, 53S, 56S, and 61S as currently used in the Material Laboratory.

4009. GORDON, M., JR. AND MURATA, K. J.
Minor Elements in Arkansas Bauxite.
Econ. Geol., **47**, 169–79 (1952).
C. A., **48**,11259h (1954).

A study of the minor elements in Arkansas bauxite has revealed some striking relation between their concn. in the parent nepheline syenite rocks as compared with their concn. in the bauxite. The ratios of concn., in general, follow a pattern predicted by Goldschmidt (*C. A.*, **31**, 4925[6]), based upon the ionic radius and ionic charge of each element present. In the Arkansas deposits, Mg, Ca, Ba, La, and Sr were depleted during the change from nepheline syenite to bauxite. The av. concn. of Pb remained the same in the samples tested. Y, Mn, Be, V, Sc, Ti, and Zr were concd., but not as much as Al, while Mo, Nb, Ga, Cu, and Cr were concd. more than Al. Nb apparently is found in sufficient quantities to warrant search for methods to ext. it commercially as a by-product of alumina plants.

4010. GRAHAM, E. R. AND ALBRECHT, W. A.
Potassium-Bearing Minerals as Soil Treatments.
Missouri Agr. Expt. Sta. Research Bull., No. **510**, 3–19 (1952).
C. A., **47**, 12719a (1953).

The silica, alumina, ferric oxide, titania, MgO, CaO, K_2O, Na_2O, ignition loss above 105°, moisture dried at 105°, MnO_2, and S as SO_3 of illite, glauconite, rhyolite, granite, wyomingite, orendite pumice, feldspar, orendite, basalt, and alunite were detd. The Cu, Co, Zn, Mo, Mn, Pb, Ag, B, Al, Na, Ca, Ni, Ti, K, Cr, V, Ba, Sr, Zr, Cd, Fe, and Sn content were also measured spectrographically. The study demonstrated the significance of the reserve minerals already within the soil and of the natural minerals which might be conveniently applied as helps in building up the fertility of the soil.

4011. GUNN, E. L. AND POWERS, J. M.
Ash Residues from Petroleum Catalytic Cracking Feed Stocks.
Anal. Chem., **24**, 742–6 (1952)
C. A., **46**, 11654i (1952).

Ashed oil samples as low as 3 mg. are analyzed spectrochemically with Li_2CO_3 as base matrix. Preference is given to the alternating arc excitation.

4012. HALPERIN, A. AND SAMBURSKY, S.
Determination of Rubidium Chloride in Rubidium-Enriched Dead Sea Carnallites.
Bull. Research Council Israel, **2**, No. 2, 107–14 (1952).
C. A., **47**, 2086c (1953).

A direct reading spectrophotometric attachment for arc spectrometers is described. In place of the photographic plate, a plate with two slits is attached, one for the Rb line at 7948 Å., and the other for the reference Cs line at 8521 Å. The light-sensitive devices are 2 phototubes. Better accuracy and more rapid analyses than conventional photographic methods is claimed. The instrument was used to det. the Rb content of fractionally crystd. carnallites. After 3 fractionations, the Rb content in the solid phases increases from 0.02 to 0.47%. NH_3 interference presumably limits further enrichment.

4013. HALPERIN, A. AND SAMBURSKY, S.
The Use of Self-Absorbing Spectral Lines in the Determination of Rubidium.
J. Optical Soc. Am., **42**, 475–81 (1952).
C. A., **46**, 8569f (1952).

A quant. analysis of salts of the Dead Sea for their Rb content was carried out. It was found necessary to use the resonance lines of Rb (at 7800–7948 Å.) as analysis lines. To eliminate the effect of extraneous elements on

the ratio of intensities of the Rb line and the internal standard line, the method of quant addn. was chosen. This method could not be used without correction for the strong self-absorption of the Rb resonance lines. Taking into account this self-absorption, a corrected formula was deduced, and with this correction the analyses were carried out with good results for concns. of 0.005–0.1% Rb.

4014. HAM, A. J., NOAR, J., AND REYNOLDS, J. G.
Metals in Oils: Their Determination by Spectrographic Methods and the Errors Involved.
Analyst, **77**, 766–73 (1952).
C. A., **47**, 997i (1953).

Clear oils require no preliminary treatment before detg. sol. metals but used oils are best clarified by centrifuging or filtering through Sterimat bacteriol. pads. Take 0.15–1 ml. sample in a glass thimble, soak two 1-in. graphite electrodes in the oil, subject to a spark discharge and, without presparking, measure the spectral lines in a Hilger Medium Quartz spectrograph and calc. the contents nomographically. The concn. ranges found were 0.005–0.3% P, 0.007–0.3% Zn, 0.005–0.3% Ca, Pb, and Ba, 0.0003-0.01% Cu, and 0.005–0.01% Fe. The accuracy, except for Pb, is comparable to that of routine chem. methods. The spectral lines used are given.

4015. HARTLEIF, G. AND KORNFELD, H.
Spectral-Determinations in Refractory Substances.
Arch. Eisenhüttenw., **23**, 103–5 (1952).
C. A., **46**, 8566e (1952).

A method for the rapid detn. of SiO_2 (95–7% in quartzites and SiO_2 masses) was developed in which the powd. sample (80-mesh) mixed with an equal amt. of $NH_4Cl+SrO$ (1:1) was burned in an elec. arc (a.-c.) in a small cavity of one of the pure C electrodes. The salt addns. serve to stabilize the arc. Because of the high-SiO_2 content it is detd. indirectly from the difference from 100% and the sum of the oxides plus a const. value for the undetd. oxides of Na, K, Mn, etc.

4016. HARTLEIF, G. AND KORNFELD, H.
Spectrum-Analytical Rapid Determinations in Metallurgical Slags.
Arch. Eisenhüttenw., **23**, 107–11 (1952).
C. A., **46**, 8566d (1952).

A new method is described for detg. Ca, Fe, Mn, Mg, Al, Ti, V, and Si in steel-plant and blast-furnace slags. The powd. (100-mesh) samples are reduced and as a soln. exposed on the pure C electrodes to the elec. arc. The test takes about 2 hr.

4017. HASLER, M. F. AND BOYD, B. R.
Use of the Quantometer for Rapid Steel Analysis.
Elec. Furnace Steel Proc., **10**, 143–51 (1952).
C. A., **47**, 12057a (1953).

In 1950 the Applied Research Laboratories began to manufacture the Production Control Quantometer utilizing as 35 phototubes, permitting a large number of elements to be determined simultaneously. Eighty channels, or element ranges, can be set up to encompass the ranges of concentration found in a variety of analytical problems. Specifications are given for the ARL-PCQ with a 1.5 meter grating vertical spectrometer, including the elements, spectral lines and percentage ranges covered by required sources for the analysis of stainless steel, carbon and silicon steels, nickel steels, low-alloy steels, and slags. Typical analysis, including concentration range, standard deviation, and coefficient of variation are given for low-alloy steels, and for stainless steels of 18–8 type.

4018. HASLER, M. F. AND BOYD, B. R.
Quantometric Analysis of Zinc-Base Die-Casting alloys.
Precision Metal Molding **10**, No. 10, 47–8, 87–9 (1952).
C. A., **47**, 1003i (1953).

The failure of certain older Zn alloys was caused by the inclusion in the alloy of small amts. of Pb, which migrated to the crystal grain boundaries upon aging. Cd and Sn can produce similar deleterious effects in the structure. Heat and moisture in combination with these elements would accelerate this whole corrosion. By using an Applied Research Laboratory's Multisource for analysis of Zn and Zn alloys, very high sensitivity was obtained for Pb, Cd, and Sn detns.

4019. HAUSER, B. B.
Analysis of Zinc Used in Galvanizing.
Applied Spectroscopy, **6**, No. 2, 11–13 (1952).
C. A., **46**, 3454i (1952).

The adherence and appearance of Zn on Fe depends on the purity of the Zn. Spectrographic analysis is the only satisfactory method for the detection and control of impurities. Routine analysis of Zn are made for Cu, Cd, Pb, Sn, Fe, Mg, Si, Mn, Ni, Al, As, Be, Bi, Cr, Ge, Ga, In, Pt, Sb with calibrated intensities of analysis lines (ranging in wave length from 2247 to 3414 Å.) relative to an internal standard line of Zn at 2670 Å.

4020. HAWLEY, J. E.
Spectrographic Studies of Pyrite in Some Eastern Canadian Gold Mines.
Econ. Geol., **47**, 260–304 (1952).
C. A., **48**, 11251h (1954).

The minor element content of more than 200 pyrite specimens from 4 Ontario and Quebec Au deposits was analyzed spectrographically to det. variations, especially with depth. The elements detd. included Au, Ag,

Te, Ni, Co, Pb, Zn, Sn, Mo, Mn, Cr, Ti, V, Bi, and As. Co and Ni range from 0.02 to 0.10% with the Co:Ni ratio usually 1:2. Au in trace amts. was probably deposited in all types of pyrite, with later enrichment controlled by structural factors. Considerable data are given in tabular form.

4021. HEGEMANN, F.
Recent Results Obtained in Quantitative Spectrochemical Silicate Analysis.
Ber. deut. keram. Ges., **29**, 68–73 (1952).
C. A., **46**, 11036h (1952).

The content of 30 scientific papers important for the spectrochemical analysis of silicates is reviewed. A method is described for the complete analysis of silicate by preparing pellets of samples mixed with NH_4NO_3 plus NH_4Cl in the ratio 1:1:2, to which Li_2CO_3 was added as a buffer (and internal standard for the detn. of Na and K). Ti was added as internal standard for other elements, and Fe for the detn. of Ti. Light from a 10 amp. a.-c. intermittent arc between sample pellets was photographed with a Zeiss Q24 spectrograph through a 6-step filter of platinum, and evaluated by a procedure to be described in another paper. The time required to det. 6 elements is 3 to 4 hr., and the reproducibility is about ±2 per cent.

4022. HEGEMANN, F. AND ZOELLNER, H.
Quantitative Silicate Analysis by Spectrographic Methods. I. II.
Glass-Email-Keramo-Tech., **3**, 283–7, 316–21 (1952).
C. A., **47**, 5084c (1953).

Details are given of the exptl. method, the evaluation of the spectrograms by nomograms, and calcn. (Cf. *Ber. deut. keram. Ges.* **28**, 229–46 (1951); *C. A.*, **46**, 11036h).

4023. HEGEMANN, F. AND ZOELLNER, H.
Quantitative Silicate Analysis by Spectrographic Methods. III.
Glas-Email-Keramo-Tech., **3**, 367–72 (1952).
C. A., **47**, 5084c (1953).

Calibration curves for the detn. of the following elements and their oxides are given, based on fundamental lines and characteristic lines of comparison elements: Al (Al_2O_3); Ca (CaO); B (B_2O_3); Na (Na_2O); K (K_2O); Li (Li_2O); Mg (MgO); Si (SiO_2). BaO as stabilizing agent in the "disk" method is important as the reference element; SrO is a const. contamination, useful for the same purpose. The "pastil" method for the detn. of Na_2O and K_2O, based on Li_2CO_3 as admixed reference material, is recommended. For a quick approx. spectrochem. analysis, the addn. of Cd (as $CdCO_3$) is discussed. Consideration is given to the resolution of the Na doublet near 3302 Å.; the detn. of K by the line 4044.1 Å. is possible, down to 0.10%, with an accuracy of about 2% of the result if Cu electrodes are used. Flame photometry of the alkalies is more accurate (±0.5% of the result) than the spectrochem. detn., and with lower detn. limit concns. Calibration curves are given for the flame-photometric detn. of Na_2O and K_2O. If the concns. of the chief elements in the sample are above 20%, diln. of the sample by pure calcined rock crystal powder in the ratios 1:1 to 1:5 is necessary.

4024. HEGEMANN, F. AND ZOELLNER, H.
Quantitative Silicate Analysis by Spectrographic Methods. IV.
Glas-Email-Keramo-Tech., **3**, 415–18 (1952).
C. A., **47**, 5084f (1953).

The useful spectral lines and the ranges of analytical detn. are tabulated for the 20 elements examd. Among the trace elements, the nomograms of the calibration for Li_2O, As_2O_3, and Cr_2O_3 are added to the previously published curves. As practical examples are given (including a comparison of the results of spectrochem. "disk" and "pastil" methods, with those of the flame photometry and of ordinary chem. analysis): (*a*) the detn. of Na_2O in a glass; (*b*) alkalies detd. in feldspar; (*c*) total analysis of a granitoid rock, including TiO_2, P_2O_5, SrO, and Li_2O; (*d*) total analysis of an alkali feldspar. The agreement is excellent, proving the usefulness of quant. spectrochem. analysis for silicate research. 53 references.

4025. HERRMANN, R.
Flame Photometric Analysis of Sodium, Potassium, and Calcium in Serum.
Z. ges. exptl. Med., **118**, 187–98 (1952).
C. A., **47**, 1223c (1953).

Simultaneous detns. of Na^+, K^+, and Ca^{2+} are obtained by injecting a 1:5 dild. serum into a well-regulated flame. The app. consists of 3 filters (589–90, 766–70, and 554–60 mμ for Na^+, K^+, and Ca^{++}, resp.), 3 Se photocells, and 3 galvanometers provided with indicators showing max. deflection. An amt. of 0.5–1 ml. serum suffices for an analysis. The abs. error is ±2%; the sources of error are discussed. Repeated sampling of serum from one person gives const. Na^+ and Ca^{2+} values but variable K^+ content.

4026. HERRMANN, R. AND BAUMANN, R.
Micromethod for the Flame Photometric Determination of Sodium, Potassium, and Calcium.
Z. ges. exptl. Med., **119**, 487–9 (1952).
Z. angew. Phys., **4**, 208 (1952).
C. A., **47**, 7020f (1953).
Cf. *C. A.*, **47**, 1223c.

The method is improved by substituting photocells with electron multiplier tubes and amplifiers for the conventional Se cells. Li^+ is added to the unknowns and the ratios Na/Li, K/Li, and Ca/Li are detd. Triple analyses for the 3 elements can be carried out in 1 min. on 0.05 ml. serum with ±1–2% error.

4027. HIGAZY, R. A.
The Distribution and Significance of the Trace Elements in the Barefoot Outer Sill, Fife.
Trans. Geol. Soc. Edinburgh, **15**, (Campbell Vol.) 150–86 (1952).
C. A., **47**, 5850f (1953).

Spectrographic analyses were made on 10 rocks previously analyzed. Rb, Li, Ba, Sr, Cr, Co, Ni, Zr, La, Y, Cu, V, Ga, Pb, Mo, and Ag were detd. The rocks range from olivine basalt to microsyenite. The course of concn. of these elements is followed for this series of differentiated rocks. Cr and Ni are concd. in the early stages, Co, V, Cu, and Sr in intermediate stages, Li, Rb, Ba, Ga, La, and Y in late stages. The early and intermediate stages have Cr > Ni > Co and Sr > Ba; the late stage has Ni > Co > Cr and Ba > Sr.

4028. HODGE, E. S. AND GOLOB, H. R.
Technique for Photographic Emulsion Calibration; Intensity Factor Tables.
Applied Spectroscopy, **6**, No. 2, 32–6 (1952).
C. A., **46**, 3410c (1952).

Photographic procedures for making quant. spectrochem. analyses by means of relative intensities of spectral lines are based on an emulsion calibration curve. This paper presents a table of intensity factors that have been computed for transmittance values from 35 to 82.5% in the stepped filter used for calibration.

4029. HUBBARD, D., JENKINS, L. B., AND KRUMRINE, E. M.
Amelung Glasses Compared with Some Commercial Glasses.
Sci. Monthly, **75**, 327–38 (1952).
C. A., **47**, 5083e (1953).

Amelung glasses are low in hygroscopicity, pH response, and osmotic pressure within the surface. They require a high working temp. and are anisotropic. They are 10–20% in CaO, <2% in MgO, and <1% in PbO. The results of chemical and semi-quant. spectrochemical analysis are given. 18 references.

4030. HÜBENER, H. J.
Flame-Photometric Determination of Calcium in Blood Serum.
Hoppe-Seylers Z. physiol. Chem., **289**, 188–201 (1952).
C. A., **48**, 10092f (1954).

For the flame-photometric detn. of Ca a higher flame temp. than for Na or K is necessary and largely Ca mols. are energized. The effect of inorg. and org. anions on Ca emission is detd. *Inorg. anions:* bicarbonate ion in concns. found in blood serum does not influence the Ca analysis values. Secondary phosphate, sulfate, and carbonate ions are present in blood serum in low enough amts. not to depress the Ca values appreciably. *Inorg. cations:* Na is the most important ion in this group. If the Na concn. is detd., a correct Ca concn. is found by a suitable graph obtained from Oer and Höfert's equation (*C. A.*, **47**, 2240c). *Influence of Complex formation:* it is shown that the common anticoagulants glycine, citric acid, Trilon A (Na nitrilotriacetate) and Trilon B depress the values of the Ca concn. Directions for the improved flame photometric detn. of Ca are given. A comparison of 20 clinical detns. show a mean square deviation of ±0.53 between the chem. (Clark) and flame-photometric detn.

4031. HÜBENER, H. J., KREUZIGER, H., HEINTZ, R., AND KOCH, M.
Flame Photometric Determinations of the Daily Rhythm of Sodium and Potassium Excretion in Humans.
Z. ges. exptl. Med., **119**, 523–34 (1952).
C. A., **47**, 7073a (1953).

The excretion of Na^+ and K^+ follows a 24-hr. rhythm in most persons, a 12-hr. rhythm in some individuals. Patients affected with chronic diffuse glomerulonephritis exhibit a reduced or no rhythm, especially after a NaCl load, even though the diseased kidneys can excrete 2–3 fold amts. over those without load.

4032. HUGHES, H. K. ET AL
Suggested Nomenclature in Applied Spectroscopy
Anal. Chem., **24**, 1349–54 (1952).
C. A., **46**, 10902a (1952).

Following an exposition of the general principles underlying standardized nomenclature a list is presented of recommended definitions for tech. terms that are used in the literature of applied spectroscopy. The significance of word endings such as -ation, -ity, -meter, and -or, is pointed out, and suggestions are offered for coining new words for tech. usage.

4033. HUGHES, R. C.
Application of Powdered Samples to Graphite Electrodes for Spectrochemical Analysis.
Anal. Chem., **24**, 1406–9 (1952).
C. A., **47**, 65g (1953).

Uniform coatings on spectrographic electrodes can be obtained with insol. materials by the use of a glycerol suspension. The electrode is dipped into the dispersion, then allowed to stand until the glycerol is absorbed. The glycerol is removed by heating for a few min. at a temp. just below its b.p. This results in a smooth adherent coating that permits the use of a.-c.-arc excitation, with its superior precision and sensitivity. The method is applicable to minerals, rocks, soils, ceramic materials, and insol. inorg. compds. Spectroscopic buffers can be added to the dispersion.

4034. HUGHES, R. C.
Spectrochemical Analysis of High-Purity Lead.
Spectrochim. Acta, **5**, 210–17 (1952).
C. A., **47**, 1001c (1953).

Application of the spectrographic method to the detection and estn. of common impurities, Cu, Ag, Bi, Fe, Cd, Sn, and Zn, in high-purity Pb was studied. The method employed requires conversion of the sample to $Pb(NO_3)_2$ which is applied to wax-treated graphite electrodes and dried. Spectra of samples are excited by a 4400-v. a.-c. arc of 5 amp. and photographed on Eastman Spectrum Analysis No. 1 Plates (ultraviolet sensitized for Cd and Zn) by use of a stigmatic grating spectrograph of 8.34 Å./mm. reciprocal dispersion. Provision is made for quant. measurements by photometric comparison of line intensities with the Pb lines 3118.92 and 2218.08 Å. employed as internal standards, and for semi-quant. detns. by visual comparison of sample spectra with spectra of suitable standards. The min. detectable proportions of impurities, in parts per million by weight, are: 0.01 Ag; 0.03 of Cu and Cd; 0.05 Zn; 0.3 of Bi and Fe, 0.1 Sn. Concn. procedures which provide at least tenfold increase in sensitivity are described. The method, though not of high precision, represents an improvement in sensitivity and in accuracy, within the range covered, over other known methods for the analysis of high-purity Pb.

4035. HÜGI, T.
Trace Elements, Their Detection and Significance.
Schweiz. Arch. Tierheilk., **94**, 402–11 (English summary) (1952).
C. A., **47**, 5294f (1953).

A short account is given of semiquant. spectrochem. methods utilizing the cathode-layer technique for the detn. of trace elements in rocks, soils, plant ashes, and other biol. materials. The applications of the technique to various fields are discussed.

4036. HULTHEN E.
Spectroscopic Intensity Modulation.
Arkiv Fysik, **4**, 399–406 (1952).
C. A., **46**, 10901f (1952).

The resolution of a prism or grating spectrograph is considerably increased by crossing the spectrum of the spectrograph with the spectrum of an interferometer. The interferometers used were either of grating type or of the parallel-plate type. The gratings were placed in the positions of autocollimation either parallel or perpendicular to the slits of the spectrometer. The effect of the grating interferometer is to modulate the intensity of the spectrum and so black out wavelengths close to any given wavelengths. In this manner, by using a 21-ft. grating spectrograph, the hyperfine satellites of the Hg 5460 line were observed. The method can be applied to any type of spectrograph and can be used to investigate hyperfine structure in at. spectra or rotational structure in mol. spectra.

4037. HURWITZ, J. K.
An Analysis of the Factors in Spectrochemical Microanalysis.
J. Optical Soc. Am., **42**, 484–9 (1952).
C. A., **46**, 8565i (1952).

Micro-analytical app. was designed and constructed to study diffusion in metals and alloys and to analyze segregates and inclusions. Versatility in changing photographic plates and sample speeds was included in the design. Based on mech. considerations, the relative importance of factors such as size of sparked area, lengths of spectrograph and microphotometer slits, and the ratio of plate speed to sample speed are discussed. The width of the sparked area was uniformly 0.6 mm. Calcns. of apparent concn. were performed to verify the exptl. discrimination factors. The most important factor was found to be the width of the sparked area. No advantage was seen in using a speed ratio greater than 10:1.

4038. HURWITZ, J. K. AND CONVEY, J.
Analysis of the Excitation Characteristics of Spectra Emitted by Ferrous Alloys.
J. Optical Soc. Am., **42**, 24–30 (1952).
C. A., **46**, 3851i (1952).

The excitation potentials of the observed wave lengths of the spectral lines emitted in the low-alloy-steel spark spectrum were calcd. Tentative homologous line pairs were selected on the basis of similar excitation potentials and freedom from interferences. The slopes of the working curves were found to be independent of alloying elements, matrix, and discharge conditions. Alterations in the circuit parameters and consequent changes in the discharge had little or no influence on the intercept of the working curves. Self-reversal of either or both the alloying element line and the internal standard line was observed. The self-reversal was removed by selecting spectral lines of higher excitation potentials or directing an air blast across the discharge. In this way, the working curves were linear over all concns. considered. Element-interference correction factors, which were found to be functions of the concn. of the interfering element, could be applied to data so that one working curve could be used regardless of the major alloying constituents in the sample. Reproducibility tests indicate some improvement in accuracy when the air blast was employed.

4039. IKEGAMI, T., TAKEI, T., AND MIKAMI, T.
Spectroscopic Determination of Silicon in Iron and Steel with an Analyscope.
Tetsu-to-Hagane, **38**, 948–52 (1952).
C. A., **47**, 12110f (1953).

Si was detd. in pig iron during tapping by a visual spectroscopic method. The red-line pair, Fe 6400 Å./Si 6437 Å., with spark excitation was observed. The method was

tested with more than 100 samples from a blast-furnace melt. Si 3904 Å., could not be observed in the arc light, but Si 6347 Å. and 6371 Å., were perceived in the heavy spark. Si (0.7–4%) could be detd. by comparing with the line pair of Fe 6400/Si 6371. An analysis can be finished in 5–8 min. after pouring the molten pig into molds. The sensitivity and accuracy are somewhat inferior to chem. analysis. The method can also be used in steel samples.

4040. INAGAKI, M.
Germanium in Japanese Coals.
J. Coal Research Inst. (Japan), **3**, 261–7 (1952).
C. A., **49**, 7219b (1955).
Cf. *C. A.*, **47**, 6631f.

Ge content in ashes prepd. from vitrains and durains of 41 coals and from 28 lignites throughout Japan was detd. by means of a spectroscopic method. Ge was usually rich in vitrain or in woody lignite, but in most cases in the order of 0.01% of ash, except some Hokkaido coals contg. approx. 0.3% of ash.

4041. IRON AND STEEL INST.
Spectrographic Analysis of Low-Alloy Steels. Iron and Steel Inst., London (England) (1952), 84 pp.

This report was prepd. by the Spectrographic Analysis Sub-Committee of the Methods of Analysis Committee of the British Iron and Steel Research Association. Based on the most successful of the alternative procedures examd. a recommended method for the spectrographic analysis of low-alloy steels has been drawn up and given extensive trials on a series of chemically analyzed standards, with very satisfactory results. The text is divided into sections corresponding broadly to the sequence of analytical operations required, and 156 references have been included to facilitate more detailed study. Successive sections deal adequately although briefly with the spectrograph, electrodes, excitation sources, photographic plates and processing, plate calibration, photometry, spectral line pairs, direct reading, and a recommended method involving a condensed spark discharge to a flat sample, photographing of the spectrum with a quartz spectrograph, density measurements of analysis — and internal standard lines, and percentage concn. of an element from a calibration curve derived from standard samples. Line pairs, empirically chosen, are recommended for the detn. of 7 elements in low-alloy steels with iron content 95% ± 1%. The element and concn. ranges are: Si(0.05–0.80%), Mn (0.05–1.50), Ni(0.10–5.00), Cr(0.05–3.00), Mo(0.05–1.50), V(0.03–0.65), and Cu (0.05–0.50).

4042. ISHERWOOD, E. I.
A Method for Production of Spectrographically Pure Cadmium Metal.
Appl. Spectroscopy, **6**, No. 4, 26 (1952).
C. A., **46**, 10967d (1952).

Exceptionally pure Cd metal, required for use as analytical standards, was produced by employing only dild. chemically pure H_2SO_4 to start the electrolytic cell, and by holding the c.d. down to about 3 amp./sq. ft.

4043. ISNARDI, H.
Solution Spectroscopy.
New Research Techniques Phys., Symposium Acad. brasil. cienc., *Centro coop. cient. Am. Latina (UNESCO)* (1952), 177–85.
C. A., **49**, 53b (1955).
Cf. *Rev. Union Mat. Argentina*, **14**, 197 (1950).

I. describes several types of electrodes for the detn. of arc spectra of aqueous solns. between Fe, Ag, Cu, Pt, Ni, and C electrodes. Spectra of several solns. are shown as examples. The following cations, as chlorides, were used, dissolved in triple distd. water: Ba, Ca, Cr, Cs, K, Li, Mn, Rb, Sr, Tl, and V. Preliminary attempts at detn. of Li are reported.

4044. JANESCHITZ-KRIEGL, H.
An Apparatus for the Rapid Conversion of Photometer Curves Into Relative Blackness Curves.
Chem.-Ing.-Tech., **24**, 158–9 (1952).

A mechanical drafting device is described in detail. It can be used for the evaluation of spectrum and X-ray photographs.

4045. JAYCOX, E. K.
Powdered Standards for Spectrochemical Analysis.
Applied Spectroscopy **6**, No. 3, 17–19 (1952).
C. A., **46**, 6988d (1952).

In spectrochem. labs. that are required to analyze a wide variety of materials, the use of samples and standards in the powd. form offers advantages which are enumerated. Powd. standards fall into two general classes, those for the analysis of materials which are sol. in a common reagent and those for materials which are insol. Methods of prepg. powd. standards of both classes are described.

4046. JOHNSTON, B. R., DUNCAN, C. W., LAWTON, K., AND BENNE, E. J.
Determination of Potassium in Plant Materials with a Flame Photometer.
J. Assoc. Offic. Agr. Chemists, **35**, 813–16 (1952).
C. A., **47**, 5301f (1953).

The K values for 13 plant materials obtained by a flame photometer are compared with those obtained by a $PtCl_4$ method (A.O.A.C. Methods of Analysis, 6th ed. (1945), Sect. 12.17), *C. A.*, **40**, 4624[2]) and found to be in good agreement. Three procedures for prepg. the solns. of plant tissue for evaluation by the flame photometer were also studied: ashing with H_2SO_4, ashing with H_2SO_4 plus removal of the Ca, and Attoe's acetate extn. procedure

(*Soil Sci. Soc. Amer. Proc.*, **12**, 91 (1947)).

4047. JONES, M. C. K. AND HARDY, R. L.
Petroleum Ash Components and Their Effect on Refractories.
Ind. Eng. Chem., **44**, 2615–19 (1952).
C. A., **47**, 1371c (1953).

The 0.001–0.05% ash, present in crude oil, concentrates in the heavy fuel fractions during refining. Study of the effect of the various ashes on the refractories used in industrial furnaces shows that fuels containing V are very destructive to fireclay brick on direct contact at high temp. Alk and alk. earth metals are somewhat destructive. The ash content of 25 crude oils was analyzed chemically and spectrographically for the metals present.

4048. KAAI, M.
Trace Elements in Clays of Seto District.
J. Chem. Soc. Japan, Pure Chem. Sect., **73**, 280–2 (1952).
C. A., **46**, 10512i (1952).

Ni and Mn contents of 5 samples of Gairome clay and 6 samples of Kibushi clay collected in Seto district. Aichi Prefecture, were detd. by colorimetric method with dimethylglyoxime and K periodate. The contents were Mn 1–21 $\times 10^{-3}$ %, Ni 2.8–23 $\times 10^{-4}$ % resp. The presence of Ag, Cu, Ga, Pb, Ti, and Zn in all the samples was detected by spectrographic method.

4049. KAHLER, F., HAAS, H., AND FISCHER, C.
Spectrochemical Analysis of Magnesite.
Radex Rundschau, **1952**, 33–45.
C. A., **46**, 6995e (1952).

The equipment used at Radenthein is described. Because the secondary constituents of magnesite (Si, Al, Fe Ca, Mn) are unevenly distributed and the volatility is rather poor, special sampling and excitation techniques are necessary. 24 references.

4050. KAISER, H.
Spectrochemical Trace Analysis.
Z. Erzbergbau u. Metallhüttenw., **5**, 138–41 (1952).
C. A., **46**, 6541g (1952).

Tech. progress in sample prepn., choice and operation of the light source, the spectrographic app., and its calibration are described, especially for the detn. of min. amts. of elements in the range 10^{-8} to 10^{-6} g.

4051. KALININ, S. K.
Atlas Spektral'nykh Liniĭ (Atlas of Spectral Lines).
State Pub. House Tech. and Theoretical Lit., Moscow (U.R.S.S.) (1952).
C. A., **48**, 11199a (1954).
78 pp.

4052. KAPUSCINSKI, V., MOSS, N., ZAK, B., AND BOYLE, A. J.
Determination of Calcium and Magnesium in Human Serum by Flame Spectroscopy.
Am. J. Clin. Pathol., **22**, 687–91 (1952).
C. A., **46**, 8701f (1952).

The samples are prepd. by ashing 2 cc. of serum with 10 cc. of a 5:1 nitro-perchloric acid soln. This eliminates diverse substances and permits soln. of the salt with exactly 2 cc. of water. This vol. is adequate for the estn. of both Mg and Ca in the same sample. Use wavelength 383 mμ for Mg and 554 mμ for Ca. It is not necessary to ash the synthetic standards for purposes of interpolation. Perchlorate is added to the standards to compensate for the presence of perchloric acid ion in the ashed sample.

4053. KARCHMER, J. H. AND GUNN, E. L.
Determination of Trace Metals in Petroleum Fractions.
Anal. Chem., **24**, 1733–41 (1952).
C. A., **47**, 5669d (1953).

Trace metals in petroleum fractions may cause deterioration of cracking catalysts, metal embrittlement, equipment deterioration, corrosion, poor heat transfer, or may promote chem. reactions in petroleum resulting in lubricant breakdown and engine wear. Other metals are employed as additives in oils or gasoline. For these reasons analytical methods are important. Errors of metal content may come from stratification of metals, ash loss due to volatilization or entrainment, and incorrect sample size. In the procedure the sample (20–1500 g.) is burned in a suitable dish by an open flame by a standardized technique. The residue is then completely ashed in a furnace at 1000°F. to const. wt. The ash is put into soln. by fusion with K pyrophosphate or Na_2CO_3-$NaNO_3$ or by treatment with HCl and H_2SO_4, the latter method generally being preferred. Colorimetric methods are used to det. Fe, Ni, V, Ti, and Cr, while Na and K are detd. by flame photometry and Ca, Si, and Mg by gravimetric detns. A reproducibility of ±5–10% is obtained for the ash content and ±10–20% for colorimetric and spectroscopic methods of metal detn. Spectroscopic methods for direct detn. of trace metals in certain petroleum stocks are discussed, and advantages are presented.

4054. KATCHENKOV, S. M.
Enrichment of Mineral Elements in Petroleum and Hard Coal.
Doklady Akad. Nauk S.S.S.R., **86**, 805–8 (1952).
C. A., **47**, 11095f (1953).

The components of the ashes of mineral oils and hard coals (with deduction of all the incidental contaminations by mineral particles) are important for the elucidation of the genesis

of these natural fuels. While in petroleum usually the ash content is very low (not above 0.01%), that of hard coals may vary between 0.7 and 28.7% (good av. 3–5%), in anthracites between 0.8 and 4%. The highest concn. of rare elements is found in coals with low ash contents; these elements are either enriched by the organisms which have formed the coals or by adsorption from circulating solns. Elaborate tabular compilations show the enrichment coeffs.; they reach 10^2–10^3, for S, V, Co, Ni, Cu, Zn, Pb, Ag, and B. There is a distinct difference in the coeffs. for V and Ni in ashes from petroleum of Paleozoic and Tertiary geol. ages. For the typical elements of sedimentary rocks, the enrichment coeffs. are rather low (1–5, or even less). V is particularly enriched in the acidic compds. of petroleum tars (asphalts), Ni, Co, Fe, and Mn in the neutral compds. Cu is more enriched in tars than in asphalts. The higher V content of Paleozoic petroleum ashes can be controlled by chem. factors in the character of the org. compds. of the original biol. media.

4055. KAZUO SAITO
Spectrochemical Analysis of Germanium by an Interrupted Arc. III.
J. Chem. Soc. Japan, Pure Chem. Sect., **73**, 427–9 (1952).
C. A., **47**, 2631i (1953).

Application of the intermediate image formation and the cathode layer method to the spectrochemical detn. of Ge were studied. By the use of cathode layer method, the detection limit of Ge was increased. (Cf. *C. A.*, **46**, 11025e).

4056. KEENAN, R. G. AND BYERS, D. H.
Rapid Analytical Method for Air-Pollution Surveys. The Determination of Total Particulates and the Rapid Semiquantitative Spectrographic Method of Analysis of the Metallic Constituents in High-Volume Samples.
Arch. Ind. Hyg. Occupational Med., **6**, 226–30 (1952).
C. A., **46**, 11527d (1952).

The atm. concns. of Si, Al, Fe, Ca, Mg, Pb, Zn, Mn, Cu, Ti, Sn, Mo, Ba, Cd, Cr, Ni, Sb, V, Co, and Be were detd. by passing air through a high-vol. pleated-paper air sampler, weighing the residue collected, removing the deposits by washing with EtOH, wet-ashing with concd. HNO_3 and H_2SO_4, treating with concd. HCl, adding to electrodes of a spectrograph, and evaluating the concns. by comparison with spectrograms from prepd. standards.

4057. KELLER, R. E. AND SMITH, L.
Chemical Analysis With High-Frequency Electrodeless Discharge.
Anal. Chem., **24**, 796–9 (1952).
C. A., **46**, 7459h (1952).

A description is given of a high-frequency source unit capable of exciting the halogen spectra in inorg. and org. halides. The sample (10–20 mg.) is placed in a borosilicate glass tube having an end window. This tube is positioned inside a coil and a vacuum of 10^{-4} mm. Hg is produced in it. The power unit is turned on and the spectrum recorded with a 3-meter grating spectrograph. This procedure permits excellent qual. tests for I, Br, and Cl. A sensitivity limit of 0.01–0.1% Br as NaBr in KCl and 0.001–0.01% I as NaI in KCl was realized. A hitherto unreported I line at 432.16 mμ was found.

4058. KEY, C. W. AND HOGGAN, G. D.
Spectrographic Method for Analysis of Cracking Catalysts.
Anal. Chem., **24**, 1921–5 (1952).
C. A., **47**, 2638i (1953).

Cr, Fe, Ni, Na, and V in silica-alumina cracking catalysts are detd. spectrographically. A high-voltage spark and a rotating-disk electrode contg. Li_2CO_3 as flux and buffer and Co as internal standard are used.

4059. KHARKEVICH, A. A.
Spektry i Analiz (Spectrum and Analysis). State Pub. House Tech. and Theoretical Lit., Moscow (U.R.S.S.) (1952). 192 pp.
C. A., **48**, 11252b (1954).

4060. KINGSBURY, G. W. J. AND TEMPLE, R. B.
A New Electrode Holder for Running a Carbon Arc in an Inert Atmosphere.
Spectrochim. Acta, **4**, 473–5 (1952).
C. A., **46**, 8525f (1952).

Two new types of electrode holder are described which allow a C arc to be run in a stream of CO_2, in order to diminish the intensity of the atm. CN bands, which might otherwise mask the lines of certain elements. It has also been found that an increase in accuracy can be obtained for certain analyses by using these holders to circulate a stream of air around the arc.

4061. KINGSLEY, G. R. AND SCHAFFERT, R. R.
Effect of Organic Solvents on the Emission Spectra of Sodium and Potassium in Serum and Aqueous Solutions.
Science, **116**, 359–60 (1952).
C. A., **47**, 2246c (1953).

Substitution of acetone for water as a diluent for serum in the flame photometric detn. of Na and K increased the emission spectra seventeen-fold for Na and thirteen-fold for K. Smaller increases were shown by MeOH and very little effect by PrOH and iso-PrOH. Increasing quantities of protein were pptd. above 50% acetone and Na was lost with the ppt. No loss of Na was noted in MeOH pptn. Bovine albumin had no effect on the flame spectrum of Na or K.

CCl_3COOH caused the loss of Na and K; its use as a protein precipitant is not recommended.

4062. KLIMECKI, W. AND MAKARUCHA, Z.
Spectrographic Determination of Alloying Constituents in Steels.
Prace Inst. Met., **1952**, 127–43 (English summary).
C. A., **47**, 7941e (1953).

A method of spectrographic detn of Mn, Si, Cr, Ni, Mo, and V in low-alloy and carbon steels is described. 15 references.

4063. KNIGHT, S. B. AND PETERSON, M. H.
Flame Photometric Determination of Sodium in Salts of Organic Acids.
Anal. Chem., **24**, 1514–16 (1952).
C. A., **46**, 11029e (1952).

A Perkin-Elmer Model 52A flame photometer was used in this study employing the internal standard method with Li at the same concn. in known and unknown samples of 30 Na salts. In no case was the test unreliable and in 19 cases the actual error was ±0.20%.

4064. KÖHNLEIN, J. AND LÜCKE, K. E.
Flame Photometric Calcium Determination.
Z. Pflanzenernähr. Düngung Bodenk., **57**, 114–21 (1952).
C. A., **46**, 11023e (1952).

In many cases this method has given good results in the analysis of plant ashes and soils. Under given conditions the sensitivity of the method depends on the temp. of the flame, and therefore on the gas used. Results of CaO detns. on mixed solns. of purest $CaCl_2$, KH_2PO_4, NaCl, KCl, and $MgCl_2$ are reported by using both illuminating gas and C_2H_2 and light filter 617 in the Rheim-Lange app. (*C. A.*, **42**, 5795h), and the Zeiss-Ca filter in the Schubknecht-Waibel app. *Angew, Chem.*, **50**, 299 (1937); *Z. anal. Chem.*, **112**, 353 (1938); *Z. tech. Physik*, **19**, 394 (1938). The conclusions are: the results are too low in the presence of phosphates; filter 617 is unsuitable in the presence of Na and K; the Zeiss filter is highly sensitive, but the presence of alkalies, especially Na and Mg increases the effect of the phosphates, so that the method is possible only after the elimination of all phosphates, and it is less convenient than the usual pptn. as oxalate.

4065. KOLB, A. C. AND STREED, E. R.
Intensity of Spectral Lines Produced in Nonhomogeneous Flames.
J. Chem. Phys., **20**, 1872–8 (1952).
C. A., **47**, 4723g (1953).

The emission and absorption of radiant energy in a nonhomogeneous flame was discussed theoretically. The soln. of the basic 1-dimensional equation of transfer was obtained as a series the 1st term of which was used as a 1st approximation. This gave a simple formula for a flame having a plane of symmetry. The formula was in satisfactory agreement with exptl. results for Cu, Ag, Ni, Fe, BaO, and CaO and had the advantage of permitting calcn. of working curves for quant. analysis from data for a few standard samples.

4066. KRESS, K. E.
Quantitative Analysis with the Spectranal; Ash Analysis of Compounded Rubber.
Appl. Spectroscopy, **6**, No. 4, 19–25 (1952).
C. A., **46**, 11744g (1952).

The quant. possibilities of visual spectroscopic analysis with the Spectranal were investigated. A multiple-line standard technique, with the Pt electrode spectrum as the standard, was devised for simultaneous detn. of relative concn. of several elements (Ca, Fe, Na, Mg, Zn) normally found in the ash of compounded rubber. An accuracy of better than ±20% of the amt. present was achieved. The procedure will be practical wherever convenience, speed, and sensitivity of analysis are of greater importance, than abs. accuracy.

4067. KUDELYA, E. S. AND DEM'YANCHUK, A. S.
Determination of Phosphorus in Steels with the Steeloscope.
Doklady Akad. Nauk S.S.S.R., **83**, 397–8 (1952).
C. A., **47**, 11076h (1953).

The sample is sparked against a conically tipped 10 mm. diam. graphite rod; comparison of the intensity of P II 6043.05 Å. with the intensities of neighboring Fe lines permits estn. of P. concns. between 0.02 and 0.13%.

4068. KULP, J. L., TUREKIAN, K., AND BOYD, D. W.
Strontium Content of Limestones and Fossils.
Bull. Geol. Soc. Am., **63**, 701–16 (1952).
C. A., **46**, 9034h (1952).

A rapid high-precision spectrographic technique is used to analyze a large no. of carbonate specimens for Sr to obtain significant geochem. and ecological data. The value of Sr/1000 Ca for all limestones is 0.71, and limestones are considerably lower in Sr than most fossils. The Sr content of fossils varies greatly, but on the av. it is about twice that of the surrounding matrix. No trends with age or fossil type were found; the primary factor which dets. the Sr/Ca ratio in a shell or limestone is the Sr/Ca ratio of the water from which they formed, but other factors of importance include the salinity, ratio of aragonite to calcite in orginal shell, and subsequent recrystn. history. The Sr/1000 Ca values are given for a no. of limestones, dolomites, marbles, deep-sea oozes, and randomly selected fossils.

4069. LANGE, N. A.
Handbook of Chemistry. 8th Edition.

Handbook Pubs., Sandusky, Ohio (1952), 1998 pp.
C. A., **47**, 2032b (1953).

Contains the following tables of Spectral lines useful in spectrochemical analysis: 1. Qualitative spectrographic analysis table (pp. 898–915) of sensitive lines, and possible interferring lines, of the following elements: Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, C, Ce, Cr, Co, Cb, Cs, Cu, F, Ga, Ge, Au, In, Ir, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, Pt, K, Rh, Rb, Sc, Se, Si, Ag, Na, Sr, S, Ta, Te, Tl, Th, Sn, Ti, W, U, V, Yt, Zn, and Zr. 2. Sensitive lines of the elements (pp. 916–921) (from MIT Wavelength Tables, John Wiley & Sons, Inc., New York, N. Y. (1939)). 3. X-ray emission spectra of the K series (pp. 1428–9). 4. X-ray emission spectra of the M series (p. 1429). 5. X-ray emission spectra of the L series (pp. 1430–3).

4070. LAPLACE, G.
Determination of Trace Elements in the Iron Minerals of Lorraine.
Pubs. Inst. Recherches Sidérurg. (Saint-Germain-En-Laye), Ser. A., No. **41**, 61 pp. (1952).
C. A., **48**, 2511b (1954).

Standard chemical methods of analyses adapted to use in the analyses of Lorraine iron ores are described. K and Na are detd. by flame photometry.

4071. LAQUA, K.
The Spectral Character of Spark Discharges.
Spectrochim. Acta, **4**, 446–66 (1952).
C. A., **46**, 8525a (1952).

An oscillatory spark discharge can be described, sufficiently for its spectrochem. use, by the energy dissipated and the duration of the discharge. The energy dissipated dets. the mass of matter volatilized and consequently the brightness of the spectrum. The duration of the discharge dets. the character of the spectrum; for equal energy the shorter the time the more sparklike is the spectrum. It makes no difference whether the spark is self-ignited or separately triggered. Of all the possible spark-discharge parameters only these 2 are essential, forming a 2-dimensional field which can readily be surveyed. Hence it is possible to present spark discharges with widely different elec. parameters and similar spectra, provided that the energies dissipated in the spark and the discharge times are equal. A series of soft discharges (i.e., of long duration), can be controlled so as to be uniform for a long time, but very hard discharges can only be given by self-ignited sparks because of the inevitable residual inductance in the discharge circuit of the spark with separate ignition. Air lines and spark lines of higher degrees of ionization show characteristic variations which are only of secondary importance. Discharge conditions for definite spectrochem. purposes can be specified in terms of the spark energy and discharge time irrespective of the spark source used.

4072. LARMO CANTIÇAO, A. DO
Trace Elements in Limestones.
Rev. quím. ind. (Rio de Janeiro), **21**, No. 238, 24 (1952).
C. A., **46**, 11533g (1952).

Spectral analysis of limestone samples (for application to the soil) showed only the presence of Cu; the other important metals such as Zn, B, and Co were absent. The amts. of S and P in limestones are generally very small; addn. of gypsum and phosphates is suggested to introduce these 2 elements into the soil.

4073. LEBEDEV, L. M. AND SUMIN, N. G.
Red Spinel from Slyudyanka.
Trudy Mineralog. Muzeya, Akad. Nauk S.S.S.R., No. **4**, 149–51 (1952).
C. A., **49**, 15672c (1955).

Spectral analysis shows strong lines of Cr, moderate lines of Fe, V, and Mn, weak lines of Zn, Ga, Ca, and Si, and traces of Cu, Ag, Ni, and Ti.

4074. LEHMANN, H. AND PRALOW, W.
Determination of Sodium, Potassium, and Calcium with the Flame Photometer in Raw Materials and Finished Products of the Silicate Industries.
Tonind.-Ztg., **76**, 33–7 (1952).
C. A., **46**, 4424h (1952).

A review of quantitative methods for detg. Na_2O, K_2O, and CaO with flame photometry with an accuracy comparable to that of gravimetric methods. Calibration curves are shown.

4075. LEPPÄNEN, V., KRUSIUS, F. E., AND METTINEN, T.
A Simple and Accurate Flame Photometer for the Determination of Blood Alkali Metals.
Ann. Med. Exptl. et Biol. Fenniae, **30**, 305–26 (1952).
Scand. J. Clin. and Lab. Invest., **4**, 320 (1952).
C. A., **47**, 4947b (1953).

An internal-standard flame photometer for the detn. of K and Na in biol. fluids was constructed, and the exact design and instrumentation are described in detail. The usual Li sulfate method for the prepn. of samples and standards is used. Cf. *C. A.*, **46**, 161g.

4076. LEVIN, H.
Standardization of Spectroscopic Methods of Analysis; Committee Activities.
Applied Spectroscopy, **6**, No. 2, 17–19 (1952).
C. A., **46**, 4416g (1952).

A brief report on the history, administration, and mechanism of intercompany and national committee activities relating to co-

operative spectroscopic efforts, principally as they concern the petroleum industry.

4077. LIMMER, G. AND EHRLER, T.
A Rapid Method of Metal Analysis.
Werkstatt u. Betrieb, **85**, 87–9 (1952).
C. A., **46**, 11021e (1952).

The principles of spectrum analysis are explained and a portable app. for detecting and detg. the constituents of steel is described.

4078. LÖBELL, D.
The Use of So-Called Volta Luminescence in Spectral Analysis.
Z. Angew. Phys., **4**, 462–6 (1952).
C. A., **47**, 5294i (1953).

If a point-shaped cathode is slowly dipped into an electrolyte contg. the anode, Volta luminescence is observed on the part of the cathode wetting the electrolyte. The effect is due to excitation of ions by elec. discharges in a thin vapor layer created by heat from large local c.d. The spectrum emitted consists of the Hα and Hβ lines and the line spectra of the cations. Elements with low excitation energy (alkali and alk. earth ions) emit very easily, elements with high excitation energy (e. g., Ge) do not show up. The method can be used for detecting certain elements. Quant. measurements, by comparing the photographic ds. of a standard and an exptl. sample show an av. error of $\pm 7\%$. The spectra are very similar to those obtained from the Lundegardh burner, the latter being superior because of its accuracy and the possibility of making quant. measurements.

4079. LÓPEZ DE AZCONA, J. M.
Spectral Study of the Influence of Physical State in the "Haynes Stellite Alloy No. 30."
Spectrochim. Acta., **5**, 18 (1952).
C. A., **47**, 969a (1953).

The aim of this investigation is to study the effect of heat-treatment of the electrodes on the spectrum emitted by the sample. The spectrum is recorded during the heat-treatment, which is carried out in a special furnace, employing a source which does not alter the structure of the specimen. Some emission anomalies have been observed in the ranges from 640° to 680°, and above 880°, both during heating of the electrodes and also during cooling from 1000°.

4080. LÓPEZ DE AZCONA, J. M., SANTOS RUIZ, A., AND DEÁN GUELBENZU, M.
Trace Elements in Normal and Pathological Human Tissues.—I. Uterus.
Rev. españ. fisiol., **8**, 13–19 (1952).
C. A., **51**, 5957c (1957).

Spectrally (2400–3450 Å.) there were found in the ash of 16 normal and pathol. uteri Ca, K, Mg, P, Ba, Cu, Fe, Li, Mn, Pb, Si, Ni, Ti, and Al; sometimes Co, Mo, and V, but never Ag.

4081. LÓPEZ DE AZCONA, J. M., SANTOS RUIZ, A., AND DEÁN GUELBENZU, M.
Oligoelements in Normal and Pathological Human Tissues. IV. Various Tissues.
Rev. españ. fisiol., **8**, 149–52 (1952).
C. A., **47**, 11500h (1953).

Spectrochem. analyses are given for mammary cancer, hydatid liver cyst., thyroid goiters (2), and normal placentas (3): Ba, 10^{-4}; Cu, 10^{-3}- 10^{-4}; Fe, 10^{-2}-10^{-4}; Mn, 10^{-3}-10^{-5}; Si, 10^{-1}-10^{-2}; Ti, 10^{-4}. Ag, Co, Li, Mo, Ni, and V were found in one or more tissues at about the limit of sensitivity of the method.

4082. LUNDGREN, P.
Flame Photometry; A Survey.
Svensk Farm. Tid., **56**, 433–44, 457–71 (1952).
C. A., **46**, 9407b (1952).

A review covering mech. constructions, operation, and limiting factors. 74 references.

4083. MACDONALD, N. S., NUSBAUM, R. E., EZMIRLIAN, F., BARBERA, R. C., ALEXANDER, G. V., SPAIN, P., and ROUNDS, D. E.
Gastrointestinal Absorption of Ions. I. Agent Diminishing Absorption of Strontium.
J. Pharmacol. Exptl. Therap., **104**, 348–53 (1952)
C. A., **46**, 6762f (1952).
Cf. *C. A.*, **45**, 5283d.

Thirty-two substances readily available in large quantities were screened for ability to diminish skeletal deposition of ingested Sr. $SrCl_2$ soln. was given to fasted rats by stomach tube and followed immediately by an aq. soln. or suspension of the substance. After 24 hrs., Sr in the femurs was detd. spectrographically. . . .(etc.)

4084. MACHER, F.
The Low-Voltage Spark as a Light Source for Quantitative Spectrographic Analysis. II. Investigation of Cast Aluminum.
Acta Tech. Acad. Sci. Hung., **4**, 145–54 (Russian summary) (1952).
C. A., **47**, 4782c (1953).

Optimum parameters for this analysis with the Pfeilsticker-Sventitskiĭ spark are: capacitance 40 microfarads, series inductance 0.4 millihenrys, charging voltage 110 v. (a.c.), charging current 0.05 amp. per microfarad, and electrode gap 3 mm. Standard deviations of 5–10% were obtained for the concns. of Si, Fe, Cu, Ti, and Mn in cast Al. Cf. *C. A.*, **43**, 8297*e*.

4085. MASI, O.
A Simple Graphic Calculating Board for Spectrographic Analysis.

Spectrochim. Acta, **4**, 429–34 (1952).
C. A., **46**, 7825f (1952).

The construction and use of a graphic calcg. board for the transformation of photometric readings of spectral lines into percentage-compn. values is described; it is easily made and versatile in application.

4086. MASI. O. AND MORELLO, B.
Some Sensitometric Determinations in Spectrography.
Spectrochim. Acta, **5**, 130–46 (1952).
C. A., **47**, 996e (1953).

Plate calibration with a group of homologous lines gives more accurate results than the use of a step sector. By using two different source units and two spectrographs the effect of these on plate calibration curves for several different types of plate was studied; the measurements made for this purpose are also statistically evaluated to give estimates of the variability due to the plate emulsion, to the spectral source, and to microphotometry. The importance of reciprocity law failure and the use of algebraic transformations to extend the linear portions of calibration curves are also discussed with adequate data.

4087. MATHIEU, F. C.
The Automatic Spectro-Reader as a Research Instrument.
Spectrochim. Acta, **5**, 174–81 (1952).
C. A., **47**, 968h (1953).
Cf. *C. A.*, **46**, 5897f.

The principles are given of the direct-reading Cie Radio-Cinéma app. and uses in spectrochem. research and purely analytical purposes are given. The indicating unit can be used to check the uniformity of a source, and the degree to which line-pairs are homologous. There were discussed specimen shape and surface condition, the value of different types of graphite as counter-electrodes, and the effect of specimen temp.

4088. MATHIOT, P.
A New Recording Microdensitometer for Spectrophotometry.
Spectrochim. Acta, **5**, 124–9 (1952).
C. A., **47**, 924c (1953).

A recording microphotometer is described with an electronic amplifier and a moving wedge, automatically operated to balance the measured beam. A lever which follows the movement of the wedge carriage ends in a ball-pen, and records the d. of the area scanned with a variable magnification (between 2.5 and 100 times) of the transverse. The precision is said to be about 0.01 d. unit between 0 and 4. The instrument is operated from the mains, and needs only 5 min. warming-up period.

4089. MATHIS, W. T.
Report on Spectrographic Methods.
J. Assoc. Offic. Agr. Chemists, **35**, 406–18 (1952).
C. A., **46**, 11474a (1952).

In the collaborative study reported the 12 collaborators analyzed 4 different samples of alfalfa by their usual procedures, either chem. or instrumental, for elements included in their usual routine. A total of 1184 detns. were made by 25 different chem. methods and 3 main instrumental techniques: spark, arc, and flame excitation. The data obtained were analyzed statistically and the following major conclusions drawn: For K the spark and flame methods are equal to, or better than, the chem. methods. For Ca the spark and flame methods are about equal to the chem. method but require very careful standardization for K influence. For Mg spark, arc, and flame methods are superior to the chem. methods. For P the spark and arc methods are equal to the chem. method, but careful control of K and Ca influence is required. For Na there appears to be little choice among the methods.

4090. MAYER, F. X.
Spectral Analytical Trace Investigation in Criminal Law.
Spectrochim. Acta, **5**, 63–72 (1952).
C. A., **47**, 996c (1953).

The value of spectrum analysis for forensic problems is discussed, and illustrated by examples. In general an interrupted arc source is used. Examples are chosen from cases of safe-breaking, of road accidents, from poisoning by metallic compds., and by solvents, the latter requiring absorption spectra for their identification.

4091. MAYORAL, C.
A Circuit for an Oscillating and Resonating Spark for Spectrographic Analysis.
Anales real soc. españ. fís. y quím. (*Madrid*) **48A**, 236–7 (1952).
C. A., **48**, 6232a (1954).
Raiskil's Circuit (*C. A.*, **34**, 2709[4]); Smith, *Metal Ind.* (London), **70**, **23** (1947)

For a spark for spectrographic analysis has been investigated. Inductance in coil L_1 should be 0.17 mH., in L_2 9.30 mH. Sepn. in the auxiliary spark should be 13 mm., in the analytical spark 2.5 m., and the capacity of the condenser 0.011 μF. These values were obtained by expts. varying these quantities over wide ranges, holding the total capacitance const., and observing the Al III 3612.35- and 3601.25-A. lines.

4092. MAYORAL, C.
Effect of Zinc on Copper in the Spectrographic Analysis of Copper-Aluminum-Zinc Alloys.
Anales real soc. españ. fís. y quím. (*Madrid*), **48B**, 775–82 (1952).
C.A., **47**, 4242c (1953).

Quant. spectrographic studies of ternary Cu-Al-Zn alloys show that, when the concn. of Zn is 10-20%, the Cu line intensity decreases, but, when the concn. of Zn is greater than 60%, the Cu line intensity increases greatly and becomes comparable to the values obtained in binary compds. of Cu and Zn. Concns. of Zn less than 2.5% have no effect whatsoever on the Cu line. Saline solns. of each of the metals could not be used for comparative purposes, as the crystn. metallographic constitution of the alloys greatly influences the intensities of the lines.

4093. McCREARY, W. B.
Silicon in Gray Iron—Further Investigation.
Applied Spectroscopy, **6**, **2**, 9–10 (1952).

Changes in procedure, largely in the casting of samples are described for the determination of silicon in gray cast iron.

4094. McMAHAN, E. L.
Some Characteristics of Spectrochemical Calculation Curves.
Appl. Spectroscopy, **6**, No. 5, 5–8 (1952).
C. A., **47**, 3171d (1953).

Quant. spectrochem. analysis is based on the theory that the light emitted by an element is a function of the quantity of element present and excited. In the absence of self-absorption and background this function is linear with unit slope when the log concn. is plotted against log intensity. In general, a straight-line working curve can be exactly described by 2 numerical values, the slope and the index defined as the concn. at which the intensity is unity. It is shown that a more convenient measure of the slope is the doubling factor, defined as the ratio of intensity values over which the concn. is doubled.

4095. McNALLY, J. R., JR.
Atomic Spectroscopy and Separated Isotopes.
Am. J. Phys., **20**, 152–60 (1952).
C. A., **47**, 38g (1953).

The advantages in the use of sepd. isotopes in at. spectroscopy for the detn. of nuclear moments I, μ, Q, and for studies of the isotope-shift phenomena are discussed. Illustrations of spectra are given for Hg, U, and Sm. In addn. a summary is given of 22 so-called problem nuclei, i.e., those naturally occurring isotopes for which the nuclear moments are completely uncertain. Concluding remarks are made on such problems as the evaluation of the abs. magnitude of isotope shifts, the role of "forbidden transitions" in isotope spectra, and the potential future value of spectro-isotopic assay techniques.

4096. MEGGERS, W. F.
Emission Spectroscopy.
Anal. Chem., **24**, 23–7 (1952).
C. A., **46**, 3894i (1952).

Review.

4097. MEGGERS, W. F.
What Use Is Spectroscopy.
Applied Spectroscopy, **6**, 6–10 (1952).

A review of the contributions of spectroscopy to the discovery of elements; knowledge of the properties of atoms; spectrochemical analysis; atomic constants of length and time; and jobs and apparatus.

4098. MEGGERS, W. F.
Description of the Arc and Spark Spectra of Rhenium.
J. Research Natl. Bur. Standards, **49**, 187–216 (1952) (Research Paper 2355).
C. A., **47**, 4193a (1953).

The arc and spark spectra of Re I and Re II were obtained by using Re metal electrodes and large concave grating spectrographs. Wavelengths were measured by comparison with secondary standards in the Fe spectrum. The use of arc and spark spectra permitted the sepn. of Re I and Re II lines. In the region from 2000 Å. to 11,789 Å., 6000 lines were observed. Relative intensities were estd. for all lines, and the total width of many broad lines were measured.

4099. MEGGERS, W. F. AND MURPHY, R. J.
Arc Spectra of Gallium, Indium, and Thallium.
J. Research Natl. Bur. Standards, **48**, 334–44 (1952) (Research Paper No. 2320).
C. A., **46**, 10869f (1952).

The arc spectra of Ga, In, and Tl were investigated photographically from 6500 to 13,000 Å.; d.-c. arcs were used to excite the spectra and infrared-sensitive photographic emulsions used to record them. A 22-ft. concave grating was employed. In Ga I 37 new lines were found, 35 in In I, and 25 in Tl I. All the lines were explained as combinations of the expected doublet terms of the atom. The new data led to a revision of the Ga I terms and extension from $n=9$ to 12 for ns^2S, from $n=7$ to 11 for nd^2D, and to the discovery of nf^2F° terms from $n=4$ to 7. Two new nf^2F° terms were found for In I and Tl I.

4100. MEHLICH, A. AND MONROE, R. J.
Report on Potassium Analyses by Means of Flame Photometer Methods.
J. Assoc. Offic. Agr. Chemists, **35**, 588–96 (1952).
C. A., **47**, 2624h (1953).

The reasons for large variations in results obtained in a previous collaborative study (*C. A.*, **45**, 10454a) were studied. The results of this investigation were analyzed statistically. When the flame photometer was used on standard solns. contg. from 0.5 to 35 p.p.m. K., the av. residual error for different analysts who used different instruments was 0.49 p.p.m. K., excluding the values obtained with one instrument model. For *N* NH_4OAc exts. of *soils* contg. from 0.02 to 1.50 meq. K, the av.

residual error including day to day variations was 0.0184 meq. K. K values obtained on the same soil exts. by a flame photometer and by the cobaltinitrite titration method were compared. With soils of low to medium K content, 0.02–0.3 meq./100 g., NH_4OAc buffered at pH 4.8 with AcOH, and $BaCl_2$ buffered at pH 8.1 with triethanolamine extd., substantially the same amt. of K as *N* NH_4OAc at pH 7. *N* $NaNO_3$ at pH 7 and *N* $NaNO_3$ in 0.1 *N* HCl at pH 2 extd. somewhat less, and 25% $NaNO_3$ extd. substantially more K than *N* NH_4OAc.

4101. MEIXNER, H., HAAS, H., AND KAHLER, F.
The Stones and Metal of Hemma's Ring and Pendant of the Cathedral of Gurk, Carinthia.
Carinthia, **142**, 81–8 (1952).
C. A., **48**, 1206i (1954).

The ring and pendant, supposedly smoky quartz set in Au, date back to the 11th century. Optical detns. show the stones to be corundum with inclusions of rutile. Spectrographic detns. show the metal to be Ag alloyed with 5–10% Cu and covered with Au. Also found were Hg, probably from the gilding process, Sn, Pb, Zn, Pd, and Pt, also Ca, Al, Mg, and Si. Few occurrences of Pd-bearing Au are known; the Caucasus is a possible source.

4102. MILLS, E. C. AND HERMON, S. E.
Comparison of Some Simple Condensed Spark Circuits in the Spectrographic Analysis of Aluminum and Magnesium Alloys and Pure Magnesium.
Metallurgia, **46**, 213–15 (1952).
C. A., **47**, 444e (1953).

It is concluded that simple uncontrolled or "free running" condensed spark circuits give better reproducibilities in the analysis of Al and Mg alloys than those obtained by condensed spark circuits controlled by an auxiliary gap or synchronous interrupter. For estg. impurities in 99.9% pure Mg. where the d.-c. arc is not readily applicable, the greatest sensitivity is obtained by the simple condensed spark incorporating a tandem gap. From the evidence available it appears that the type of source unit does not have a major effect on the precision attainable. The homogeneity of the standards and the selection, measurement, and coordination of the spectral lines are other factors affecting this.

4103. MITTELDORF, A. J. AND LANDON, D. O.
Spectrochemical Determination of the Mineral-Element Content of Beef.
Anal. Chem., **24**, 469–72 (1952).
C. A., **46**, 5220c (1952).

Seven composite samples, each representing one grade of beef, were dried at 105–106° for 24 hrs., raising the temp. gradually, ignited at 350°, heated at 500° for 8 hr., ground in a sapphire mortar; the heating and grinding were repeated 2 more times. Some samples were further concd. by pptn. of Co with 8-quinolinol. Synthetic meat ash was prepd. from KPO_3, NaCl, and MgO. It had a similar compn. to actual meat ash, but different mol. configuration, as shown by X-rays. To reduce possible matrix errors, all samples and standards were dild. with specially purified $Al_2(SO_4)_3$ and graphite in a 1:2:3 ratio. Standards were prep. from the synthetic meat ash by adding known amts. of elements to be detd. A d.-c. arc was used. Quant. values were obtained for 17 elements and ranges for another two (Al and Si). Sensitivity figures were detd. for an addnl. 17 elements not detected. For Tl and Hg, which volatilized during ashing, dried samples were used.

4104. MOORE, C. E.
Atomic-Energy Levels as Derived from the Analyses of Optical Spectra.
Natl. Bur. Standards (U. S.), Circ. **467**, At. Energy Levels II, 227 pp. (1952).
C. A., **47**, 4191h (1953).

This 2nd vol. of Atomic Energy Levels, like the first (*C. A.*, **43**, 8883e), contains all available information on energy levels derived from the analyses of 152 at. and ionic spectra of 18 chem. elements: Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Rb, Sr, Y, Zr, and Nb. The information consists generally of electron configurations giving rise to designated spectral terms, the inner quantum nos. and relative values of the individual energy levels, the intervals when energy levels are grouped in terms, and the observed magnetic splitting factors of the levels. Predicted terms of the isoelectronic sequences of 17 elements and the spectroscopic ionization potentials of 41 elements are displayed in addnl. tables.

4105. MOORE C. E.
An Ultraviolet Multiplet Table.
Nat. Bur. Standards (U. S.), Circ. No. **488**, Sect. 2, 115 pps. (1952).
C. A., **47**, 965d (1953).

The leading multiplets are given in some ultraviolet portions of 46 spectra assocd. with 18 chem. elements, viz. Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Rb, Sr, Y, Zr, and Nb. The wavelengths are mostly shorter than 3000 Å. In addn. to wavelengths, data are given on intensities, low and high excitation potentials, quantum nos., and spectral terms with multiplet numbers.

4106. MORINAGA, K.
Trace Elements in Sphalerites from Japan.
Bull. Nagoya Inst. Technol. (Anniversary Issue), **4**, 228–31 (1952).
C. A., **48**, 2526h (1954).

Qual. spectroscopic analyses of 44 samples of sphalerites (I) from Japan are given. The kind of trace elements in I was found to be

related to the temp. at which I was formed. Ge and Ga seem most likely to occur in I from epithermal deposits; In occurs in I from hypothermal or pyrometasomatic deposits.

4107. MOROWITZ, H. J. AND BROIDA, H. P.
Rapid Spectroscopic Determination of Total Water Content.
Anal. Chem., **24**, 1657–8 (1952).
C. A., **47**, 1006a (1953).

The H_2O content of a hydrate is detd. by dissolving the sample in D_2O and detg. the ratio of the intensities of the Hβ and Dβ lines in a high-frequency electrodeless discharge. Photoelec. recording is used. An analysis can be made in 0.5 hr. with an error of 3% or less.

4108. MOSHER, R. E.
Newer Methods for the Spectrochemical Analysis of Solutions.
Univ. Microfilms (Ann Arbor, Mich.), Pub. No. **4314**, 81 pp. (microfilm and paper enlargements).
Dissertation Abstracts, **12**, 815 (1952).
C. A., **47**, 3103h (1953).

4109. MOSTYN, R. A. AND JURY, R. V.
The Calibration of Precision Slits for Spectrographic Analysis.
Spectrochim. Acta, **5**, 257–77 (1952).
C. A., **47**, 8517e (1953).

The importance of an accurate calibration of a spectrograph slit is demonstrated by a discussion of the effect of slit width upon the intensity and resolution of the spectrum. More rigid standardization of slit widths for analytical purposes is recommended. Casual observations over a long period have suggested that slits often show departure from the nominal calibration, and the results obtained confirm this view. A diffraction-pattern method proposed by Preuss for the detn. of slit widths has been investigated, with particular reference to the range 0–50 μ, in comparison with other methods, and the results obtained show close agreement. Results are given for 24 slits, covering 6 different types of mechanism, and a study of the precision obtainable shows that the standard error is approx. 0.5 μ on the aero estimation and approx. 0.05 μ on the drum calibration.

4110. MUIR, S. AND AMBROSE, A. D.
A Method for Determining Dissolved Aluminum and Alumina in Steel.
Spectrochim. Acta, **4**, 482–8 (1952).
C. A., **46**, 8567f (1952).

A partly chem. and partly spectrographic method is described for detg. Al and Al_2O_3 in steel. After sepn. of the 2 compds. by acid soln., the Fe is removed from the filtrate contg. the Al by electrolysis with a Hg cathode. Since difficulty is experienced in the H_2SO_4 present, oxine is used to ppt. the Al. This ppt. is dissolved in acid, as also is the reserved Al_2O_3 ppt. Known vols. are impregnated into especially prepd. graphite electrodes and spectra obtained by spark excitation. A comparison is made between spectrographic and chem. results.

4111. NAISH, J. M. AND RAMSDEN, W.
A Photoelectric Apparatus for Spectrochemical Analysis.
Spectrochim. Acta, **5**, 295–307 (1952).
C. A., **47**, 9066d (1953).

The app. described comprises a double photomultiplier adapter of the variable-wavelength type, designed primarily for basic research with quartz prism spectrographs, and an electrical integrator. Details of performance are given for electrical and for photometric measurements, and the influence of movements of the light source is considered. The precision of analysis of Duralumin, with excitation conditions of comparatively large variability, was not significantly higher than by equiv. photographic methods except for Si at high concns. and for Ni. The accuracies were lower than those claimed by other workers for photoelectric methods, the difference being attributed to excitation conditions. The long-term reproducibility of the results was worse than the short-term value, because of temp. effects. The speed of analysis with the adapter in its primary form was not high when used for detns. of more than one element.

4112. NAKAI, T., ISHIDA, R., AND HIDAKA, S.
Quantitative Spectrochemical Analysis by Flame Photometry. I. Determination of Manganese.
J. Chem. Soc. Japan, Pure Chem Sect., **73**, 19–22 (1952).
C. A., **46**, 8568f (1952).

The vertical-type atomizer was used. The so-called abs. method and internal-standard method in which Rb was used as the standard were studied. The lines used were Mn 4030.8 and Rb 4201.8 Å. As Fe and Ca affect the intensity of Mn line, addn. of Fe and Ca to the standard sample was necessary. Results of application to the analysis of pulp ash and rocks were given.

4113. NIELSCH, W.
Spectrochemical Determination of Magnesium in Nickel.
Z. Metallkunde, **43**, 370–1 (1952).
C. A., **47**, 1536g (1953).

By using the Mg line 2802.7 A. and the Ni line 2821.3 A., 0.001 to 1% Mg can be detd. in Ni or Ni soln. The Mg content of the carbon electrode must be corrected. An accuracy of ±7% is reported.

4114. NOBBS, J. M.
Intensity Scales In Spectrographic Photometry.
Spectrochim. Acta, **5**, 286–94 (1952).
C. A., **47**, 8517d (1953).

Of the methods used to calc. line-pair ratios in spectrographic photometry that requiring intensity detns. from plate calibration curves appears to be the one most favored. The main disadvantage of the method is that it is tedious and time-consuming, especially when background corrections are made. A saving of time has been achieved by replacing the linear galvanometer scale by one reading intensities directly. Now an account is given of the construction and use of a family of intensity scales, by means of which the time of spectrographic analysis is reduced without loss of accuracy. A statistical survey was made of deviations from the norm of calibration curves.

4115. NORRIS, J. A. AND PEPPER, C. E.
Quantitative Spectrochemical Analysis of Rare Earth Mixtures.
Anal. Chem., **24**, 1399–1403 (1952).
C. A., **47**, 71b (1953).

Rare earth oxides, dissolved in HCl, are detd. with a spectrograph by a porous-cup method. Detection of 100 γ per ml. of impurity in a soln. concn. of 10 mg. per ml. necessitates use of the spark source at a high power level. This amt. of power causes boiling of the soln., and a special water-cooled Ta electrode holder is described to lessen boiling. The procedure is limited only to the elements available for standards. Analysis lines are listed for Y, La, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, and Sr. Consideration of the energy-level schemes of the elements concerned suggested Sr as internal standard. The low concn. of Sr as internal standard requires care that the sample is not contaminated with it. The precision of the method, ±10% at a 99.5% confidence level, permits detection of small differences. Analyses of 10 samples for 5 rare earths can be completed in approx. 8 hr.

4116. OBOLENSKAYA, L. I.
The Application of the Spectrographic Method in Analyzing Plants and Soils.
Pochvovedenie, **1952**, 278–86.
C. A., **47**, 997c (1953).

A complete description of prepg. and analyzing K, Na, Ca, and Mn in soils and plants by the spectrographic method.

4117. O'CONNER, R. T. AND HEINZELMAN, D. C.
Application of Line-Width Method of Spectrogram Evaluation to Spectro-Chemical Analysis of Plant Products.
Anal. Chem., **24**, 1667–9 (1952).
C. A., **47**, 996g (1953).

With an automatic recording microphotometer, the line-width method of spectrogram evaluation is applied to the detn. of Cu, Fe, Mn, B, Zn, Al, Ni, and Sn in plant materials. Samples contg. 3 p.p.m. to 1% of the element to be detd. are ashed after addn. of $Mg(NO_3)_2$ as buffer; samples contg. over 1% are ashed alone (followed by addn. of GeO_2 as internal standard). Spectrographic data are given. A single detn. is accurate to within ±15%; the av. of triplicate detns. is accurate within ±8%.

4118. ODA, NAKASUGI, ET AL.
An Apparatus for Making Carbon Electrodes for Spectroscopic Analyses.
Japan. Patent 3962, Oct. 2, 1952.
C. A., **47**, 8428d (1953).

4119. OHYAGI, Y.
Spectrochemical Analyses of Tuberculous Materials.
Nisshin Igaku, **39**, 356–8 (1952).
C. A., **48**, 7747a (1954).

Mechanisms of formation and growth of pulmonary calcareous deposits and its suspected relation to the progress of silicosis were considered from the chem. equil. of ions and salts in blood.

4120. ONGARO, M.
Spectrographic Determination of Manganese and Silicon in Special Steels.
Met. ital., **44**, 221–5 (1952).
C. A., **46**, 11019b (1952).

Because many of the common alloying elements in steel oxidize readily and so influence the intensity of the discharge, the specific effects of Al, W, Cr, V, Co, Ni, Mo, Cu, Si, and Mn were detd. The variation of intensity of the lines of Mn and Si along the discharge is described for 4 types of luminous source. The metallurgical history of the specimen has a significant effect. A source of low inductance and high capacity gives best results for 18–8 and 18–4–1 steels.

4121. OPLINGER, G.
Calculator for Spectrochemical Analysis. Application of Seidel Function of Density in its Development.
Anal. Chem., **24**, 807–12 (1952).
C. A., **47**, 5729h (1953).

A sliding calculator is described for spectrochem. analysis with internal standards and expressing line blackening by the Seidel function. In the spectral region where the characteristic curve of the photographic plate is nonsymmetrical, the calibration scale is rotated through a small angle proportional to the slope of the Seidel d. curve.

4122. ORSAG, J.
New Apparatus Usable for Direct-Reading Spectrochemical Analysis.
Spectrochim. Acta, **5**, 9–10 (1952).
C. A., **47**, 922e (1953).

The outfit consists of a controlled spark unit by Durr which gives a spectrum of satisfactory reproducibility and a two-prism spectrograph of aperture f/14, giving a spectrum 103 mm. long from 2145 to 6000 Å. The plate holder can be replaced in a few sec.

by a reading device having two fixed electron multipliers, a series of fixed slits, and mirrors to reflect the light onto the multiplier cells. One cell reads the radiation from the base element, the other that from two or three alloying element lines in turn. Metals with simple spectra such as copper and aluminum alloys can be directly analyzed in this way. The use of photographic methods remains possible, and can be made more accurate by a specially devised simple densitometer.

4123. OWEN, L. E.
Twin-shell Microblender for Powders.
Anal. Chem., **24**, 1234 (1952).
C. A., **47**, 4660d (1953).

A microblender of the twin-shell type made with arms 1 in. in diam. is described. Samples as small as 5 to 15 cc. can be blended.

4124. PAGLIASSOTTI, J. P. AND PORSCHE, F. W.
Spectroscopic Determination of Metals in Silica-Alumina Cracking Catalysts.
Anal. Chem., **24**, 1403–5 (1952).
C. A., **47**, 69g (1953).

Ignite the sample to 815° for 1 hr. and then dissolve in acid. Analyze the soln. spectrographically for Fe, V, Ni, Cu, Pb, Ca, and Mg with a pos. rotating electrode by interrupted-arc or spark discharge. No significant interference is noted except for Mg interference on Pb with spark excitation. CO_2 is used to suppress the air spectra. Na is detd. by the flame photometer with precision and accuracy both within ±1% of the amt. present.

4125. PASVEER, W.
Spectrographic Calculation with the Aid of Nomographs.
Spectrochim. Acta, **5**, 163–9 (1952).
C. A., **47**, 922c (1953).

Following some fundamental facts of nomography it is shown that it is possible to substitute nomographs for the curves used in spectrographic calcns., preferably after rectifying the emulsion calibration curve by a Seidel transformation. In the microdensitometer a galvanometer scale with direct readings in Seidel ds. has been fitted. Instructions are given for making a complete nomograph which replaces the graphical calcns. usually made in the lab. with curved calibration lines.

4126. PATAKI, B.
Adsorption Investigations by Flame Photometry.
Agrokémia és Talajtan, **1**, 461–70 (1952).
C. A., **50**, 4441g (1956).

Samples of soils of different types were examd. with the Mehlich method (*C. A.*, **43**, 3127i), by applying the ion-exchange technique proposed by Schachtschabel (*C. A.*, **45**, 10453c), to prove suitability of flame photometry for the examn. of adsorbed cations. It is possible to est. Ca and Na in the presence of Ba. When detg. K, Ba must first be removed as carbonate. A method was evolved to det. the cation-exchange capacity of soils by photometry, on the basis of differences in the concn. of the solvent (Ca_I) and the filtrate (Ca_{II}). Examn. was carried out by extg. the soil (after the usual cation exchange with $BaCl_2$) with a 0.25–0.50 *N* $CaCl_2$ soln. The tedious direct detn. of Ba was avoided by measuring the Ca concn. of the $CaCl_2$ soln. and of the soil ext., the concn. of the latter being reduced according to the degree of exchange of adsorbed Ba with Ca. The method is suitable for serial analysis and gives data more accurate than other procedures.

4127. PATAKI, B.
Simplification of Computing Calcium Contents Measured by Flame Photometry.
Agrokémia és Talajtan, **1**, 523 (1952).
C. A., **50**, 4716h (1956).

Instead of the usual 4–5 standard solns. only 2 solns. are prepd. with known Ca concn. and the photometer values read. The current of the photocell is adjusted to show the same photometer values, then the actual concn. can be established by means of a simple table.

4128. PATTERSON, G. D., JR. AND MELLON, M. G.
Automatic Operations in Analytical Chemistry.
Anal. Chem., **24**, 131–43 (1952).
C. A., **46**, 2439g (1952).
Cf. *C. A.*, **45**, 2361c.

A review with 287 references. A discussion of advances in direct-reading electronic spectrometers and flame photometers for emission spectroscopy is included.

4129. PEROSA, L., ORABONA, M., AND MANGANELLI, G.
Changes in the Potassium Content of Muscle and Blood Cells in Rats Subjected to Stress and in Rats Treated with Digitalis.
Boll. soc. ital. biol. sper., **28**, 1817–20 (1952).
C. A., **49**, 14187c (1955).

In studying the mechanism of action of digitalis, this expt. was done to show whether it was true that both stress and nonlethal doses of digitalis could cause an *in vivo* drop in muscle K, and corresponding changes in blood cell K content. Rats, in 3 groups, were treated as follows: (1) 8 controls; (2) 12 injected 15 days with 0.08 I.U. of digitoxin per day; (3) 9 forced to swim at 37°, 8 hr./day for 8 days. K, detd. by flame photometry, was lower in muscle tissue from groups (2) and (3) than in controls. Blood cell K values showed little difference.

4130. PETERS, H. J.
The Lange Flame Photometer.

Chem. Weekblad, **48**, 710–11 (1952).
C. A., **47**, 2251c (1953).

A discussion of the detn. of Na and K in blood serum and urine by means of the Lange flame photometer.

4131. PFEILSTICKER, K.
Applications of Spectral Analyses in Food Chemistry.
Z. Lebensm.-Untersuch. u.-Forsch., **95**, 24–31 (1952).
C. A., **46**, 11472f (1952).

The literature is reviewed with regard to the rapidity and sensitivity of spectral analyses for the principal minerals, toxic metals, and nutritionally important or adulterant elements in food, water, mineral waters, etc. 20 references.

4132. PICCARDI, G.
Spectroscopy, Archeology, and Metallurgy.
Spectrochim. Acta, **5**, 73–6 (1952).
C. A., **47**, 996a (1953).

The possible scope of spectrochemical analysis in its application to the unsolved problems of archeology and of ancient foundry techniques is outlined.

4133. PINTA, M.
Spectrophotometry of the Flame.
J. recherches centre natl. recherche sci., Labs. Bellevue (Paris), No. 20, 210–26 (1952).
C. A., **47**, 6192i (1953).

A simple yet versatile app. is described which utilizes an acetylene-air flame source, a flint prism spectrograph with an F.8 opening, and both photoelec. and photographic detectors. Both qual. and quant. tests can be carried out with this equipment. Some of the problems and applications of spectrophotometry are reviewed and the sensitivities of 18 elements are given. 42 references.

4134. PINTA, M.
Flame Spectra of Rare Earths.
J. recherches centre natl. recherche sci., Labs. Bellevue (Paris), No. 21, 260–70 (1952).
C. A., **47**, 8511g (1953).

The flame spectra of dilute chloride solns. of 16 elements (Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu) from 4000 to 9000 Å. with a small prism spectrograph. The spectra are mostly bands due to spectroscopic mols. formed in the oxidizing region of the flame. Approx. wavelengths of the band heads of the principal systems are given, but intensities are not mentioned except to say that in each spectrum they are a function of concn. of the element in the flame. The possibility of using flame spectra to det. rare earths spectrophotometrically has been investigated. The sensitivity of this method ranges from 4 γ/cc. for Eu to 50 γ/cc. for Pr.

4135. POEHLMAN, W. J. AND SARNOWSKI, R. E.
Spectrochemical Determination of Tantalum and Niobium in 18 Cr-8 Ni Stainless Steel.
J. Optical Soc. Am., **42**, 489–92 (1952).
C. A., **46**, 8570b (1952).

A spectrographic method for detg. Ta and Nb covering the concn. ranges 0.01 to 0.40% and 0.30 to 1.25%, resp., is described. Samples are excited by an a.-c. arc discharge from point to plane. A prism-type spectrograph is employed, and the resulting spectrograms are recorded on calibrated emulsions. With the Fe matrix as an internal standard, photographic photometer readings and intensity ratio comparisons are made for the analytical line pairs 3311.16 Ta *vs.* 3165.86 Fe and 3299.61 Nb *vs.* 3165.01 Fe. Included in the discussion are referee analyses, comparisons, working curves, and standards. The analytical results of this method indicate adequate sensitivity, precision accuracy, and range of analysis for this type of material.

4136. POKORNÝ, A.
Development and State of Spectrography in the Soviet Union.
Hutnické Listy, **7**, 62–4 (1952).
C. A., **46**, 9407c (1952).

4137. PORTALUPI, A.
Collaboration on the Unification of a Method of Quantitative Spectrographic Analysis of Cast Iron.
Spectrochim. Acta, **5**, 182–3 (1952).
C. A., **47**, 1000f (1953).

This paper outlines the scope of a cooperative research by 5 Italian labs. on the quantitative analysis of cast Fe by using spark spectra.

4138. PREUSS, E.
Cleaning Electrodes of Spectral Carbon.
Spectrochim. Acta, **5**, 327–8 (1952).
C. A., **47**, 8557i (1953).

The purest C rods supplied for spectrochemistry may be contaminated by handling, packing, cutting, or dust. A device for cleaning short lengths of electrodes of pure C is described. It consists of a terminal block with sockets for the C rods and a movable C cathode connected to a resistance limiting the current to 20 amp. The cathode is moved by hand so as to traverse the surface of the pos. electrode spirally with an arc, thus volatilizing the superficial impurities; this is done just before loading the electrodes with samples to be analyzed.

4139. PRICE, W. J.
Quantitative Spectrographic Analysis of Slags.
Brit. Cast Iron Research Assoc. J. Research Development, **4**, 315–35 (1952). (Research Rept. No. 335).
C. A., **46**, 8571f (1952).

A rapid method of routine analysis of various types of slags, especially cupola and open-hearth slags, was developed based on the principle that known wts. of slag and an internal standard, preferably CoO, are fused in a large known excess of borax. The product is ground, mixed with graphite powder, pelleted, and arced with a controlled d.-c. arc. A system of standardization is described which makes the method entirely independent of chemically analyzed standards. The time required for this spectrographic analysis of a slag sample is about 2 hrs. against more than a day for a chem. analysis, and the results are within about 3% of the truth. The method is described in detail. 39 references.

4140. PRICE, W. J.
Evaluation in Spectrographic Analysis. A Note on the Application of the Nomographic Method of Spectral Densities Lying Off the Straight Line Portion of the Normal Emulsion Characteristic.
Spectrochim. Acta, **5**, 278–85 (1952).
C. A., **47**, 9205i (1953).

In the internal standard method of evaluation, an analytical curve plotted as log deflection ratio *vs.* log concn. of minor element gives an index value which is independent of the γ of the emulsion, but has a slope which is directly proportional to the γ. Variations in γ, therefore, would have the effect of rotating the curve about its index value, and unless the standard spectra and analysis spectra are photographed on emulsions having the same γ, incorrect results are given. The nomographic method of evaluation was evolved with the object of correcting automatically for changes of γ across one plate and from plate to plate. This method is theoretically correct provided that a linear relation exists between the d. and intensity functions employed. Since normally, d. differences are plotted in working graphs, the range of the above procedure was limited to the straight-line portion of the characteristic curve of the emulsion employed (i.e., an upper microphotometer deflection limit of about 16 cm. is imposed, assuming 50 cm. clear plate). The present paper examines the effects arising when the straight-line limit is exceeded and suggests that deflections up to 25 cm. can be used with insignificant error. The useful intensity range of this method is further increased considerably by plotting P-transformed ds. (introduced by Kaiser, *C. A.*, **42**, 7637f) instead of normal d. values. It is claimed that deflections up to 45 cm. can be used with this procedure, increasing the intensity range covered 4-fold. Suitable conversion tables are already available.

4141. PUIG, A. CAMUÑAS AND ALVAREZ ARENAS, E. A.
Carbon Diffusion Constant in Carburized Steel Measured Spectrographically.
Inst. hierro acero, **5**, Spec. No. 768–85 (July, 1952).
C. A., **46**, 9488i (1952).

A technique has been developed for the counter electrode/carburized sample, by using Pt wire, which gave a high sensitivity for the CIII 2296.89 Å. line. A mechanism was used to analyze many spots along the carburized region. *D* was calcd. from the data obtained, to vary between 8.80×10^{-7} cm.^{2} sec.$^{-1}$ (on surface) to 4.96×10^{-7} cm.^{2} sec.$^{-1}$ near the center. This value depended on the C concn. The diffusion const. was calcd. by using Frick's law.

4142. RAMÍREZ MUÑOZ, J.
The Nomograph and Calculating Rules for the Quantitative Spectral Analysis of Trace Elements.
Anales edafol. y fisiol. vegetal (*Madrid*), **11**, 267–81 (1952).
C. A., **47**, 2080g (1953).

The necessity for hand tracing of characteristic curves and the use of 2 conversion tables of numerical values are avoided, and a saving of time and increase in accuracy are accomplished by the use of a nomograph and transparent additive rule devised by R. The nomograph contains function scales which change the intensity curves into straight lines, and thus it is necessary to obtain only 2 photometric readings at 2 consecutive locations on the spectrum. To construct the nomograph, the intervals between 2 steps of the sector are utilized. There are 2 vertical scales at either end of the nomograph, the 1st of left-hand scale running from 0 to 20 and the 2nd or right-hand scale running upward from 20, these values representing functional values *d*, corresponding to the microphotometric readings, rectified for *d*. less than 0.3. The diagonal scale is divided into 30 parts (log 2 = 0.30103). The transparent rule is placed between the plotted photometric readings on the vertical scales, and the value is read at the point of intersection on the diagonal scale. The background reading is made in the same way, and the additive corrections are made from the tables on the transparent rule. While the method was devised to detg. traces of elements in biol. materials, it can be adapted to other spectrographic problems by adopting the appropriate sectors and galvanometric scale.

4143. RATZE, G.
On the Testing of Metal Foils by Spectrum Analysis.
Aluminium, **28**, 152, (1952).

When metal foils are melted to form electrodes for spectrochemical analysis, impurities from the crucible may be present.

This may be avoided by folding the foil to produce electrodes about 300 μ in thickness which are then clamped at right angles to each other in a specially constructed spark stand.

4144. RAUSCHER, K.
Spectrographic Determination of Small Amounts of Cobalt in Nickel.
Sborník Celostátní Pracovní Konf. Anal. Chemiků, 1, 39–41 (1952).
C. A., **49**, 13014e (1955).

Co in Ni was detd. spectrographically in a condensed 15-k.v. spark, after evapg. about 0.1 ml. of 0.5 *M* Ni^{++} soln. on a C electrode. A Hilger quartz spectrograph, type medium, was used with slit width 0.025 mm., electrode gap 2–2.85 mm., and approx. 1-min. exposure. A Hilger microphotometer H 451 was used. The amt. of soln. evapd. had some effect on the results. Three homologous Co-Ni line pairs could be used of which Co 2378.6/Ni 2379.7 Å. was the best at low Co. concns., but in the presence of Fe and Mn other lines may have to be used. Amts. of Co > 0.1% can be detd. in the presence of 4% Fe, Cu, Mn, or Na.

4145. REDINHA, S. J.
Geochemical Study of Portuguese Wolframites.
Publ. museu e lab. mineral. geol. a centro estudos geol. univ. Coimbra, Mem. e notic. No. **32**, 46–62 (English summary) (1952).
C. A., **48**, 1207a (1954).

Qual. spectrographic analyses are given for 34 samples, in which Sn, Si, Ca, Al, Mg, Ti, Nb, Ta, Cu, Pb, As, and K were detected.

4146. RICH, C. I.
Flame Photometric Determination of Exchangeable Magnesium in Soils.
Soil Sci. Soc. Am., Proc., 16, 51–5 (1952).
C. A., **46**, 5237i (1952).

A high flame temp. and a narrow slit width increased the intensity of Mg (2852 Å.) relative to the flame background. Centrifuging satisfactorily cleared exts. and prevented most clogging of the atomizer. The effects of concns. of certain elements found in soil on the Mg detns. were also studied. From the instrumental studies it was decided to use the 2852-Å. wavelength. Analyses of 24 Virginia soils for exchangeable Mg by the photometric method gave results that did not differ significantly from those obtained by the chem. method. The most favorable instrumental conditions were: wavelength, 2852 Å.; slit width, 0.15 mm.; propane pressure, 2.0 cm. toluene; O_2 pressure, 75 in. H_2O; air pressure, 18 lb. per sq. in.; sensitivity control, about 1 turn from the counterclockwise limit.

4147. ROSETTA, M. S.
Spectrochemical Determination of Silicon in Cast Iron and Observations of Microstructure.
Spectrochim. Acta, **5**, 77–86 (1952).
C. A., **47**, 1002e (1953).

Spectrochemical detns. of Si in cast iron with the use of a spark source and a quartz spectrograph of medium dispersion are discussed, and the effect on spectrochemical results of the diam. of the cast electrodes is shown. This is partially explained by variations in the microstructure of the cast rods; a pearlitic structure is to be preferred.

4148. ROSSI, C. AND INTONTI, R.
Unification in the Spectrographic Analysis of Low-Alloy Steels.
Spectrochim. Acta, **5**, 147–57 (1952).
C. A., **47**, 997d (1953).

On summarizing results of a collaborative comparison of spectrographic results for the analysis of low-alloy steels by 18 labs. the advantages of this type of work are described. The principal causes of error are discussed, with particular reference to the photographic conditions. The samples compared were of satisfactory homogeneity, and the method of sparking flat disks with a counter-electrode of Al was approved. Calibration with a step-wedge and very contrasty development is also recommended. Standard deviation within labs. of approx. 3% for Mn and Cr and 5% for Ni and Si were obtained.

4149. ROTHERMEL, D. L. AND NORDBERG, M. E.
A Flame Photometric Estimation of the Durability of Glass.
Am. Ceram. Soc. Bull., **31**, 324–5 (1952).
C. A., **46**, 10564g (1952).

In this "miniature" method a 1-g. sample is digested at 90° for 4 hr. in 5 ml. of either distd. H_2O or 0.02 *N* H_2SO_4. A 96% SiO_2 glass test tube with flattened bottom 2.5 cm. in diam. is used to give the same depth of glass powder as that in the usual titration method with its 10-g. sample in a 250-ml. Erlenmeyer flask. Analysis is accomplished by means of a Beckman model DU spectrophotometer with attachment for flame photometry. Standards of mixed alkalies, with compns. quite similar to that of the unknown sample, are necessary. Results are accurate to within 3% even when the alkali content is extremely low. The method permits sep. detns. of Na, K, Li, etc.

4150. ROZSA, J. T. AND ZEEB, L. E.
Efficacy of Low-Inductance Alternating-Current Spark Technique for Aluminum Alloys.
Appl. Spectroscopy, **6**, No. 5, 14–17 (1952).
C. A., **47**, 3181c (1953).

The analysis of Al alloys by spectrochem. methods presents formidable obstacles vary-

ing from a wide boiling range to unusual affinities for O. By choosing analysis lines of comparable excitation and reducing inductance in the spark circuit, it seems possible to reduce the disturbing effects of alloying variations and obtain improved accuracy.

4151. RUNNELS, R. T., REED, A. C., AND SCHLEICHER, J. A.
Minor Elements in Kansas Salt.
State Geol. Survey Kansas Bull., No. **96**, 185–200 (1952).
C. A., **46**, 6553e (1952).

Spectrographic analyses are given for the H_2O-insol. least-sol., and most-sol. fractions of 35 samples. Polyhalite and celestite were found. Most of the Cu present is in the insol. fraction.

4152. RŮŽIČKA, J. AND ZIKA, Z.
Determination of the Magnesium Content of Malleable (Nodular) Iron by Emissive Spectral Analysis.
Hutnické Listy, **7**, 64–6 (1952).
C. A., **46**, 9464d (1952).

Fixed electrodes were used. The top electrode consisted of pure Ag and was 7 mm. in diam. As standards, specimens from normal test specimens were made, selecting them carefully to cover the entire range of Mg contents 0.020–0.080%; these standards were analyzed several times chemically and by spectral analysis. For analysis the following spectral lines were used: Mg 2795.53 Å. and Fe 2851.80 Å. This line can be used for Mg contents up to 0.012% and probably even lower contents. The Mg line was measured in the filtered part of the spectrum (20% passage), the Fe line was in the nonfiltered part of the spectrum. Comparative chem. tests showed that the results of chem. analysis are considerably less reliable than those of spectral analysis. The results of the spectral analysis were confirmed by microscopic study of specimens and also by results of mech. tests.

4153. ŠAFIR, K.
The Use of Flame Photometers in Continuous Laboratory Analysis.
Chemie (Prague), **8**, 230–4 (1952).
C. A., **47**, 10905c (1953).

Expts. with flame photometers in the continuous lab. analysis of K^+ and Na^+ in solns. of inorg. salts are described. The photometer is rated as a useful instrument for series analyses; this makes possible quick and relatively precise detns.

4154. SAITO, K.
A New Interrupted-Arc Source with a Thyratron Tube.
J. Chem. Soc. Japan. Pure Chem. Sect., **73**, 306–8 (1952).
C. A., **47**, 2612i (1953).

An interrupted-arc source with thyratron TX 915 was constructed. The plate current of a thyratron tube, which was the current passing the arc gap for spectrochem. analysis, was regulated by the interruption of the grid circuit with the mech. device. To ignite the arc between electrodes a high-frequency spark generated with two TX 311 tubes was used.

4155. SAITO, K.
Spectrographic Determination of Germanium by the Interrupted Arc. II. Effects of Matrix.
J. Chem. Soc. Japan, Pure Chem. Sect., **73**, 254–6 (1952).
C. A., **46**, 11025e (1952).
Cf. *C. A.*, **46**, 1371d, 1915f.

Arsenic contained in the samples to be analyzed for Ge makes its detection difficult. A diffuse line 2650.4 Å. of Pb coincides with the most sensitive lines 2651.1 and 2651.6 Å. of Ge. Si gives band spectra of SiO at 2500–2800 Å. and interferes. Effects of other elements are negligible. Sulfides can be analyzed in the same way as oxides.

4156. SAITO, K.
Spectrochemical Analysis of Germanium by an Interrupted Arc. III.
J. Chem. Soc. Japan, Pure Chem. Sect., 73, 427–9 (1952).
C. A., **47**, 2631i (1953).
Cf. *C. A.*, **46**, 11025e.

Application of the intermediate image formation and of the cathode layer method to the spectrochemical detn. of Ge were studied. By the use of cathode layer method, the detection limit of Ge was increased.

4157. SAITO, T.
Manganese Minerals. II. Minor Components in Manganese Minerals from Southwestern Hokkaido, Japan.
J. Japan Assoc. Mineral. Petrol. Econ. Geol., **36**, 1–7 (1952).
C. A., **47**, 10418d (1953).

Spectrographic analysis of minor components in the Mn ores from about 20 mines of southwestern Hokkaido showed the following results: Al, Fe, Si, Mg, Cu, Ca, Ti, V, Ce, Na, K are detected in all specimens of Mn ores, irrespective of their types of deposits or of their ages of formation. Besides these, Sn, In, Ni, Co, Cr, etc., are found in the ores of metasomatic replacement deposits of the Paleozoic era, and Ag, As, and Ba are present in those from the epithermal Tertiary deposits. This mode of distribution of the minor elements in the Mn ores may probably be ascribed to differences of their conditions of crystn.

4158. SAKSELA, M.
The Tetrahedrite Deposit at Seinäjoki, Southern East Bothnia, Finland.

Compt. rend. soc. géol. Finlande, 25; *Bull. comm. géol. Finlande*, **157**, 41–52 (1952) (in German).
C. A., **47**, 4802e (1953).

Partly mineralized quartz veins in leptite contain pyrrhotite, tetrahedrite, chalcopyrite, arsenopyrite, cobaltite, and sphalerite, and also gudmundite, breithauptite, linnaeite, berthierite, and a member of the sternbergite group. The properties of these minerals, their manner of formation, and the origin of the deposit are discussed. According to spectrochem. analyses, the tetrahedrite contains, in %, Zn 0.1–1, Ag 0.01–0.03, As and Bi 0.1, Co and Pb 0.01, Ni 0.01–0.1, and the linnaeite (impure) contains Ni 0.1–1, As 0.01–0.1, Ag 0.01, Bi 0.01, Pb 0.003. 23 references.

4159. SALPETER, E. W.
Spectroscopic Determination of Chlorine in Stony Meteorites.
Ricerche spettroscop. Lab. astrofis. spècola vaticana, **2**, 1–63 (1952).
C. A., **47**, 2637e (1953).

Eighteen mg. of powd. meteorite was treated with 0.05% Br as KBr soln. The sample was dried in an oven, placed in a Pyrex combustion boat, and excited by electrodeless discharge (Gatterer and Frodl, *C.A.*, **40**, 7062[7]). The Cl content is detd. by observing the d. difference between Cl II 4180.81 and Br II 4816.71 and referring to a curve prepd. by plotting this difference against the turbidimetrically detd. Cl content of meteorites excited in the same manner. Synthetic standards prepd. by treating Al_2O_2, with the same quantities of Cl and Br gave considerably higher Cl-Br d. differences. Cl contents between 0.04 and 0.6% were detd. for various meteorites.

4160. SÀNCHEZ SERRANO, E., AND JIMENO MARTIN L.
Auxiliary Ionization in Spark Excitation in Spectrochemistry.
Inform. quím. anal. (*Madrid*), **6**, 107–16 (1952).
C. A., **47**, 9766d (1953).

When the spark gap was subjected to irradiation by U, Ra, or Po certain lines corresponding to states I and II of elements (e.g., Mg II 2790.8 Mg I 2852, Fe 3370 Å.) present in small amts. were intensified. The effect appears near the electrodes as well as in the center of the spark. When gas from a burning flame was supplied to the gap, a similar effect was noted. Some lines not detected in normal excitation (Pb II 2628, Sn 2762 Å.) become sufficiently intense to use in quant. analysis. This auxiliary ionization permits the use of lower potentials or wider gaps and tends to stabilize the spark, thus making detns. more reliable. Cf. *C. A.*, **45**, 3750i.

4161. SANTOS RUIZ, A., DEÁN GUELBENZU, M., AND LOPEZ DE AZCONA, J. M.
Biochemical Investigation of the Oligo-Elements by Spectrographic Technique.
Congr. Intern. Patol. Comp., 6th Congr., Madrid, May 4–11, **1952**, 99–139.
C. A., **49**, 12574a (1955).

Oligo-elements are defined as inorg. microcomponents of living matter that act mainly as catalysts. A spectrographic method is described for the detn. of the oligo-elements in Spanish soils, waters, common salt, vegetables, fruits, herbs, grasses, woods, cork, animal and vegetable foodstuffs, graminous seeds, *Lens esculenta*, *Bombyx mori*, white rat, guinea pig, human milk, and normal and pathol. human tissues. In the studies on the guinea pig, the death of the animal occurred after several Au injections and its metabolism and localization in the organs was investigated. Human milk samples obtained from clinically normal patients were compared with samples from patients with syphilis, tuberculosis, and various infections. In practice the elements that can be detd. are all the metals and the following non-metals: AS, B, C, P, S, Se, Si, Te, and the halogens. Excitation procedures (flame, arc, and spark) and the analytical techniques for qual., semiquant., and quant. analyses are described and sensitivity limits are given. The following oligo-elements were determined: Ag, Al, Au, B, Ba, Be, Bi, Co, Cr, Cu, Fe, Ga, Ge, Li, Mn, Mo, Ni, Pb, Sb, Si, Sn, Sr, Ti, V, W, Zn, and Zr. The results point out the advantages of the direct semi-quant. spectrographic method used as a tool for orientation. For a higher sensitivity, concn. of the samples is necessary and the use of a photometer is indicated for higher accuracy in the studies of possible quant. variations of materials. 58 references.

4162. SANTOS RUIZ, A, DEÁN GUELBENZU, M., and LOPEZ DE AZCONA, J. M.
Trace Elements in Normal and Pathological Human Tissues. V. Discussion of results obtained in four earlier notes.
Rev. españ. fisiol., **8**, 207–15 (1952).
C. A., **47**, 7085d (1953).

Semiquant. spectrographic analyses were made for metals in the ash of normal and pathol. human uterus, ovary, vagina, stomach, breast, thyroid, placenta, and hydatid cyst. The mean concns. of each element in the ash, and the frequency with which it was found were: Ag, 10^{-5}–10^{-6} g./g. ash, 4.3%; Al, present, 100%; Ba, $<10^{-4}$, 100%; Ca, present, 100%; Co, $\leqslant 10^{-5}$, 41.7%; Cu, 10^{-3}–10^{-4}, 100%; Fe, 10^{-1}–10^{-4}, 100%; K, present, 100%; Li, 10^{-3}–10^{-4}, 95.7%; Mg, present, 100%; Mn, 10^{-3}–10^{-4}, 100%; Mo, $\leqslant 10^{-5}$, 54.4%; Na, present, 100%; Ni, 10^{-3}–10^{-5}, 93.5%; P, present, 100%; Pb, 10^{-4}–10^{-5}, 93.5%, Si, 10^{-1}–10^{-2}, 100%; Ti 10^{-3}–

10^{-5}, 100%; V, 10^{-5}–10^{-6}, 41.3%. Cu and Fe appeared to be inversely related in any tissue. The duodenal cap contained less ash than any other tissue. The Cu content of tumor tissue was not significantly different from that of normal tissues. Mo content and tumor development appear to be related. The analytical technique is discussed.

4163. SCALISE, M.
Spectrographic Determination of Impurities in Cadmium.
Met. ital., **44**, 153–7 (1952).
C. A., **46**, 6991b (1952).

The spectrographic (arc, spark) detn. of impurities in Cd is described with an Italian instrument similar to the Zeiss Q 24 and the calibration curves for Cu (to 1.41), Zn (to (0.47), Pb (to 0.57), Bi (to 0.705), Sb (to 0.51), and Tl (to 0.41%) are shown. Traces of Fe, Sn, As, and Ni can be estd.

4164. SCALISE, M.
Spectrographic Determination of Impurities in Lead.
Met. ital., **44**, 568–9(1952).
C. A., **47**, 3177b (1953).

Since 0.0015% Cu in Pb makes it difficultly usable in glass manufg. the speed and accuracy of spectrographic analysis are pointed out. The sensitivities are (%): Cu 0.005, Bi 0.002, Sb 0.01, Sn 0.004, and Ag 0.001. Cd, As, and Zn can be detd., although interferences are encountered with Cd.

4165. SCHÄFER, K. and STAAB, K.
Effect of Flame Photometry on Line Intensity.
Naturwissenschaften, **39**, 375–6 (1952).
C. A., **47**, 7325f (1953).

The intensity of the K lines from a flame spectrum is affected by the presence of Na in the flame. From the ionization constant K_2 for K ionization, c_2 the K concn. in flame, c_3 the Na concn., and T the flame temp. follows for the intensity of K doublet (7664.9, 7699.0 Å.) proportional to the concn. of undissocd. $K{:}I = f(T)\ \{c_2\{1 + [2K_2/(c_2 + c_3)]\}\}$. For constant total c_2, ratio $c_3/c_2 = \alpha$ and $f(T)c_2 = C$, a constant, it follows that $(1 + a)/I$ is a linear function of a. This is experimentally confirmed and graphically shown for various concns. of K.

4166. SCHALL, E. D. AND HAGELBERG, R. R.
Application of Flame Photometry to the Determination of Potash in Fertilizers.
J. Assoc. Offic. Agr. Chemists, **35**, 757–64 (1952).
C. A., **47**, 2918h (1953).

Representative grades of fertilizers were prepd. in the lab. from reagent-grade ingredients. Analysis of these samples demonstrated that potash can be detd. in fertilizers by flame photometry with an accuracy comparable to that of the A.O.A.C. chem. procedure (A.O.A.C. Methods of Analysis, Secs. 2, 39–41, 7th Ed. (1950). In general, the flame values were slightly lower and nearer the theoretical potash values than the results obtained by the chem. method.

4167. SCHELLER, W. AND TREADWELL, W. D.
Determination of Traces of Zinc in Zinc-Cadmium Alloys.
Helv. Chim Acta, **35**, 3, 754–62 (in German) (1952).
C. A., **46**, 7929c (1952).

Zinc can be detd. by means of the spark spectrum, polarographically, and by electrometric titration. As little as 0.001% $ZnSO_4$ in $CdSO_4$ can be detected in a C arc with 11 amp. applied for 40 sec. by means of the Zn lines at 472.22 and 481.01 mμ and the Cd line at 467.82 mμ. The electrometric titration of Zn by $K_4Fe(CN)_6$ reaction is more accurate when K_2SO_4 is present and at low acidity; Cd^{++} interferes. It is not difficult to sep. Cd from Zn by pptn. as CdS or by electrolytic sepn. at the cathode from solns. 0.2 *N* in H_2SO_4. In the absence of O_2, it is possible to det. either Cd or Zn by polarography. The electrolyte is preferably a soln. which is *M* in both NH_4Cl and NH_4OH. A calibration curve for detg. 0.1–10 γ of Zn as sulfate was prepd. By pptg. CdS at pH 0.38 and detg. the residual Cd by polarography the soly. product of CdS was calcd. as 3.73×10^{-29}.

4168. SCHMIDT, R.
De Grondslagen van de Spectrochemische Analyse ten Dienste van Analytici, Bedrijfsleiders en Studenten. A. E. E. Kluwer, Deventer (Holland) (1952).
C. A., **47**, 3760d (1953).
96 pp. Fl. 5. Reviewed in *Chem. en Pharm. Tech. (Dordrecht)*, **7**, 322 (1952).

4169. SCHÜLER, H. AND MICHEL, A.
About Two New Hollow-Cathode Discharge Tubes.
Spectrochemica Acta, **5**, 322 (1952).

Two simple forms of hollow cathode discharge tubes are described, which have been found useful for spectroscopic work. The chief advantage of the first type is the use of glass to metal seals which are vacuum-tight and resist the thermal shock of immersion in liquid air. The second tube can be used without liquid air cooling, it is made of quartz and can be cleaned out by heating with a burner, or by the discharge itself. The possible uses of such tubes in analytical spectroscopy are mentioned.

4170. SCHWARZ, G. AND KRAUSZ, B.
Flame Photometry in the Determination of Potassium, Sodium, and Calcium in Milk.
Kiel. Milchwirt. Forschungsber., **4**, 579–93 (1952).
C. A., **47**, 10144i (1953).

Compressed air was used to generate a mist of the substance under investigation; this mist was then passed through 2 bulbs set at 90° with respect to each other in order to remove large drops. The mist-air mixt. was burned with acetylene. Special light filters were employed for each element. Max. flame intensity was obtained at air and acetylene pressures between 0.6 and 0.8 atm. and 60 and 89 mm. water, resp. The Na value of milk increased with diln. to a point at which 1 part milk was dild. with 2 parts water, after which the value remained const. In the detn. of Na, a correction factor was required, the magnitude of which depended on the Ca content of the milk. Fifty mg. Ca per 100 ml. milk brought about an increase of 8–9 scale divisions in the calibration curve for Na. To correct for the influence of P_2O_5 in the detn. of Ca, the standard curve for Ca was obtained in the presence of 40 mg. P_2O_5 per 100 ml. in the form of $(NH_4)_2HPO_4$. Recovery expts. showed an accuracy of approx. ±3%.

4171. SCOTT, R. O. and FRASER, A. M.
Electrode Clamps for Spectrochemical Analysis.
Spectrochimica Acta, **4**, 472 (1952).

Spring loaded clamps designed for spark and pulsed arc operation in a Hilger de Gramont stand are described.

4172. SCRIBNER, B. F.
Spectrographic Analysis in Air-Pollution Studies.
Air Pollution (*Proc. U. S. Tech. Conf. Air Pollution, 1950*), Ed. by L. C. McCabe. McGraw-Hill Book Co., Inc., New York, N. Y. (1952).
C. A., **46**, 6287g (1952).

The results of spectrographic analysis may be affected by variations in the general compn. of the sample. To avoid this a buffer material, such as ZnO or Ga_2O_3, is added to serve as a common matrix for analysis. Ga_2O_3 is more satisfactory although expensive. The sample (2 mg.) is added to 20 mg. Ga_2O_3 and the material is volatilized completely in a 10-amp. d.-c. arc. Each new sample is analyzed as impurities in the Ga_2O_3 mixt. Spectrographic methods are useful for the detn. of about 70 chem. elements in dusts, fumes, air, and animal and plant ashes.

4173. SEGER, A. J., VAN LOON, E. J., AND LIKINS, M. R.
Flame Photometry.
Am. J. Med. Technol., **18**, 281–9 (1952).
C. A., **47**, 5479d (1953).

The mechanism and operation of the Barclay Flame Photometer were described. The internal standard method, with a Li_2SO_4 soln. as the reference standard, was employed for the detn. of Na and K in urine serum. Possible sources of error in flame photometry are discussed.

4174. SEITH, W. AND KOTTMANN, A.
The Spectral Analysis of Nickel-Cobalt Alloys in the Range 0–100%.
Spectrochim. Acta, **5**, 36–40 (1952).
C. A., **47**, 1002c (1953).

Spectrographic analysis can be extended to the whole range of the Ni-Co system when the purpose of the analysis is the detn. of the diffusion coeff. of the solid metals. This is appropriate because the error of the spectrographic estn. is of the same order as the sampling error which arises from the disappearance of the original interface between the two metals. A soln. method was used, and samples of about 20 mg. from successive layers of the metal were analyzed.

4175. SHAW, D. M.
The Geochemistry of Thallium.
Geochim. et Cosmochim. Acta, **2**, 118–54 (1952).
C. A., **46**, 5494b (1952).

A double-arc spectrochem. method of high sensitivity was used. Tl substitutes K in igneous minerals and closely resembles Rb in geochem. behavior. It is concd. in K-bearing pegmatite minerals and some sulfides. During weathering Tl goes into soln. as the univalent cation and is deposited in Mn-rich sediments under strong oxidizing conditions or is adsorbed in clay sediments. A strong reducing environment may conc. it in carbonaceous shale. Petrologic significance is attached to the mode of distribution of Tl in igneous rocks and to Rb/Tl ratios which are computed. Numerous analyses of Tl in rocks and minerals are given and the mean crustal abundance is calcd. to be 1.3 p.p.m.

4176. SHUGAR, D.
Semiquantitative Spectrographic Analysis of the Boron Content of Graphite and Carbon.
Bull. centre phys. nucléaire, Univ. libre Bruxelles, No. **34**, 5 pp. (1952).
C. A., **46**, 6029c (1952).
Cf. Russell, *C. A.*, **43**, 4396i

A powd. sample of graphite or C is mixed well with a $Ca(OH)_2$ suspension and evapd. to dryness. It is then fired at 850–900° for $1^1/_2$ hr. The resulting mixt. is divided into 3 portions, each being packed into a 5-mm. deep hole in Acheson graphite electrodes. Arcing was carried out at 10 amp. for 60 sec. Intensity of the 2497.8 Å. line of B was estd. with a 7-step sector. Standards were made up with known quantities of B in the $Ca(OH)_2$ suspension. Be was used as an internal standard. It was possible to detect 0.1 p.p.m. of B in this manner and as low as 0.2 p.p.m. could be estd. This method is much more rapid than the usual colorimetric procedure but is not as precise.

4177. SIMONSEN, S. H.
Improved Drilling Jig for Preparation of Porous-Cup Electrodes.
Anal. Chem., **24**, 1233–4 (1952).
C. A., **47**, 4658d (1953).

A chuck slightly larger than the diam. of the electrodes to be drilled is fastened to a steel base so that the whole can be clamped to the bed of the drill press. A depth gage on the same base makes possible the drilling of all holes to the same depth.

4178. SIMOVA, P., VASILEVA, N., BONCHEV, T., AND BUDUROFF, S.
Quantitative Spectroscopic Analysis of Colored Melts by Means of Standard Solutions.
Izvest. Bulgar. Akad. Nauk, Otdel. Fiz.-Mat. i Tekh. Nauki, Ser. Fiz., **3**, 13–22 (German summary) (1952). (Pub. 1954).
C. A., **49**, 5208i (1955).

From spectroscopic data of metal salts adsorbed on charcoal, charts were prepd. relating line intensities with concn. The following pairs of metals were studied at the given wave lengths: Pb 2833 Zn 2771; Zn 3202.6 Cu 3307; Pb 2833 Cu 2824; and Sn 2840 Cu 2824 A. When inorg. salts were used line intensities were independent of the length charcoal was soaked in the soln. When the b.ps. of the metals in a mixt. differ widely, a fractionation occurred; in such cases the spectrum was taken immediately after the arc was started.

4179. SINGH, K. P.
Spectrochemical Estimation of Boron.
Science and Culture (India) **18**, 194–6 (1952).
C. A., **47**, 4786e (1953).

The H_3BO_3 fluctuation bands in the region 4500–6400 Å., were compared with the B line at 2498 Å. line as a means of estg. B. With a condensed spark for concns. between 0.5 and 10%, the 5478 Å. fluctuation band is better. Above 10% the spectroscopic method appears to be insensitive.

4180. SMIRNOV, V. F.
Organizatisiya i Oborudovanie Tipovykh Spektral'nykh Laboratorii (Organization and Equipment in Standard Spectral Laboratories).
Pub. House Acad. *Sci.* (S.S.S.R.) (1952).
C. A., **48**, 11199a (1954).
116 pp.

4181. SMIT, J. A.
Physical Principles of Flame Photometry.
Chem. Weekblad, **48**, 697–9 (1952).
C. A., **47**, 2624h (1953).

A survey of the principal of flame-photometric analysis and a description of the flame photometer.

4182. SMIT, J. A.
Spectral Apparatus, Photodetection, and Intensity Measurements.
Chem. Weekblad, **48**, 703–5 (1952).
C. A., **47**, 1990f (1953).

A general description of equipment used in flame photometry.

4183. SMITH, D. M.
Spectrographic Copper Standards.
Spectrochim. Acta, **5**, 1–4 (1952).
C. A., **47**, 997a (1953).

Three graded series of "Matthey" Cu standards are in course of prepn. intended to cover the ranges 0.05–0.0001% of Al, Sb, Bi, Cr, Ga, Pb, Ag, Sn (Series A), Co, Fe, Mn, Ni, Si (Series B), and 0.05–0.001% of As, Be, P, Se, Te, Zn (Series C). Chem. analyses have been made of the 0.05% standards and the compns. of the dilns. of these alloys with pure Cu are now being checked spectrographically, with particular reference to the standards contg. the smallest amts. of added elements, with a globulo arc method. Plate calibration is effected by means of an Fe arc spectrum and a correction for spectrum background is made for each line measured. By extrapolating the linear portion of the log $(I_{element})/I_{copper})$ *vs.* log % element calibration curve, the residual impurities in the pure Cu can be estd. Satisfactory checks have been obtained with Bi, Ag, Sn, Co, and Mn and the detn. of the remaining elements is in progress.

4184. SMITH, D. M.
Visual Lines for Spectroscopic Analysis.
Hilger and Watts, London, England, 2nd Ed. (1952). 102 pp.
C. A., **47**, 3760e (1953).

Successive chapters deal with the wavelength spectrometer and accessories, arc excitation sources, the use of the carbon arc, wavelength tables for use in analysis, and spectroscopic identification of metallic constituents of glass. The wavelength tables include sensitive lines in the visible spectrum (8943.5 to 3903.0 Å.) of 71 elements, both by elements and in order of wavelength, and a list of sensitive band heads in order of wavelength (7403.5 to 4101.2 Å.).

4185. SMITH, R. G., BOYLE, A. J., FREDRICK, W. G., AND ZAK, B.
Spectrographic Determination of Beryllium in Urine and Air.
Anal. Chem., **24**, 406–9 (1952).
C. A., **46**, 4948c (1952).

A spectrograph with a.-c. spark and rotating electrode is used to det. Be in soln. Ca and Mg phosphate are eliminated by chelation with ethylenediaminetetraacetic acid. Al is used as internal standard. The method is accurate, rapid, and simple; in the range 0.005–0.025 γ of Be per ml. sparked, the av. error is 10%.

4186. SPITZER, E. J. AND SMITH, D. D.
Spectrochemical Analysis of Zirconium Oxide.
Appl. Spectroscopy, **6**, No. 5, 9–11 (1952).
C. A., **47**, 3181g (1953).

A spectrochem. method is given for the analysis of ZrO_2 for 22 impurities. AgCl is used as a carrier in a carrier-distn.-type arcing procedure. The general range is 10,000 p.p.m. to 10 p.p.m. on most impurities, and these can be detd. by visual comparison with synthetic standards to an accuracy of ±50% of the element present at the rate of 1 element/min., or 20 samples/day.

4187. STEINBERG, R. H. AND BELIC, H. J.
Spectrographic Determination of Lead and Tin in Stainless Steels.
Appl. Spectroscopy, **6**, No. 4, 14 (1952).
C. A., **46**, 11019g (1952).

The chemical detns. of Pb and Sn in stainless steels are tedious and costly, whereas the spectrographic detns. of these elements can be made rapidly and at relatively low cost. The source of these elements in the steel can be attributed to the scrap used in melting, furnace refractories, fluxes, and furnace addns. By using a d.-c. arc technique, a single sample can be analyzed in approx. 20–25 min. The spark technique which is preferable for most detns. is unsatisfactory because it lacks sensitivity.

4188. ŠTERNBERG, Z.
Spectrochemical Analyses With Special Regard to Light Metals.
Tehnički Pregled (Zagreb), **4**, 20–6 (1952).
C. A., **49**, 772h (1955).

The basic principles and techniques of spectrography and methods of evaluating spectrograms are discussed.

4189. STETTER, A.
Influence of Slit Magnification on the Measured Intensity Ratios of Spectral Lines.
Spectrochim. Acta, **5**, 251 (1952).
C. A., **47**, 968i (1953).

Owing to the variable magnification on the plate of the entrance slit by the prism, which is a function of the angular deviation, any photometric intensity measurements used to det. spectral source temps. require a correction factor. This is plotted for a three-prism spectrograph, and the magnitude of the error introduced is indicated.

4190. STICH, J. N.
Spectrographic Identification of Mineral Grains.
U. S. Geol. Survey Circ., **234**, 1–16 (1952).
C. A., **47**, 3183i (1953).

Methods are given for qual. to semiquant. detns. of 69 elements on samples of 1 mg. to 0.01 mg., and their application to the identification of individual sepd. mineral grains or on the material of an X-ray spindle. A small electrode cut from $^1/_8$-in. graphite stock is loaded and burned in the d.-c. arc. Standardization is against plates prepd. with only 1 element present at different concns.

4191. STRASHEIM, A.
A Note on the Influence of the Optical System of a Microphotometer on the Plate-Calibration Curve.
Spectrochim. Acta, **4**, 489–95 (1952).
C. A., **46**, 8525h (1952).

The influence of the optical system of 4 microphotometers, *viz.* Zeiss, Leeds and Northrup, A.R.L., and Optical Milano, on the plate-calibration curve of a photographic plate is described. It was concluded that when the Zeiss and Optica Milano instruments are used for the blackening detn. of spectrum lines the slit width of the detector must at least be a sixth of the width of the projected image of the spectrum lines which are being measured. These instruments show little stray-light effects in measuring weak lines, but stray-light effects must be taken into consideration for intense lines. In using A.R.L. instruments it is very important to use a slit which is about a third of the width of the spectrum lines which are being measured. Of the instruments tested the Leeds and Northrup instrument has the least amt. of stray light. This means that a very limited amt. of stray light is dispersed in the optical system of a microphotometer when the light source is a strip filament of restricted diam. and the image of the light source formed in the gelatin layer of the photographic plate is at least a third of the abs. width of the weakest spectrum lines.

4192. STRENGERS, T. AND KLINKENBERGH, E. A. M.
Experiences with the Beckman Flame Photometer.
Chem. Weekblad, **48**, 705–8 (1952).
C. A., **47**, 2251b (1953).

The detn. of Na and K in blood serum and urine with an early type Beckman flame photometer is discussed.

4193. STUKENBROEKER, G. L., SMITH, D. D., WERNER, G. K., AND MCNALLY, J. R., JR.
Spectro-isotopic Assay of Lithium.
J. Optical Soc. Am., **42**, 383–6 (1952).
C. A., **46**, 7426b (1952).

The isotope spectrum shift in the 6707.8-Å. resonance line of Li has been used for the assay of the isotopes Li^6 and Li^7. A hollow-cathode source loaded with 4 mg. of Li_2SO_4 was excited at 35 ma. with purified helium at 2- to 3-mm. pressure as support gas. Characteristics such as tube geometry, pressure, sample life, flow rate of gas, current, and anode-cathode spacing have been studied to give reproducible line-intensity ratios. Pre-

cision of the method based on a 95% confidence interval is about 6% of the Li^6 content or, by difference, about 0.5% of the Li^7 content in natural material. Spectra were obtained with a 21-ft., 30,000-lines-per-in. grating spectrograph; in the first order the Li^6-Li^7 isotope shift of 0.159 Å. is readily sepd. A multiplier phototube (1P28) set on the 4603-Å. Li line was used in an integrating circuit as an exposure meter.

4194. SWINDALE, L. D. AND FIELDES, M.
Rapid Semimicromethod for Cation-Exchange Capacities of Clays and Soils with the Flame Photometer.
Soil Sci., **74**, 287–90 (1952).
C. A., **47**, 12720i (1953).

By using only 0.1 g. samples and leaching a mixt. of the sample and quartz with 40 ml. of *N* K acetate, 40 ml. of distd. 95% EtOH, and finally with 40 ml. of *N* neutral NH_4OAc, 24 samples could be detd. in 5 hrs. Although reproducibility was poorest in the soil samples, results were adequate for the purpose.

4195. TERRIEN, J.
La Spectroscopie.
Presses Univ. France., Paris (France). (1952). 128 pp.
C. A., **47**, 4208a (1953).

Spectroscopy has been one of the most fecund chapters of physics. This is shown in an elementary discussion of its history and fundamental concepts, a general description of emission spectra, the production of optical spectra, the measurement of spectra, spectrochemical analysis, and the application of spectroscopy in mechanics, astronomy, nuclear physics, and meteorology.

4196. THIERS, R. E.
A Step-Sector for Use with Intermittent Light Sources.
Spectrochim. Acta, **4**, 467–71 (1952).
C. A., **46**, 8525d (1952).

Tests are described on the use of a "focal plane" step-sector with intermittent source units. This sector consists of a band of jet-black film with stepped shapes cut from it. By making the spacing between the shapes irregular, a more random sample of the exposure time is taken than with a disk-type sector. It was found that, except under conditions so extreme as to be insignificant, this sector eliminated troubles due to stroboscopic effects and that it could be used with intermittent and interrupted light sources just as easily as with the d.-c. arc.

4197. TLAPA, C. J., AND RAISIG, R.
A Visual Method for the Qualitative and Semiquantitative Analysis of Aluminum Alloys.
Applied Spectroscopy, **6**, No. 4, 32–36 (1952).
C. A., **47**, 8582f (1953).

Methods and techniques for rapid typing of Al alloys and for preliminary quant. analysis are presented. Visible analysis lines and their limits of detectability in the d.-c. arc are listed for Bi, Cr, Cu, Fe, Mg, Mn, Ni, Sn, Ti, and Zn. Similar data in the a.-c. spark are given for Pb and Si which were not visible in arc spectra.

4198. TOISHI, K., MAKINO, I., AND YAMAGUCHI, H.
Second Advantage of a Twin-Condenser in Spectrochemical Analyses.
J. Sci. Research Inst. (Tokyo) **46**, 207–10 (1952).
C. A., **48**, 5711e (1954).

A novel spectrographic condensing lens system has been found to achieve greater sensitivity than by use of conventional equipment. The material to be detected is dissolved in aq. NaCl, coated on the electrode surfaces, dried (with heat), and sparked in the usual way. Thus, with only 10^{-8} g. of Hg, the 2537 Å. line was visible only when the described equipment was used. In other expts., the brilliancy of Ag lines was increased by a factor of 3.

4199. TÖRÖK, T.
Determination of Traces of Zinc in Aluminum by Spectrography.
Acta Chim. Acad. Sci. Hung., **2**, 347–68 (1952) (in English).
C. A., **47**, 5303e (1953).

The methods generally use the line Zn 3345.0 by which a Zn content of 0.001% can be detd. Theoretical considerations indicated the applicability of the most sensitive line Zn 2138.56, excited by spark excitation of great self-induction. The detection was extremely sensitive when a 20-kv. Feussner spark generator at 4500-millifarad capacitance and 20-millihenry inductance was used. An interfering NO band line disappears when the excitation is carried out in pure N. The interfering line Cu 2138.51 can be corrected by measuring the intensity of the line Cu 2134.36. The presence of 13.88% Cu caused an apparent increase of 0.0005% in the Zn concn. The line Al 2174.0 or preferably Al 2258.0 was found suitable as a pair to the line Zn 2138.56. The spectrograms were prepd. with a Zeiss spectrograph, type Qu 24, on Kodak UV plates. The calcn. was carried out by a straight working curve. Measurements and calcns. proved that in case of solid samples excited in air at a Zn concn. cm = 0.00054%, the intensity of the line Zn 2138.56 was equal to the intensity of the NO band line coinciding with it. The amt. of radiant Zn vapor with the use of which the line Zn 2138.56 caused a readily measurable d. on the plate was estd. to be about 10^{-4} γ.

4200. TREADWELL, W. D., AMREIN, E., AND BODMER, A. E. R.
Spectrographic Analysis of Silver in Lead Containing Small Quantities of Silver (0.001%–1.6%).
Helv. Chim. Acta, **35**, 765–70 (in German) (1952).
C. A., **46**, 7931h (1952).

The spark-spectrographic analysis of Ag in alloys with Pb, by using the sharp sensitive Ag lines, 3280.7 Å. and 3382.9 Å. in the above range, is determinable to 5%, but there is a complication due to an aging effect. On standing 6 weeks a given alloy shows a 50% decreased Ag-spark spectral line intensity. Pb alloys contg. Ag form a solid soln. with a neg. heat of mixing. Ag at the temp. used diffuses into the vapor phase relatively more readily than does Pb (because of the known diffusion coeff.-temp. relations). Very small crystals of Ag (10^{-6} mm. diam.) have a higher vapor pressure than larger ones (0.01 mm. in diam.). Thus, very small crystals of Ag formed in the alloy have a higher vapor pressure than on standing, where larger crystals form, since at room temp. the solid soln. is no longer stable. Also, the Ag in solid soln. has a higher vapor pressure because of the neg. heat of soln. This explanation is confirmed with photomicrographic examn. and in the change in hardness behavior on standing of the whole alloy series. They also noted that the Pb lines 3572.7–3639.6 A. are attenuated considerably by the Ag.

4201.. VALLEE, B. L. AND ADELSTEIN, S. J.
The Effects of Argon and Argon-Helium Mixtures on the Direct-Current Arc.
J. Optical Soc. Am., **42**, 295–9 (1952).
C. A., **46**, 6971d (1952).

The use of A as an atm. for the d.-c. arc results in marked prolongation of volatilization, increased initial electrode currents, and enhancement of lines of many elements, particularly volatile ones, when samples are burnt to extinction and compared to He and A-H mixts. An interdependent relation between total time necessary for complete volatilization of samples, percentage He and A compn. of the atm., and sample concns. is demonstrated. Independently, a relation between the electrode current, percent He and A, and concn. of the sample exists.

4202. VALLEE, B. L. AND PEATTIE, R. W.
Volatilization Rates of Elements in the Helium Direct-Current Arc.
Anal. Chem., **24**, 434–44 (1952).
J. Optical Soc. Am., **41**, 869 (1951).
C. A., **46**, 6542e (1952).

The volatilization characteristics of some elements differ in air and He; in all others the parameters are const. The expts. described were performed to assess the volatilization of more than 30 elements by a study of neutral atoms and lines of first ionization at different amperages and in different gaseous environment by use of the moving-plate technique. Full details are given about the electrodes, the spectrograph, and plates used. Lines were measured in air and He at 6 and 15 amp. The term *volatilization* refers to the time period during which a line (or different lines) of a given element could be detected on the photographic plate. The relative intensity of the line was plotted against time. The following elements were studied: Be, Mg, Sr, Ca, Ba, Al, Sc, Y, Fe, Co, Ni, Pa, Pu, Re, Mn, Ti, Zr, V, Nb, Mo, Cr, Li, Rb, In, Ga, Ge, Sn, Pb, Bi, Cu, Ag, Cd, and Zn. The data presented permit evaluation of optimal analytical conditions. The relative sensitivity of spectrochem. detns. in He is often better than in air because of the low background. The choice of He as an environment for the d.-c. arc beings about decisive changes in volatility and relative line intensities.

4203. VAN CALKER, J.
Spectroscopic and Electrical Measurements in Low-Voltage Sparks.
Spectrochim. Acta **5**, 19–23 (1952).
C. A., **47**, 969e (1953).

With an auxiliary electrode to trigger the spark it has been possible to obtain a spark at 220 v. with d.c., a capacity value of up to 2000 microfarads, and an inductance of no more than 0.03 microhenry in the discharge circuit, and intensities of up to 10,000 amp. Current intensity, ignition voltage, and sparking time length have been detd. by the oscillograph. The corresponding spectra of the Fe electrodes which have been used show a systematic variation of the spectral character of the discharge with energy and time. With the delay at the beginning of the discharge at very high energy levels important deviations from the running of a free discharge can be observed. By decreasing the electrode diam., the spectral characteristics can vary, from a sparklike type to an arclike.

4204. VANCE, E. R.
Emission Spectroscopy in the Steel Industry.
Ohio J. Sci., **52**, No. 3, 114–17 (1952).
C. A., **46**, 7932i (1952).

A Baird Associates-Dow direct-reading spectrometer is used to give a simultaneous analysis of 8–10 elements in steel alloys within approx. 6 min. after the sample is received in the lab. The instrument is operated 24 hrs. a day, 7 days a week with only 1 operator per shift, to give results on the following elements: Mn 0.05–1.60, Si 0.01–1.00, Cr 0.03–7.00, Ni 0.02–5.00, Mo 0.01–1.00, Cu 0.02–1.20, V 0.01–0.30, W 0.05–5.40, Al 0.002–1.60, and Sn 0.007–0.10%.

4205. VIALE, L., FERRINI, O., AND CASTELLANI, L.
Sodium and Potassium of Blood Serum by Flame Spectrophotometry.
Arch. "E. Maragliano" patol. e clin., **7**, 211–20(1952).
C. A., **47**, 5478h (1953).

In 34 normal subjects the following av. values were found: Na 329 ± 2.05, K 19.9 ± 2.05 mg. %.

4206. VOIGT, G. E.
Silver in Human Hair.
Deut. Z. ges. gerichtl. Med., **41**, 151–3 (1952).
C. A., **47**, 4991d (1953).

Small traces of Ag can be found spectroscopically in normal human hair. All age groups were included in the studies. None of the subjects was treated with Ag salts as medication or had their hair dyed. Therefore, the presence of Ag in human hair cannot be taken as a proof for any kind of Ag poisoning.

4207. WALKER, F., VINCENT, H. C. G., AND MITCHELL, R. L.
The Chemistry and Mineralogy of the Kinkell Tholeiite, Shirlingshire.
Mineralog. Mag., **29**, 895–908 (1952).
C. A., **46**,, 7482b (1952).

Chem. and spectrographic analyses of augite, plagioclase, tholeiites, and their residual glasses are tabulated. Minor elements of the Kinkell tholeiite enter into crystal structure or are concd. in the residual glass according to their ionic radii and electrostatic charges.

4208. WARFIELD, J. M.
Spectrographic Analysis of Carnotite Ores for Their U_3O_8 Content.
Quart. Colo. School Mines, **47**, 1–19 (1952).
C. A., **48**, 1200b (1954).

The methods of spectrographic analysis were applied to the detn. of small amts. (0.01–1.0% U_3O_8), of U in carnotite ores. Following development of a technique, mixts. of U_3O_8 and silica sand were tested to obtain a working curve. Carnotite ores contg. 0.06–0.8% U_3O_8 were analyzed but a high degree of reproducibility was not obtained owing to difficulties in sample burning and focusing. MnO_2 was used as internal standard with spattering being reduced by prefusion, plus inclusion of C in the mix.

4209. WARREN, R. L.
A Flame Photometer for Routine Biochemical Use.
J. Sci. Instr., **29**, 284–6 (1952).
C. A., **47**, 2546c (1953).

An instrument designed primarily for the detn. of Na and K. The sample is atomized with compressed O and sprayed directly into an O-butane flame. The photometer employs narrow band filters and separate emission-type photocells for Na and K, resp. Use of high-grade components of liberal ratings results in stable operation and negligible drift. The burner is water-cooled and does not backfire.

4210. WATSON, E. C.
The First Reported Observations on Emission Spectra.
Am. J. Phys., **20**, 569–77 (1952).
C. A., **47**, 1997d (1953).

There is reproduced a portion of a paper by Thomas Melvill, read before a philosophical society in Edinburgh in 1752, the first account of the use of a prism to examine colored flames.

4211. WEISSLER, G. L., EINARSSON, A. W., AND MCCLELLAND, J. D.
Semi-Automatic Graphical Computer with Use in Spectroscopy.
Rev. Sci. Instruments, **23**, 209–12 (1952).
C. A., **46**, 9424g (1952).

A device is described which is capable of transforming semiautomatically a microphotometer d. *vs.* wavelength trace into an intensity trace. In the same manner, the logs or antilogs of a variable can be graphically computed. In addn., this machine can take the differences of two curves and plot the results either directly or logarithmically or antilogarithmically, or in a way appropriate to any specific problem. It is possible to evaluate, for instance, in successive steps all the quantities in Beer's law of absorption as a function of wavelength.

4212. WERNER, O.
The Significance of Spectroanalysis for Foundry Practice.
Giesserei, **39**, 73–81 (1952).
C. A., **46**, 4417c (1952).

A review with bibliography.

4213. WHITE, J. U.
Precision of a Simple Flame Photometer.
Anal. Chem., **24**, 394–9(1952).
C. A., **46**, 4861e (1952).

Complete directions are given for setting up a flame photometer including construction details for the soln. atomizer and the complete schematic wiring diagram for the photocell galvanometer measuring system. The air-gas flame is completely enclosed to prevent atm. contamination. Under good operating conditions a precision of ±1% of the amt. of Na present in the soln. was obtained for direct-intensity observations and ±0.3% for internal-standard observations. Similar results were obtained for K, Li, and Ca detns.

4214. WILLEBRANDS, A. F., JR.
Experiences with a Self-Built Flame Photometer.
Chem. Weekblad, **48**, 708–10 (1952).

C. A., **47**, 2251c (1953).
Cf. *C.A.*, **44**, 8984d

A discussion of the detn. of Na and K in blood serum and urine by means of a flame photometer.

4215. WILLITS, C. O. AND CONNELLY, J. A.
Atomizer for Flame Spectrophotometry.
Anal. Chem., **24**, 1525–6 (1952).
C. A., **47**, 1433i (1953).

A description of the construction of a reflux-type glass atomizer which uses only 0.3 to 0.4-ml. sample soln./min. It is free of changing nozzle characteristics and can be easily cleaned. It produces a stable aerosol which may be piped up to distances of 20 ft.

4216. WILLMER, T. K.
Experiments with the Spectrochemical Method of Rapid Analysis.
Stahl u. Eisen, **72**, 1443–7, discussion 1447 (1952).
C. A., **47**, 4782b (1953).

A description of a typical spectrochem. lab. in a steel works.

4217. WILSKA, S.
Trace Elements in Gold Panned in Finnish Lapland.
Suomen Kemistilehti, **25B**, No. 12, 75–9 (in English) (1952).
C. A., **47**, 9867i (1953).

The principal alloy is Ag. By spectrographic examn. Ag, Cu, Mn, Fe, Pb, Al, Ni, Ti, Cr, Co, Sb, and V were found. Pt and Pt metals are notably absent. Cf. *C. A.*, **47**, 4526i.

4218. WILSKA, S.
Trace Elements in Finnish Ground and Mine Waters.
Ann. Acad. Sci. Fennicae Ser. A., II, No. **46**, 7–76 (1952).
C. A., **47**, 4526i (1953).

Spectroscopic analyses are given for alkali metals, alk. earths, Al, B, Cu, Fe, Mn, Zn, Co, Cr, Ni, and Pb. The B content is significantly low.

4219. WOLDRING, M. G.
Flame Photometric Determination of Sodium and Potassium in a Few Biological Liquids.
Pharm. Weekblad, **87**, 725–40 (1952).
C. A., **47**, 1768g (1953).

In a quick and accurate method of detg. the Na and K in saliva, blood serum, and urine, the test liquid is dild. with distd. water to 1:25, 1:50, and 1:25, resp., and the Na and K contents are detd. with a flame photometer against a pair of standard solns. of 100 mg. % Na and 100 mg. % K (as the chloride). Equil. is reached in 15–20 sec., and the galvanometer reading is made. The results obtained show that the flame photometric method is more rapid than and as accurate as the more laborious chem. analytical methods. 22 references.

4220. YAMAGUCHI, T. AND NISHINO, M.
Microanalysis of Solutions by an Alternating-Current Arc.
J. Phys. Soc. Japan, **7**, 118–19 (1952).
C. A., **47**, 3751c (1953).

The complete setup is described as used in expts. for detecting Li, Cd, and K as chloride or nitrate in dil. solns.

4221. YASHIMA, H.
An Apparatus for Quantitative Analysis by Spectroscopy.
Japan. Patent 2525, July 8, 1952.
C. A., **47**, 6196e (1953).

4222. YOSHINAGA, H., FUJITA, S., AND MINAMI, S.
Construction of a Photoelectric Instrument for Emission-Spectrochemical Analysis and Its Performance in the Analysis of Metals.
Technol. Repts. Osaka Univ., **2**, 147–56 (1952).
C. A., **47**, 7830i (1953).

A photoelec. instrument was constructed from a quartz spectrograph by replacing the photographic cassette with photoelec. receiver units. The intensity ratio of spectral lines was measured with multiplier phototubes. The instrument was found to have an accuracy of ±0.2%, a speed of analysis based on the charging time of the condensers (20–30 sec.) and the time required to read the meter, and a measurable intensity ratio of 10,000:1. The expense of photographic materials is eliminated. Circuit diagrams are given and also spectral lines for analysis of elements in steel, Al, Pb, and ferro-silicon.

4223. YUDIN, I. A.
Mineralogical Composition of the Stone Meteorite of Vengerovo.
Doklady Akad. Nauk S.S.S.R., **84**, 123–5 (1952).
C. A., **47**, 11096f (1953).

The spectral-analytical examn. of the meteorite gave weak indications for Mn, Co, V, Ti, Cu, strong Ca, medium Na. (The mineralogical composition is discussed in detail.)

4224. ZAĬDEL, A. N., PROKOF'EV, V. K., AND RAISKIĬ, S. M.
Tabilitsy Spektrakl'nykh Liniĭ (Tables of Spectral Lines).
State Pub. House Tech. and Theoretical Lit. Moscow (U.R.S.S.) (1952). 560 pp.
C. A., **48**, 11199b (1954).

Tables of selected spectral lines in order of wavelength for chemical identification. Table 1.—Wavelengths, element, arc and spark intensities of 40,000 lines of 60 chemical elements copied from the *M.I.T. Wavelength*

Tables. Wavelengths from 8003.18 to 2000.04A. 309 pp. Table 2.—Separate tables of wavelengths, intensities and excitation potentials (where known) of 93 chemical elements, quoted from various sources. 224 pp. Table 3.—Mendeleeff Periodic Table of the elements, 2 pp. Table 4.—Ionization potentials of elements and ions, 1 p. Table 5.—Table of atomic and molecular weights, melting, and boiling points, 3 pp. Table 6.—Sensitive lines in order of wavelengths, 7 pp. Table 7.—Sensitive lines by elements. 8 pp. Table 8.—Ultraviolet wavelengths from 200.35 Å to 1800.04 Å. 5 pp. Table 9.—Wavelengths (8349.52 to 3990.03 Å.) in the H_2 spectrum. 2 pp. Table 10.—Wavelengths (6561.00 to 3749.15 Å.) in the spectrum of D. 1 p.

4225. ZAK, B., CHASE, J. D., MYERS, G. B., AND BOYLE, A. J.
The Use of the Emission Spectrograph for the Determination of Serum Gold.
J. Lab. Clin. Med., **39**, 660–2 (1952).
C. A., **46**, 6695b (1952).

A simple, rapid, and accurate spectrographic method for the detn. of gold in 4 ml. of serum is described. The spectrogram is obtained directly from the serum after diln. and incorporation of an alk. lead internal standard, and the gold content is estd. by calibration against values obtained from the analysis of normal serum, after the addn. of internal standard and known amts. of gold. The technique involved enhances the accuracy of the results since the calibration curve and samples contain the same qual. constituents.

4226. ZALMANZON, E. S. AND LIZUNOV, N. V.
Comparability of Chemical and Spectral Analysis Data in Lithological Investigations.
Doklady Akad. Nauk S.S.S.R., **86**, 1163–6 (1952).
C. A., **50**, 102i (1956).

A report of the analysis of 90 samples from a series of wells of Secondary Baku. The intensities of the spectral lines were evaluated visually. The chem. and spectroscopic data led to the same conclusion.

4227. ZAZINI, G.
Method of Quantitative Spectrographic Analysis with a Hilger E492 Spectrograph.
Spectrochim. Acta, **5**, 158–62 (1952).
C. A., **47**, 921i (1953).

By using a quartz spectrograph of large dispersion, routine analysis of steel was established by the spark method. After trying out cylindrical electrodes for some time, a change was made to flat surface sparking with a pure Al counter-electrode and this gave more reproducible results; the sparking conditions were also altered. By using a low-contrast plate and developer the linear portion of the calibration line was usefully extended.

4228. ZELIKOFF, M., WYCKOFF, P. H., ASCHENBRAND, L. M., AND LOOMIS, R. S.
Electrodeless Discharge Lamps Containing Metallic Vapors.
J. Optical Soc. Am., **42**, 818–19 (1952).
C. A., **47**, 420e (1953).

Methods for producing and exciting discharge lamps of a variety of metallic vapors are discussed. The design of a resonant cavity for use with a 2450-Mc. microtherm unit in exciting the lamps is given. These lamps are long-lived and simple in construction and because of the great intensity of the principal lines, they are adaptable to photo chem. uses. Satisfactory lamps contained Pb, In, Ga, Sb, Bi, Hg, Cd, Tl, Zn, Ca, and Ba.

4229. ZWETSCH, A.
Use of the Flame Photometer.
Sprechsaal, **85**, 91–3 (1952).
C. A., **46**, 5481h (1952).

Details are given for detg. Na_2O and K_2O by flame photometry.

1953

4230. ADAMS, J. W.
Beryllium Deposits of the Mount Antero Region, Chaffee County, Colo.
U. S. Geol. Survey Bull., No. 982-D, 95–119 (1953).
C. A., **47**, 9867h (1953).

Beryllium occurs as beryl, phenakite, and bertrandite in pegmatites and as beryl in quartz veins. The deposit cannot be considered a com. one. A comparison with Be-bearing quartz veins of other areas is given. Spectrographic analyses and *n*s of the beryl are tabulated.

4231. ADDINK, N. W. H.
Quantitative Spectrochemical Analysis by Means of the Constant-Temperature Direct-Current Carbon Arc.
Spectrochim. Acta, **5**, 495–9 (1953).
C. A., **47**, 12100d (1953).

Burn 5 mg. of material in a const.-temp. arc between electrodes of special shape and compare the photographic ds. of analysis lines visually with a range of lines of increasing ds. photographed on paper which has been standardized by a rotating step sector spectra. Typical results and comparison with chem. analyses are shown for Fe oxide and scheelite.

4232. ALEKSEEVA, M. V. AND BELOZERSKAYA, V. I.
Spectroscopic Determination of Metals in

Atmospheric Dust. Determination of Copper and Lead.
Gigiena i Sanit., **1953**, No 6, 48–9 (1953).
C. A., **47**, 12108f (1953).

The arc method of excitation is used with suitable standard electrodes. For Pb the 2893.1 Å. line was used and for Cu the 3273.96 Å. line.

4233. ALLEN, R. D. AND KRAMER, H.
Occurrence of Bassanite in Two Desert Basins in Southeastern California.
Am. Mineralogist, **38**, 1266–8 (1953).
C. A., **48**, 11983e (1954).

$CaSO_4 \cdot \frac{1}{2}H_2O$, probably formed from gypsum, occurs at 2 localities intercalated with silty clay. Chem. and spectrographic analyses and optical data are given.

4234. AMERICAN SOCIETY FOR TESTING MATERIALS.
American Society for Testing Materials. Methods for Emission Spectrochemical Analysis, 1953.
Am. Soc. Testing Mats., Phila., Pa., 309 pp. (1953).
C. A., **48**, 6903d (1954).

Suggested or tentative methods for spectrochemical analysis are given for: Ni alloys; wrought Cu alloys; bronze; Ni sheet; 70–30 cupro-nickel; Admiralty metal for As; Cu alloys; lead-base and Sn-base alloys; pig leads; Pb-Sn solders; antimonial Pb alloys; Pb-base bearing alloys; type metal alloys; Sn; Al and Al-base alloys; Mg-base alloys; Ti for Mg, Fe, and Mn; Ti metal; Zn-base alloys; high-grade Zn; Zn-base die-casting alloys; Cd metal; Zn; low-alloy steel; alloy cast steel and Fe; steel for B; alloy cast iron; Na_2O and K_2O in portland cement; SiO_2 refractories; Cu strike plating solns. for Ag; alk. earth titanates; Ni-plating solns. for Zn; Li-bearing ores for Li, Na, and Fe; soda ash and other Na salts; metallic Ag and $AgNO_3$; NaOH; ceramic and other nonmetallic materials; silica brick and glass sand; slags; and open-hearth slags for the lime-silica ratios. Suggested practices are given for: installation and safe operation of the spectrochem. lab.; photographic processing in spectrochem. analysis; and photographic photometry in spectrochem. analysis. Suggested nomenclature is given for applied spectroscopy.

4235. ANDERSON, J. W.
Application of an Exposure-Transmittance Table to Rapid Quantitative Spectroscopic Analysis.
Appl. Spectroscopy, **7**, No. 3, 121–4 (1953).
C. A., **48**, 2506h(1954).

The rapidity of quant. spectrochem. analysis, performed by recording spectra on a photographic emulsion, is retarded by the necessity of converting photometric measurements of transmittance into relative intensities or exposures. A table has been prepd. to det. log exposure (times a const.) directly from transmittance values. This exposure-transmittance table can be used to prep. working curves, or corrected to relative log exposure by first detg. the γ of the photographic emulsion. A method of detg. γ from the table is also described.

4236. ANTONINI, F. M.
Flame Spectrophotometry. Construction of an Apparatus with Internal Standard.
Sperimentale, **103**, 305–23 (1953).
C. A., **48**, 9445b (1954).

A new flame spectrophotometer with an internal Li standard for the detn. of Na, Ca, and K in biol. liquids is described.

4237. ASHTON, F. L.
A Constant-Ratio Method for Spectrographic Analysis by the Lundegårdh Flame Technique.
Spectrochim. Acta, **5**, 426–35 (1953).
C. A., **47**, 11993c (1953).

Certain refinements are suggested for the Lundegårdh flame technique applied to the spectrographic analysis of soil and plant exts. A new method of evaluating results called the "constant ratio method" is described, in which Co is used as an internal standard and a series of dilns. of the unknown is used. An internal standard line is selected with an intensity similar to that of the analysis line, and an intensity ratio curve is plotted for the unknown, from which the dilution required to give an intensity ratio of one is found. Standard solns. are used to find the concn. of the element which is required to give that ratio, and from this figure the concn. of the element in the unknown is calcd. In support of the principle on which the method is based, it is shown that there is a correlation between the coeff. of variation and the amount by which the intensity ratio differs from 1. Further refinements consist in the control of the acetylene supply by means of a flowmeter and the introduction of the condensing lens and concave reflector into the optical system. The standard deviation of the method for Na and K is estd. to be 1.5%. This figure is based upon the variance within replicates carried on separate plates and it is contended that this is the only fair method of estg. spectrographic errors.

4238. AUSTIN, H. C., JR., DENSON, W. P., AND EPPS, E. A., JR.
Instrumental Methods for the Determination of Available Phosphoric Acid and Potash in Fertilizers.
J. Assoc. Offic. Agr. Chemists, **36**, 885–90 (1953).
C. A., **48**, 9602f (1954).

The described photometric methods for available P and K reduce the time about 50% and 10%, resp., and use less reagents, com-

pared with the A.O.A.C. official methods. The flame photometric method for K gave results as accurate as the official method, except for KCl. The results for available P were comparable in accuracy to the official method. The same soln. used for P detn. can be used for K.

4239. BAIR E. J., CROSS, P. C., DAWSON, T. L., WILSON, E. A., JR., and WISE, J. H.
A Kinematically Focused Concave-Grating Spectrometer.
J. Opt. Soc. Amer., **43**, 681–4 (1953).
C. A., **47**, 10350i (1953).

A description is given of a 21 ft. concave-grating spectrometer which achieves the compactness of the Eagle arrangement and the convenience of being able to scan with automatic focusing. The principal features consist of turntables which translate at appropriately different speeds and the connecting lever arms which rotate them in proper relation to the Rowland circle to maintain the focusing conditions. Photographic, photomultiplier, and photoconductor recording systems can be quickly interchanged. This instrument was built for the purpose of studying vibration-rotation spectra of gas mols.

4240. BALÁŠ, J.
Influence of the Oxidized Layer and the Electrode Gap on the Accuracy of Quantitative Spectral Analysis.
Hutnické Listy, **8**, 352–5 (1953).
C. A., **50**, 7000d (1956).

In the analysis of high-alloy steel, the content of a given element, e. g., Si, depended on the pair of lines used, when the surface of the samples, but not of the standard, was freshly cleaned. Repeated sparking without recleaning gave more concordant results which were satisfactory after 4 repetitions. This is due to the different thickness of the oxidized layer, produced by presparking, which affects differently lines of different elements, and even different lines of the same element. Results also depended on the electrode gap; this dependence increased with decrease in the condenser aperture.

4241. BALDI, F.
The Spectrochemical Analysis of Slags.
Spectrochim. Acta, **6**, 39–52 (1953).
C. A., **48**, 2518i (1954).

The most suitable conditions for analysis of slags with a medium dispersion spectrograph, a spark source, and an a.-c. arc with high-frequency ignition, have been detd. The controlled spark and uncontrolled spark and the arc were compared on powd. samples, and on pellets made from the slag mixed with conducting materials such as graphite, Cu, Bi, Zn, and brass. The best results were obtained by the use of pellets made of brass filings and the sample was subjected to controlled spark discharges. In the evaluation of the spectra the mutual standard method was used for detg. the metal-oxide silica ratios, and the internal standard for metal oxide contents. The application of this mutual standard method is discussed. The paper covers only the detn. of SiO_2, CaO, MnO, FeO.

4242. BARBIER, D.
Comparison of the Spectra of Comets and of the High Atmosphere.
Mém. soc. roy. sci. Liège, **13**, 303–16 (1953).
C. A., **47**, 8508h (1953).

A tabulation is given of the emission features in the spectra of comets' heads and tails, of the air-glow (high, low, and at twilight), and of polar aurorae. The elements prominent in comets are C and H, whereas O and N are outstanding in sky and auroral spectra. Cometary radiation is due to fluorescence following excitation by sunlight, whereas collisional excitation following photodissociation seems to be the most probable mode of excitation in the high atm. and in aurorae. Common to both types of spectra are the bands of the neg. system of N_2^+, probably due to the same mechanism of fluorescence, but different mechanisms of producing the ions.

4243. BARDÓCZ, Á.
Investigations Concerning Light Sources for Spectrum Analysis. III. Electronically Controlled, Alternating-Current Operated, Alternating-Current Interrupted Arc Source.
Spectrochim. Acta, **5**, 397–408 (1953).
C. A., **47**, 10910e (1953).

An electronically controlled a.-c. operated a.-c. interrupted arc source is described. The arc circuit is of conventional design. Igniting sparks are produced by the discharge of a condenser previously charged to high voltage through a thyrathron tube and the primary of the Tesla transformer. The thyrathron grid is controlled by voltage pulses produced by a pulse generator. By means of the multivibrator in the pulse generator the no. of igniting pulses per unit of time can be varied within wide limits. Besides, the interrupted arc source is especially suitable, in addn. to normal working possibilities, for rotating or porous-cup electrode soln. analysis, since, by the adjustment of the arcing repetition rate, detrimental warming or boiling of the soln. can be avoided. Cf. *Acta. Phys. Acad. Sci. Hung.*, **2**, 265–76 (1952); *C. A.*, **46**, 9893i.

4244. BARKER, H.
Sampling Instruments.
Studies in Conservation, **1**, 82–3 (1953).
C. A., **47**, 10909c (1953).

The instruments described are for taking samples from valuable museum objects for microchem. and spectrographic analysis. A

diamond-tipped scraper is made by embedding a diamond fragment in a clear (methacrylic) plastic block and filing the plastic away to expose a suitable facet of the diamond. The block in turn is mounted in a suitable holder. A device for sample collecting is based on the principle of the cyclone separator. It is made of glass and allows the powd. sample to be picked up by suction and deposited directly on a glass microscope slide. Details of construction are given in diagrams.

4245. BARLOW, J. S. AND MANERY, J. F.
A Comparison of the Method of Flame Photometry with the Chemical Methods for the Determination of Cations in Tissues.
Can. J. Med. Sci., **31**, 326–37 (1953).
C. A., **47**, 10609i (1953).

A procedure is described whereby the Perkin-Elmer flame photometer, model 52A, can be used to analyze 10 ml. of a soln. of ashed biol. materials, the soln. contg. 0.5 meq. of Na or K per l. The Li concn. for the internal standard, the optimal rate of flow through the atomizer, the air and gas pressure, and cation interferences are discussed. The results of photometer analyses of tissues and serum compare favorably with those obtained from well-established chem. methods. The instrument was found to be too insensitive to Ca and Mg to be of value for the detn. of these elements in most animal tissues.

4246. BARTHAUER, G. L., RULFS, C. L., AND PEARCE, D. W.
Investigation of Thucolite.
Am. Mineralogist, **38**, 802–14 (1953).
C. A., **49**, 8749c (1945).

A complete chem. analysis was made of thucolite from the Besner Mine, Ontario, Canada. The results were as follows: (*1*) compn. of volatile gases from low-temp. vacuum procedure: CO_2 23.09, O 1.38, CO 17.20, H 19.37, CH 14.92, inert gases 24.04% (av. of 3 runs); (*2*) compn. of volatile matter by high-temp. technique: CO_2 23.90, HO 46.03, CO 0.34, CH 15.73, N (A. S, etc.) 13.84% (by difference) (percentage by wt.); (*3*) chem. analysis of ash: SiO_2 15.52, PbO 1.03, ThO_2 + R.E.$_2O_3$ 19.64, U_3O_8 53.09, Al_2O_3, 0.97, Fe_2O_3 0.63, BeO 1.20, CaO 5.50, MgO 1.86, sum 99.44% (av. of 2 analyses). Spectrographic analysis of the rare earths showed that no more than 0.54% of the ash could be ThO_2, in contrast to other analyzed thucolites, which are high in Th. Details of the analytical procedures used are given.

4247. BAUSERMAN, H. M. AND CERNEY, R. R., JR.
Flame Spectrophotometric Determination of Sodium and Potassium in Viscous Solutions of Plant Extracts.
Anal. Chem., **25**, 1821–4 (1953).
C. A., **48**, 3845b (1954).

A new method was developed for the routine detn. of Na and K in plant exts. with the Beckman Model DU spectrophotometer and the flame attachment. Differences in phys. properties of solns. caused by differences in the amts. of org. substances present affect the flame intensity by altering the rate at which the sample is introduced into the flame. The difficulty is overcome by adding a known amt. of Li to each sample. The transmittance of Li is used to calc. a concn. correction factor which is used to det. the true concns. of Na and K. The method has been successfully applied to beet root water exts. clarified with $Pb(OAc)_2$, factory diffusion juice, carbonated factory juices, and sulfured factory juices preserved with alc.

4248. BELEGIŠANIN, N.
The Use of Sodium Fluoride as Carrier in the Spectrographic Determination of Cadmium and Boron in Uranium.
Rec. trav. inst. recherches Structure Matiere (Belgrade), **2**, 27–30 (in English) (1953).
C. A., **48**, 75f (1954).

The carrier distn. method of spectroscopic detn. of impurities in U (*C. A.*, **41**, 1571i) has been modified by using NaF as the carrier material. Qual. and quant. estimates of Cd and B in U samples were made.

4249. BELYANKINA, E. D.
Spectroscopic Examination of Potassium Sodium Feldspars.
Voprosy Petrog. i Mineral., Akad. Nauk S.S.S.R., **2**, 77–87 (1953).
C. A., **49**, 12216d (1955).

On the isomorphism in the feldspar group from the standpoint of ionic replacement and thermodynamic stability the previous work of Schiebold (*C. A.*, **26**, 5037) is fundamental. His predictions have been entirely confirmed. Rb, Cs, Li, Ba, Sr, Mn, Pb, Fe, Ga, and Ti are regular accessorial elements. Cu is only exceptionally observed, in very low amts. Mg, however, is observed in all of the samples in higher amts. than Cu, and cannot easily be explained as a contamination. Be, V, Ni, Cr, and Co are absent, in spite of their distinct presence in the surrounding rocks. A comparison of the feldspars from the Caucasus with those from other occurrences in the U.S.S.R. shows the similarity of the distribution of accessorial elements, independently of the geographic locations. The Caucasian feldspars, however, contain equal amts. of Sr and Ba, or even more Sr, while for the other feldspars these are reversed, as a norm. The alkali elements appear in the following concns.: Rb from 0.01 to 0.019; Cs from 0 to 0.02; Li from 0.00034 to 0.00100; all these elements are enriched in K feldspars. Amazonites have higher amts. of Rb and Cs, but also of Ga, Be, and Pb, but less of Sr, Ba, Ca, Mg, and Ti than the other types.

4250. BENNETT, H. S., QUINTON, W. E., OTHBERG, R., AND REIS, G. W.
A Small Air-Turbine-Driven Step Sector.
Appl. Spectroscopy, **7**, No. 3, 129–31 (1953).
C. A., **48**, 1814c (1954).

A tiny step sector rotated by air pressure was developed for use in absorption micro-spectroscopy. When placed immediately in front of a photographic plate it provides a series of reference ds. which serve as calibrations.

4251. BERGSTROM, N. C. AND LUCAS, E. H.
Spectrographic Analysis of Antimony, Cadmium, and Tin in a Lead-Base Alloy.
Appl. Spectroscopy, **7**, No. 1, 13–15 (1953).
C. A., **47**, 6303f (1953).

A Pb-base alloy contg. approx. 2% Sn, 1% Cd, and 0.25% Sb is applied as a hot-dip coating to Cu wire and requires close control. The time of 8–16 hrs. for chem. analysis was reduced to 1 hr. by employing spark spectrographic methods. The improved service has resulted in a more uniform coating on wire and in reduced production cost.

4252. BERNSTEIN, R. E.
Flame Analysis of Sodium and Potassium in Small Volumes of Serum, Heparinized Plasma, and Cerebrospinal Fluid.
Am. J. Clin. Pathol., **23**, 933–7 (1953).
C. A., **47**, 12488g (1953).

Plasma (or serum), cerebrospinal fluid, or other fluid (0.02–0.05 cc.) is dild. 1:100 or 1:200 to a final Li concn. of 5 mg. % for Na estns. For K estns., a 1:50 diln. is made. The sample is vaporized and measured against standards in a flame photometer. A slow atomizer must be used. Calibrated, siliconed tubes (*Science*, **114**, 637–40 (1951)) are employed. The accuracy compares favorable with macro flame photometry or chem. methods.

4253. BERNSTEIN, R. E.
Some Factors Affecting Glucose Utilization and Potassium and Sodium Exchanges in Human Red Cells.
S. African J. Med. Sci., **18**, 31 (1953).
C. A., **47**, 10655C (1953).

By a sterile technique, packed red cells were incubated up to 60 hr. with an equal vol. of isotonic soln. (of high buffer capacity with varying pH, glucose, and K concn.). Samples were removed at frequent intervals for estn. of glucose, pH, hematocrit, and the various electrolytes. K and Na detns. were performed by flame photometry on the whole suspension and "plasma," red-cell values being calcd. from the hematocrit measurement corrected for the vol. of intercellular "plasma." Processes of active transfer (K accumulation and Na extrusion by red cells) only occurred in systems of adequate glucose content, at pH 7.3–8.0, and at 30–37° for periods of up to 12 hrs.; glucose utilization by the red cells was 150–220-mg/l. red cells/hr. These observations generally confirmed those of Ponder (*C. A.*, **44**, 10101f) and Maizels (*C. A.*, **45**, 4815c) for cold-stored cells. Between pH 6.5 and 7.2 diffusion of cations exceeded active transfer, evinced by a decrease in cell K and an increase in Na content; glucose utilization diminished by as much as 50%. At 18–25° red-cell K and Na maintained a steady state with glucose utilization at 100–160 mg./l. red cells/hr. until glucose had disappeared from the medium. A progressive fall in cell K with a concomitant rise in Na followed. The almost complete inhibition of glycolysis with NaF produced the same cation changes. Changing the K (2–15 meq./l.) and Na (120–160 meq./l.) contents of the media did not influence exchange in normal red cells (K 96.8 ± 3.7 meq./l., Na 13.7 ± 5.3 meq./l.). However, cells with low K (less than 85 meq./l.) took up K and extruded Na more rapidly and for longer periods in suspensions contg. not less than 4 meq. K/l. Active transfer of cations in human red cells is conditioned by glycolysis and the factors influencing this process. Active transfer serves to keep the cell base and vol. const. The mechanism is inhibited by acidosis and accelerated by low intracellular K.

4254. BERTRAND, G., AND BERTRAND, D.
Rubidium in Seeds.
Compt. rend. **236**, 2460–2 (1953).
C. A., **48**, 12254a (1954).
Cf. *C. A.*, **46**, 5672c; **47**, 3937c.

The Rb content of 50 seed samples ranged from 1.4 p.p.m. in leek to 33.2 in cumin. By families the Rb content of the entire plant is like that of the seeds, relatively high in crucifers and the papilionaceous seeds and low in the labiates and grasses. On the dry wt. basis the family average for the entire plant is about double that for the seeds.

4255. BLACKWELL, A. T., YEAGER., C. L., AND KRAUS, M.
Use of Flame Photometry to Determine Potassium at 404 Millimicrons.
J. Assoc. Offic. Agr. Chemists, **36**, 898–902 (1953).
C. A., **48**, 9603d (1954).

Comparison of 28 samples of fertilizers for K detn. by flame photometry at 404 mμ with the A.O.A.C. procedure show equal precision and accuracy with saving of more than half the time. These data furnish more confirmatory work to help establish the validity of the flame photometer as an official routine method.

4256. BOESCHOTEN, F. AND HOENS, F. A.
Determination of the Concentration of an Element in a Nonconducting Sample by the Photoelectric Measurement of Relative Spectral Intensities by Means of a Single Measurement with a Single-Electron Multiplier Cell.

Congr. groupement avancement method. anal. spectrog. produits mét., **16**, 237–41 (1953).
C. A., **49**, 4446h (1955).

Cu is detd. in soil and plant samples by measuring the intensity relative to a known added amt. of Ag. The app. is precise to within 0.5%; the precision of measurement of relative concns. of nonconducting samples is worse.

4257. BOGOMOLOVA, M. I.
Quantitative Spectral Analysis of Solutions.
Uchenye Zapiski Kazan. Univ., **113**, No. 9, 167–85 (1953).
Referat. Zhur., Fiz., **1955**, No. 10177.
C. A., **50**, 4702i (1956).

Four methods of introducing a soln. into the excitation source were studied: (*1*) with the aid of a metallic fulgurator and (*2*) a rotating metallic electrode, (*3*) by satn. of C electrodes, and (*4*) by application of drops of soln. on the C electrodes. Method 1 makes it possible to det. in an activated a.-c. arc the Na in soln. in concn. range of 0.07–1% within 3–4%, and in a spark, Al to less than 2%. The comparison element was Ni. Method 2 guarantees approx. the same accuracy in detg. Na and Mg (concn. range of the latter 0.1–0.8%) in an arc and Al in a spark as there is in an analysis with a fulgurator; however, the consumption of time and materials for prepg. electrodes in this case is greater. Method 3 makes it possible to det. Al in an arc within 3%, and in a spark somewhat more accurately. Accuracy is attained by prepg. the electrodes from one, large, uniform, piece of C 1st roasted in an oven at 400° in order to increase its adsorption capacity. In some cases roasting can be replaced by washing in alc. Prepn. of the electrodes is simple. Repeated utilization of the electrodes is possible. Method 4 guarantees high sensitivity in detg. Al in the arc source, but poor accuracy (8%). Reproducibility depends greatly on phys. properties of the C. Best results are obtained with soft, fresh carbons. In a spark, accuracy is higher (2%), sensitivity is lower; differences in phys. properties of the carbons do not show in the analysis results. Comparative intensity of lines does not depend on amount of soln. applied on the electrode. Prepn. of electrodes is simplest here. The conclusion is reached that for analyzing solns. in an arc the most suitable method is 3, for analysis in a spark, 4. It is noted that each of the 4 methods studied is sufficiently accurate when expts. are carried out carefully.

4258. BOROVIK, S. A.
Use of Spectrographic Analysis for the Quantitative Determination of Alkalies in Rocks.
Doklady Akad. Nauk S.S.S.R., **89**, 333–4 (1953).
C. A., **49**, 10794d (1955).

A number of problems connected with prospecting for certain types of mineral raw materials (e.g., diaspore) required means for distinguishing sericitic from pyrophyllitic varieties. While this could be done by microscopic or by chem. methods, these were too troublesome and time-consuming, considering the large number of samples involved. The spectrographic method developed for detg. small amts. of Na and K used a glass optical system of Russian make adapted for use with spectral lines in the infrared region, which were photographed on commercial plates sensitized for 8500–6800 Å., 6800–5500Å., and 5500–4500 Å. The lines were generated by a stabilized carbon arc operating at 12 amp., the 15-mg. sample being placed in a 4-mm. depression of 3 mm. diameter in the lower carbon, and exposed for 50 seconds. For sodium the lines 5889.8 and 8183 Å. (the first for low concentrations, the second for concentrations from 0.1 to 5.0%), and for K, line 7664.9 Å., were measured photometrically. As a control, the following lines could be used: the sodium doublet 5890 present at 0.0002% Na; the doublet 3302 at 0.005% Na; and the doublet 2853 at 0.2% Na. For K, the following can be used—7664.9 at 0.001% K, and 5802 Å. at 3% K.

4259. BRANNOCK, W. W. AND BERTHOLD, S. M.
Determination of Sodium and Potassium in Silicate Rocks by the Flame Photometer.
U. S. Geol. Survey, Bull., **992**, 1–14 (1953).
C. A., **48**, 2514e (1954).

To 0.5000 g. of sample (100 mesh or finer) in a 100-ml. Pt crucible add 6 ml. of 18 *N* H_2SO_4 and approx. 25 ml. of 27*N* HF. Cover and digest overnight or heat until the sample is decompd. Remove and rinse cover, and evap. Add 5 to 10 drops HNO_3 and heat until fuming ceases, then heat to fumes of H_2SO_4. Cool, add water, then digest to dissolve the residue. Cool and dil. to approx. 180 ml. Add NH_4OH until basic to litmus, then add approx. 0.5 ml. freshly prepd. concd. $(NH_4)_2CO_3$ soln. Dil. to 200 ml. in a volumetric flask. Filter 75 to 100 ml. of soln. through Whatman No. 40 filter paper. Withdraw a 50-ml. aliquot and add exactly 50 ml. of $LiNO_3$ soln. contg. approx. 200 p.p.m. Li. Det. Na and K in a flame photometer. A special atomizer is described for the Perkin-Elmer Model 52A flame photometer.

4260. BREHM, R. K. AND FASSEL, V. A.
A New Approach to Direct-Reading Spectrochemical Analysis.
J. Opt. Soc. Amer., **43**, 886–9 (1953).
C. A., **48**, 44e (1954).

A preliminary note on the design and performance of a new type of direct-reading instrument for spectrochem. analysis is presented. A single multiplier phototube is

used in combination with a rapid-scanning spectrometer. As the spectral lines cross the single exit slit, voltage pulses are generated by the phototube and are panoramically presented on an oscilloscope, whose time-base is synchronized with the spectrum scan. The pulse heights are measured by converting them to "bursts" of constant amplitude pulses, whose no. is proportional to the magnitude of the original spectral line pulse. This is accomplished by means of a cathode-ray tube, a "comb-grid," and a secondary multiplier phototube. The pulse bursts corresponding to the lines whose intensity is of interest are sepd. by means of electronic gates. High-speed scalers and mech. registers indicate the time integrals of the spectral-line intensities. Intensity ratios are automatically computed after the exposure and recorded on a variable span strip chart recorder, which may be empirically calibrated to read directly in percent. Preliminary data indicate that a precision of analysis of ±1% can be achieved.

4261. BRENNER, W. AND GRALKA, C.
Flame Photometric Potassium Determination in the Serum of Normal Children.
Z. Kinderheilk., **72**, 409–18 (1953).
C. A., **47**, 5981i (1953).

Flame photometry is an easy and useful means for detg. K. The serum K in the umbilical cord varies from 14.9 to 22.1 mg.%, av. 19.3 mg.%. In infants from 1 to 16 months the values are between 16.0 and 21.5 mg. %, av. 19.34 mg.% and in children from 6 to 15 yrs. it ranges from 14.0 to 21.0 mg. %, av. 18.1 mg. %. There is no definite difference in the serum K level due to age or sex and the values in each individual are quite const.

4262. BŘESKÝ, L.
Limits of Sensitivity in Spectral Analyses of Nonferrous Metals.
Hutnické Listy, **8**, 356–8 (1953).
C. A., **50**, 7000c (1956).

Sensitivities of the detn. of the metals in various solns. are tabulated. The most favorable electrode shape was one ending in a flat surface. When the electrode diam. became too small, low results were obtained.

4263. BRIT. STANDARDS INST.
Recommended Method for the Spectrographic Analysis of Low-Alloy Steels. British Standard 1121B, 1953. 21 pp.
C. A., **48**, 1890i (1954).

Specifies the app. required (a large quartz spectrograph), the electrodes, photographic plates, and their processing. Describes the procedure, plate calibration, and standardization. Gives recommended line pairs. Si, Mn, Ni, Cr, Mo, V, and Cu can be detd.

4264. BRIT. STANDARDS INST.
Certified Samples for Metallurgical Analysis.
British Standard 1548, 1953. 6 pp.
C. A., **48**, 1890i (1954).

Describes general conditions for the prepn. of samples, and their analysis, packing, and storage.

4265. BRODERSEN, S.
Noise Filter Effects in Recording Spectroscopes.
J. Opt. Soc. Amer., **43**, 1216–20 (1953).
C. A., **48**, 2478i (1954).

The magnitude of the noise present in the signal from a spectroscope depends strongly upon the frequency-band-pass width of the amplifier. It is, therefore, possible to reduce the noise by inserting a low-pass filter. At the same time a distortion is produced in the spectrum recorded. It is shown for 2 different kinds of filter that this distortion may be divided into 2 effects: (*1*) a displacement of the spectrum as a whole, which is easily corrected for, and (*2*) a real distortion depending upon the width of the spectral lines. It is shown that the only means to limit this distortion is to scan the spectrum at a sufficiently low speed. An expression is given for this speed, which is proportional to the width of the narrowest line (often equal to the effective slit-width) and inversely proportional to the time-constant of the filter and to a constant characterizing the max. tolerable distortion.

4266. BROWN, J. A.
Lacquer Color Filters for Qualitative Flame Tests.
J. Chem. Educ., **30**, 363–4 (1953).
C. A., **47**, 9066c (1953).

Lacquer filters applied to glass plates are used in detection of Ba, Sr, Na, and K in a Bunsen flame. A nitrocellulose lacquer base is mixed with suitable dyes to provide a red-transmitting Sr filter, a green-transmitting Ba filter, and red-blue transmitting filter for K. Na is observed without a filter. Elements are reported if any flame is visible through the filters.

4267. BRYAN, F. R. AND NEVEU, C. H.
Metallurgical Microspectroscopy.
Metal Progr., **64**, No. 6, 82–5 (1953).
C. A., **48**, 1734i (1954).

Equipment is described and illustrated for microdrilling selected portions of a polished and etched surface, collecting the chips in collodion, and transferring them to a pure C electrode for analysis in a standard arc. Applications to inclusions and electrode-deposited coatings are cited.

4268. BUCCHERI, R. T.
Spectroscopic Analysis of Manganese in Aluminum Alloys.
Anais assoc. brasil. quím., **12**, 5–11 (1953).
C. A., **51**, 11927b (1957).

The analysis of Mn in Al alloys by using a

Bausch and Lomb spectrograph and an Applied Research Labs. microphotometer is described. Analysis is based on the relative optical ds. of the Al 2669.26-Å. and Mn 2688.24-Å. bands. Results are compared with chem. analysis, and the causes of spectroscopic errors are discussed.

4269. BÜCKERT, H.
New European Apparatus for Spectrochemical Emission Analysis.
Österr. Chem.-Ztg., **54**, 202–9 (1953).
C. A., **47**, 10910b (1953).

New com. models of controlled-spark and interrupted- arc generators, a projection-comparison densitometer, and a Féry prism spectrograph are described (Cf. *C. A.*, **47**, 357a). A direct-reading, single-prism spectrograph features a lever-operated mirror arrangement which can be moved into the light path; this allows the instrument to be used also as a photographic spectrograph. Six to eight phototube receivers are normally used, although as many as 12–14 can be accommodated. Calibrated clocks indicate the amt. of elements present in the sample, and these can be photographed after each analysis for a permanent record. The use of logarithmic clock scales is said to make fewer calibration standards necessary. All clock mechanisms are driven by a quartz crystal oscillator to assure const. frequency operation. The use of this spectrograph as a direct-reader provides a lower analytical limit of 0.001-0.008% for the elements detd. It can be used in the analysis of steel and cast iron, as well as Cu, Al, and Zn alloys. Cf. *C. A.*, **46**, 8525g.

4270. BURRIEL MARTÍ, F. AND JIMÉNEZ GÓMEZ, S.
Spectrographic Analysis of Nickel, Cobalt, Zinc, and Molybdenum in Soils and Plants. I. Study of "Diluting Substances."
Anales edafol. y fisiol. vegetal (Madrid), **12**, 43–53 (1953).
C. A., **47**, 6818f (1953).

The sensitivity and precision obtained with the use of diluents in analyzing spectrographically soils and plants for Ni, Co, Zn, and Mo were studied. The diluents used were CuO, $BaCO_3$, $CaCO_3$, $Ca_3(PO_4)_2$, $Na_2H_2P_2O_7$, and NaCl. Four tables show the sensitivity in each case.

4271. BURRIEL MARTÍ, F. AND JIMÉNEZ GÓMEZ, S.
Interferences in the Simultaneous Spectral Determinations of Nickel, Cobalt, Zinc, and Molybdenum Caused by the Same Elements. II.
Anales real soc. españ. fís. y quím. (Madrid), **49B**, 199–204 (1953).
C. A., **47**, 7939c (1953).

Spectrochem. behavior was studied in a diluent of CuO. In the presence of Zn a decrease in the line intensities of Mo was noted. Better precision in Mo detns. was obtained with a mixt. of $BaCO_3$ and NaCl as diluent, but concns. below 31.6 p.p.m. did not register. Cf. *C. A.*, **47**, 4243d.

4272. CALKER, J. VAN
Problems of Light Excitation in Electrical Sparks.
Spectrochim. Acta, **5**, 476–82 (1953).
C. A., **47**, 11954b (1953).

For a spectrochemical detn. of the components of an alloy the parameters of the spark source are of fundamental importance. This becomes evident from measurement of variation of the intensity of the lines with time during a single spark. By variation of the compn. of the alloys the effect of the different alloy components on the line intensity-concn. curve can be observed. These can be related to the metallographic behavior of the alloys, as deduced from the equil. diagram.

4273. CAMBEL, B. AND KUPČO, G.
The Geochemical, Genetic, and Geological Relations in the Ore Deposits of the Little Carpathians.
Geol. Sborník, **3**, 135–92 (1953).
C. A., **49**, 3744c (1955).

Two distinct phases of mineralization, not previously recognized, are distinguished. The older, related to gabbroic intrusives, consists of pyrite pyrrhotite deposits; the younger, related to granitic rocks, includes Au and stibnite deposits. Qual. spectrographic analyses are given of 131 rocks and minerals, including quartz, ankerite, pyrite, pyrrhotite, sphalerite, and stibnite.

4274. CANODY, L. J., HARRIS, T., JR., and WOODRUFF, J. E.
The Influence of Varying Amounts of Elements in Steel and Cast Iron on Spectral Intensity.
J. Opt. Soc. Amer., **43**, 145–8 (1953).
C. A., **47**, 3754g (1953).

Many investigators have shown that the intensity of a spectral line or the intensity ratio of element to be analyzed to internal standard is influenced by other constituents that make up the sample. The present studies were undertaken to evaluate the effects upon spectral intensity of varying amts. of residual and alloying elements in cast irons and steels as they would occur in production. Some sixty standard samples of steel and cast iron supplied by the National Bureau of Standards were used in these studies. Spectroscopic electrodes were made of these samples by compressing chips in a $^1/_4$-in. diam. mold at 10,000 lb. pressure. The spectrum characteristic of two such electrodes excited in a.-c. arc of 2200 v. and 3 amp. was photographed with a 3-m. concave grating spectro-

graph. The Fe line at 3173.41 Å. was selected to represent the over-all intensity of the spectrum for each exposure. The intensity of this line was detd. in terms of percent transmission. It was found that the spectral intensity varies inversely as the per cent of P in cast irons, and inversely as the Cr content in high and low alloy steels. For all basic open-hearth, acid open-hearth, ingot iron, Bessemer, and basic electric steels, the spectral intensity varied directly as the C content.

4275. CAROBBI, G., PIERUCCINI, R., AND BALDANZA, B.
Spectrographical Traces of Mercury in Sicilian Celestite.
Atti soc. toscana sci. nat (Pisa), Ser. A, Mem. **60**, 13 pp. (1953). (Reprint.)
C. A., **48**, 12622b (1954).

In 34 of 37 celestite samples from Silician S mines, amts. of Hg averaging 0.0001% were spectrographically detd. In 13 samples Cu traces were also found. The authors think that this is a case of pseudoisomorphism due to the likeness of ionic radii of Sr and Hg.

4276. CARPENTER, R. O'B. AND WHITE, J. U.
Double-beam Densitometer and Comparator.
Anal. Chem., **25**, 1473–7 (1953).
C. A., **48**, 3726i (1954).

A double-beam densitometer is described which has a servotype automatic balancing system, a scale linear in d. from 0 to 2.0, and a projection comparator. The system contains a precision logarithmic aperture in a circular form and a special electronic system. The densitometer is easily converted from nonrecording to recording and may be connected to a standard strip chart recorder. The uncertainty in d. is less than ±0.003 d. unit, corresponding to a relative accuracy of 0.7% of the transmittance, and this precision is obtained at all ds. from 0 to 2.0.

4277. CHALMERS, T. W.
A Short History of Spectroscopy. Early Days of Spectroscopy.
Engineer, **196**, No. 5089, 166–8 (1953).
C. A., **47**, 11966d (1953).

Exploration of the Ultraviolet and Infrared Regions. Ibid., No. 5090, 194–5. Theory of the Prism. Ibid., No. 5091, 226–7. Theory of the Interferometer. Ibid., No. 5093, 290–1. Limits of Transparency. Ibid. No. 5094, 328–9. Selective Reflection. Ibid. No. 5095, 359–60. Stefan's Law of Total Radiation. Ibid., No. 5096, 386–7. Measurement of Energy Distribution in the Spectrum. Ibid., No. 5097, 418–19.

4278. CHEN, P. S., JR. AND TORIBARA, T. Y.
Determination of Calcium in Biological Material by Flame Photometry.
Anal. Chem., **25**, 1642–4 (1953).
C. A., **48**, 2804h (1954).

A study of the interference problems. Ca can be detd. in blood serum (I), serum ultrafiltrate (II), and urine (III) by comparison with a suitable standard in a flame photometer at 620 mμ. Because the proteins in I eliminate the quenching effect produced by the usual concns. of phosphate, I can be used directly (with attention to Na effects). In II, correction for phosphate quenching is necessary; in III preliminary isolation of Ca as the oxalate is recommended. Oxalate, sulfate, NH_4^+, and bicarbonate do not interfere; nor does Mg coming down with the Ca oxalate. If only a small sample of III is available, or if Na and K, as well as Ca, are to be detd.; acidified, dild. III is used directly in the flame photometer. In routine work the method is accurate to within ±3–4%.

4279. CLAFFY, E. W.
Composition, Tenebrescence, and Luminescence of Spodumene Minerals.
Am. Mineralogist, **38**, 919–31 (1953).
C. A., **48**, 12623b (1954).

Spectrochem. analyses are given for 10 samples of various colors. Green chromian spodumene is neither luminescent nor tenebrescent; varieties free from Cr, whether colorless, pink, lilac, or green, fluoresce under excitation at 3650 Å.; they turn green when irradiated and become colorless on exposure to light or when heated to 500°. Absorption spectra are recorded for samples before and after irradiation by X-rays and after bleaching by light. Notable changes at about 2500 and 6400 Å. may be due to Mn and Cr, resp.

4280. CLIFFORD, P. A.
Report on Sodium in Foods.
J. Assoc. Offic. Agr. Chemists, **36**, 594–6 (1953).
C. A., **48**, 8971g (1954).

A partial review of the literature and the results of C. show the variations of Na content of different foods. The importance of the measurement of Na content in foods and the development of methods are outlined. Flame photometric methods were used on 2 flame instruments, Perkin-Elmer Model 52C and Beckman Du Spectrophotometer. Na results agree quite well. The Mg-uranyl acetate method fails for very small amts. of Na, especially with the high ratio of K present.

4281. CLOSE, P., SMITH, W. E., AND WATSON, M. T., JR.
Determination of Magnesium Oxide by Hydrogen Flame Spectrophotometry.
Anal. Chem., **25**, 1022–5 (1953).
C. A., **47**, 11077d (1953).

By using a Beckman DU spectrophotometer with a H flame attachment, MgO can be detd. quickly and accurately. Results in the range 0.5–6.0% MgO agree favorably with gravimetric methods. Even results above 6.0% are of some practical value.

4282. COATS, R. R.
Geology of Buldir Island, Aleutian Islands, Alaska.
U. S. Geol. Survey Bull, No. 989–A, 26 pp. (1953).
C. A., **47**, 9869h (1953).

Chem. and spectrographic analyses, norms, and Niggli values of 5 specimens of the basalts are given.

4283. COCCO, G.
Genesis of the Elba Granite Rocks: Geochemistry of Strontium and Barium.
Rend. soc. mineral. ital., **9**, 48–77 (1953).
C. A., **48**, 2533d (1954).

In 16 samples of granite rock from the central part of Mt. Capanne and from the boundary parts (in contact with limestone, schists, diabase, and serpentine rocks), the Ba, K_2O, Sr, CaO, Fe_2O_3, TiO_2, and MgO contents (Ba and Sr detd. spectrographically) were 0.014–0.132, 4.08–12.43, 0.008–0.028, 1.72–2.87, 0.10–3.67, traces–0.35, 0.37–1.50%. The ratios Sr/Ba, Sr/Ca, and Ba/K were rather const. in the various samples. Statistical considerations on the data reveal no dependence of the amts. of the elements from the location of the samples, elements from the contact rocks having not been assimilated. From the chem. compn. and the ratio Sr/Ba, C. thinks that either the granite did not originate from a granite magma or it reacted in depth with carbonate sedimentary rocks.

4284. CONWAY, J. G. AND FRED, M.
Isotope Shift in the Plutonium Spectrum.
J. Opt. Soc. Amer., **43**, 216 (1953).
C. A., **47**, 5249e (1953).

Isotope shifts were measured in the spark spectra of enriched samples of Pu. One sample was a mixt. of isotopes 238 and 242, another contained 240 and 239, and essentially pure Pu^{239} was used as a reference. Data are given for 27 lines between 3370.26 and 4021.42A. The shifts range from -98 to $+225 \times 10^{-3}$ Å.

4285. COOLEY, M. L.
Determination of Calcium in Feeds by Flame Photometry.
Cereal Chem., **30**, 39–47 (1953).
C. A., **47**, 3490e (1953).

The feed ash is dissolved in dil. HCl. A large excess of phosphate is added and the soln. made to vol. This soln. was atomized through the burner and the intensity of the flame measured at 622 mμ. By the addn. of phosphate to bring the P to Ca ratio to 10:1 or more there was no increase in depressing effect on the emission spectrum of Ca. Under these conditions, Na, K, Mg, and Mn ions may be present in concns. several times greater than that of Ca without effecting the accuracy of the detn. The interference of Co, Cu, and Fe was small when present in concns. lower than that of Ca as in the case of the ash of feeds. The effect of Na (strong emission band at 589 mμ) is mitigated by insertion of a didymium filter in the path of the light reaching the phototube. The replicate detns. check each as well or better than chem. procedure. Less time and expense are necessary. The results compare well with those by the A.O.A.C. oxalate pptn. method.

4286. COOLEY, R. A., MARTIN, A. V., FELDMAN, C., AND GILLESPIE, J.
The Hafnium to Zirconium Abundance Ratio and Specific Radioactivity of Some Ores.
Geochim. et Cosmochim. Acta, **3**, 30–3 (1953).
C. A., **47**, 5330i (1953).

Spectroscopic examn. of 14 samples gives ratios varying from 0.0078 to 0.068.

4287. CORLISS, C. H., BOZMAN, W. R., AND WESTFALL, F. O.
Electrodeless Metal Halide Lamps.
J. Opt. Soc. Amer., **43**, 398–400 (1953).
C. A., **47**, 6762i (1953).

The at. spectra of metals of high m.p. can be excited in electrodeless lamps if a volatile salt of the metal is introduced into the lamp together with a noble gas at a pressure of a few mm. Hg. The lamps are simple prepd. from lengths of Pyrex or Vycor tubing, excited with microwaves, and produce sharp spectral lines free from self-reversal. Lamps were prepd. which emit at. spectra of Be, Ti, Fe, Ni, Cu, Mo, and U.

4288. CORNU, A.
Quantitative Spectrochemical Analysis Using a Slit-less Spectrograph. I, II.
Cahiers phys., No. **44**, 74–80, No. **45**, 1–28 (1953).
C. A., **48**, 6169c (1954).

A spectrograph utilizing a polished cylinder in place of a slit is described. The application of the instrument to spectrochem. analysis is discussed.

4289. CROOKS, R. C.
Determination of Potassium in Mixed Fertilizers.
J. Assoc. Offic. Agr. Chemists, **36**, 891–8 (1953).
C. A., **48**, 9603e (1954).

A rapid and accurate flame photometer method, with wavelength of 767 mμ, for detn. of K compared favorably with the A.O.A.C. method. For screening mixed fertilizers the method reduces the cost of each analysis in man hrs. and eliminates the expensive Pt.

4290. CUNDALL, C. M. AND CRAGGS, J. D.
Photoelectric Spectroscopy of Transient Discharges.
Spectrochim. Acta, **5**, 452–9 (1953).
C. A., **47**, 11953c (1953).

Details are given of various optical techniques used with photomultiplier tubes in the measurement of the relative intensities of

spectral lines in the emission spectra of transient discharges, notably sparks lasting a few microsec.

4291. CURTIS, D. AND HOUSER, S. S.
Bibliography of U. S. Geological Survey Trace Elements and Related Reports.
U. S. Geol. Survey Circ., No. **281**, 1–21 (1953).
C. A., **47**, 11089e (1953).

This is a list of papers, mostly dealing with the geology, mineralogy, and analytical chemistry of radioactive materials.

4292. CYPRES, R.
Spectrographic Analysis of Thorium and the Preparation of Nuclear Pure Thorium Oxide.
Bull. centre phys. nucléaire univ. libre Bruxelles, No. **40**, 19 pp. (1953).
C. A., **47**, 11074b (1953).

Entrainment distn. of Th, Zr, and Ta into the arc is used for the spectrographic analysis of these metals. From 1 to 4% of Ga_3O_4 in the sample mixt. is used as the entraining agent. This method is applicable to elements having highly refractory oxides which are not reduced bv C in the arc. Detn. of Ag, Al, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Fe, Li, Mg, Mn, Ni, P, Pb, Tl, V, and Zn are described when present in Th; and qual. tests are described when present in Zr and Ta. Sufficiently pure salts to serve as standards would serve for detg. these elements in Zr and Ta. The sensitivity of detection of the above elements are given. This method of analysis is used to follow the purification of Th by liquid extn. with org. liquids. The solvents studied were Et_2O, isoBuCoMe, mesityl oxide, AmOAc, iso-PrOAc, and BuOAc. It is possible to prepare a nuclear pure ThO_2 or Th $(NO_3)_2$ by starting with a tech. grade of salt. If large amts. of impurities are present, however, the extn. process does not produce a nuclear-pure product probably because the presence of various metallic nitrates in soln. changes the distribution coeff.

4293. DANILOVA, V. I.
Spectrum Analysis of Slags.
Trudy Sibir. Fiz.-Tekh. Inst. Tomsk. Univ. 1953, No. **32**, 99–109.
Referat. Zhur., Khim. 1954, No. **48562**.
C. A., **50**, 4704f (1956).

In spectroscopic analysis of slags for Sn, Al, Ca, Fe, Si, and W a sample was placed in a 3 × 2 mm. opening in the C anode and then burned completely. The slag sample contained 20% C powder and 20% Cu as CuO used as an internal standard. The sample was ignited preliminarily for 27 sec. and the exposure lasted 2 min. 45 sec. The 6-amp. arc had an addnl. capacitance of 18 microfarads, distance between electrodes was 2 mm. In the analysis of slags for 0.11–0.78% Sn the lines Sn/Cu 2840/2825 and 2863/2825 (relative error 25–50%) were used; for 0.11–20% Sn the error was approx. 100%; for 1.5–20% Sn with the Sn/Cu lines 2572/2492 the error was ±20–25%. In the analysis of slagging materials for Si detd. from the lines Si/Cu 2881/2825 the relative error was 3.6% and for the lines 2528/2492 it was approx. 10–15%. For Fe detd. from Fe/Cu 3047/3064 it was 30%, for Ca detd. from 3158/3108 it was 20%, and for Al detd. from Al/Cu 3082/3108 the relative error was 18%. The method of complete combustion was used only for preliminary analysis of slags for Sn, Fe, Ca, Al, and Si.

4294. DAVID, D. J. AND OERTEL, A. C.
A Trial of Statistical Techniques in Assessing Spectrographic Influence of Basic Composition.
Australian J. Appl. Sci., **4**, 235–43 (1953).
C. A., **47**, 9847h (1953).

A study of the influence of K and Ca in a plant ash on the emission by 4 minor components, viz. Cu, Mn, Mo, and Sn. Emission by Cu and especially by Mn was dependent on the basic compn., the influence of which varied with the level of concn. of the minor component. Emission by Mo and Sn was slightly dependent on the basic compn. The use of powd. graphite as a buffer was beneficial for Cu but harmful for Mn, Mo, and Sn. The results are interpreted in terms of the temps. of the sample crater and the arc stream of the d.-c. arc source.

4295. DESCAMPS, J.
Microspectrographic Analysis of Metals and Alloys.
Recherche aéronaut., No. **32**, 39–49 (1953).
C. A., **47**, 7368i (1953).

A review with 31 references.

4296. DESPAUL, J. E., WEISSMAN, H. B., AND BARSKY, M. H.
Comparison of Results of Analyses for Potassium in Jam and Jelly by the Chloroplatinate and Flame Photometer Methods.
J. Assoc. Offic. Agr. Chemists, **36**, 1083–7 (1953).
C. A., **48**, 14029i (1954).

Flame photometry was found to be readily adaptable to the detn. of K in jams and jellies. The procedure offers a great saving of time over conventional methods. Since ashing is unnecessary and sample solns. are passed through the instrument directly, basic data for K are obtained in about 10 min. per detn. Comparative results for K in fruit spreads obtained by flame photometry and by the official chloroplatinate procedure are presented and are in fair agreement.

4297. DEWEY, R. D.
Direct-Reading Calculator.
Appl. Spectroscopy, **7**, No. 2, 87–8 (1953).
C. A., **47**, 10910g (1953).

With former equipment for spectrochem. analysis by photographing spectra, the light transmissions of spectral line images have been converted to intensity ratios on a calcg. board and then manually plotted to produce a working curve for deriving percentage compn. A new calculator has been designed to provide means of plotting directly film transmission vs. percentage compn. with proper allowance for variables such as film sensitivity and gamma, background, exposure index, and other shifts of analytical curves.

4298. DIAMOND, J. J. AND BEAN, L.
Improvements in Flame Photometric Determination of Sodium in Portland Cement.
Anal. Chem., **25**, 1825–30 (1953).
C. A., **48**, 3256i (1954).

Flame photometers having wide effective band widths give low, often neg., results in the detn. of Na because Si inhibits the emission of Ca in the 589 mμ region. The magnitude of the error is a function of the ratio of light caused by Ca to that caused by Na which strikes the photocell. Increased accuracy is obtained by using a multilayer interference filter to narrow the effective band width of the instrument or by removing the Si from the cement prior to the detn. of Na. The use of both techniques converts the current routine procedure into one which gives results in agreement with those from the gravimetric Smith method when the Barclay, the Beckman DU, or the Perkin-Elmer flame photometer is used. The modified procedure seems warranted for referee analyses.

4299. DIXON, K.
Tungsten Steels-Rapid Method of Spectrographic Analysis.
Iron and Steel (London), **26**, 220–6 (9153).
C. A., **47**, 6819g (1953).

A flat surface sparking technique is outlined for the rapid detn. by spectrographic analysis of W and its accompanying constituents in tool steel. Compn. ranges of W 5–22, Co 0.1–20, Cr 2.0–6.0, V 0.1–4.0, Mo 0.1–6.0% and of the usual values for Mn and Si are covered. The light emitted from the discharge is integrated by a vacuum phototube (blue sensitive) to maintain const. d. spectrograms. By using the concn. ratio method all types of high-speed tool steels, except those with 3.0–5.0% V, can be analyzed from a single set of curves. Data are included on the effects of available sparking area, sample, size, and heat-treatment on the stability of these curves.

4300. DOORSELAER, M. VAN, KRUSE, J., AND GILLIS, J.
Spectrochemical Analysis of Copper and Bronze by the Copper Oxide Spark Technique.
Spectrochim. Acta, **5**, 388–96 (1953).
C. A., **47**, 6817i (1953).

Some variables in the CuO spark technique were studied. A cavity of 4.5 mm. diameter and 3 mm. depth is drilled in 6 mm. graphite electrodes and entirely filled by 60 mg. of oxides. A high inductance, 0.8 millihenrys, i.e., higher than usual in this spark technique, was found to produce a steady and arclike spark, the intensity of which decreased slowly and almost linearly, as a consequence of the regular ejection of the oxide powder out of the electrode. Capacitors up to 0.0166 microfarads were added to the Feussner spark app. by means of which the spectral intensity and the sensitivity of detection of the minor constituents was considerably increased. Suggestions are given for the choice of line pairs. Working curves are drawn for analyzing 10 minor constituents down to 0.01% in Cu and bronze by using a small dispersion spectrograph. This method is particularly suited for the analysis of archeological bronzes, when samples of about 50 mg. can be taken.

4301. DRAGUNOV, V. I. AND KATCHENKOV, S. M.
Celestite and Barite from Neogenic Sediments of South Mangyshlak.
Doklady Akad. Nauk S.S.S.R., **93**, 315–18 (1953).
C. A., **50**, 5471c (1956).

Quant. spectroanalytical data are given for the sulfate minerals; they show that not only pure celestite and barite occur but also barite-celestite solid solns. (*See C. A.* for complete abstract.)

4302. DUNKER, E.
A Burner for Flame Photometer.
Klin. Wochschr., **31**, 280–1 (1953).
C. A., **47**, 7014e (1953).

App. is described.

4303. DVOŘÁK, M.
Determination of Silicon in Steel.
Hutnické Listy, **8**, 355–6 (1953).
C. A., **50**, 7008g (1956).

To speed up the fabrication of samples into electrodes, Al counter-electrodes were used, and the samples were not polished. Presparking time was also reduced.

4304. DYROFF, G. V., HANSEN, J., AND HODGKINS, C. R.
Comparison of Spectrochemical and Semimicromethods in the Analysis of Petroleum Ashes.
Anal. Chem., **25**, 1898–1905 (1953).
C. A., **48**, 4209c (1954).

Samples of ashes from various petroleum fractions were analyzed by spectrochem. and semimicroprocedures, and the data obtained were subjected to a statistical evaluation. A spectrochem. procedure was developed with a Li_2CO_3 graphite matrix with a Co internal standard. Samples were burned and ignited in a muffle at 550°. Samples were excited in the a.-c. arc, and spectra were photographed

with a 1.5-m. grating spectrograph. Three methods of dissolving the samples for the semimicromethod were studied statistically: (1) The sample was fused with Na_2CO_3; the melt was leached with water; and the insol. residue was digested with concd. HCl. (2) The sample was digested with 18*N* H_2SO_4 and the insol. residue was fused with $K_2S_2O_7$. (3) The sample was water leached and the residue was fused with Na_2CO_3. The melt was dissolved in water and any residue was fused with $K_2S_2O_7$. Procedure 3 was chosen. Fe, Na, Ni, and V were detd. by the semimicro- and spectrochem. methods.

4305. ÉFENDIEV, F. M.
Development of a Combined Spectrochemical Method of Analyzing Ores and Rocks for Trace Elements. I. Method of Determining Antimony, Tellurium, Germanium, Chromium, and Cadmium.
Trudy Inst. Fiz. i Mat., Akad. Nauk Azerbaĭdzhan, S.S.R., **6**, 3–20 (1953).
C. A., **50**, 1523h (1956).

The method consists of dissolving the mineral in an appropriate solvent and then spectrographically analyzing the extract. A comprehensive table of spectrographic data is given for each of these elements, including wave lengths and intensities of emissions from elements interfering with each line. Recommended solvents for each element are: Sb, H_2SO_4; Te, HCl + HNO_3; Ge, H_2SO_4; Cr, Na_2O_2 fusion; Cd, HCl + HNO_3. (Sb and Ge form volatile compds. with HCl.)

4306. EICHHOFF, H. J., DITTMANN, G., AND CREMER, H. D.
Spectrochemical Determination of Magnesium in Teeth.
Biochem. Z., **324**, 32–5 (1953).
C. A., **47**, 12487g (1953).

A method is described by means of which the Mg content of teeth can be detd. with an accuracy of ±5 to ±7%.

4307. ELLENBURG, J. Y. and OWEN, L. E.
Spectrochemical Analysis of Beryllium in Biological Tissue.
Arch. Ind. Hyg. Occupational Med. **7**, 503–7 (1953).
C. A., **47**, 12478a (1953).

The Be content of tissues can be detd. by comminution in a blender in a ratio of 5 g. tissue to 20 ml. EtOH, filtering through Whatman No. 4 paper, evapg., combining the residue with remaining solids, wet ashing with 30% concd. H_2SO_4-70% concd. HNO_3, drying, dissolving in 6.2 *N* HCl, extg. with Et_2O, adjusting the pH to 6.2 with $NH_4C_2H_3O_2$, copptg. with Ge, mixing the ppt. with powd. graphite, adding MoO_3 as internal standard, placing in electrodes, and arcing in a controlled atm. of 80% He and 20% O_2. The method has a sensitivity of 5×10^{-10} g. Be.

4308. ELLIOTT, H. C., JR. AND HOLLEY, H. L.
Flame Photometric Determination of Serum Sodium and Potassium Using Small Quantities of Samples.
J. Alabama Acad. Sci., **23–24**, 39–40 (1953).
C. A., **47**, 9401c (1953).

A modification of the technique of Mosher, *et al.* (*C. A.*, **43**, 5441g) permits detns. of Na and K on 0.1–0.2 ml. of serum or plasma. Results are reproducible within the limits of clinical requirements.

4309. FAIRBAIRN, H. W., AHRENS, L. H., AND GORFINKLE, L. G.
Minor-Element Content of Ontario Diabase.
Geochim. et Cosmochim. Acta, **3**, 34–46 (1953).
C. A., **47**, 5325d (1953).

Ni, Co, V, Cr, Cu, Ag, Pb, Sc, Zr, La, Ga, Sr, Ba, Li, Rb, and K were detd. in 59 samples of Ontario diabase and 3 samples of Duluth gabbro. The data are given in the form of frequency distribution diagrams. Ga shows the most uniform distribution, while Cr shows the largest scatter. The Sc abundance is higher by a factor of 3 than earlier analyses indicate.

4310. FASSEL, V. A., HOWARD, M., and ANDERSON, D.
Conducting Briquet Technique of Spectrographic Analysis.
Anal. Chem., **25**, 760–3 (1953).
C. A., **47**, 8576e (1953).

The refractory nature of Zr in spectrographic analysis is overcome by the use of the conducting briquet technique. Conducting briquets are made from powd. flake graphite. The excitation is provided by a unidirection, high-energy, overdamped-condenser discharge. Al, Ca, Cr, Cu, Fe, Ni, Mg, Si, and Ti have been detd. with a coeff. of variation ranging from 3.1 to 6.9%. These values agree very well with those obtained spectrophotometrically.

4311. FERGUSON, M. H. and KAY, L. A.
Sodium Concentration in Drinking Water and Other Fluids and Its Significance in Restricted Sodium Intake.
Can. Med. Assoc. J., **69**, 491–3 (1953).
C. A., **48**, 6055h (1954).

The concn. of Na in water and various beverages sampled in southern Manitoba was detd. by flame photometry or by a gravimetric method. Of 165 water samples 62% had Na levels below 100 p.p.m. Of those contg. more than 50 p.p.m. (13) the highest had a concn. of 2900 p.p.m. The beverages made with local water supplies showed similar variations in Na concn. The importance of these sources of Na for patients on restricted diets is considered.

4312. FINKELSTEIN, N. A.
Measurement of Wavelength in Echelle Spectra.
J. Opt. Soc. Am., **43**, 90–96 (1953).

Echelle spectrographs produce a two-dimensional array of spectral lines, and therefore present a new problem in the detn. of wavelengths. A system has been developed for detg. the wavelengths of spectral lines in an echellogram produced on the Littrow echelle spectrograph to an accuracy of about 1 part in 100,000 which is more than sufficient for routine line identification. Additional effort will make possible improvement in wavelength precision.

4313. FORD, O. W.
Report on Potash.
J. Assoc. Offic. Agr. Chemists, **36**, 649–54 (1953)
C. A., **48**, 9001f (1954)
Cf. *C. A.*, **47**, 2918f.

Twenty-five collaborators reported results on 4 samples for K with the flame photometer in comparison with the official A.O.A.C. and the modified Perrin wet-digestion methods (details given). All 3 methods were in good agreement on sample No. 1 (KCl). The flame photometer results were higher on the 3 mixed fertilizers than those obtained by the other 2 methods, which may be due to effect of other elements on the emission intensity. The flame photometer shows promise as a rapid method for the detn. of K in fertilizers.

4314. FREDERICKSON, L. D., JR.
The Effect of Electrode Bottom Thickness in Spectrochemical Analysis by the Porous-Cup Electrode Technique.
Appl. Spectroscopy, **7**, No. 1, 19–20 (1953).
C. A., **47**, 6192h (1953).

Expts. with solns. of Fe, Ni, Cu, Mn, Cr. and Al in HCl in graphite-cup electrodes of 1-, 2-, and 3-mm. bottom thicknesses show that intensity ratios of the element to Al lines increase or decrease with changing bottom thickness for the various ions. It is concluded that a constant bottom thickness should be used in porous-cup electrodes for spectrochem. detns.

4315. FUKUDA, T. AND MOTOICHI, M.
The Mineral Substances Present in the Various Organs and Tissues of the Silkworm, *Bombyx* Mori.
Sericult. Sci. Japan, **22**, 243–7 (1953).
C. A., **48**, 10942b (1954).

Na, K, Mg, Ca, P, Si, Cu, Mn, Zn, Fe, Al, Ti, V, Ag, Sr, Sn, Pb, Ni, and B were found spectrographically in the silkworm at the 5th instar and Na, K, Mg, Ca, P, Si, and Cu were always common to the various organs and tissues. The ash compns. are given quantitatively for each of the organs and tissues.

4316. GALAKHOVSKAYA, T. V.
Spectroscopic Determination of Small Quantities of Copper, Lead, Manganese, Iron, and Nickel in the Soluble Portion of Halite, Sylvite, and Sylvinite.
Trudy Vsesoyuz. Nauch.-Issledovatel. Inst. Galurg. **1953**, No. **27**, 230–8.
Referat. Zhur., Khim. **1954**, No. **45113**.
C. A., **50**, 724i (1956).

The heavy metals in the sol. portions of these minerals were detd. in a ISP-22 spectrograph by using an a.-c. arc between C electrodes. The satd. soln. to be analyzed was placed on the flat surface of a C plate which was the lower electrode and slowly evapd. so as to obtain a uniform, thin layer of salt. The lower electrode was moving at a rate of 10 mm./min., the width of the slit being 0.03 mm., current 6.5 amp., exposure time 1 min. For construction of calibration curves satd. solns. of the pure salt were used with admixt. of the sought microcomponents (1×10^{-3}, 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} % dry salt basis). For each 100 ml. of the standard soln. was added 1 ml. of 2% $(NH_4)_2MoO_4$ as internal standard. For the detn. of Ni (3414.8 Å.) and Cu (3158.2 Å), Mo 3158.2 Å. was used and for Pb (2833.1 Å), Mn (2798.3 Å), and Fe (2599.4 Å). Mo 2816 Å. was used. The calibration curves for NaCl, KCl, and NaCl + KCl practically coincided. The sensitivity limit for Cu, Mn, and Pb was 10^{-6} %, and 10^{-4} % for Fe and Ni on the dry salt basis. The results of spectroscopic analysis of halite, sylvite, and sylvinite agreed satisfactorily with the results of colorimetric analysis.

4317. GAMMON, N., JR., HENDERSON, J. R., CARRIGAN, R. A., CALDWELL, R. E., LEIGHTY, R. G., AND SMITH, F. B.
Physical, Spectrographic, and Chemical Analyses of Some Virgin Florida Soils.
Florida Agr. Expt. Sta. Bull., **524**, 5–124 (1953).
C. A., **48**, 14070h (1954).

The pH, moisture equiv., soln. losses, org. matter, total N, P, base-exchange capacity, exchangeable bases (Ca, K, Mg), Sr, Ba, Fe, V, Cr, Mn, Ni, Zr, Cu, Ti, Co, Pb, B, and Zn content of Florida soils were detd. Moisture equiv. measurements correlated well with soil texture, org. matter, and base-exchange capacity. Light-textured soils were usually lower in the less abundant elements than heavier soils. These elements often occur in highly insol. minerals, so that their mere presence does not indicate a soly. sufficient to influence crop growth.

4318. GANDON, C. AND JAUDON, É.
Polarographic and Spectrographic Identification of Cadmium in Metallurgic Products.
Compt. rend. **236**, 1166–7 (1953).
C. A., **47**, 7365f (1953).

Polarographic studies on HCl solns. of cast iron indicated the possible presence of Cd. After electrolysis of the HCl soln. on a Hg cathode it was possible to confirm this by a spectrographic test.

4319. GANTZCHOW, H.
Electrical Control of Spectrochemical Analyses.
Metall, **7**, 517–19 (1953).
C. A., **47**, 9847h (1953).

In order to increase the precision of spectrochemical detns. from sparks or a.-c. arcs., high-frequency control of the electrical current in the light sources is proposed and described. This is especially important for the analysis of trace elements.

4320. GATTERER, A.
The Carbon-Flame Method and Its Application to the Excitation of Pure Band Spectra.
J. Opt. Soc. Amer. **43**, 345–6 (1953).
C. A., **47**, 6769e (1953).

Pure C rods impregnated with salt solns. become heated to a temp. of 3000° when they carry a current of several hundred amp. and emit band spectra that are nearly free of at. lines. Though chiefly suited for oxide spectra, the method also gives spectra of fluorides, bromides, chlorides, and iodides.

4321. GAYDON, A. G.
Dissociation Energies and Spectra of Diatomic Molecules. 2nd ed.
Chapman and Hall, London (England) (1953). 261 pp.
C. A., **48**, 11198i (1954).

4322. GAYDON, A. G.
Use of Spectroscopy in Elucidating Reaction Mechanism. Selected Combustion Problems: Combustion Colloquium, Cambridge Univ., Engl.
(*AGARD, Palais de Chaillot, Paris*) **1953**, 132–43.
C. A., **48**, 10438i (1954).

Some recent exptl. developments in flame spectroscopy are discussed. Results derivable from intensity anomalies, predissocns., and continuous spectra in flames are examd. The mechanism of formation of C_2, OH, CH and HCO radicals in flames is reviewed. Several speculations on the details of the burning process are put forth. 48 references.

4323, GEFFNER, J.
Application of Statistical Methods to Problems of Standardization.
Appl. Spectroscopy, **7**, No. 1, 5–11 (1953).
C. A., **47**, 6299h (1953).

Starting with the assumption that the set of data under consideration is a random sample from a normally distributed parent population it is shown how statistics may be applied to certain problems encountered by spectrographers.

4324. GIESON, K. AND KAMPA, P.
Investigations of the Alkali Content of Refractory Materials with the Flame Photometer of Riehm-Lange.
Tonind.-Ztg. u. Keram. Rundschau, **77**, 383–8 (1953).
C. A., **48**, 3000i (1957).

The app. by Riehm-Lange yields accurate analyses when proper precautions are taken. Elimination of extraneous light, cleaning of gas and air, and fine regulation are imperative. Concn. of standard solns. should not exceed 1% for Na_2O and 4 for K_2O. Foreign elements, as Al_2O_3, and acidity must be considered when solns. are standardized.

4325. GILLIS, J. AND EECKHOUT, J.
Determination of Small Quantities of an Element in a Powder Without the Aid of Standard Samples.
Spectrochim Acta, **5**, 409–16 (1953).
C. A., **47**, 12100c (1953).

A new method of calibration for estg. an element in a powder sample without synthetic standard samples is described; it makes allowance for the possible effect of the state of combination of an element on relative line intensities, which might interfere with extrapolation from simple addn. standards. The method has been tried on a sample of graphite from nodular cast iron, and gave a working curve for the estn. of 0.1–1% Mg in graphite.

4326. GINZBURG, A. I. AND BERKHIN, S. I.
Composition and Chemical Constitution of Lithium Micas.
Trudy Mineralog. Muzeya, Akad. Nauk S.S.S.R., **5**, 90–131 (1953).
C. A., **49**, 6041i (1955).

Many of the lepidolites that occur in pegmatites were formed by the metasomatic replacement of biotite or muscovite, with replacements such as 3Al by Li + 2Si or of 2 Mg by Li + Al. Chem. analyses of the Li micas are plotted in various ternary diagrams and correlated with optical properties and X-ray data. The distribution of minor elements, detd. by spectrographic analyses, is discussed, with special reference to their zoning in the transition biotite to lepidolite.

4327. GLOGOCZOWSKI, J. J. and BIERNAT, Z.
Spectrochemical Logging of Oil Wells.
Nafta (Poland), **9**, 4–7 (1953).
C. A., **47**, 8351c (1953).

Samples of cuttings recovered at various depths from the mud fluid in drilling a borehole were triturated and placed in a hollow C electrode for spectroscopic examn. in the elec. arc. The spectra of the different elements recorded on photographic plates were then evaluated with a microphotometer; the unit is the faintest darkening still observable. The resultant curves for each element, arranged in the form of a profile corresponding to the

depth from which each sample was taken from the borehole, show a distinct increase in Mn, Ti, Zr, and Al content for the depth range of 1350–1385 m. Further work is required to det. whether this is a purely local anomaly or possibly a characteristic of the normally oil-bearing Krosno formation. If so, the above method can be used as a logging method for quick correlation of strata.

4328. GOLDBLUM, R. W., DERBY, S., and LERNER, A. B.
The Metal Content of Skin, Nails, and Hair.
J. Invest. Dermatol., **20**, 13–18 (1953).
C. A., **48**, 10171e (1954).

Normal skin, hair, and nails from white males 15–70 yes. of age were examd. spectrographically for 14 metals. Metals assocd. with enzymes (Zn, Mg, Cu, Fe, Mn) occur in the skin in the order listed; Zn ranged from 2×10^{-3} to 6.78×10^{-2} %; Mn, 2.4×10^{-9} to 6.1×10^{-7}%. The relative frequency in nails and hair was the same except for Mg and Cu. Elements which are inert so far as metabolic processes are concerned (Si, Pb, B, Ti, Ag, Al) are present in relatively large amts. in the skin, somewhat less in the nails, least in hair. Variations in the readings are so great that small differences resulting from many metabolic disorders cannot be detected by spectrography at this time.

4329. GOLDSPIEL, S. AND BERNSTEIN, F.
Applicability of Controlled-Atmosphere Excitation to Spectrographic Methods of Analysis of Aluminum Alloys from Compacted Chips.
Appl. Spectroscopy, **7**, No. 2, 71–5 (1953).
C. A., **47**, 11070a (1953).

For further improvement of reproducibility of intensity ratios of constituent vs. Al lines, noted when A atms. were used in the spark excitation of Al alloy (Alcoa 24S) chip compacts, a study was made of the effects of the following factors: chip size, carbon bonding, shape of pellet, sample pellet to sample pellet and to carbon electrode forms. The results show that unbonded, flat-tipped pellets to C counterelectrodes produce the most desirable combination. Chip size does not have a significant influence on the results. Analytical working curves for Mn, Mg, and Si covering the percentage ranges found in Alcoa types 14S, 17S, and 24S were obtained for flat pellet *versus* pellet and *versus* C electrode forms. The slopes of all curves for the latter combinations are essentially the same as those working curves obtained by the use of the conventional solid Al disk *versus* C counterelectrode in air. Lateral shifts of curves for pellets in A are in a direction indicating a decrease in energies available to neutral atom transitions. Standard errors of estn., except for the Mn, are nearly twice those for the conventional technique indicating need of addn. improvement in the pellet form and the size for more reproducible sample material. (Cf. *C. A.*, **46**, 11019h.)

4330. GOŃI, J. AND GUILLEMIN, C.
Mendipite from Langban, Vermland, Sweden.
Bull. soc. franc. minéral. et crist. **76**, 216–18 (1953).
C. A., **47**, 9869h (1953).

Chem. and spectrographic analyses show the presence of Pb, Cl, traces of Mn and Ca, and weak trace of As. Mendipite, a Pb oxychloride with formula $Pb_3O_2Cl_2$, forms in thin lamellar seams approx. $^1/_2$ mm. thick deposited on the surface of a gang composed of calcite, tephroite, and jacobsite. The mineral is colored grayish green and spotted with yellow. It is translucent in small fragments and has a sharp cleavage with pearly fragments on the clevage faces. Mendipite is biaxial (+) with a (+) sign of elongation, 2V close to 80°, optical indexes n_p 2.24, n_m2.28, n_g2.31 ± 0.1, hardness 2.5, and d. 7.16 ± 0.02.

4331. GOODWIN, A. G.
The How and Why of Spectroscopy.
Australian J. Instr. Technol., **9**, 59–73 (1953).
C. A., **48**, 4957g (1954).

The techniques and uses of spectroscopy are very briefly reviewed in successive sections labelled: early history of spectroscopy, general principles, definition of slit images, dispersion, resolving power, prism materials, prism spectroscopes and spectrographs, two and three prism types, double monochromator, spectrochemical analysis, qualitative analysis, quantitative analysis, absorption spectra, infrared spectroscopy, and recording spectrometers and spectrophotometers.

4332. GORDON, N. E. JR. and JACOBS, R. M.
Spectrographic Determination of Impurities in Zirconium and Hafnium.
Anal. Chem., **25**, 1605–8 (1953).
C. A., **48**, 2515g (1954).

The spectrochem. method for detg. 22 elements found in Zr and Hf metals and oxides is reported. By using an a.-c. arc of 2400 v., the spectra of volatiles, near-refractories, and refractories can be photographed while the bulk of the Zr or Hf remains in the sample electrode. Strong identifying lines below 2600 Å. are recorded on a Hilger prism spectrograph. Above 2600 Å., the Jarrell-Ash grating type is used. Ten p.p.m. of most impurities can be detd. with an accuracy and precision of ±30%.

4333. GORDON, JR., N. E., JACOBS, R. M., AND RICKEL, M. C.
Spectrographic Analysis of 18–8 Stainless Steel for Cobalt, Manganese, and Stabilizing Elements.
Anal. Chem., **25**, 1031–4 (1953).
C. A., **47**, 11071a (1953).

This spectrochem. method was developed to decrease the time required by wet chem. procedures for the detn. of Nb, Mo, Ta, Co, Ti, and Mn in 18–8 stainless steel. A salt-graphite mixture was burned in an 2400 v a.-c. arc, and photographed with a Jarrell-Ash grating spectrograph. The analysis lines and Fe internal standard lines are listed. A precision of ±10% is obtained.

4334. GREEN, M.
The Equation of the Characteristic Curve of Photographic Emulsions. I.
Appl. Spectroscopy, **7**, No. 1, 24–34 (1953).
C. A., **47**, 6287a (1953).

A general equation has been derived for the characteristic curve for the spectrographic level of illumination. This equation is relatively simple, fits the expt. curve very well, and although applied to only 3 types of emulsions so far, is believed to be applicable to most emulsions. This equation is $\log_{10} D_S/D = (I_{10}/I)^n (t_{10}/t)^q$, where **D** and D_S are d. and satn. density, resp.; **I** and **t** are intensity and time, resp.; I_{10}, t_{10}, **n**, and **q** are constants. D_S, I_{10}, **n** and **q** are all parameters of emulsion, wavelength, and development.

4335. GROSSMAN, H. H., PRATT, C. B., AND MEYERS, W. S.
Sampling Gun for Spectrographic Pin Samples.
Anal. Chem., **25**, 1939 (1953).
C. A., **48**, 3070d (1954).

Release of the trigger of this device causes a spring-loaded plunger with leather-cup piston to create a vacuum, filling a 5.0–5.4 mm. inside diam. × 20 cm. borosilicate glass tube with molten Mg alloys. This is then used for spectrographic analysis by the pin technique.

4336. GRUM-GRZHIMAĬLO, S. V.
Spectral Analysis of Corundum.
Trudy Inst. Kristallogr. Akad. Nauk S.S.S.R., No. **8**, 5–12 (1953).
C. A., **49**, 4250g (1955).

Russian synthetic corundum samples are purer than foreign samples, contg. less Fe, Cu, and Ca; foreign synthetic corundum products often contain Ti and V; two samples contained Na. Only Cr and Mn are higher in domestic corundum products than in the foreign material.

4337. HAMAGUCHI, T. AND OTO, Y.
Local Spectrographic Analysis in Metallography. I. Apparatus for Determining Magnesium in Nodular Cast Iron.
Rept. Osaka Munic. Inst. Ind. Research, **5**, No. 2, 11–14 (1953).
C. A., **47**, 11069d (1953).

The Mg content in spheroidal cast iron was larger than in the matrix.

4338. HAMAGUCHI, T. AND OTO, Y.
Local Spectrographic Analysis in Metallography. II. Detectable Limits for Pure Aluminum and Zinc.
Rept. Osaka Munic. Inst. Ind. Research, **5**, No. 2, 15–18 (1953).
C. A., **47**, 11069d (1953).

The estn. of Mg as well as Cu and Fe in Al is possible, but, the detection of Zn in Al or Cd and Al in Zn is more difficult. Large Al crystals contain Mg and Cu impurities in the vicinity of grain boundaries.

4339. HANNICK, A.
Direct Analysis of Zinc and of Phosphorus in Steels by the MACQ Electronic Apparatus.
Rev. universelle mines, **9**, 436–41 (1953).
C. A., **47**, 11077a (1953).

The apparatus consists of an arc-like spark, an A.R.L. 1.5 m spectrograph, and direct-reading MACQ electronic equipment employing electron-multiplier phototubes. The spark is produced between a flat sample and a graphite counter electrode, by the discharge of a condenser of 40 mf capacity, charged to 980ν in a circuit of 350 μh self inductance and 50 ohms resistance. The following analysis lines are employed in the direct analysis of zinc: Pb 4057, Fe 3020, Cu 3274, Cd 3466, Al 2568, and Mg 2796A. The P 2149A line is used to determine phosphorus in steel. The maximum difference between the results obtained by direct reading of spectra and by polarographic, photocolorimetric, or chemical methods rarely exceeds 10 per cent.

4340. HANS, A.
Results Obtained in a Plant with the Aid of Direct-Analysis Apparatus.
Congr. Groupe. Avance. Method. Anal. Spectrog. Products Met., **16**, 205–7 (1953).
C. A., **49**, 3581i (1955).

A review of the general performance and application of several direct-reading spectrographs.

4341. HANS, A.
Direct Analysis of Steels by Means of the MACQ-electronic Apparatus of Radiosynthesis.
Rev. universelle mines, **9**, 428–35 (1953).
C. A., **47**, 11077a (1953).

A modified app. of the American-type production control Quantometer is described; this is especially intended for detg. Si and Mn in open-hearth and elec.-furnace steels.

4342. HASLER, M. F.
Quantometry in 1952.
Spectrochim. Acta, **6**, 69–79 (1953).
C. A., **48**, 2479a (1954).

Eleven years of development work on direct-reading instruments for spectrochem. an-

alysis resulting in the production of 100 Quantometers, 26 of which are in Europe, has been climaxed by the design of Quantometers with 35 phototubes for the accurate analysis of a variety of alloys such as low-alloy steels, high-alloy steels, slags, Cu-base, and Al-base alloys, Al, Zn, and Pb-base alloys. This versatility of the Quantometer is made possible by alloy selector switches that provide separate zero and sensitivity controls for use of each spectrum line. Specifications for such an instrument are detailed and analytical curves for silica and Fe in slags are displayed.

4343. HAWLEY, J. E. AND RIMSAITE, Y.
Platinum Metals in Some Canadian Uranium and Sulphide Ores.
Am. Mineralogist, **38**, 463–75 (1953).
C. A., **48**, 13561a (1954).

A spectrographic method with high-voltage condensed sparks is described for the quant. analysis of the Pt metals in fire-assay beads to which Au is added as a collector. The beads are incorporated into Pb buttons and analyzed by using Pb as a variable internal standard. U ore from one locality in the Lake Athabasca area contains remarkable concns. of the Pt metals which are related to the amt. of Au present. All nickeliferous ores tested indicated the presence of platinoids. All contain 1 to many p.p.m. Pd and usually Pt and Rh in lower quantities. Of the sulfides, chalcopyrite is usually richest in Pt metals. There is a suggestion that Ru and Os are concd. more in pyrrhotite. In the Insizwa (South Africa) magmatic ore Pd and Pt appear to be concd. in chalcopyrite while Rh, Ru, Ir, and possibly Os are more abundant in pyrrhotite. In non-nickeliferous Cu-Fe sulfides of pre-Cambrian deposits, Pd, Rh, and in a few cases Pt are present in amts. ranging from $^4/_{1000}$ to 1 p.p.m. Pd is invariably present in larger amts than Pt. In several cases Rh is in excess of Pd. The data presented show a much greater affinity of the Pt metals for nickeliferous ores than for nonnickeliferous ores.

4344. HAWLEY, J. E., RIMSAITE, Y., AND LORD, T. V.
Lead-Bead Method of Spectrographic Analysis of Platinum Metals, Gold, Silver, and Bismuth in Sulfide and Uranium Ores.
Trans. Can. Inst. Mining Met., **56**, (in Can. Mining Met. Bull. No. **490**, 67–74) (1953).
C. A., **47**, 4789f (1953).

The Pb bead method is described for use with fire assay beads obtained from various ores and minerals. The method can be applied also to these metals in concentrates obtained in other ways.

4345. HEADLEE, A. J. W. AND HUNTER, R. G.
Elements in Coal Ash and Their Industrial Significance.
Ind. Eng. Chem., **45**, 548–51 (1953).
C. A., **47**, 5094i (1953).

Analyses of 596 spot samples of coal ash were made for 38 elements by means of a large Littrow spectrograph. Na, K, Ru, Ca, Mg, Si, Cr, and Mn were present in the coal ash to a lesser extent than their av. presence in the earth's crust. Li, Sr, Ag, As, Bi, B, Ga, Ge, La, Hg, Pb, Sb, Sn, Zn, and Zr had enrichment values (coal ash to earth's crust) between 10 and 185.

4346. HEGEMANN, F.
Quantitative Spectrochemical Total Analysis of Glass.
Glastech. Ber., **26**, 168–71 (1953).
C. A., **47**, 11677h (1953).

An explicit discussion is given of the sources of errors in the spectrochem. analysis of silicates, and of the most suitable electrode constructions and sampling methods in use in the geochem. lab. in Munich. As an example, the data of the chem. analysis of the quant. spectro-chem. detns. are given for a comparison, for a plate glass, further corresponding data of Na detns. in 3 different glass samples, with a reproducibility of ±0.5%, and an abs. accuracy of ±2–3% of the results for the constituents of a normal glass, or for cements, ashes, slags, etc. A considerable increase in accuracy is possible by abandoning the photographic-photometric methods and by using photoelec. direct intensity measurements.

4347. HEGEMANN, F.
Use of the Spectrograph in Silicate Analysis.
Zement-Kalk-Gips, **6**, 397–400 (1953).
C. A., **48**, 4355f (1954).
Cf. *C. A.*, **47**, 5084c.

The principles of spectrochem. analysis are outlined. Two new methods of excitation are described, *viz.*, the use of tablets in an a.-c. intermittent arc for the detn. of the alkali metals and of a rotating sample holder in a d.-c. arc for the detn. of other major constituents. These methods are applicable to spectrochem. analysis of silicates. The trace elements are detd. by current methods in a d.-c. C arc. More accurate results are obtainable only with direct-reading instruments.

4348. HEGEMANN, F. AND LEYBOLD, C.
A Spectrochemical Analytical Method for Rapid Determination of Trace Elements in Galena.
Z. Erzbergbau u. Metallhüttenw., **6**, 175–80 (1953).
C. A., **47**, 8577i (1953).

The ignition of carbons contg. the sample is described. NiO is added as a control element. Evaluation of the spectrogram is us-

ually visual, although photometric evaluation can be used for more accurate detns.

4349. HEGEMANN, F. AND PFAB, B.
Accurate Flame-Photometric Sodium Determination.
Glastech. Ber., **26**, 238–41 (1953).
C. A., **47**, 11073a (1953).

The described flame-photometric method is particularly useful for detg. Na in industrial glass. The Zeiss flame photometer is improved in some important details; a standard soln. of accurately known Na contents is used. It is essential that for the accurate detn. of Na, Ca must be carefully removed (by oxalate pptn.). If K is present, simultaneously a slight correction must be applied; and if the above ratio of K:Na = 2, an accurate detn. of Na is difficult. The limits of errors of the flame-photometric method are discussed in detail. A calibration curve for a standard soln., with 0.021% Na, is given for the range of 0.01 to 0.04% Na in the sample. The Na detn. in plate glass is described.

4350. HEGGEN, G. E. AND STROCK, L. W.
Determination of Trace Elements, Combining Chemical Enrichment and Spectrochemical Methods.
Anal. Chem., **25**, 859–63 (1953).
C. A., **47**, 7936a (1953).

To the dil. HCl soln. add 5 mg. of dissolved In^{+++}; this serves as an internal spectrographic standard and acts as a collecting agent in the pptn. step. Then add 10 ml. or more of a soln. of 5% 8-quinolinol in 2 *N* AcOH. Add NH_4OH to pH 1.8 followed by 45 ml. of 2*N* NH_4OAc. Adjust to pH 5.2 with AcOH or NH_4OH. Add 2 ml. of freshly prepd. tannic acid in 2*N* NH_4OAc and stir in 2 ml. of a 1% soln. of thionalide in AcOH. Let stand overnight, filter, and wash with dil. oxine soln. of pH 5.2. Ash overnight at 450°. Det. Ag, Al Co, Cr, Cu, Fe, Mo, Ni, Pb, Sn, V, and Zn with a Littrow quartz prism instrument. Typical results show 0.15–370 p.p.m. of elements just listed.

4351. HEINEN, E. J.
Sodium in Plants.
J. Assoc. Offic. Agr. Chemists, **36**, 392–7 (1953).
C. A., **47**, 12115h (1953).

Na values for several plant materials detd. by the official Mg uranyl acetate method (*A.O.A.C. Methods of Analysis*, 7th ed. (1950)) are compared with those detd. by the flame photometer. A brief investigation of the factors which affect the precision of results by the official method is reported.

4352. HELLER, H. A. AND LEWIS, R. W.
Spectrochemical Determination of Magnesium, Iron, Silicon, and Manganese in Titanium Metal.
Anal. Chem., **25**, 1038–42 (1953).
C. A., **47**, 11072c (1953).

Directions are given for the spectrochem. detn. of Mg, Fe, Si, and Mn in high-purity Ti. Impurities can be analyzed in the range 0.04–0.17% Mg, 0.03–0.24% Fe, 0.02–0.12% Si, and 0.01–0.05% Mn.

4353. HERRMANN, R.
Flame Photometric Ultramicroanalysis of Sodium, Potassium, and Calcium in Serum.
Z. ges. explt. Med., **122**, 84–9 (1953).
C. A., **48**, 8858b (1954).

The earlier method was modified to require 0.005 ml. serum for analysis of Na, K, and Ca with an error of 0.7, 2.3 and 2.2%, resp. The improvement involved (*1*) increasing the sensitivity of the photocell by increasing circuit resistances and (or) the voltage on the photomultipliers, (*2*) selection of light wave lengths by metal interference filters. Cf. *C. A.*, **47**, 7021c.

4354. HILGERS, A.
Experience with the Flame Photometric Determination of Sodium, Potassium, and Calcium in Blood Serum.
Hoppe-Seyler's Z. physiol. Chem., **294**, 61–74 (1953).
C. A., **49**, 14860f (1955).

The optimum conditions for flame propagation for the Zeiss Model III flame photometer are detd. Na produces a 27% enhancement of the K flame. The presence of Na and K ions also produces an increase in the Ca-emission flame. For the detn. of Na in serum, pure Na solns. give a better standard curve; for K, mixed Na and K solns. should be used to give a standard curve; for Ca a soln. contg. all 3 ions should be used. Examples of the efficiency of this type of standard soln. for curve prepns. and an illustration of a complete detn. procedure are given. The accuracy of the flame photometric procedure for Na, K, and Ca is within 2% of the true value.

4355. HILLER, J. E. AND SMOLCZYK, H. G.
Spectrographic Studies on Galena with Consideration of the Photoelectric, Thermoelectric, and Rectifier Effect.
Z. Elektrochem., **57**, 50–8 (1953).
C. A., **47**, 6245i (1953).

Samples of PbS (57) from different locations and formed in nature at different temps. were examd. The photoelec. effect was detd. by illuminating a PbS crystal in contact with a W point. Eight samples showed a neg. effect, i.e., current flow from W to Pbs; they were deficiency semiconductors. Twenty-three samples showed a pos. effect, which was weaker than the neg. effect, and were excess semiconductors. Twenty-three other samples showed both types of conduction. Three samples had a very slight pos. effect. The thermoelec. effect, which was smaller and more sluggish than the photoelec. effect, was

detd. with a similar app. with the PbS heated to 50°. Rectifying properties were observed only qualitatively. Samples with a pos. photoelec. effect had neg. thermoelec. effect and no rectifying action. Samples with neg. photoelec. effect or a pos. thermoelec. effect were good rectifiers. The shape of the crystals had no effect. The samples were examd. spectrographically, and all those with a pos. photoelec. effect contained Sb. For several samples from each group, a quant. spectrographic Sb detn. was made, and amts. from 0.007 to 1.1% were found. X-ray examn. and d. detn. did not correlate with semiconductor properties, and lattice defect concns. could not be calcd. accurately because of impurities. Some other minerals present as impurities were identified under the microscope.

4356. HINSVARK, O. N., WITTWER, S. H., AND SELL, H. M.
Flame Photometric Determination of Calcium, Strontium, and Barium in a Mixture.
Anal. Chem., **25**, 320–2 (1953).
C. A., **47**, 5297f (1953).

By use of linear corrections Ca, Sr, and Ba can be detd. in mixts. without sepn. Neither Ca nor Ba interfere with Sr; Sr interferes with Ca; and Ca interferes with Ba. These interferences are obtained when the samples are dissolved in $HClO_4$.

4357. HOLIDAY, E. R. AND PREEDY, J. R. K.
Precision of a Direct-Reading Flame Photometer for the Determination of Sodium and Potassium in Biological Fluids.
Biochem. J. (London), **55**, 214–20 (1953).
C. A., **48**, 223g (1954).

An instrument is described for flame photometric analysis of Na and K which, in simple solns., reproduces results with a high degree of precision. For urine analysis the sample generally must be dild. 1:300 or 1:1000. Estns. of serum Na show good agreement with chem. methods but the serum K detns. are subject to a large systematic error.

4358. HONMA, M. AND O'CONNOR, J. D.
Spectrographic Analysis of Potassium in Urine and Feces Using the Copper Electrodes.
Appl. Spectroscopy, **7**, No. 3, 131–5 (1953).
C. A., **48**, 1461e (1954).

The Cu spark technique was employed for detg. various elements in eliminated materials. Samples in the form of dry-ashed powders, were dissolved in acidic Co chloride soln., dried on Cu electrodes, and excited with an elec. spark. The spectra were photographed with a 2-m. grating. Similar spectra of synthetic standards also contg. Co provided working curves exhibiting a linear relation between spectral intensity ratio K 4047 .Å/Co 4092 Å. and γ K. In more than 1000 samples K has been detd. between 5 and 400 γ, with 3% standard deviation of the mean.

4359. HORWITZ, A.
Photometric Determination of Exchangeable Bases of the Soil.
Brazil Ministério viacao e obras públ., Publ. No. **151**, 32 pp. (1952);
Soils and Fertilizers, Commonwealth Bur. Soil Sci., **16**, 275 (1953).
C. A., **50**, 7368c (1956).

Detns. of exchangeable Ca, K, and Na, by the Perkin-Elmer flame photometer are described. Good agreement was found between results from chem. and photometric detns. The advantage of the latter method is its speed. For detn. of Mn and Mg the chem. methods were more satisfactory. Interference effects have not yet been fully studied.

4360. HÜBENER, H. J.
Remarks on the Paper of Dunker "A Burner for Flame Photometry."
Kiln. Wochschr., **31**, 708–9 (1953).
C. A., **47**, 11299b (1953).

Criticism of D.'s app. (*C. A.*, **47**, 7014e).

4361. HÜBENER, H. J., MAURER, H., AND WALTHER, T.
A Simple Method for the Exact Flame-Photometric Determination of Serum Calcium by Difference.
Klin. Wochschr., **31**, 1095–6 (1953).
C. A., **48**, 4621b (1954).

The method is based on the addn. of a known amt. of Ca to a portion of the sample and correcting the result for amt. of Ca recovered.

4362. HUNT, D. J. AND PISH, G.
Spectrochemical Analysis of Bismuth.
U. S. Atomic Energy Comm., **MLM-891**, 6–20 (1953).
C. A., **49**, 6022f (1955).

A spectrochem. method of analysis for low percentages of Ag, Cd, Pb, Sb, Sn, Zn, Cr, Mn, Fe, and Ni in Bi was developed with the line-width and intensity-ratio methods. The concn. range studied was 0.00005–1.0%. The order of precision was 20% in most cases; the line-width method is somewhat better than the intensity-ratio method in the upper concn. range, with the reverse true at the lower concn. range.

4363. HURWITZ, J. K.
Spectrographic Determination of Residual Impurities.
Anal. Chem., **25**, 1028–31 (1953).
C. A., **47**, 11069b (1953).

This discussion stresses background corrections in the detn. of residual impurities. When the ratio of spectral line intensity to background intensity is less than 80:1, the correction is found to be significant. A Hilger large quartz and glass spectrograph with a wavelength of 2450–3500 Å. is used.

4364. IIJIMA, H.
Quantitative Spectrochemical Analysis of Steel by Solution Method.
Bunkô Kenkyû, No. **6**, 16–19 (1953).
C. A., **51**, 13649b (1957).

Quant. analysis of Mn, Cu, Ni, and Cr in aq. soln. was carried out by use of a porous cup electrode (Feldman, *C. A.*, **43**, 8945b). The upper electrode has a hole, 3 mm. in diam., and the C layer between the bottom of the hole and the surface of the electrode is 15 mm. in thickness. The soln. which is kept in this hole diffuses out through the porous C electrode to give arc spectra of the elements contained in the soln. C steel, low-alloy steel, and 18–8 stainless steel were analyzed by dissolving the samples in dil. H_2SO_4 and applying the soln. method, with the results in good agreement with those by chem. analysis. The errors were within a few %.

4365. IKEDA, N.
Determination of a Minute Quantity of Indium in Mineral Water.
J. Chem. Soc. Japan, Pure Chem. Sect., **74**, 91–3 (1953).
C. A., **47**, 8294g (1953).

The pH of the water was adjusted to 5–6, and it was extd. by a CCl_4 soln. of dithizone. The evapd. residue is treated with HNO_3, and 10 mg. of $NaNO_3$ is added. The mixt. was arced in C electrodes, and the In content was detd. by comparing with the spectra of standard samples. The max. content found in 34 spring waters was the order of 0.1–1 γ/l.

4366. IMRE, J.
Rapid Determination of the Sodium to be Removed from Soda-Alkali ("Szik") Soils During Reclamation and of the Quantities of Amendments Required.
Jahrb Landesanstalt Qualifikation Landwirtsch. Prod. (Budapest), **2**, 135–44 (1952–53). (Pub. 1954).
Soils and Fertilizers, **18**, Abstr. No. 1707 (1955).
C. A., **52**, 14933g (1958).

In the procedures described, the adsorbed Na + K (mg. equivs.) is detd. by titration of the $Ba(OH)_2$ or $(NH_4)_2CO_3$ exts. of the soil, and the adsorbed Na is calcd. by difference after the flame-photometric detn. of K. From the Na expressed as g. equivs. to 30-cm. depth of soil (apparent d. of 1.3) the amts. needed of anhyd. $CaSO_4$/sq.m. can be obtained by calcn. Proper adjustment of application rates is to be made for gypsum or lignite contg. less $CaSO_4 . 2H_2O$ and S than the pure product.

4367. INAGAKI, M.
Rare Elements in Japanese Coal. I. Germanium.
J. Chem. Soc. Japan, Pure Chem. Sect., **74**, 19–22 (1953).
C. A., **47**, 6631f (1953).

Ge contents of ashes of about 80 samples of Japanese coal were detd. by the arc spectrographic method. The limit of detection was 0.001%; the spectral lines used were Ge 2651.18 and Si 2631.28. Ge was found in coals younger than Tertiary and not found in those of Paleozoic and Mesozoic. Ge was found more frequently in coals of Hokkaido and Tohoku districts than those of Kyūshū. Max. content found was 0.26% Ge in the ash of coal of the Kayanuma Mine, Hokkaido.

4368. IVANOV, D. N.
The Application of Interference Light Filters for the Determination of Sodium and Potassium in Soils.
Pochvovedenie 1953, No. **1**, 61–6.
C. A., **47**, 7144i (1953).

A photometer is described and illustrated which is capable of detg. Na and K in concn. of 1 mg./l., with a ±5% error.

4369. JANKE, B. AND SHARPFF, D.
Clinical Investigations of Sodium, Potassium, and Calcium Metabolism.
Deut. Med. Wochschr., **78**, 786–8, 816–19 (1953).
C. A., **47**, 8225f (1953).

For healthy persons the mean serum concns., as detd. by flame photometry, were, in mg.%: Na 305, K 17.6, Ca 9.4. The K/Ca ratio (I) was 1.8 in 80% of the cases. In cardiac patients *I* was elevated and the urinary K excretion was increased. Patients with liver diseases showed abnormally low serum-K levels, but normal *I*. In diabetes I was abnormally low.

4370. JOPE, E. M.
Three Late Bronze Age Swords from Ballycroghan, Near Bangor, County Down.
Ulster J. Archaeology, 3rd ser., **16**, 37–40 (1953).
I.I.C. Abtsr. **1**, Abstr., 224 (1956).
C. A., **51**, 3393a (1957).

The compn. of the metal was detd. by spectrographic analysis.

4371. JORDAN, J. H. JR.,
Determining TEL [tetraethyl lead] in gasoline by flame photometry.
Petroleum Refiner, **32**, No. 8, 139–40 (1953).
C. A., **50**, 8186f (1956).

The Pb content of gasoline can be rapidly and accurately detd. by flame spectrophotometry by using a standard of approx. the same compn. as the unknown sample.

4372. JURKOVIĆ, I.
The Occurrence of Nickel-Linneite (Siegenite) and Millerite in Tourmalinized Barite Near Brestovsko in the Central Bosnian Mountains.
Geol. Vjesnik, **5–7**, 273–94 (German Summary) (1951–53).
C. A., **49**, 3744i (1955).

The ores, in actinolite-epidote schists, are considered to be of pneumatolytic-hydrother-

mal origin. In the first phase, rutile, tourmaline, actinolite, albite, quartz, and magnetite were formed. In the hydrothermal phase, the paragenetic succession was pyrite, molybdenite, siegenite, millerite, chalcopyrite, chalcocite, bornite, tetrahedrite, and barite. Semiquant. spectrographic analysis of the siegenite showed major Ni and Co, less Cu and Fe, and traces of Pb, Zn, Ag, and Bi. X-ray powder data gave a_0 9.446 Å. for the siegenite.

4373. KAJIMA, J., YASUDA, K., and SANADA, K.
Relations Between the Segregation of Elements and the Sampling Methods of Metal Blocks for Analysis. I.
Japan Analyst, **2**, 108–12 (1953).
C. A., **47**, 7941f (1953).

Samples from various parts of metal ingots were analyzed by the spark spectrophotometric method. As the center of segregation did not coincide with the geometrical center on the cross section of cylindrical cast Fe ingot, it was found incorrect to take samples around the geometrical center. The uniformity of components in the ingot was improved with the rate of cooling.

4374. KATZ, M. AND CLAYTON, G. D.
Instrumentation and Analytical Techniques for the Continuous Determination of Air Contaminants.
Am. Soc. Testing Materials, Proc., **53**, 1136–57 (discussion 1158–9 (1953).
C. A., **49**, 8534d (1955).

Discussed are the detn. of aerosol contaminants by continuous paper filtration techniques followed by identification by chem. and spectrographic analysis. (*See. C. A.* for complete abstract.)

4375. KEENAN, R. G. AND WHITE, C. E.
Suppression of Cyanogen Bands in the Direct-Current Graphite Arc by Lithium Chloride.
Anal. Chem., **25**, 887–92 (1953).
C. A., **47**, 9214b (1953).

The suppression of CN bands by alkali metal chlorides and carbonates was studied. LiCl was almost as effective as NaCl in suppressing the CN bands, and the spectral line d. of added metals were greater in the LiCl matrix. Dilg. the LiCl with graphite lessened the suppression of line spectra; and a matrix contg. LiCl and graphite in a 1:2.5 wt. ratio was adopted for quant. analysis. The analysis of synthetic samples indicated that the matrix made possible quant. spectrography throughout the region normally masked by CN bands. Alkali metals probably suppress the CN band spectra by lowering the potential of the d.-c. arc.

4376. KEY, C. W. AND HOGGAN, G. D.
Determination of Trace Elements in Fuel Oils—Direct Spectrographic Method.
Anal. Chem., **25**, 1673–6 (1953).
C. A., **48**, 3672b (1954).

A spectrographic method is described which provides a rapid and accurate detn. of V, Na, Ni, and Ca in residual fuel oils without prior ashing. Spectrographic lines of adequate sensitivity of V, Ni, and Ca were found to be available in the ultraviolet spectral region when a rotating disk electrode was used and when the fuel oil with its metallic constituents was introduced into a high-voltage discharge in an inert atm. To include the Na line it was necessary to use Eastman Type 103-F film and to position the camera to cover the 3265–5915 Å. range in a single exposure. The instrument used for this investigation was an Applied Research Laboratories 2m. spectrograph. Improvements in sensitivity were obtained by incorporating Li_2CO_3 into the disk and by using Ba 2-ethyl hexoate as a buffer. Disk compn. was established at 1 part of Li_2CO_3 to 4 parts of S.P. No. 1 graphite and the briquetting pressure at 100,000 lb. per sq. in. N was introduced into the electrode housing to prevent the ignition of the fuel oil during the discharge. Actual procedure involved adding the buffer and internal standard solns. to the dehydrated sample of fuel, placing the sample in a porcelain boat, and positioning the boat in the arc-spark stand. Working curves were prepd. from the ratio of line pair intensity *vs.* p.p.m. concn. These curves were used for detns. in fuels having an ash content ranging between 100 and 1500 p.p.m., while calcns. for fuels having a normal ash content were made on the Dunn-Lowry calculator. This direct spectrographic method required only 40 min. for a single detn., as compared to several hrs. or days by spectrographic, chem., or phys. methods based upon the ash. The precision and sensitivity are comparable to those obtained by the longer methods. The method has been applied in the same manner to the detn. of these metals in crude oil after the gasoline fraction had been removed by distn.

4377. KICK, H.
Flame-Photometric Measurements by Means of a Monochromator in Connection with a Secondary-Electron Amplifier with a Photocathode.
Z. Pflanzenernähr. Düng. Bodenk., **60**, 163–7 (1953).
C. A., **47**, 7325g (1953).

A flame photometer is described in which narrower spectral band widths are obtained by means of a prism monochromator instead of a filter. As a detector is used a photocathode with a secondary-electron amplifier. This app. makes possible the detn. of Na, K, Li, Ca, Ba, Sr, Mn, and in larger amts. Mg, without noticeable interferences.

4378. KIESS, C. C.
Description and Analysis of the First Spectrum of Chromium, Cr I.
J. Research Natl. Bur. Standards, **51**, 247–305 (1953). (Research Paper No. **2457**).
C. A., **48**, 4967d (1954).

Wavelengths and estd. intensities are presented for about 4400 lines of Cr I recorded photographically between 11610 Å. in the infrared and 1800 Å. in the ultraviolet. Zeeman patterns, measured in magnetic fields of 35,000 and 85,000 oersteds for approx. 10% of the lines, are presented also. Analysis of the spectrum with these observational data has yielded classifications for about 80% of the Cr I lines, as combinations among the terms that arise from the various configurations assumed by the valence electrons of the atom in its excited and unexcited states. Of these terms 53 are due to the even electron configurations $3d^5ns$, $3d^4ns^2$, $3d^6$, and $3d^5nd$; and 115 due to the odd configurations $3d^5np$ and $3d^44snp$. Among both even and odd terms several series of 2 or more members converge to the ground state a ^6S and to the metastable state a ^6D of Cr II. The ^7S, ^5S, and $^7P°$ series, of 3 or more members, that converge to a ^6S are in remarkable accord in fixing the sepn. of the ground states of the neutral and singly ionized Cr atoms as 54570 cm.$^{-1}$ This corresponds to an ionization potential of 6.764 e. v.

4379. KINGSLEY, G. R. AND SCHAFFERT, R. R.
Direct Microdetermination of Sodium, Potassium, and Calcium in a Single Biological Specimen.
Anal. Chem., **25**, 1738–41 (1953).
C. A., **48**, 2805a (1954).

The use of the photomultiplier tube attachment with the Beckman DU flame photometer permitted the selection of narrow slit widths of light, and the elimination of nonspecific spectral emission. Excellent measurement and recovery were obtained in serum and urine detns. in the presence of extreme ratios of Na, K, Ca, chlolesterol, P, glucose, and urea.

4380. KIRCHGESSNER, W. G. AND FINKELSTEIN, N. A.
Application of Echelle Spectrographs to Quantitative Analysis of Boron in Steel.
Anal. Chem., **25**, 1034–8 (1953).
C. A., **47**, 11070i (1953).

The spectrographic detn. of B in steel is beset by two difficulties: (*1*) the concns. of B commonly encountered in alloy steels are near the limit of detection when the usual methods of excitation are employed, (*2*) only two spectral lines are available, the stronger of which, with wavelength 2497.733 Å., is subject to interference from a neighboring iron line 2497.820 Å. This investigation was undertaken to test the applicability of echelles to this problem. Two quartz spectrographs incorporating echelles of 200 grooves per in. were used. The dispersion at 2500 Å is 0.39 Å./mm. and on the photographic plate the two lines in question are separated by 0.28 mm. Analyses were made with B 2497.733 Å. and an internal standard Fe 2496.991 Å. Excitation was supplied by a 250 v., 8 amp. d.-c. arc, and calibration was obtained from NBS standards (400 series). In these standard samples B was detd. in the range 0.19 to 0.0006% with average deviation 7.5%. The data point to the possibility of B detn. at still lower concns.

4381. KIRSANOV, N. V. AND DISTANOV, U. G.
Composition and Character of Miocene Clay of Bashkir.
Doklady Akad. Nauk S.S.S.R., **90**, 879–81 (1953).
C. A., **50**, 7030d (1956).

In the compn. of the solid phase the presence of H, Li, B, C, O, F, Na, Mg, Al, Si, P, S, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Ga, Sr, Sn, Ba, Pb, and Zn was detd. by chemicomineralogical and spectrographic studies. The contents (in % by wt.) of the leading elements (other than O and C) were Si 27.23, Al 14.10, Fe 0.96, Ti 0.74, Cu 0.73, Mg 0.57, K 1.71, Na 0.31, S 0.06, and Mn 0.03. (*See C. A.* for complete abstract.)

4382. KOEHLER, W.
Spectrochemical Purity Testing of the Purest Metals, Especially Noble Metals.
Metall, **7**, 422–7 (1953).
C. A., **47**, 9154g (1953).

Testing of the purity of Pt, Pt metals and Ag is described. 15 references.

4383. KOLTERMAN, D. W. AND TRUOG, E.
Determination of Fixed Soil Potassium.
Soil Sci. Soc. Am., Proc., **17**, 347–51 (1953).
C. A., **48**, 2964g (1954).

Fixed soil K is detd. by heating NH_4-satd. soil at 500° for 2 hrs., then extg. the K made exchangeable with NH_4OAc soln., and finally detg. the K in the soln. by means of the flame photometer. This procedure is repeated once, and from the amt. of fixed K released during the second heating, the total amt. of fixed K present can be calcd. by use of a summation formula for a geometric progression.

4384. KOROLEV, F. A.
Spektroskopiya Vysokoĭ Razreshayshcheĭ Sily (Spectroscopy with High Resolving Power).
State Pub. House Tech. and Theoretical Lit., Moscow (U.R.S.S.). (1953). 278 pp.
C. A., **48**, 1163d (1954).

4385. KUBAL, J.
Spectral Analysis in Metallurgy.
Suppl. to Orbis (Prague), **1953**, No. 9.
Referat. Zhur., Fiz., **1955**, No. 1618.
C. A., **50**, 7000c (1956).

4386, KUBAL, J. AND DVOŘÁK, M.
Complete Spectrographic Analyses of Aluminum Alloys.
Hutnické Listy, **8**, 405–8 (1953).
C. A., **50**, 7008a (1956).

A method is described for detg. simultaneously with a single standard all the elements in the alloy, Al-Zn-Cu, the major ones (Zn about 11–14%, Cu about 1.8–3%, as well as the trace ones, Si, Fe, Pb approx. 0.1%, Mg and Mn about 0.01%). Excitation conditions involved the use of a spark from a Feussner generator with a mech. current interrupter, presparking 20–30 sec., exposed for 90 sec., cylindrical electrodes of 3 mm. diam., electrode gap 2 mm., slit 0.03 mm., 3-step filter.

4387. KÜHNS, K. AND MÜLLER, G.
Results and Errors in the Flame Photometric Determination of Sodium and Potassium in Serum and Organs with a Modified Lange Instrument.
Hoppe-Seyler's Z. physiol. Chem., **294**, 86–92 (1953).
C. A., **49**, 14861b (1955).

The use of a modified Lange flame photometer is described. The factors which are responsible for variability of results, e.g., air and fuel pressure, soln. viscosity, filter aberrations, element interference, and the means to overcome them, are discussed. The values obtained for Na and K in normal human serum and in various rat and dog organs are given.

4388. KUNISZ, M. D.
Graphic Method of Eliminating the Background in Photographic Spectrophotometry.
Acta Phys. Polon., **12**, 3–7 (In English) (1953).
C. A., **47**, 11992c (1953).

Dorgelo's spectrophotometric method (*Z. Physik*, **26**, 756 (1925)) cannot be employed directly if the spectral lines appear on a background of a continuous spectrum which cannot be eliminated by lab. means. For detg. the ratio of line intensities for lines close together, 2 curves obtained from rotating-sector measurements are first plotted, one representing the dependence of plate-blackening on light intensity calcd. for the background alone. For a no. of points with blackening P_1 on the first curve the points on the second with blackening P_2 which have the same intensity, are found graphically and a third curve of P_1 *vs.* the background intensity corresponding to a blackening of $P_2 - P_1$ is then plotted from these data. This last curve is also the representation of the dependence of the blackening on the ϵ true line intensity. After plotting corresponding curves for all lines which have been observed, the ratio of their intensities can be detd. by Dorgelo's method. The method was employed to det. the ratio of intensities of spectral lines of the $4d^3D - 4p^3P^\circ$ Zn I triplet with the result, I 3344A : I 3303 A I 3282 = 100: (61 ± 1): (22 ± 3), agreeing with that calcd. from the sum rule.

4389. KURODA, R.
Quantitative Spectral Analysis of Rare Elements in Silicate Rocks by Use of a Rotating Logarithmic Sector.
Bunkô Kenkyû, No. **6**, 24–7 (1953).
C. A., **51**, 13640b (1957).

For the spectral analysis of Cr, V, Ga, Tl, Ba, and Sr in silicate rocks a Cu electrode was used in place of a C electrode to avoid CN and SiO bands. BeO was added to the samples (2% by wt.) for the internal standard of line intensity. With samples of known compn. the intensity ratio of the line of the atom to be examd. to that of Be was measured against the conc. of the atom. The pairs of lines used were Cr I 3578.6/Be I 2651.0, V I 3184.0/Be I 2651.0, Ga I 2943.6/Be I 2651.0, Tl I 3775.7/Be I 2651.0, B I 2497.7/Be I 2495 (unresolved triplet), Ba II 4554.0/Be II 3131.1, Sr I 4607.3/Be II 3131.1. The standard deviation of the analysis was ±20% for Cr of the concn. of 0.01–0.0003%, for V of 0.03–0.001%, for Ga of 0.10–0.001%; and for Tl of 0.03–0.0003%, and ±18% for B of 0.10–0.0004%, and ±30% for Ba and Sr of 0.03–0.01%.

4390. KUROYANAGI, S.
Qualitative Analysis of the Chemical Elements in Woods and Trees by Emission Spectroscopy.
Science Rept. Fac. Agr. Okayama Univ., No. **2**, 92–106 (1953).
C. A., **50**, 3572f (1956).

Spectra of raw wood samples were less intense than those of their ash. Fe, B, Si, P, Mg, Mn, Al, Ca, Cu, Na, Ti, and K were detd. qualitatively with raw wood samples. There was little difference in the kinds and amts. of inorg. elements among species, seasons, and parts of trees. The contents of inorg. elements in leaves of trees seem to be connected intimately with those of the forest soils.

4391. KUTINA, J.
Microscopic and Spectrographic Study of the Origin of Certain Colloidal Structures of Sphalerite and Wurtzite.
Geologie (Z. Ges. Geol., Mineral., sowie angew. Geophys.), **1**, 436–52 (1953).
C. A., **48**, 505i (1954).

Optical study of banded ores from the Schmalgraf Mine, Moresnet, Belgium, and from the Orzel Bialy Mines, Katowice, Poland, leads to the conclusion that the sulfides

are of colloidal origin. Qual. spectrographic data show much higher concns. of Fe, Mn, Ge, As, and Tl in dark bands of sphalerite than in adjacent light bands of sphalerite; the light bands contained more Zn and Cd.

4392. LAGRANGE, R. AND POBEGUIN, T.
Qualitative Spectrographic Analysis of Several Calcareous Skeletons Produced by Living Beings.
Compt. rend. **237**, 151–3 (1953).
C. A., **48**, 2806a (1954).

The arc spectra of calcareous skeletons were examd. in the region between 2300 and 5900 Å. and used for the detection of trace constituents. A table is included which gives the occurrence and approx. concn. of the trace elements in various types of calcareous skeletons.

4393. LAGRANGE, R. AND URBAIN, P.
Spectrographically Detected Elements in Thermal Mineral Waters.
Bull. soc. franc. minéral. et crist., **76**, 208–15 (1953).
C. A., **47**, 9867b (1953).

The elements Ag, Sn, Cu, Pb, Ge, Mo, Cr, Ti, Sb, Be, Zn, Ga, Ba, Ni, Al, V, Bi, W, Sr, and Tl occur in watery thermo-minerals and belong to a group in which the S^{--} ion causes a pptn. which is incomplete in an alk. medium. W, Bi, and Tl have a spectral sensitivity of 10^{-3} -10^{-4} while the rest of the elements listed have a sensitivity of 10^{-5} -10^{-6}.

4394. LARSSON, A.
Spectrochemical Determination of Small Amounts of Aluminum in Copper Alloys.
Jernkontorets Ann., **137**, 177–90 (1953).
C. A., **47**, 12104*a* (1953).

Two methods are given for detg. 0.001 to 0.1% Al in Cu alloys. (*1*) Dissolve the sample in HF and HNO_3. Evap. 1 drop of the soln on a C electrode and excite with an interrupted d-c. arc. Working curves are made with standard solns. of the pure elements. (*2*) For routine work, use a flat surface of the sample as one electrode, a graphite rod as the other, and excite by a low-tension, triggered spark. Use samples analyzed by method *1* as standards.

4395. LARSSON, A.
Spectrochemical Determination of Lead in Ferrotitanium.
Jernkontorets Ann., **137**, 191–3 (1953).
C. A., **47**, 12111h (1953).

Dissolve the powd. alloy in HF and HNO_3 and evap. a drop on a C electrode. Use an interrupted d.-c. arc for excitation.

4396. LARSSON, A.
Spectrochemical Determination of Impurities in Lead.
Jernkontorets Ann., **137**, 194–6 (1953).
C. A., **47**, 12111g (1953).

Dissolve the sample in HNO_3 and add a little HF to prevent formation of SnO_2. Add Co as the internal standard. For Bi, the line 3067.72 Å. is strong. Lines 3072.34 and 3082.62Å. are also good if the Pb is not too impure. Sn has several strong lines, the best of which is 3175.02 Å. The best Sb line is 2598.06 Å. and for Cu the line 3273.96 Å. is easily recognized.

4397. LEPPÄNEN, V. AND HALLMAN, N.
Improved Instrument for Internal Standard Flame Photometry
Scand. J. Clin. & Lab. Invest., **5**, 250–60 (1953).
C. A., **48**, 1078e (1954).
Cf. *C. A.*, **46**, 161g.

A new internal-standard flame photometer which used vacuum-tube photocells is described in great detail with diagrams. Topics discussed include the atomizer and burner system, the optical and elec. systems, standard solns., operation, interferences, and prepn. of sample.

4398. LEUTWEIN, F.
Spectrochemical Analysis in Metallurgy and Mining Industry.
Wiss. Ber. I. Metallurgie u. Giessereiwesen No. **62**, 32 pp. (1953).
C. A., **48**, 74d (1954).

A review with 18 references.

4399. LEWIS, C. L. AND OTT, W. L.
Spectrochemical Analysis of Palladium by the Sponge Technique.
Trans. Can. Inst. Mining Met., **56** (in Can. Mining Met. Bull. No. 489, 17–20) (1953).
C. A., **47**, 5300g (1953).

The method of sponge prepn. adopted is the direct reduction of salts from a H_2PdCl_6 acid soln. The sponge metal is dissolved in aqua regia. An aliquot is evapd. to a sirupy consistency in a breaker, transferred to a silica crucible, and evapd. to dryness under an infrared lamp. When dry, the salt is transferred to an agate mortar for pulverizing and mixing. It is returned to the crucible for reduction by means of a H flame without auxiliary heat. The sponge metal is transferred to the same agate mortar as before, pulverized and mixed. The finely pulverized sponge is again returned to the crucible, which is placed in a muffle furnace. A temp. of 700° is maintained while a second reduction is effected with a H flame. This final reduction, lasting 20 min., is to insure complete reduction of the base metals. When the crucible is removed from the furnace it is cooled with the H flame still playing on the sponge, which changes from dark to light gray on cooling. The crucible is then placed in a desiccator. In prepg. spectrographic standards the contaminant elements are added as solns. to the H_2PdCl_6 soln. by using micropipets and temp.

control, and the reduction process is carried through as outlined above.

4400. LEWIS, J. A. AND SERIN, P. A.
Determination of Gold in Solution by Adsorption Extraction and Spectrography.
Analyst, **78**, 385 (1953).
C. A., **49**, 8034a (1955).

Extn. of Au by adsorption on ethylcellulose is practicable in some acid solns. The pad, after adsorption, is dried by suction, ignited at 600°, and the residue is dissolved in aqua regia and adsorbed on Al_2O_3. The mixt. is dried and then ground with a mixt. of Al_2O_3 and AgCl contg. 0.1% of added SnO_2, which acts as an internal standard. The detn. is then continued by carrier-distn. spectrography. Extns. of 4–50 γ of Au have been satisfactory from solns. contg. 0.2–10 p.p.m.

4401. LIEDKE, W.
Spectrographic Detection of Marginal Carburization and Decarburization.
Arch. Eisenhüttenw., **24**, 465–7 (1953).
C. A., **48**, 2517e (1954).

A spectrographic method is described which has advantages over purely chem. or microscopic methods and also over the usual spectrographic detn. of C. It is particularly advantageous for the detn. of the C distribution.

4402. LINDSTROM, F. J.
A Spectrographic Method for Thorium.
U. S. Atomic Energy Comm., **AECU-2851**, 8 pp. (1953).
C. A., **49**, 6773c (1955).

Th is detd. spectrographically in a HCl soln. with a rotating Ag disk electrode. Cr is used as an internal standard; a Th line of 2837.3 Å. and a Cr line of 2835.6 Å. are used. The method detects 4 γ per ml. with corrections for background. Attempts to use the Th line at 4019.1 Å. with Mo and Mn as internal standards were unsuccessful.

4403. LUNDEGÅRDH, P. H.
The Vätö Granite (Sweden).
Sveriges Geol. Undersökn. Ser. C., Avhandl. och Uppsat., No. **534**; *Årsbok*, **47**, No. 5. 34 pp. (English Summary). (1953).
C. A., **49**, 6791i (1955).

A description is presented of the geology, lithology, petrography, contact relations, chem. compn., and manner of formation of the Vato granite, a younger Svionian granite in eastern Upland. Five chem. analyses (4 new) of the Vätö granite are presented. The content of Li, B, V, Cr, Co, Ni, Cu, Zn, Rb, Au, and Pb in the granite is given according to spectrochem. detns. The content of Sr in silicate rocks of the Roslagen area in Sweden is tabulated. The analyses are discussed, and the exceptionally high Sr content of the granite is emphasized. 17 references.

4404. LUNDGREN, P.
Applications of Flame Photometry to Analysis of Alkalies and Calcium in Saline Solutions for Infusion.
J. Pharm. and Pharmacol., **5**, 511–27 (1953).
C. A., **47**, 11073c (1953).

A thorough discussion is given of the factors affecting detns. of Na, K, and Ca, separately and in aq. saline mixts., by use of the Beckman Du spectrophotometer with flame attachment. Cf. *C. A.*, **46**, 9407b.

4405. LUNDQVIST, J.
A Post-Karelian Peridotite in the Basement Complex North of Lake Torneträsk [Sweden].
Geol. Fören. i Stockholm Förh., **75**, 77–88 (1953).
C. A., **47**, 4805e (1953).

A peridotite (I) consisting of slightly serpentinized olivine occurs intrusive in granite at Råveåive in northern Sweden. I is accompanied by soapstone composed of almost pure talc. A petrographic and mineralogical description of I is presented. Spectrochem. analyses of I gave, in %, Cr 1.3, Ni 0.4, Co 0.01. I is exceptionally high in Cr and Ni. The bulk of Cr probably is incorporated in magnetite and of Ni, in olivine.

4406. MAASSEN, G.
Progress in the Spectroanalysis of Copper and Copper Alloys Since 1940.
Angew. Chem., **65**, 286–91 (1953).
C. A., **47**, 8580b (1953).

A review covering the analysis of pure and crude Cu, brass, bronze, and red brass.

4407. MALAMAND, F.
Spectrographic Determination of Several Elements in High Concentration by the Method of Transfer to a Counter-Electrode.
Congr. groupement avancement méthod. anal. spectrog. products mét., **16**, 109–25 (1953).
C. A., **49**, 3270f (1955).

A metallic deposit of the sample is formed on the tip of a Ag, Al, Cu, or C counterelectrode by preliminary elec. discharge. The deposit contains the components of the alloy in proportions that are a function of their concn. in the alloy; excitation of the deposit gives the spectral lines that are measured. The method gives decreased background, sharper delineation, reduced no. of lines, and better precision. In Co-Cr and Fe-Cr alloys contg. 25–50% Cr, Cr can be detd. to about 1% of the amt. present; Ni can be detd. in alloys contg. 13–90% Ni to a precision of better than 2%.

4408. MALAMAND, F.
The Method of Transfer to a Counterelectrode and Its Application to Spectrographic Analysis of High-Content Alloys.

Recherche aéronaut. (*Paris*), No. **32**, 51–8 (1953).
C. A., **47**, 8575i (1953).

The method of transfer to a counterelectrode has been found satisfactory for the quant. spectrographic analysis of alloys in which the constituent elements are present in amts. ranging from 8 to 90%. A high-frequency spark discharge between a plane surface on the test sample and a counterelectrode of Al, Ag, Cu, Zn, or C sputters a thin deposit of the sample onto the conical end of the counterelectrode, with the elements in the deposit in the same proportions as in the sample; an exposure of 30 or 40 sec. is usually sufficient to prep. a counterelectrode. The test sample is then replaced with an electrode of the same material as the counterelectrode and having a plane surface. The high-frequency spark between them is recorded with the spectrograph. Tests for Cr and Ni in the binary alloys Co-Cr, Fe-Cr, and Fe-Ni, in Nichrome and in stainless steels show that their proportions in the analytical samples can be detd. with accuracies in accord with those given by the usual methods of analysis. Advantages of the method are: (*1*) up to very high concns. the photographic density of the lines increases linearly with concn.; (*2*) the continuous background of the spectrograms is greatly diminished; (*3*) reduction of the no. of lines excited in rich-lined spectra, so that with low-dispersion spectrographs errors due to blending are minimized.

4409. MARTIUS, C. O. V.
Clinical and Spectroanalytical Studies on Acute Thallium Sulfate Poisoning.
Deut. Arch. kiln. Med., **200**, 596–602 (1953).
C. A., **48**, 9548h (1954).

Acute Tl toxicosis was observed over a considerable period in 13 subjects. In addn. to the usual symptoms, there were observed, in severe cases, choreatic trembling, speech disturbances, and personality changes. Internal secretions were affected in various ways, and the specific dynamic effect was in some cases increased, in other lessened. The gastric juice was at first subacid, but after a time hyperacidity appeared in one patient. Temporary albuminuria and erythruria occurred; in a pregnant woman porphyruria was observed. No typical blood picture could be found, although early stages were usually marked by a tendency toward leucocytosis with lymphopenia. For spectral analysis the material was moistened with H_2SO_4 and HNO_3. Na_2SO_3 was added to reduce Tl to the thallous state, $BaCO_3$ was then added, and the mixt. was neutralized and filtered to remove $BaSO_4$. The slightly acidified HNO_3 mixt. was then treated with 2 ml. of 2% $Pb(OAc)_2$, and the Tl pptd. with KI, along with PbI, the latter amounting theoretically to 50 mg. Only a rough quant. estn. could be made of the Tl content. For spectrographic analysis the material was placed in a cavity in a C cathode, and the photographic exposure lasted 30–50 sec. In some cases traces of Tl could be detected qualitatively in the urine 3 or 4 months after ingestion; for shorter periods it was found not only in the feces but in the gastric juice, bile, blood serum, spinal fluid, and in hair and nails. Tl was found in the urine and meconium of infants whose mothers had absorbed Tl during the 7th month of pregnancy.

4410. MASI, O.
Anomalies in the Spectral Emission of Crystallographically Definite Monocrystal Surfaces.
Metallurgia ital., **45**, 399–404 (1953).
C. A., **48**, 5641d (1954).

Spectrographic and X-ray investigations of the (100) and (111) planes of Al-Cu single crystals show differences in the compn. and stability. The ratio Al/Cu is better reproducible for (100) and (111) surfaces. Also the intensity of the Al lines for the 2 planes changes differently with the progress of the discharge between the spectrographic electrodes. The X-ray diagrams of the surfaces which were used for the spark spectrum showed the (100) reflection practically unchanged. On (111), however, coarse and polycryst. material was found to be present.

4411. MASON, G. L. AND ADCOCK, J. N.
A Spark-Traverse Attachment for the Hilger Large Quartz Spectrograph.
Spectrochim. Acta, **5**, 364–70 (1953).
C. A., **47**, 6192f (1953).

An auxiliary attachment for the Hilger large quartz spectrograph has been described, with which it is possible to guide a sample under a stationary upper electrode while the photographic plate on which the spectrogram is recorded moves downward past the camera aperture of the spectrograph. The width of the spark crater caused by this form of excitation is 0.4 mm. (0.016 in.). From the resultant spectrogram it is possible to det. the variations in concn. of the elements Mn, Si, Ni, Cr, Mo, and V over the area of sample traversed. With certain modifications of the technique it is hoped later to include C in the above range of elements. An illustration is given of the application of the above technique to the detn. of variations in compn. across a weld area. It is considered that this technique will prove of valuable assistance to the metallurgist in the examn. of: (*a*) concn. variation within steel segregates, (*b*) variation with compn. across a weld area, and (*c*) inclusions in steel.

4412. MASSEY, D. M. AND WINSOR, G. W.
Determination of Potassium in Soil Extracts and Plant Tissue.
Cheshunt Exptl. Research Sta. Rept., **1953** 59–60

Soils and Fertilizers, **18**, Abstr. No. 1507 (1955).
C. A., **52**, 14425h (1958).

The linear regression of K values obtained in AcOH exts. of soils and in plant ash by flame photometry and the cobaltinitrite-perchlorate technique showed a high degree of agreement between the 2 methods.

4413. MASSIL'ON, T. K. AND EMEL'YANOV, A. S.
Spectral Determination of Alkali Content in Slurry and Clinker.
Tsement, **19**, No. 3, 27–9 (1953).
C. A., **48**, 973i (1954).

The chief alkali in nepheline slurry was only a third of Na_2O-K_2O. Detn. was reduced from 2 hr. to 30 min. by using the method of photometric interpolation. Deviation between two detns. is ±0.2%.

4414. MATHIEN, V.
Application of Direct Spectrochemical Analysis of Steels and Cast-Irons in a Basic Bessemer Steel Plant.
Rev. universelle mines, **9**, 441–5 (1953).
C. A., **47**, 11077a (1953).

4415. MATHIS, W. T.
Spectrochemical Analysis of Plant Material Using Spark Excitation.
Anal. Chem., **25**, 943–7 (1953).
C. A., **47**, 9206f (1953).

A method for detg. simultaneously K, Ca, Mg, P, Mn, Fe, Al, Zn, Na, Cu, B, and Mo in plant materials has been developed. It can be adapted to any material which lends itself to wet prepn. Cratered graphite electrodes are packed with the graphite removed in drilling, imprgenated with the soln. to be analyzed, and dried. Samples are excited in the a.-c. spark, and the ultraviolet spectrum is photographed with an A.R.L. 1.5-m. spectrograph. The Co 3044 Å. line is used as an internal reference standard for all analysis lines. It is necessary to consider the effect of variations in the relative amts. of Ca, K, and P upon the slopes and fiducial points of their respective curves. Fluctuating conditions are handled routinely by the use of correlated analysis scales. Comparison of the spectrographic method with chem. methods of analysis for the major elements in 240 samples of alfalfa indicated that the procedures were equally precise for K, Ca, and P. The spectrographic method gave greater precision for Mg.

4416. MATHIS, W. T.
Spectrographic and Flame Photometric Methods.
J. Assoc. Offic. Agr. Chemists, **36**, 411–15 (1953).
C. A., **47**, 12668h (1953).

Information obtained concerning last year's collaborative study (*C. A.*, **46**, 11474a) failed to disclose any obvious explanation for the calibration differences between labs. on the basis of standards and standardization procedures used.

4417. MAYER, F. X. AND MACHATA, G.
Spectrographic Series Studies of Prehistoric Metal Discoveries.
Österr. Chem. Ztg., **54**, 178–9 (1953).
C. A., **48**, 5755d (1954).

The advantages of spectrographic methods of analysis in the identification and classification of prehistoric metallic objects are pointed out. The basic types of Cu alloys found in 170 Austrian metal specimens are tabulated. A detailed spectrographic procedure is given, along with the most suitable spectrum lines of frequently occurring alloying metals.

4418. MAZUMDER, K. C. AND GHOSH, M. K.
Phosphorus In Steel.
Indian J. Phys., **27**, 11–16 (1953).
Sci. Abstr., **57A**, 362 (1954).
C. A., **51**, 7944g (1957).

By using a medium quartz spectrograph lines of P in steel were photographed and the content evaluated. The accuracy was fairly good. It is suggested that the inaccurate ones were due to segregation.

4419. MCCLURE, J. H. AND KITSON, R. E.
Spectrochemical Determination of Impurities in Cobalt Oxide.
Anal. Chem., **25**, 867–8 (1953).
C. A., **47**, 9206i (1953).

A direct spectrographic procedure is described for detg. Ca, Ba, Cu, SiO_2, Fe, Mn, Cr, Al, and Ni as impurities in Co_3O_4. From 0.001 to 0.1% of the impurities can be detd. with an accuracy and precision of about ± 20%. Standards were prepd. by adding standard solns. of the impurities to high-purity Co oxide and drying and grinding the mixt. Samples were burned in C electrodes in the d.-c. arc and photographed with a 2.5-meter grating spectrograph to cover the 2nd-order spectrum from 2000 to 3800 Å. and the 1st-order spectrum from 5000 to 6700 Å. Analytical line pairs with their usable ranges are listed. Independent methods of analysis were used to check the calibration curves for SiO_2, Ni, Mn, and Ba.

4420. MCDUFFIE, B.
Qualitative Analysis With the "Spectranal."
J. Chem. Educ., **30**, 454–6 (1953).
C. A., **48**, 1074e (1954).

The features of a Todd "Spectranal" instrument, which consists of a Bunsen-type spectroscope with an attachment for sparking solns. at a partially submerged electrode, are described. Many cations encountered in the usual qual. scheme were studied with the instrument.

4421. MEEKER, R. F.
Spectrographic Determination of Trace Elements in Lubricating Oils.
Anal. Chem., **25**, 1938 (1953).
C. A., **48**, 2354*i* (1954).
A correction (Cf. *C. A.*, **47**, 4069d).

4422. MEEKER, R. F. AND POMATTI, R. C.
Spectrographic Determination of Trace Elements in Lubricating Oils.
Anal. Chem., **25**, 151–4 (1953).
C. A., **47**, 4069d (1953).
Spectrographic analysis of trace elements in lubricating oils provides a rapid convenient method of studying engine wear and corrosion. A method for the detn. of Fe, Pb, Cu, Si, Al, Cr, Sn, and Ag is described. Ba is used as a matrix element and Ni as an internal standard. A precision of ±10% is generally obtained. The method can be extended to other trace elements.

4423. MEHLICH, A.
Rapid Determination of Cation-and Anion-Exchange Properties and pH of Soils.
J. Assoc. Offic. Agr. Chemists, **36**, 445–57 (1953).
C. A., **47**, 12716c (1953).
A rapid method for the detn. of cation- and anion-exchange properties and pH of oils is described. For the detn. of cation-exchange properties, 2–8 g. of soil (depending upon the cation-exchange capacity) is weighed into special leaching tubes and 20 ml. $BaCl_2$-triethanolamine buffer (pH 8.1) is added. The sample is then leached with 20 ml. $BaCl_2$ and the excess Ba removed by leaching with H_2O. The combined leachates are first titrated (by difference) for H with HCl. A sulfate-oxalate mixt. is then added, and the Ca detd. in the presence of $BaSO_4$ by titrating with $KMnO_4$. In an alternate procedure the Ba is removed as the sulfate and Ca detd. by means of a flame photometer. The Mg is detd. colorimetrically with Thiazole Yellow, and the K and Na are detd. flame photometrically. For the detn. of cation-exchange capacity, the Ba-soil is leached with 50 ml. $CaCl_2$, and the Ba in the leachate measured colorimetrically following pptn. as $BaCrO_4$ or flame photometrically in the presence of $CaCl_2$. The anion-exchange capacity is detd. on the Ca-soil, corresponding to 0.2 meq. cation-exchange capacity, by treatment with 20 ml. of 0.03*N* H_3PO_4. The pH and the phosphate retained are measured. In a separate sample the exchangeable PO_4 is detd. by means of HCl-NH_4F. The molybdovanadate phosphate method is employed. Factors to be considered in the accurate detn. of cation-and anion-exchange properties are discussed.

4424. MEHLICH, A. AND HARWARD, M. E.
Potassium Analyses in Soils and Plant Materials by Flame Photometer Methods.
J. Assoc. Offic. Agr. Chemists, **36**, 227–30 (1953).
C. A., **47**, 12114d (1953).
Results obtained with a Perkin-Elmer Model 52A flame photometer are reported on studies involving varying concns. of Li as the internal standard, day to day variations, and analyst variations. The work suggested that instrument performance is largely dependent on the care of the analysts and on the selection of an optimum concn. of Li as the internal standard. Cf. *C. A.*, **47**, 2624*h*.

4425. MENDENHALL, R. M., RAMORINO, P. M., and GERSTL, B.
Water, Sodium, and Potassium Contents of Human, Guinea Pig, and Rabbit Lung.
Proc. Soc. Exptl. Biol. Med., **82**, 318–22 (1953).
C. A., **47**, 6010h (1953).
Methods and analytical data are given.

4426. MÉNDEZ PADILLA, J.
The Use of Flame Photometry for the Determination of the Alkali Elements (in Portland Cement).
Mem. congr. cient. mex., IV Centerario univ. Méx., **2**, 366–75 (1953).
C. A., **49**, 2046i (1955).
In the detn. of the alk. elements in portland cement, the photometric method requires about 1/4 the time used for a gravimetric detn., the use of reagents is less, and the cost is reduced. The results obtained by the 2 methods are about equal.

4427. MICHALOV, K. N. AND RAFF, E. L.
Redistribution of the Intensities of Spectral Lines of Elements in a Discharge in Argon.
Doklady Akad. Nauk S.S.S.R., **91**, 1067–70 (1953). (*Engl. translation issued as U. S. Atomic Energy Comm., N.S.F.-tr-* **174**, 4 pp. (1954)).
C. A., **48**, 8647i (1954).
The at. spectra of a no. of metals are observed both in an arc in air and an arc in an atm. of A. In going from air to A, the arc spectrum lines are observed to decrease in intensity, the spark spectra lines to increase. A few observed anomolies are attributed to wrong identification as arc or spark lines in published lists. The Fe lines 2431.024, 2505.62, 2546.874, 2548.080, 2551.092, 2553.185, 2582.299, 2925.791 and 3174.96 are identified as arc lines and 2469.512, 2852.13, and 2896.96 as spark lines. The following elements were investigated: Li, Cu, Ag, Mg, Ca, Zn, Al, Ce, Si, Ti, Sn, Pb, V, Cr, Mo, W, Mn, Fe, Ni, and Pt.

4428. MICHEL, P.
La Spectroscopie d'Émission et Ses Applications.
Armand Colin, Paris (France). (1953). 224 pp.
C. A., **47**, 8520a (1953).

This is a really concise and selective textbook on analysis by emission spectra; starting from fundamentals and closely reasoned, the author's aim is to provide academic or industrial research workers with a statement of the basic principles of spectroscopy, a few selected examples and an indication of its scope in analysis. Roughly two-thirds of the volume is given to principles and one third to technique and application, yet the subject is followed through the principles of the calibration of photographic methods of analysis to an outline of the methods recently developed for direct analysis. There is a bibliography admittedly selective, of 44 references, which can be criticized for omitting any bibliographies; and there is an adequate index. Finally, the book is published at a price which would make an American publisher suspect a misprint, and printed in a style which is sober but graceless. (Reviewed by E. Van Someren *Spectrochimica Acta.* **7,** 180 (1955). Also reviewed in *Metaux* (*Corrosion-Inds.*) **28,** 93 (1953).

4429. MICHONSNIKY, M.
The Spectrographic Analysis of Steel During Manufacture and in Routine Laboratory Control.
Rev. mét., **50,** 341–51 (1953).
C. A., **48,** 6318*h* (1954).

M. describes the organization of a spectrographic lab. which is in continuous operation and carries out 10,000 detns. per month, 40% of which are rapid analyses with standard equipment. Statistical studies were made to det. the precision of the spectrographic analysis.

4430. MIELENZ, K. D.
Rapid Analysis of Steels, Aluminum, and Copper Alloys with the Metal Spectroscope.
Metall, **7,** 256–60 (1953).
C. A., **47,** 6819*f* (1953).

Formerly spectrochemical analysis of metals and alloys involved photography of spectra, processing plates, and measuring photographic densities of spectra lines. These delays can be eliminated either by direct photocell detection of the lines, or by visual observations. Here a Metal-Spectroscope is described; it consists of $1^1/_2$ prisms in autocollimation, and a split-field ocular illuminated simultaneously by two arcs, one for analysis and the other for comparisons. With the aid of chemically analyzed samples, pairs of visible analysis and internal standard spectral lines have been selected for quant. detns. over various ranges of concn. These are presented in 25 tables for the detn. of Co, Ti, Cr, Mo, Mg, Mn, Ni, Si, V, W, in steel, Ti, Cu, Zn, Mg, Fe, Mn in aluminum, and Ag, Cr, Mg, Mn, Ni, Fe, Pb, Sn, Zn in copper. Detns. can be made in a few seconds, and appear to be as accurate as the gravimetric results.

4431. MILBOURN, M.
The Behavior of Various Metals in Emission Spectrography.
Spectrochim. Acta, **5,** 483–90 (1953).
C. A., **47,** 11953*g* (1953).

Observations have been made on changes in spectral d. caused by variations in elec. parameters in the General Purpose source unit with samples of Al, Cu, Fe, Pb, Mg, Ni, Sn, Ti, and Zn. Although observed changes were very different for each metal, a broad classification can be made into three groups, namely (*1*) Al and Mg, in respect of which only degree of damping has any considerable effect, (*2*) Cu Fe, Ni, and Ti with which in general greater d. is obtained when the sample is the neg. electrode; with these metals greater d. is also obtained when the metal forms the positive electrode to an underdamped discharge, and (*3*) Pb, Sn, and Zn, with which spectral d. is consistently greater with neg. polarity. By correlating the observations with selected properties of the metals, indications have been obtained that volatilization of the metal may be influenced by its at. wt., the stability of its oxide, and the direction of the electron stream with respect to the metal, but not to any great extent by melting or boiling point, ionization potential, thermal cond. or work function. With the second group of metals, it has also been established that when the sample is pos. the low-voltage discharge conditions the surface in such a way as to render it more amenable to attack by the trigger discharge. Certain conclusions of minor practical importance have been drawn from this work, but the main conclusion is that the influence of elec. parameters cannot be considered independently of the metal under test. At the same time, the observations, although, to a large extent unrelated, provide a new outlook on spectral problems and a foundation on which further work can be based.

4432. MILLS, E. C. AND HERMON, S. E.
Effect of Certain Sample Forms on the Reproducibility of Analysis of Some Aluminum Alloys by Using Simple Condensed Spark Source Units.
Metallurgia, **48,** 209–11 (1953).
C. A., **48,** 495d (1954).

The possibility of using an extruded rod for the construction of day-to-day calibration curves when analyzing cast material is shown to be satisfactory. The efficiency of production of usable extrusions is at least 5 times as great as that of the usable portions of cast pencils from a similar size melt.

4433. MINGUZZI, C. AND VERGNANO, O.
Inorganic Element Content of Plants of the Ophilolite Formation of Impruneta (Florence, Italy). I. Determination of Marcronutritive Elements and Detection of Trace Elements.
Nuovo giorn. botan. ital. **60**, 287–319 (1953).
C. A., **48**, 13837g (1954).

Analyses are given for Si, Fe, Ca, Mg, K, Na, P, S, and Cl contents of 16 samples (I) of Centaurea paniculata, Alyssum bertolonii, Euphorbia nicaeensis, and Helichrysum italicum (II) grown in serpentine soils of Impruneta, and of 4 samples (III) of II grown at Monte Ceceri (Florence). Spectrography showed also the presence of Al, Ba, Co, Cr (generally scarce), Mn, Ni, Pb (only in some samples and absent in Euphorbia), Cu, Sr, Ti, and V (scarce) in I (Ag, Ga, Sn, Rb, Li doubtful; W and Zr absent). A. bertolonii had the highest amts. of Cr, Ni, and Cu. Spectrography showed Al, Mn, Ti (all 3 rather high), Cr, Cu, Sr, V (all 4 traces), Ba, and Ni (not as high as in I) in III (Ag doubtful; Be, Co, Ga, Ge, Li, Sn, Zn, Zr absent). The analyses of the soils of Imprueneta (and of the serpentine rock) and of Mt. Ceceri are also reported and discussed from a pedol. geochem. viewpoint, etc.

4434. MINNHAGEN, L.
Improved Wave Lengths for Some Infrared Lines in the Arc Spectrum of Carbon.
Arkiv Fysik, **7**, 413–14 (1953).
C. A., **48**, 6820f (1954).

C lines accidentally appeared as impurity lines in the spectrum of an electrodeless discharge tube contg. A and Ne at a total pressure of a few hundredths of a mm. The wave lengths of 10 infrared lines (8335.148 to 9620.785 Å.) were measured relative to A I and Ne I standards. The new wavelengths agree well with solar lines, and improved values for some triplet levels in C I were calcd. from the new measurements.

4435. MITROVIC, M.
The Spectrochemical Analysis of Boron.
Rec. trav. inst. recherches Structure Matiere (Belgrade), **2**, 23–6 (in English) (1953).
C. A., **48**, 75e (1954).

In the case of spark spectra the lower limit of sensitivity under optimum conditions was 3×10^{-7} g. for the specimen in soln. and 1×10^{-6} g. as solid. For d.-c. arc spectra the corresponding sensitivity limits are 3×10^{-8} and 1×10^{-7} g., resp.

4436. MITSUHASHI, T., SHIRAISHI, Y., AND NAKASHIMA, T.
Application of the High-Voltage Alternating Arc Source to Spectrographic Analysis of Steel.
Tetsu-to-Hagané, **39**, 1277–81 (1953).
C. A., **49**, 7299b (1955).

App. of the high-voltage a.-c. arc source as the light source of spectrographic analysis was designed, manufd., and used for the quant. spectrographic analysis of Mn, Ti, Si, Ni, Cr, As, and B in steel. The quant. analysis, heretofore, had been impossible for a small amt. of the above elements in steel by the usual spark-discharge method, while it became possible with higher sensitivity and about 3–8% reproducibility with the above app. The lower limit of the detn. was 0.015% for Si, 0.01% for Cr, 0.006% for Ni, and 0.06% for As. As for the other characteristics, it was proven that there was practically no continuous background and few losses of test pieces on account of a lower temp. of the electrode.

4437. MONNOT, G. A.
Determination of Small Quantities of Elements in the Ash of Carbon Compounds and in Silicates.
Chim. anal., **35**, 274–6 (1953).
C. A., **48**, 1199e (1954).

A procedure is given for detg. GeO_2 in oil contg. 5–300 g. per ton of GeO_2.

4438. MONNOT, G. A.
A Spectrographic Method Applicable to the Analysis of Tissues and Biological Products.
Compt. rendus, **236**, 1492–4 (1953).
C. A., **47**, 11313g (1953).

The method of Triche (Cf. *C. A.*, **29**, 4283[4], 4292[8]) concerning the spectrographic analysis of metals in light alloys is applied to the detn. of SiO_2 and BeO in biol. material such as tissues and urine. The spectral bands of the substance to be detd. are compared with the zones of a counter electrode of Cu or Al, which are free of traces of that substance. Tissues are weighed and placed into a hole of the graphite of an arc of 300 v. and 8 amp. Known amts. of urine are first absorbed on a filter and introduced without ashing. Since liquids can be utilized, solns. of SiO_2 from 10–1000 γ/cc. and of BeO 0.025–25 γ/cc. can be standardized by titration. The spectra can be photographed. The sensitivity of SiO_2 was found to be 0.3 γ and of BeO 0.001 γ. The advantage of this spectral method lies in the simplicity without ashing or chem. manipulation risking contamination of the sample.

4439. MORGAN, G. D.
High-Frequency Discharges in Gases.
Science Prog., **41**, 22–41 (1953).
C. A., **47**, 3103g (1953).

A review with 70 references.

4440. MORTIMORE, D. M. AND NOBLE, L. A.
Determining Low Concentrations of Hafnium in Zirconium—A Spectrographic Method.

Anal. Chem. **25**, 296–8 (1953).
C. A., **47**, 5297g (1953).

Hf in Zr is dtd. spectrographically in concns. of 0.003 to 0.4% by the use of direct arc conditions with a current of 30 amp. at 230 v. The spectra are recorded in third-order ultraviolet to obtain a higher line to background ratio; a filter suppresses the second-order cyanogen band. A BaF_2-graphite buffer is used to maintain a steady, even arc stream.

4441. MOSER, H. AND SCHMIDT, W.
Application of the Method of Characterization by Minimum Rays to Spectroscopic Investigations.
Z. Physik. **134**, 546–53 (1953).
C. A., **47**, 9765f (1953).

Instead of identifying a spectral line by a max. of blackening in a spectrogram, a min. obtained by interference can sometimes be used to good advantage. To get the necessary interference between out-of-phase rays a totally reflecting glass prism with one half of the reflecting surface silvered was inserted into the path of the collimated light in a spectrograph. Since the interference minima corresponding to separate lines are rather sharp, the distance between lines can be detd. with high accuracy and the effective resolution of the instrument increased. Cf. Wolter, *C. A.*, **45**, 39h; *Z. Naturforsch.*, **5a**, 139 (1950).

4442. MULD, W.
The Spectrochemical Analysis of Silicate Rocks.
Spectrochim. Acta, **6**, 53 (1953).
C. A., **48**, 2518f (1954).

Methods have been worked out for the spectrochem. analysis of the major and minor constituents of rocks, sediments, and ores. The samples to be analyzed are fused with KOH or NaOH in a Ag crucible and then dissolved in dil. HNO_3 or HCl. For the spectrochem. detn. of the major constituents in this soln., 2 methods have been employed alternatively. (*1*) In a high-voltage spark between a graphite-rod upper electrode and a slowly rotating graphite disk, the soln. is carried into the spark column by the rotation of the disk dipping in the soln. (*2*) The soln. is dispersed by means of an atomizer and injected into an arc or spark column through a small bore (1.5 mm. in diam.) in the purified C rod (4 mm. in diam.) which serves as the lower electrode. The counter electrode is a purified graphite rod (6.6 mm. in diam.) turned to a conical tip with included angle of 120° For the detn. of the major constituents, a Feussner controlled spark is used. When recording the spectra photographically, the accuracy of the method is measured by a standard deviation of about 3.5% for the SiO_2 detn.; for the other major constituents of rocks (Al, Fe, Ca, Mg, and the alkali metals) a standard deviation of 2–2.5% is obtainable.

4443. MUÑOC TABOADELA, M. AND RAMÍREZ-MUÑOZ, J.
Several Trace Elements in Various Spanish Clay Minerals.
Anales edafol. y fisiol. vegetal (*Madrid*), **12**, 231–41 (1953).
C. A., **47**, 11627c (1953).

Differential thermal curves and spectrographic analyses are given for 5 clay minerals. They are classed as metahalloysite (I), saponite (II), sepiolite (III), "cartón de montaña" (IV), and gibbsite. Ion-exchange capacities were reported as: I, 14.6; II, 83.5; III, 24.4; and IV, 31.0 meq./100 g. The montmorillonitic groups, II, III, and IV, are characterized by traces of the alkalies and alk. earth elements, particularly Li. The gibbsite sample contained considerable Pb, Zn, and Mn, while I was alone in showing Ge as a trace.

4444. MURATA, K. J., ROSE, H. J., JR., AND CARRON, M. K.
Systematic Variation of Rare Earths in Monazite.
Geochim. et Cosmochim. Acta, **4**, 292–300 (1953).
C. A., **48**, 5741i (1954).

La, Ce, Pr, Nd, Sm, Gd, Y, and Th were detd. in 10 samples of monazite from widely scattered localities. The elements showed strong variations in concn. calcd. as at. % of total rare earths: (*1*) the sum of La and Nd is nearly const. at 42 ± 2 at. %; (*2*) Pr is nearly const. at 5 ± 1 at. %; and (*3*) the sum of Ce, Sm, Gd, and Y is very nearly const. at 53 ± 3 at. %. Th showed no correlation with any of the examd. elements. The results are interpreted by assuming that the monazites formed by a fractional ppt. process in which there is a gradational increase in the precipitability of rare earth elements with decreasing ionic radius. As crystn. proceeds, La and Ce increase, Pr remains const., and Nd, Sm, Gd, and Y decrease. Ce, Pr, and Nd show the greatest deviations from this hypothesis. The authors suggest the temp. dependence on the precipitability is greater for this trio of elements.

4445. MUTH, H. W.
Flame Photometric Determination of Calcium in Serum.
Ärztl. Wochschr., **8**, 160–2 (1953).
C. A., **47**, 4946a (1953).

The detn. of Ca^{++} in serum by the Lange flame photometer gives higher values owing to the interference of Na^{+}. Org. matter lowers the value for Ca^{++}, because the illuminating gas cannot give the required high temp. The Ca^{++} is pptd. as the oxalate, dissolved in HCl, and the detn. made in the Lange app. Controls in the range of 6 to

14 mg. % gave more concordant results than did the Kramer and Tisdall titration, the latter were generally 0.2 mg. % higher.

4446. NAGATA, M.
Spectrographic Analysis of Minor Elements in Tea Leaves. I. Method.
J. Chem. Soc. Japan, Pure Chem. Sect., **74**, 462–3 (1953).
C. A., **48**, 2284i (1954).

Semiquant. spectrographic method was used by the use of low-voltage a.-c. arc and rotating sector.

4447. NAGATA, M.
Spectrographic Analysis of Minor Elements in Tea Leaves II.
J. Chem. Soc. Japan, Pure Chem. Sect., **74**, 534–8 (1953).
C. A., **48**, 2839d (1954).

Contents of metals in old and new tea leaves were detd. by a semiquant. spectrographic method. K, Mg, P, Ni, Na, and Cu were more abundant in new leaves, and Al, Sn, Pb, Be in old leaves. During the period when new leaves were growing, Ni, Na, K, Mg, and P were displaced from the old leaves into the new leaves.

4448. NAKAJIMA, T. AND SHIRAISHI, Y.
Spectral Analysis of Elements Difficult to Excite.
Bunkô Kenkyû, No. **6**, 20–3 (1953).
C. A., **51**, 13638c (1957).

A high-voltage a.-c. source which is provided with a capacity of 1 microfarad in the 2nd circuit is used for exciting spark spectra of Se, F, Cl, Br, and I. Powd. samples are stuck to a massive Cu bar by collodion soln. which is dild. with amyl. alc. and dried at 110°. The Cu bar is installed as the lower electrode and a cone-shaped upper electrode is used. As the discharge proceeds, the lower electrode is moved by an ebonite bar perpendicularly to the optical axis, to expose fresh surfaces for discharge. The limit of accuracy of the analysis is 0.01%.

4449. NAZAREVICH, E. S.
Qualitative Spectrochemical Method for Determination of Micro Quantities of Some Heavy Metals in Natural Waters.
Ukrain. Khim. Zhur., **19**, 544–7 (1953).
Referat. Zhur., Khim. **1954**, No. 23980.
C. A., **49**, 4914g (1955).

In this method for detg. micro quantities of Cu, Pb, Ag, Ni, and Co, the metals are concd. by extn. as dithiazonates. For detection of the concd. metals the effect of a near-cathode layer is used. The sensitivity of this method is Cu 0.01, Pb 0.01, Ag 0.01, Ni 0.5, and Co 0.25 γ.

4450. NIELSCH, W.
Spectrochemical Analysis of Nickel.
Metall, **7**, 260–1 (1953).
C. A., **47**, 6818e (1953).

A spectrochem. method is described, which is suitable for analysis of Ni and Ni salt solns. by means of soln. spectral analysis with spectral C and a spark source. This method can be used for detg. Co, Mn, Fe, Mg, and Cu in the concn. range of 0.01 to 1.0% with an accuracy of ±6.5%. It is also suitable for detn. impurities in Pb, Sn, Zn, and Ag in the range of 0.003 to 0.05%. Si cannot be detd. in soln. since SiO_2 seps. This can be overcome by sparking the metallic sample.

4451. NIELSCH, W.
Modern Radiation Methods in the Spectral Determination of Nickel.
Metall, **7**, 513–16 (1953).
C. A., **47**, 10398b (1953).

A qual. spectrochem. method for detecting small traces of Pb, Zn, Sn, and Ag in metallic Ni is described. A low-voltage spark is used. Mg, Mn, Fe, and Co can be detd.

4452. NOBBS, J. M.
Automatic Electrical Ignition of the d.-c. Arc in Spectrographic Analysis
British J. Applied Phys., **4**, 118, (1953).

In spectrographic analysis the striking of a d.-c. arc between electrodes of the material under test is usually performed mechanically; in this paper apparatus is described which besides igniting the arc electrically by means of a high-frequency trigger spark reignites it automatically should it be accidentally extinguished or the arc current drop below a pre determined value during the period of exposure. A circuit diagram of the automatic d.-c. arc igniter is shown.

4453. NORTH, J. C.
A Projector-Comparator for Examining Spectrographic Plates.
J. Sci. Instr., **30**, 366–9 (1953).
C. A., **48**, 9203a (1954).

A bench-mounted projector-comparator, by which any section of one 10 × 4-in. spectrographic plate can be compared with any section of another, is described and has the following special features: (1) a magnification of ×20 with a 5% adjustment, (2) an opaque white screen of 20 sq. in., (3) overlapping between the images of the 2 plates, (4) provisions for several observers to view the screen, (5) rotation of each plate in its own plane through about 5°, (6) sep. longitudinal and transverse movement of each plate and combined longitudinal movement, (7) comparison of the opposite ends of 2 plates taken with different but overlapping settings, and (8) provisions for marking the emulsion of 1 plate. The comparator can be used for semiquant. estn. by the method of comparing the intensities of impurity and main constituent lines.

4454. NOVOKHATSKIĬ, I. P. AND KALININ, S. K.
Fluorine Content of Some Natural Waters of Kazakhstan from Spectrum-Analytical Data.
Doklady Akad. Nauk S.S.S.R., **93**, 289–91 (1953).
C. A., **50**, 3680f (1956).

The presence of F in waters was studied by the sharp green band, 5291.0 A, which becomes visible with 0.05–0.1% F. Results obtained by spectroscopy were compared with chem. analysis data. High Fe content (>1% in solid evapd. residue) was found in the hot springs in Tien-Shan and in wells from granites and lakes in granite massives. No F was found in limestone-mine waters.

4455. OERTEL, A. C. AND CORNISH, E. A.
Frequency Distribution of Errors in Spectrographic (d.-c. arc) Analysis.
Australian J. Appl. Sci. **4**, 489–507 (1953).
C. A., **48**, 5711g (1954).

The frequency distribution of the errors which occur in the d.-c. arc excitation of samples of soil and plant ash has been detd. from 259 sets of triplicate and 64 sets of sextuplicate measurements of line intensity. In general, the error is found to be a proportional one. On transforming to a logarithmic scale, the frequency distribution becomes effectively normal. Therefore, it is concluded that measures and tests of significance based on normality are applicable in spectrographic (d.-c. arc) investigations.

4456. OKUDA, H. AND INAGAKI, M.
Quantitative Spectrographic Analysis of Powdered Samples by Continuous Arc.
J. Chem. Soc. Japan, Pure Chem. Sect., **74**, 186–8 (1953).
C. A., **47**, 8576d (1953).

$SrCO_3$ and Li_2CO_3 were added to the sample as the internal standard and flux, resp. A medium-size quartz spectrograph and d.-c. arc with 100 v. and 10 amp. were used. Contents of SiO_2, Al_2O_3, Fe_2O_3, CaO, and MgO in the silicate sample were detd.

4457. ORSAG, J.
The Use of Direct-Reading Spectrographic Analysis in the Aluminum Industry.
Spectrochim. Acta, **6**, 80–4 (1953).
C. A., **48**, 1733g (1954).

A direct-reading spectrograph is used in several French works for the analysis of Al and its alloys. This instrument, because of its versatility and its faculty of analyzing spectral phenomena with a very short integrating time, has been useful for basic research as well as for the standardized industrial analysis. The method used to compare different brands of graphites, the influence of the spark-gap on the analysis, and the evolution of line-intensities as a function of the capacities and self-inductance of the generator are briefly described. Samples and their prepn., differences found between cast and wrought structure, evaluation of the mean error, and the analysis of Cu in light alloys are discussed.

4458. OTA, N.
Spectrographic Determination of Boron.
Japan Analyst, **2**, 205–8 (1953).
C. A., **47**, 12105e (1953).

Quant. spectrographic analysis of B was studied with Te as internal standard. The sample was supported in a Cu electrode and burned by a d.-c. continuous arc. Interfering substances and the condition of burning were discussed. Submarine mud was analyzed by this method.

4459. OTO, Y.
The Influence of Extraneous Elements in Quantitative Spectral Analysis. I.
Rept. Oska Munic. Inst. Ind. Research, **5**, No. 2, 40–2 (1953).
C. A., **47**, 11069c (1953).

There was no effect of Zn in estg. Mg, or Mn in estg. Cu in Al alloy when measured either with a solid metal electrode or by a special emission method with a metal electrode.

4460. OTTE, M. U.
Trace Elements in Some German Mineral Coals.
Chem. Erde, **16**, 237–94 (1953).
C. A., **48**, 4387b (1954).

The contents of Ge, Ga, Be, Ti, Mn, V, Ni, Co, Cu, Mo, Zr, Cr, Pb, Zn, Sb, Sn, As, and Bi in Carboniferous and Wealden coal were detd. by means of spectral analysis with visual evaluation. The coal ash was divided in plant ash (sp. gr. 1.4) and "foreign ash" (= the mineral substances which were added during or after the formation of coal) (sp. gr. >1.8). Ge, Ga, Be, Ti, V, Ni, Cu, Mo, Zr, and Cr were bound to the org. substance while Mn was bound to the "foreign ash," and Co, Pb, Zn, Sb, and Sn to both. As and Bi were not detected certainly. Coals with low ash content showed more trace elements bound to the org. substance than the coals rich in ash. Carboniferous coals contained more Pb, Zn, Sb, and Sn than Wealden coal.

4461. PASSEREAU, G.
Two New Spectrographs With Large Dispersion.
Congr. groupement advancement méthod. anal. spectrog. produits mét., **16**, 91–107 (1953).
C. A., **49**, 1434d (1955).

Two spectrographs having large dispersion are described. The first has a dispersion of 22 cm. from 3900 to 7000 Å. The second gives 50 cm. from 2100 to 10,000 Å.

They can be used for very complex spectra such as those of high-speed steels.

4462. PECORA, W. T. AND KERR, J. H.
Burbankite and Calkinsite, Two New Carbonate Minerals from Montana.
Am. Mineralogist, **38**, 1169–83 (1953).
C. A., **48**, 11983b (1954).

Chemical and spectrographic analyses are given.

4463. PENNY, D. S.
Analysis of Aeroengine Deposits.
Shell Aviat. News, **1952**, No. 173, 14–19.
Fuel Abstr., **13**, No. 6, 172–3 (1953).
C. A., **49**, 9913h (1955).

Time can be saved in the analysis of aero-engine deposits by first detecting the elements and compds. present, and later, if necessary, detg. the proportions. Phys. methods of analysis described include arc and flame spectrography, X-ray diffraction with spectroscopy or monochromatic X-radiation, and microscopy. The arc spectrographic method (suitable for very small samples) is chiefly used to distinguish the presence of metallic constituents, though some quant. information can be obtained from the relative ds. of the lines in the spectrum. Flame spectrographic methods are used for the detn. of trace inorg. impurities such as compds. of Na, Cu, Ni, or Fe in liquid fuels. (*See C. A.* for complete abstract.)

4464. PERMAN, I.
Under-Water Excitation of Solution Spectra.
Bull. Sci. Conseil Acad. RPF Yougoslav., **1**, No. 2, 42–3 (1953).
C. A., **48**, 6310d (1954).

Spectral analysis of solns. has many advantages, e.g. inhomogeneities of the test material do not matter and trace elements can be concd. Com. app. for this purpose presents 2 difficulties: overheating of the soln. and corrosion of Pt electrodes. A water-cooled cell that overcomes these difficulties is described. In a soln. of 3 parts EtOH, 4 parts concd. HCl, and 5 parts water with a salt concn. of 0.5 mg./ml. min. amts. of the following elements could be detd. (in γ/ml.): Ag 10, Au 25, Ba 5, Be 200, Bi 100, Ca 3, Cd 15, Ce 50, Co 200, Cr 5, Cs 10, Cu 5, Fe 100, Ga 5, Hg 20, La 10, Li 2, Mg 2, Mn 50, Na 2, Ni 100, Pb 25, Pd 50, Pt 50, Rb 50, Sn 100, Sr 3, Ti 100, V 50, Y 5, Zn 10. The concn. of the elements in the soln. can be estd. from successive dilns. with an accuracy of about $\pm 20\%$. A micro-cell of this type requires only 1 ml. of soln.

4465. PERNIS, B.
Spectrochemistry in Biology: Determination of Zinc and Copper in Blood.
Riv. infortuni e mal. profess., **40**, 441–54 (1953).
C. A., **48**, 3437e (1954).

A lecture.

4466. PETERSON, M. J. AND JAFFE, H. W.
Visual-Arc Spectroscopic Analysis.
U. S. Bur. Mines, Bull., **524**, 20 pp. (1953).
C. A., **47**, 12101a (1953).

This method can be used for the identification of most metallic elements. By means of a d.-c. arc a sample of mineral powder, boiler deposit, metal fragment, or other inorg. material is volatilized from a graphite electrode, and the metallic constituents are detd. objectively by visual observation of their spectral lines. The anions, except for F and Cl, cannot be detected because they do not yield spectra in the visible range. Examns. are limited to the visible region of the spectrum. The lines of minor constituents may be obscured if the major ones have complex spectra. For example, a small amt. of Ni in pyrrhotite may be obscured by numerous Fe lines.

4467. PIEUCHARD, M.
A Large Dispersion Spectrograph, Type Z3.
Congr. groupement advancement méthod. anal. spectrog. produits mét., **16**, 161–3 (1953).
C. A., **49**, 1434d (1955).

A spectrograph having a dispersion of 56 cm. between 2000 and 8000 Å. is described.

4468. PINTA, M.
Analysis of Rare Earths Fractionated on an Ion-Exchange Column. Other Applications.
J. recherches centre natl. recherche sci., Labs. Bellevue (Paris), No. **22**, 19–35 (1953).
C. A., **47**, 7936c (1953).

Mixts. of rare earths were dissolved in dild. HCl, adsorbed on a column of Dowex 50 (120 cm. high and 5 cm. in diam.), and eluted with NH_4 citrate soln. contg. 5% citric acid at various pH values (adjusted with NH_4OH). The eluates were collected in 125, 250, and 500 ml. fractions, and the rare earth oxides were pptd. with base. Sufficient HCl to dissolve 0.1 g. of pptd. oxide was added, the soln. dild. to 10 ml., and the flame spectrum photographed (4 min. exposure, 80 μ slit width). Standards were oxides of theoretical formula M_2O_3, obtained by calcination of hydroxides or oxalates. By this method eluate fractions were examd. for rare earth content in less than 1 hr. The error was not over 3%, and oxide concns. up to 0.5% were detected. Greater sensitivity could not be had because of the complexity of the flame spectra of the rare earths. A soln. of Ce earths was adsorbed on a column and eluted at pH 3.1. After elution of Tb, Y, Gd, and Sm, Nd, and Pr were eluted separately, then La after the pH was raised to 3.4. A soln. of Y earths was adsorbed and

eluted at pH 2.85. Yb, Tb, Er-Ho, Ho-Dy, and Y-Tb fractions were separately eluted. A soln. of Y earths, rich in Er and Y, was adsorbed and eluted at pH 2.80, giving a sepn. into Er and Y fractions, each contg. small less of amts. Ho.

4469. PISAREV, V. D.
Spectrum Analysis of Soils.
Trudy Sibirskogo Fiz.-Tekh. Inst., Tomsk. Univ., **1953**, No. 32, 53–62.
Refrat. Zhur. Khim., **1954**, No. 39999.
C. A., **49**, 10560c, (1955).

A review and some general principles are given. 36 references.

4470. POHL, F. A.
Microchemistry and Spectroanalysis.
Spectrochim. Acta, **6**, 19–22 (1953).
C. A., **48**, 2506h (1954).

Emission spectroscopy has become a particularly useful aid to the microchemical analyst who separates groups of elements from the main sample by chemical procedures. These chemical procedures being with the classical methods of separation, and extend to the special microchemical techniques, and the use of specially sensitive organic reagents, in particular the reagents which form chelate complexes used for chloroform extraction, and the precipitation of traces of metals by the addition of coprecipitants. Recently developed procedures enable the selective concentration of a number of heavy elements from million-fold excess of other elements; and also the complete separation of disturbing iron or other elements with complex spectra which is helpful when spectrographs of small dispersion are used. The extracted trace elements are put in solution to which a buffer and reference element (usually Be) is added. A condensed high-voltage spark excites the spectra of 0.02 ml. of solution on carbon electrodes and the elements are detd. from blackenings of a calibrated photographic plate. The method is illustrated by the detn. of trace metals in waters, synthetic fibers, coal ashes, and soils.

4471. POHL, F. A.
Methods for the Spectrochemical Determination of Traces. I. Analysis of Waters.
Z. anal. Chem., **139**, 241–9 (1953).
C. A., **47**, 12706g (1953).

Complete details of the procedure are given and photographs of some of the spectra shown. By a mixt. of org. reagents (diethyldithiocarbamate, 8-quinolinol, and dithizone) it was possible to effect a considerable concn. of approx. 40 elements studied. A complete analysis can be carried out in 1 working day, and, for detg. as little as 1 γ per l. of an element, a l. of the water suffices.

4472. POHL, F. A.
Methods for the Spectrochemical Determination of Traces. II. Determination of Vegetable Materials.
Z. anal. Chem., **139**, 423–9 (1953).
C. A., **48**, 895i (1954).

Dry and ash the material at 450–500°. Remove silica by fuming with HF. Enrich the trace metals by extn. with mixed diethyldithiocarbamate, 8-quinolinol, or dithizone in $CHCl_3$. Details are given for detecting 20 elements when only 0.1–1.0 γ is present in 1 g. of the dry material. Cf. *C. A.*, **47**, 12706g.

4473. POHL, F. A. AND TREIBER, E.
Spectral Analytical Determination of Traces of Heavy Metals in Cellulosic Materials, Particularly in Delustered Rayon.
Melliand Textilber., **34**, 747–8 (1953).
C. A., **48**, 5717e (1954).

A discussion of the importance of heavy metals in the dyeing and the deterioration of cellulosic materials, and of the difficulty of detg. these metals in the presence of large amounts of TiO_2 often found in rayons. It was found that the benzoate method (*C. A.*, **44**, 6334e) is satisfactory for the sepn. of Cr, Fe, Cu, Co, Mn, Ni, Pb, and V from Ti, but recommended the following adaptation of the method of Gleu and Schwab (*C. A.*, **44**, 8286f). Ash 1 g. dried fiber in a Pt or quartz crucible at 550°. Fuse with $K_2S_2O_7$. Dissolve in 50 ml. of cold water. Add 5 ml. of 10% NH_4 tartrate soln., 10 ml. of acetate buffer (pH 5), and 2 ml. of $Zn(OAc)_2$ soln. contg. 1 mg. Zn^{2+}/ml. If the final pH is not 5, adjust by adding dropwise 5 *N* NH_4OH or 5 *N* AcOH. Heat to about 70 and add while stirring 10 ml. of a 5% soln. of (Na 1-pyrrolidinecarbodithioate). The ppt. which is milky at first becomes flocculent after a short time, leaving the supernatant liquid clear. Filter carefully with a porcelain filter stick and wash the ppt. once with lukewarm water to which a few drops of acetate buffer and of the carbate soln. has been added. Dissolve the ppt. in 2 ml. concd. HNO_3 and transfer to a quartz dish. Wash the beaker with 2 ml. more of concd. HNO_3 and add to the quartz dish. Add a little $HClO_4$, evap., and ash on a sand bath. Dissolve the residue in 100 cc. of 6*N* HCl. By means of a capillary pipet, remove 20 cc. of the soln. and place on a preheated C electrode. Compare the spectrum with one contg. the same amt. of Zn. If photometric d. measurements are desired, add to the quartz dish 10 cc. of a 0.1% soln. of Be^{2+} or other suitable reference element.

4474. POKROVSKIĬ, P. V. AND TSIMDALENKO, M. N.
The Nature of the Siliceous Powdery Incrustration on Chalcedony.
Trudy Gorno-Geol. Inst., Akad. Nauk

S.S.S.R., Ural Filia, No. **20**, *Mineralog. Sbornik*, No. **2**, 144–7 (1953).
C. A., **49**, 2958d (1955).

Chalcedony from the southern Urals often had a surface incrustation of a milk-white color. Spectral analysis of the chalcedony and the white substance gave almost identical results, indicating a siliceous compn. for the white substance. X-ray analysis also gave identical results.

4475. PÓLIT, I. AND GARCÍA-LLAURADÓ, J.
A Flame Photometer Which Can be Constructed in the Laboratory.
Biochem. Z., **323**, 418–23 (1953).
C. A., **47**, 5174e (1953).

The app. is described.

4476. POPOV, L. V. AND POMINOV, I. S.
Relation of the Temperature of an a.-c. Arc to the Ionization Potential of Electrode Material.
Uchenye Zapiski Kazan. Univ., **113**, No. 9, 107–9 (1953).
Referat. Zhur., Fiz., **1955**, No. 14447.
C. A., **40**, 14347f (1956).

The relation of the temp. of an a.-c. arc to the ionization potential of electrode material was studied. One of the electrodes was made of Armco iron with an admixt. of 1.2% Cu. In the 2nd electrode (from pure Armco iron) an opening was made with a diam. of 2 mm., in which the metal being studied was introduced in the form of a salt. Temp. of the arc was measured on a stylograph by the Cu line. The Fe was used for a line of comparison. The linear relation of temp. to ionization potential of the admixt. element was obtained. It was concluded that the discharge mechanism was basically the same for an a.-c. arc and for a d.-c. arc. (The linear relation of temp. to the ionization potential of the admixt. for a d.-c. arc was established by O. P. Semenova (*C. A.*, **40**, 5632[4]).)

4477. PREUSS, E.
Prismatic Spectroscopes and Spectrographs, Bibliography.
Arch. Tech. Messen, No. **205**, pp. 45–48, Feb. 1953.

This is a discussion of general principles and characteristics of prismatic spectroscopes and spectrographs, including transparency of prism materials, dispersion and length of spectrum with glass or quartz optics, construction of apparatus, and adjustments.

4478. PRICE, W. J.
Spectrographic Analysis of Complex Oxides with Particular Reference to Slags and Ores.
Spectrochim. Acta, **6**, 26–38 (1953).
C. A., **48**, 2519c (1954).

A method for spectrographic analysis of slags, ores, refractories, and other simple or complex oxides is given. This method has the following advantages: (*1*) much faster and as reliable as the chem. method; (*2*) not influenced by the chem. nature of the samples; (*3*) easily obtainable app.; and (*4*) easily calibrated and independent of chemically analyzed standard samples. Known wts. of the material to be analyzed and CoO as added internal standard are fused in borax. The resulting melt is quenched, crushed, mixed with graphite, and briquetted. The arc spectrum is obtained by means of a controlled d.-c. source. A result with a standard deviation of less than 3% content is obtained by taking the av. result of 5 replicate spectra and the total time involved (including 20 min. for sampling) is about 105 min. By taking triplicate spectra, thereby obtaining an accuracy of about 4%, this time can be cut to less than 90 min. A single comprehensive standardization for all these materials can be carried out by means of synthetic mixts. of pure oxides or other suitable compds. Working details of the procedure and standardization are given in full, together with line-pairs found suitable for various ranges of lime, silica, alumina, magnesia, manganese oxide, and total Fe. A no. of results obtained for various materials are quoted and discussed. Cf *C. A.*, **46**, 8571f.

4479. PRO, M. J. AND ETIENNE, A. D.
Flame Spectrum of Whiskey. Determination of Sodium and Potassium.
J. Assoc. Offic. Agr. Chemists, **36**, 1150–7 (1953).
C. A., **48**, 14108c.

The flame spectrum of approx. 100 straight whiskies has been detd. These whiskies contained not more than 10 p.p.m. of Na and not more than 35 p.p.m. of K. Ca was present in trace quantities. Several blended whiskies analyzed for K and Na contained similar metal concns. The K content of blends is partially due to the presence of blending agents high in K. The flame photometer method employed is described in detail.

4480. PRYTZ, B.
Sodium and Potassium Concentrations in Whole Blood and Serum.
Bull. St. Francis Sanatorium, **10**, No. 3, 27–31 (1953).
C. A., **48**, 842b (1954).

With the use of a flame spectrophotometer Na and K were detd. in blood and serum. For K detns. serum was dild. 1:20 and blood 1:100; for Na the dilns. were 1:400 and 1:266, resp. The av. figures obtained on over 100 samples from 26 children were: Na 94 ± 1.11 in blood and 141 ± 0.65 meq./l. in serum. The K figures were 41.6 ± 5.3 and 6.16 ± 1.0 meq./l., resp. It was found that

the electrolyte concn. of serum was more stable than that of whole blood.

4481. RAMSAY, J. A., BROWN, R. H. J., AND FALLOON, S. W. H.
Simultaneous Determination of Sodium and Potassium in Small Volumes of Liquid by Flame Photometry.
J. Expl. Biol., **30**, 1–17 (1953).
C. A., **47**, 5842f (1953).
Cf. *C. A.*, **45**, 3449f; **46**, 8278f.

A small vol., e.g. 10^{-3} cu. mm., of the liquid is drawn up into a silica capillary pipet, then transferred to a Pt wire, dried, and the wire thrust into the flame by a mech. device. The emission from the flame enters a spectrometer; the spectrum falls upon a mask having 2 slits, one passing the Na doublet and the other the K doublet and these emissions are allowed to reach 2 photomultiplier tubes. When the method is used with quantities near the lower limits of detection (4×10^{-8} mg. Na and 6×10^{-8} mg. K) the reproducibility expressed as standard deviation is $\pm 7 \times 10^{-9}$ mg. Na and $\pm 17 \times 10^{-9}$ mg. K. When larger quantities are used the standard deviation is approx. ±3% of the wt. of sample. Interference errors caused by the presence of other substances in the sample were reduced to ±6% by the addn. of excess $(NH_4)_3PO_4$.

4482. RECARTE, A. B.
Meteoric Iron Found in Villanueva Del Fresno (Badajoz, Spain).
Notas y comuns. inst. geol. y minero España, No. **30**, 35–41 (1953).
C. A., **48**, 5744h (1954).

A strongly magnetic metallic nodule about 152 g. and approx. 7.5 × 4.5 × 1.5 cm. was studied by chem., X-ray, and microscopic analysis. Qualitatively the object was composed of Fe with little Ni. The spectroscope disclosed that only Ir (0.001%) of the Pt group was present. Microscopic study of etched carefully polished surfaces compared with those of other meteorites, and other data led to the iron being classified as ataxite, poor in nickel, derived from an actahedrite transformed by heating to at least 850° after being formed.

4483. RICARD, R.
The Effect of Carbon in the Spectrographic Analysis of Refractory Materials.
Spectrochim. Acta, **5**, 417–21 (1953).
C. A., **47**, 11685c (1953).

The effect of adding graphite to mixtures of refractory powders volatilized in the crater of a carbon arc has been studied for various proportions of graphite; in general the spectral lines of the less volatile elements, Al, Mg, Si and Ti, are amplified. This may be due to the reduction of the refractory oxides by the graphite, and also to the inhibition by the graphite of globule formation in the crater, resulting in more rapid volatilization of the powder. (*See C. A.*, **46**, 2961b.)

4484. RICARD, R. AND PARISOT, G.
A Review of the Illumination of the Spectrograph Window.
Congr. groupement advancement méthod. anal. spectrog. produits mét., **16**, 171–3 (1953).
C. A., **49**, 1434e (1955).

The importance of proper slit illumination is discussed.

4485. RICHARDSON, D.
The Use of Echelles in Spectroscopy.
Spectrochimica Acta, **6**, 61 (1953).

An echelle has properties intermediate between those of the reflection echelon and an echellette grating. It may be used with either prism or grating cross dispersion to provide a spectrograph of moderate size with unusually high dispersion and resolving power for a wide range of spectra. Several arrangements for using echelles are discussed together with some applications to particular spectroscopic problems.

4486. RIETHMÜLLER, H. U.
Magnitude of the Error in the Flame-Photometric Determination of Calcium in Human Serum and Urine.
Klin. Wochschr., **31**, 527–8 (1953).
C. A., **47**, 9389g (1953).

For serum the mean deviation is ±4.5% and the standard deviation ±6.0%; for urine the values are ±23% and ±31%, resp.

4487. RIETHMÜLLER, H. U.
Emission Spectroscopic Methods in Particular for the Determination of Calcium in Biological Materials.
Mikrochim. Acta, **1953**, 178–95.
C. A., **48**, 782g (1954).

A review with 53 references.

4488. RIETHMÜLLER, H. U. AND BRETSCHNEIDER, A.
Errors in the Flame-Photometric Determination of Calcium in Human Serum (and Urine).
Hoppe-Seyler's Z. physiol. Chem., **293**, 49–62 (1953).
C. A., **49**, 9723i (1955).
Cf. *C. A.*, **47**, 9389g.

The mean reproducibility of replicate detns. of serum Ca by flame photometry with a direct reading instrument is 0.9% (0.05 meq./l.). This results from both instrumental and manipulative errors. Analyses of 500 varied serums by the direct acidimetric technique (Sobel and Sklersky, *C. A.*, **32**, 2162[6]) showed a mean error of 4.5% (0.23 meq./l.). In this series the smallest error occurred in the normal range of values, while a larger error (8.9%) occurred among the low Ca values. Of 300 serums which had normal values by the titrimetric procedure, 6.7% were higher

and 6% were lower than normal by the flame procedure. The flame-photometric procedure cannot be used for Ca in urine. The practical errors in the flame-photometric procedure for serum Ca do not apply to the detn. of Ca in inorg. salt solns. or similar media, which are uncomplicated by the cumulative complexities of biol. media.

4489. ROHNER, F.
Sample Preparation in the Routine Spectrographic Analysis of Aluminum and Its Alloys.
Spectrochimica Acta, **5**, 473 (1953).

An improved mold, made of aluminum alloy, for casting 6-mm pins of aluminum alloys for routine spectrographic analysis is described. The new mold provides more uniform samples of finer grain than those obtained with an iron mold. The precision observed on determination of magnesium in samples from the two molds was ±3.6% and ±4.7% for the aluminum and iron molds, respectively.

4490. ROSEN, B.
Spectroscopic Determination of Oxygen in Steels.
Rev. universelle mines, **9**, 445–54 (1953).
C. A., **47**, 10405i (1953).

A new method was developed for detg. gases in steel by using a discharge tube with a hollow graphite cathode in which the samples are brought to melting by a discharge in argon. The liberated O combines with graphite to form CO. The measurement of the intensity of the CO bands with respect to the intensity of the argon rays shows the amt. of O liberated in the steel. The principle of the measuring method, and the evaluation of the photograms are described in detail.

4491. ROUIR, E. V. AND VANBOKESTAL, A. M.
Quantitative Spectrographic Analysis of Slags by the Combined Use of Solutions and Compressed Pellets.
Rev. mét., **50**, 153–8 (1953).
C. A., **48**, 5730g (1954).

The prepn. of standard slags avoids difficulties in the chem. analysis of slags. To simplify the prepn. of standards, curves are prepd. for the quant. analysis of synthetic slags. These curves serve to analyze with accuracy the slags which are to be used as standards. Then the slags were studied by the method of compressed pellets. The soln. method appears more accurate, but the combination of the two methods enables a rapid and precise method of analysis.

4492. ROZSA, J. T.
Spectrochemical Techniques in Titanium Technology.
Iron Age, **172**, No. 12, 166–70 (1953).
C. A., **47**, 12116h (1953).

Accurate standard samples can be made by the fusion technique commonly used in chem. decompn. of Ti ores. Solid samples are satisfactory for production analytical control.

4493. ROZSA, J. T. AND GOLLAND, J. D.
Spectrochemical Analysis of Leaf and Biological Materials.
Appl. Spectroscopy, **7**, No. 3, 125–6 (1953).
C. A., **48**, 1487f (1954).

Recent studies have shown that certain trace elements or micronutrients play a vital part in crop yields and plant or animal health. Spectrographic analysis, because of speed, sensitivity and, nonspecificity of the method, is best suited for the detn. of these minute mineral elements. Both fusion and concn. techniques are applied to the analysis of apple, pear, peach, cherry, and lily leaves, as well as corn., Alfalfa, carrots, tomatoes, crotalaria, sea animals, and miscellaneous vegetables and fruits. The fusion technique and a.-c. spark are used to det. B, Ca, Cu, Fe, Mg, Mn, and P relative to synthetic standards and indium lines as added internal standards. For the detn. of Co, Mo, and Zn in low concns. a concn. method and d.-c. arc were employed.

4494. ROZSA, J. T. AND ZEEB, L. E.
Trace Determination in Lube Oil.
Petroleum Processing, **8**, 1708–12 (1953).
C. A., **48**, 6106a (1954).

A spectroscopic method is given for the detn. of trace amounts of metals introduced by engine wear into used lubricating oils. The sample is dropped on a hot (700° F.) platform electrode; evapn. produces an adherent tar in which the metals are retained. The electrode is rotated during the exposure. It is claimed that, for a series of tests on synthetic samples, the "correlation was within a 10% range" if the concn. exceeded 10 p.p.m.

4495. RUDNEVSKIĬ, N. K. AND KUZNETSOV, E. V.
Effect of Thermal Treatment of Duralumin on the Relative Intensity of Spectrum Lines of Magnesium, Copper, Silicon, and Manganese in a Spark and Arc Alternating-Current Spectrum.
Uchenye Zapiski Gor'kov. Univ., **1953**, No. 24, 7–13.
Referat. Zhur., Khim., **1954**, No. 40322.
C. A., **49**, 10124h (1955).

Results of the effect of hardening and annealing are shown graphically. At the beginning of the arc burning, the heat-treatment had a considerable effect on the intensity of spectrum lines. Preliminary annealing of the electrodes eliminated this effect. In the analysis of duralumin in a concd. spark, the effect of thermal treatment on the line intensity by using preliminarv anneal was nullified only for Mn and Si.

4496. RUDNEVSKIĬ, N. K. AND PORKHUNOVA, A. Y.
EFFECT of Thermal Treatment of the Binary Aluminum-Silicon Alloy on the Intensity of Lines in a Spark.
Uchenye Zapiski Gor'kov. Univ., **1953**, No. 24, 3–6.
Referet. Zhur., Khim., **1954**, No. 38529.
C. A., **49**, 9470i (1955).

The effect of hardening and anneal of Al-Si alloys contg. 0.5–18% Si on the relative intensity of Si lines in spark spectra was studied. Thermal treatment of the alloy effect mostly the intensity of lines at the beginning of spark excitation. The relative intensity of lines is greater in hardened than in annealed specimens. The intensity graph of Si lines in a spark has a break in the region of eutectic Si concns. The slope of the lines is greater for eutectic concns. than for preeutectic. This difference is strongest expressed at the beginning of the spark and is wiped out after anneal.

4497. RYSSING, E.
Influence of Surface Tension in Serum and Urine on Flame Photometric Analysis.
Scand. J. Clin. and Lab. Invest., **5**, 321–3 (1953).
C. A., **48**, 5255h (1954).

Dild. icteric serum with lowered surface tension has no effect on the results obtained by flame photometric analysis, whether an internal standard instrument is used or not.

4498. SAITO, K.
Emission Spectroscopic Analysis.
Japan Analyst, **2**, 54–62 (1953).
C. A., **47**, 5787c (1953).

The practice of emission spectrography is described.

4499. SAITO, K.
Emission Spectral Analysis by the Interrupted Arc Method.
J. Japan. Chem., **7**, 382–7 (1953).
C. A., **47**, 11069e (1953).

A review with 23 references. Cf. *C. A.* **47**, 5787c.

4500. SAITO, T.
Minor Elements in Ore Minerals of the Yakumo Mine, Hokkaido, Japan.
J. Fac. Sci., Hokkaido Univ., Ser. IV, **8**, 267–76 (in English) (1953).
C. A., **47**, 10414b (1953).

The mineralization of the Yakumo Mine, composed of Pb-Zn-Mn deposits developed in the Neogene Tertiary formations is divided into 3 stages, and quartz, rhodochrosite, galena, sphalerite, pyrite, and chalcopyrite are the chief minerals. Among 24 elements such as Si, Fe, Mn, Pb, Zn, Al, Cu, Ag, Ba, Sb, As, Ca, Ti, Au, Mg, Ru, Cd, Be, Ce, V, Rh, Ge Sr, and Se, detected in the minerals, Si, Fe, Mn, Al, Mg, Cu, Pb, and Zn are commonly discovered, while the others are less often detected. Ni, Co, Pt, Mo, W, and Sn cannot be detected at all. The content of minor elements varies even in the same mineral as the mineralization stage differs. Such variation of content is also observed even in the same mineral as the mineralization stage differs. Such variation of content is also observed even in the same mineral of the same stage as the mineralization proceeds. Thus minerals crystd. earlier contain Si, Fe, Mg, Cu, Zn, and Pb, while later ones have As, Ag, Sb, Au, Mn, and Ca. Those minor elements have been found in minerals of epithermal origin and have some relation not only to the chem. character of the ore soln., but to the condition of the ore formation under which the minerals crystd.

4501. SCALISE, M.
Spectrographic Determination of Nickel and Cobalt Content in Bright Nickel Baths.
Metallurgia ital., **45**, 170–4 (1953).
C. A., **47**, 9816i (1953).

In bright Ni baths, Co can be used as a brightener, and S. demonstrates a spectrographic method of detg. their relative concns., by using the 3412.3 Å Co line and the 3414.8 Å. Ni line and comparing their intensities photometrically.

4502. SCHALL, E. D.
Potassium Analysis of Twelve Years Magruder Check Samples by Flame Photometry.
J. Assoc. Offic. Agr. Chemists, **36**, 902–7 (1953).
C. A., **48**, 9863a (1954).

The Magruder check samples distributed monthly for the past 12 years were analyzed for comparison with compiled results in the Magruder report. The standard deviation of the difference between the flame and Magruder values were 0.20% on these samples ranging from 2.00 to 62.50% K. Diln. was required for samples with over 15% K. Interference from phosphate and oxalate ions was compensated for by the addn. of each to the standard soln.

4503. SCHARRER, K. AND LEMME, G.
Usefulness of Lundegårdh's Leaf Analysis for Ascertaining the Fertilizer Requirements of Soils.
Z. Pflanzenernähr. Düng. Bodenk., **60**, 125–48 (1953).
C. A., **47**, 7145a (1953).

Rye and barley were used in sand culture and in soil, with elaborate combinations of N, P, K, and Ca. All results were in accord with Lundegårdh's contention (*C. A.*, **37**, 4186[6]) that the concn. of these elements in leaves reflects their concn. or availability

in the soil, and that leaf analysis can be of definite use in detg. fertilizer requirements.

4504. SCHELLER, H.
Einführung in die angewandte spektrochemische Analyse.
Berlin: Verlag Tech., **1953**, 137 pp.
C. A., **49**, 2954d (1955).

This book was written to stimulate the use of spectrochemical apparatus for saving time and material in German industrial developments during recent years. In successive chapters it treats qualitative spectrochemical analysis, the evaluation of spectrograms, semiquantitative analysis of solid alloys, the quantitative analysis of alloys by using standard samples, and the evaluation of spectra without standards. It includes discussions of light sources, spectrographs, analysis lines, calibration of photographic plates, properties and preparation of standard samples, construction and use of working curves, detailed directions for making analyses, and a bibliography of 83 most useful references to pertinent literature.

4505. SCHLÜTZ, G. O.
Quantitative Determination of Calcium in Blood Serum by Flame Photometry.
Schweiz. Med. Wochschr., **83**, 383–4 (1953).
C. A., **48**, 4621f (1954).

Ca in blood serum is pptd. as the oxalate, centrifuged, taken up in dil. HCl, and the clear soln. examd. with the flame photometer. In the range of 5–10 mg. %, the curve is linear and the Ca value can he read directly.

4506. SCHLÜTZ, G. O.
The Quantitative Flame-Photometric Semimicrodetermination of Calcium in 0.1 ml. of Deproteinized Whole Blood.
Schweiz. Med. Wochschr., **83**, 452 (in German) (1953).
C. A., **48**, 4030f (1954).
Cf. ibid. **383**.

Mix 0.1 ml. of finger-tip blood with 0.1 ml. of 20% CCl_3COOH and 0.3 ml. of H_2O. Shake, centrifuge, and wash the ppt. with 0.5 ml. of H_2O. Combine the supernatants and boil down to 0.3 ml. to decomp. the CCl_3-COOH. Adjust to pH 5 with 0.1% AcOH, add 0.1 ml. of cold satd. NH_4 oxalate, and let stand 30 min. Centrifuge and wash the ppt. twice with 2% NH_3-water for removal of Na and K. Take up the ppt. in 0.5 ml. of 0.1 *N* HCl and read in the flame photometer against a standard Ca soln. prepd. from vacuum-dried $CaCO_3$.

4507. SCHMITZ, W.
Flame Photometric Process of Analysis in Water Analysis.
Jahresber. Limnol. Flusssta. Freudenthal, **1950**, 45–59.
Water Pollution Abstr., Dept. Sci. Ind. Research (Brit.), **26**, 42 (1953).
C. A., **49**, 11212a (1955).

S. discusses the application of flame photometry in the detn. of Na, K, and Ca in water and describes various designs of photometer. After investigation of the process and of the various possible sources of error (variations in the atomizing process, alterations in the conditions of the flame, the presence of interfering substances), the following method was adopted: The sample of water was filtered as soon as possible after being taken and was treated with HgCl to prevent growth of algae and fungi. It was stored in a polyethylene or paraffined glass flask. Na was then detd. by the flame photometer. For detn. of K 0.5 cc. of a radiation buffer solution (a std. soln. of Ca, Mg, and Na chlorides) was added to 5 cc. of samples. For detn. of Ca 5 cc. of sample was treated with 0.5 cc. *N* H_2SO_4 and then with 0.5 cc. of a buffer soln. consisting of a std. soln. of Mg and Na chlorides. Results are given of analyses of river waters by the method.

4508. SCHROER, F. W. AND BENTLY, C. F.
Modification of the Beckman Model 10300 Flame Photometer.
Chemist Analyst, **42**, 75–6 (1953).
C. A., **47**, 10281e (1953).

The new Beckman oxygen-acetylene burner designed for the Beckman Model 9200 can be easily adapted to the Model 10300 flame photometer.

4509. SCHROLL, E.
Differences in the Trace Element Content of Wurtzite, Sphalerite, and Banded Zinc Sulfide.
Österr. Akad. Wiss., Math.-naturw. Kl., Sitzber., Abt. I, **162**, 305–32 (1953).
C. A., **49**, 785g (1955).

Spectrographic analyses are given of 76 samples. Wurtzite showed characteristic concs. of Mn, Fe, Co, Ag, Cd, Ga, Tl, Ge, and Sn whereas Ni, Tl, As, and Ge were normally found in sphalerite. Banded ZnS concd. Mn, Co, Fe, Hg, and In.

4510. SCHUHKNECHT, W.
The Use of Small Film in Spectrochemical Investigations.
Optik, **10**, 237–40 (1953).
C. A., **47**, 10284e (1953).

Narrow strips of film are more convenient than glass photographic plates for routine spectrographic work. The film is light in wt. and nonbreakable, and is more uniform and more easily stored than glass plates. A simple easily made film holder is described which permits the use of film strips in plate holders of various spectrographs.

4511. SCHUHKNECHT, W.
Method and Technique of Flame Spectrography.
Optik, **10**, 245–68, 269–302 (1953).
C. A., **48**, 7481d (1954).

A review of the history, techniques, theoretical aspects, and applications of flame photometry.

4512. SCOTT, R. O. AND FRASER, A. M.
A Cutter for the Preparation of Carbon Electrodes.
Spectrochim. Acta, **5**, 422–5 (1953).
C. A., **47**, 11816i (1953).

A tool for the prepn. of carbon or graphite electrodes for spectrochemical detn. is described.

4513. SCRIBNER, B. F. AND MEGGERS, W. F.
Index to the Literature on Spectrochemical Analysis, Part III, 1946-50. American Society for Testing Materials, *Spec. Tech. Pub.* No. 41-C, Philadelphia, Pa. (1953), 226 pp.

Like the previous volumes in this series, this is a standard work of reference for every library which has to serve spectroscopists. It contains over 1250 references, which are listed alphabetically in five sections, each covered one year. The disadvantages of this time-conscious classification are redeemed by an excellent subject-index and an accurate author-index. Like the second volume of the series this volume contains abstracts of nearly all the papers; some are neat informative abstracts compiled by the Editors, some quoted from Chemical Abstracts or other sources and enriched by varying degrees of detail. There is something to be said for the uneven treatment, which in general provides more detail for paper which would be less accessible to the average American reader. The scope of the subjects is comprehensive, from Meteorites to the sediments of the Tyrrhenian Sea; but a bias towards chemistry rather than physics is shown by the scarcity of papers dealing with details of equipment. It would be unfair to complain of this basis, which is indicated by the title of the work; and all spectroscopists when faced with a sample outside their usual routine will wish to refer to this book (Review by E. Van Someren, *Spectrochemica Acta* **7**, 180 (1955).)

4514. SEMENOVA, E. D.
METHOD of Sampling Granites and Accessory Minerals of the Upper Iset Massif.
Trudy Gorno-Geol. Inst., Akad. Nauk S.S.S.R., Ural. Filial, No. **20**, *Mineralog. Sbornik*, No. **2**, 35–52 (1953).
C. A., **49**, 3749g (1955).

S. prepd. concentrates, detd. the accessory minerals in them. sepd. monomineral fractions, detd. the optical properties of accessory minerals, established by the method of spectral analysis the qual. chem. compn. of the most important accessory minerals, and observed some morphological characteristics and different grain sizes of the most important accessory minerals-sphene, apatite, and zircon—in relation to their location in the massif.

4515. SHABALIN, I. I.
Spectroscopic Analysis of Solutions with Carbon Electrodes.
Uchenye Zapiski Kazan. Univ., **113**, *No.* 9, 125–35 (1953).
Referat. Zhur., Khim. **1955**, No. 595 (1955).
C. A., **50**, 6247c (1956).

The absorption properties of spectroscopically pure C electrodes were tested with solns. of $MnCl_2$, $CuCl_2$, $CuSO_4$, and $FeCl_3$ in connection with studying the satn. method of spectroscopic analysis of solns. In the analysis of 0.1–1.2% $MnCl_2$ solns. and 0.05–1.0% $FeCl_3$ solns., as internal standard was used a 10% $Al_2(SO_4)_2$ soln. The electrodes were steeped in the sample for 20–30 min. The adsorptive capacity of the electrodes, the sensitivity, and reproducibility of the method were increased by activating the electrodes by heating for 15 min. at approx. 800°. The satn. method is unsuitable at concns. of approx. 10^{-3}%. For solns. of this strength a 2 × 2-mm. crater is drilled in the lower electrode and filled with the sample, and the tip of the upper electrodes sharpened to a cone having a 3–4 sq. mm. cross-section. With this artifice the limit of sensitivity was lowered to 10^{-3}% for Cu, 10^{-4}% for Fe, 10^{-5}% for Mg, and 10^{-4}% for Mn, with an error of less than 6%.

4516. SHURKUS, A. A.
Emission Spectrography in Industrial Control.
Ind. Labs., **4**, No. 2, 8–12 (1953).
C. A., **48**, 10477e (1954).

Applications to metal making, agriculture and biology, portland cement and other mineral products, and porcelain enamel are discussed.

4517. SIMONOV., A. I.
Neotocite from the Malo-Sedel'nikovsk Deposits of Rhodonite in the Central Urals.
Trudy Gorno-Geol. Inst., Akad. Nauk S.S.S.R., Ural. Filial, No. **20**, *Mineralog. Sbornik*, No. **2**, 140–3 (1953).
C. A., **49**, 2959f (1955).

Neotocite, a hydrous silicate of Mn contg. Mg, Fe, and Ca, has variable phys. properties. Samples were brown, liver-brown, and black, with hardness $3^1/_2$–4 and sp. gr. 2.54–2.80. Neotocite is optically amorphous, weakly anisotropic, or cryptocryst. The mineral dissolves completely in concd. HCl, with sepn. of cryst. silica. Spectral analyses of neotocite showed strong lines for Mn, Mg, and Si; av. lines for Al; weak lines for Ca; and trace lines for Fe, Pb, Cu, P, and Sn. The formula may be written as: 1.0 (Mn, Mg, Ca) 0.99 SiO_2.1.04 H_2O. Thermal analysis of neotocite showed that water

was present in weakly bound state and sepd. gradually from 90 to 250°. The thermal curve showed a max. endothermic effect at 150°, and in addn. an exothermic effect with max. at 710°, which is as yet not explained. Neotocite is a supergene mineral forming the hydration zone of the deposition from colloidal, almost neutral or slightly alk. aq. solns.

4518. SIMS, E. A. H. AND KAPLOW, L.
Exclusion of Airborne Contamination in Flame Photometry.
J. Lab. Clin. Med., **41**, 303–6 (1953).
C. A., **47**, 5175g (1953).

A device is described (with diagram) which eliminates dust contamination in flame photometers using an open air supply.

4519. SKALSKA, S.
Spectral Determination of Vanadium in Carbon Electrodes.
Przemysl Chem., **9**, 297–300 (English Summary) (1953).
C. A., **49**, 96i (1955).

A method of detg. V in C electrodes in the range of concns. 0.0625–0.009% is described. The Cr line, λ = 3155 Å., is used as internal standard; the analytical line of V was chosen as λ = 318.54 mμ. $K_2Cr_2O_7$ was added to make the intensity of the spectra of Cr and V almost equal. Standard Cu electrodes were used; the excitation was made in a 5-amp. a.-c. arc.

4520. SMIT, J. AND SMIT, J. A.
Spectrochemical Cobalt, Molybdenum, and Copper Determinations in Plants.
Anal. Chim. Acta, **8**, 274–82 (1953).
C. A., **47**, 12105b (1953).

The spectrochemical detn. of traces of Cu, Mo, and Co in plants is discussed. Data are given about the choice of light source and spectral app., as well as detailed information about the optical arrangement. In the concg. pretreatment with pptg. chemicals, a wet ashing has been shown to give better results than a dry ashing.

4521. SMITH, I. L., KAUFMAN, N., YEAGER, E., KINNER, T. D., AND HOVORKA, F.
A Spectrographic Method for the Mineral Analysis of Normal Human Tissues and NEOPLASMS.
Lab. Invest. (*Philadelphia*), **2**, 284–91 (1953)
Excerpta Med., Sect. V, **7**, 312 (1954).
C. A., **49**, 13347c (1955).

An emission spectrographic method for the quant. analysis of the mineral elements in biol. specimens is presented. The technique discussed uses a porous-graphite cup electrode for introducing the soln. to be analyzed into a high-voltage spark. The procedure outline includes suggestions concerning sample prepn., standard solns., excitation conditions, electrodes, and the exposure technique. Sensitivity limits for 18 elements of prime interest in biol. work are presented. Errors are of the order of ±5%.

4522. STEINBERG, R. H.
Determination of Cerium in Ferrous Alloys.
Appl. Spectroscopy, **7**, 163–4 (1953).
C. A., **48**, 2509h (1954).

Ce metal and its alloys and compds. are now used in the production of ductile iron, cast steel, and some stainless steels. The amts. used are generally of the order of 0.01 to 0.10%. A satisfactory method of analysis employs chem. concn., followed by spectrographic detn. The Ce is co-pptd. with Ba as fluorides in a HCl-$HClO_4$ soln. The ppt. is ignited in a d.-c. arc and analyzed spectrographically by comparison with synthetic standards made by adding standardized Ce soln. to a Ce-free alloy similar to the unknown. The lowest detectable amt. is about 0.003% Ce for stainless steel and somewhat lower for Fe and steel. The spectrographic analysis requires about 0.5 hour.

4523. STEINBERG, R. H.
Spectrochemistry of Boron in Ferrous Metals.
Applied Spectroscopy, **7**, 176–8 (1953).
C. A., **48**, 2509b (1954).

Small quantities (0.0005 to 0.0030%) of B, used to harden steel, can be detd. in massive samples, rods, and drillings by photographing the ultraviolet spectrum of a sample excited in a d.-c. arc, and measuring the calibrated intensity ratio of 2 spectral lines B 2496.8 Å. and Fe 2497.0 Å. Cf. *C. A.*, **40**, 5454[3].

4524. STEINHAUS, D. W., CROSSWHITE, H. M., AND DIEKE, G. H.
Short-Period Investigations in Spark Discharges.
J. Opt. Soc. Amer., **43**, 257–70 (1953).
C. A., **47**, 6244c (1953).

With the help of an automatic electronic switch placed between phototube and recorder of a spectrograph, the intensities as function of time of a series of spectrum lines produced in a spark have been recorded. The changes as function of the position in the gap were also investigated. There is an extensive afterglow, which in general decays faster for the higher stages of ionization. The continuous background has the same characteristics as the spectrum of the surrounding gas. The changes in self-absorption excitation and line profile were also studied as function of time and partly correlated with the fundamental processes responsible for the afterglow.

4525. STEINHAUS, D. W., CROSSWHITE, H. M. AND DIEKE, G. H.
Short-Period Spectral-Intensity Measurements.

Spectrochim. Acta, **5**, 436–51 (1953).
C. A., **47**, 11978e (1953).

Details are presented for the construction and testing of an automatic switch interposed in a spectrograph between multiplier phototube and recorder. The switch transmits the signal only during a short time interval the length of which can be varied as well as the delay after an initiating signal. This device is useful for the investigation of repetitive phenomena such as sparks and is capable of giving a time resolution of half a microsec. and can handle intensity ratios of more than 10^4 to one. It eliminates much of the background noise. The ability of this device to select only the arc-like portions of individual spark discharges made it possible to combine the reproducibility of the controlled spark with the sensitivity of the d.-c. arc. Cf. *C. A.*, **47**, 6244c.

4526. STENIUS, A. S.
Modification of the Beckman Spectrophotometer With External C Battery Supply and Voltage-Checking Arrangement.
Anal. Chem., **25**, 1572 (1953).
C. A., **48**, 1156c (1954).

A modification of the external battery supply and a voltage-checking device for the Beckman spectrophotometer is described. A seventh *C*-battery is included in the external battery supply.

4527. STETTER, A.
The Excitation of the Lines of Nonmetals in the Pfeilsticker Sparks.
Spectrochim. Acta, **5**, 460–8 (1953).
C. A., **47**, 11953d (1953).

Previously published calcns. (*C. A.*, **47**, 6760f) about the Pfeilsticker-type controlled arc discharge are confirmed; and a theory of this discharge is worked out which gives a satisfactory agreement between calcn. and observation about certain changes of the intensity of lines when pressure is varied. This confirms the decisive influence of pressure on the degree of ionization in the discharge. An attempt is made to explain a study of the energy levels for certain atoms by conditions in this type of discharge are suitable for the detection of nonmetallic elements. Examples from practical analytical spectroscopy are quoted to show how slightly changes of temp. in the discharge influence the relative intensity of spectrum lines compared to the continuous background.

4528. STRANGE, E. E.
Determination of Lithium in a Magnesium Alloy by the Flame Photometer.
Anal. Chem., **25**, 650–1 (1953).
C. A., **47**, 5842b (1953).

Dissolve 1–5 g. of alloy in 20–100 ml. of 6 *N* HCl. Dil. to exactly 1 l., mix, and use an aliquot suitable for the range of standard graph. Measure the Li content in a Beckman instrument with a 10,000 megohm resistor. Full directions are given.

4529. STREED, E. R. AND STROLL, U. W.
Flame Method for Estimating Cement Content of Soil-Cement and Pozzolan-Cement Mixtures.
ASTM Bull. No. **189**, 58–60 (1953).
C. A., **47**, 6629c (1953).

The usual method for detg. the cement content of soil-cement or pozzolan-cement mixts. is based on a detn. of the acid-sol. Ca by volumetric or gravimetric methods. The flame photometer can be used for estg. the Ca concn. Standards are prepd. from known proportions of the individual constituents, which are usually available. The Ca band at 554 mμ is used. Either C_2H_2 and O_2, or H_2 and O_2, give suitable flames, but the C_2H_2 and O_2 is preferred.

4530. STROCK, L. W.
Quantitative Evaluation of a Metal-Base Method for Determining Major Constituents in Nonmetallic Samples.
Appl. Spectroscopy, **7**, No. 2, 64–71 (1953).
C. A., **47**, 11068g (1953).

A Ge metal buffer is used in making spectrochem. detns. of major constituents in geol. materials. The powd. sample or standard is dild. with 9 parts of finely crushed Ge, and this mixt. is then combined with 2 parts of C powder for burning in a d.-c. C arc. A stepped sector at the spectrograph slit leads to an analytical curve when the log of relative exposure time of any spectral line relative to the intensity standard Ge line is plotted against log concn. Advantages of Ge as a buffer are illustrated by parallel fractionation curves, similar temp. of liquid range, and ionization potentials of many elements. The observed fact that the slope of many intensity vs. concn. curves is less than unity is ascribed to collisions of the 2nd kind in which excited atoms at high concns. collide with other atoms and thus transfer energy to them rather than emit it as spectral radiation. It is suggested that this phenomenon may explain the nature and cause of shifts encountered in standard working curves used in the analysis of samples.

4531. SYCHEV, V. P.
Method for Spectroscopic Determination of Silver in Industrial By-Products and Wastes.
Trudy Sibirskogo Fiz.-Tekh. Inst., **1953**, No. 32, 67–73.
Referat. Zhur., Khim., **1954**, No. 43474.
C. A., **49**, 13826c (1955).

Ag content of 10^{-4}–10^{-2}% is detd. spectroscopically in a d.-c. arc with 3 standards. As internal standard the continuous spectrum was used homologous to the lines Ag 3383 and Ag 3281 A. Most favorable conditions

were 110 v., 10 amp., and an exposure until the sample burns out completely, approx. $2^1/_2$ min. The sample was placed in the 5 × 3 mm. cavity of the anode. As electrodes spectroscopically pure C was used. The electrodes were arranged vertically. The Spectrograph was a ISP-22, the films were "Isoortho." They were developed in metholhydroquinone developer and compared on a MF-microphotometer. Standards contg. 0.001–0.1% Ag were prep. by adding a $AgNO_3$ soln. to a concentrate or to a blue powder. The error of this method is estd. at 15–20%.

4532. TADA, K. AND WATASE, T.
Quantitative Spectrochemical Determination of Tantalum and Niobium.
J. Chem. Soc. Japan, Pure Chem., Sect. **74**, 787–8 (1953).
C. A., **48**, 4361i (1954).

Between opposite C electrodes a shallow Pt dish is placed contg. the soln. A Feussner spark is applied. To avoid evapn. the dish is cooled by ice. The lines used are Ta 2635.58, 2685.11 and Nb 2590.94, 2697.06 Å. with Cu 2618.37 Å as an internal standard.

4533. THIERS, R. E.
The Advantages of Controlled Atmospheres for Arc Spectroscopy.
Appl. Spectroscopy, **7**, 157–63 (1953).
C. A., **48**, 2506f (1954).

Spectrochemical analysis with the usual light source in air is handicapped by the interference of the CN bands accompanying the reaction between atm. N and the C electrode. By substituting CO_2, O, He, A, or some other gas for air, (*1*) CN bands are suppressed, (*2*) the background interference is reduced, (*3*) changes are produced in the relative volatility of elements in the source, (*4*) increased sensitivity may result, and (*5*) analysis can be extended to include N or O. These advantages are illustrated by relative intensities of a CN band in 7 gases, variation of volatility and arc-gap voltage in 6 gases, and variation of Co and Be sensitivities in 6 gases. The effects of controlled flow of gases to stabilize the arc were studied, and a description of the arc in various gases is appended.

4534. TÖRÖK, T.
Low-Voltage Spark Generator for Spectrographic Analysis.
Acta Tech. Acad. Sci. Hung., **6**, 429–44 (1953).
C. A., **47**, 9753h (1953).

Low-voltage spark generators apply 100–1000 v. and condensers from 1 to 2000 microfarads. The sparks are ignited by periodically passing Tesla-discharges and constitute essentially short-period 50-v. arcs. The construction theory, circuit diagrams, and a picture of the analytical and auxiliary spark stand are given.

4535. TÖRÖK, T. AND SZAKÁCS, O.
Determination of Traces of Copper in Penicillin Nutrients by Spectroscopy of Liquid.
Acta Chim. Acad. Sci. Hung., **3**, 413–19 (in German) (English summary) (1953).
Magyar Kem. Folyóirat, **59**, 203–5 (1953).
C. A., **48**, 218a (1954).

Org. matter of the samples was destroyed by digestion with a 2:3 mixt. of concd. H_2SO_4 and 30% H_2O_2. The addn. of reagents was repeated until the liquid remained colorless. The total metallic contamination of a 50–100 ml. sample could be concd. into 5 ml. Some $CoCl_2$ soln. was added as an internal standard. The lines Cu 3247.5/Co 3283.5 and Cu 3274.0/Co 3283.5 were used.

4536. VANREUSEL, L., VERWIMP, J., AND TIGGELEN, A. VAN,
Spectroscopic Analysis of Powders.
Bull. soc. chem. Belges, **62**, 664–5 (in French) (1953).
C. A., **48**, 10477e (1954).

Nonconducting powders are analyzed semiquantitatively by mixing with a known wt. of pure Fe and pelletizing. Arcing between C and Cu electrodes forms a metallic globule which gives a stable, uniform arc. The spectrum is compared visually as in the case of special steels or ferroalloys.

4537. VAN SOMEREN, E. H. S.
Notes on a Punched Card Indexing System for Spectrochemical Compositions.
Applied Spectroscopy, **7**, No. 2, 89–90 (1953).

A punched card is described with single rows of holes, 28 in the top edge, 29 in the bottom; and 20 at each side. These are allotted as follows: top edge to the main subject of the paper or book; right hand edge to the substance being analyzed; left edge of the date or volume classification; bottom edge to the elements or subjects looked for by the analytical method.

4538. VASSERBERG, V. E., KASHIRTSEV, A. S., AND POPOVA, K. N.
Spectroscopic Determination of Gallium in Upper-Paleozoic Sediments of the Verkhoyansk Range.
Doklady Akad. Nauk S.S.S.R., **93**, 863–4 (1953).
C. A., **49**, 8755g (1955).

The examn. of the Ga content of 177 rock samples from the sandstone-clay formations of the Verkhoyansk Range (of Upper-Carbonian to Lower Permian age) gave clear evidence that the older horizons contain relatively const. contents in Ga, while the younger sediments are very poor in it, or even free from Ga. No reason can be given for this remarkable differentiation of the

Ga contents; Ga is in general a trace element of highly uniform distribution all over the rocks of the earth's crust, enriched only in sphalerite or germanite ores, and in bauxites.

4539. VELASCO, F. V.
Spectrochemical Analysis of Special Elements in Steels with Zinc Oxide Electrodes.
Inst. hierro acero, **6**, 351–5 (1953).
C. A., **48**, 6319b (1954).

The purpose of this investigation was to find a practical spectroanalytical method for special steels with equipment of low or medium dispersion. With a medium-type spectrograph, qual. analyses were made for Ni, Cr, Mo, W, V, and Cu. ZnO briquetted electrodes were used in the arc.

4540. VOĬNAR, A. O.
Amount of Microelements in the Nuclei of Nerve Cells as Measured by Emission Spectra.
Biokhimiya, **18**, 29–33 (1953).
C. A., **47**, 7625d (1953).

Besides the usual functions of mineral substances in protoplasm, a metal component is present in many enzymes, such as arginase cytochrome oxidase, and carbonic anhydrase, so that a knowledge of the microelements in tissues becomes important. The ash of the cerebral and cerebellar cortex of man contains, resp., (%): Al 0.01, 5.0; Si 0.5, 0.5; Mn 0.008, 0.001; Pb 0.1, 0.1; Ti 0.1, 0.01; Cu 0.05, 0.03; Ag 0.08, 0.1; Ni 0.1, 0.5; Cr 0.05, 0.8; Ba 0.005, 0.01; Li 0.1, 0.1; Cd 0.001, 0.001; Zn 0.1, 0.1; Co 0.03, 0.05; Mo trace, 0.005; Bi 0.03, trace; Ga+, +++. Values are also listed for the brain nerve nuclei of the cow and dog. The following metals were detected: Fe, and occasionally Sn, Sr, and Ge. The heavy metals Pb, Ag, Ni, and Cr are present in comparatively large concns. The biol. role of many of the elements in the animal organism still remains unexplained.

4541. VOLBORTH, A.
Two Finds of Apophyllite at Ihalainen and Pyterlahti (Southeastern Finland).
Geol. Fören. i Stockholm Förh., **75**, 360–6 (in German) (1953).
C. A., **48**, 1207b (1954).

Apophyllite (*I*) occurs in a rapakivi granite pegmatite cutting through limestone at Ihalainen and has been deposited from aq. solns. The phys. properties of I are described. Its chem. compn., in %, is SiO_2 52.64, Al_2O_3 0.20, Fe_2O_3 0.20, MgO trace, CaO 24.37, Na_2O 0.45, K_2O 5.12, F 0.80, H_2O + 15.58, H_2O − 0.71, total 100.07, less 0 for Fe_2 0.33, total 99.74%; sp. gr. 2.360. Two old chem. analyses of I from Pyterlahti are given. Results of qual. and semiquant. spectrochem. analyses of I from Ihalanien and Pyterlahti are presented. At Pyterlahti, I occurs as inclusions in a rapakivi granite pegmatite.

4542. VONNEGUT, B. AND NEUBAUER, R. L.
Counting Sodium-Containing Particles in the Atmosphere by Their Spectral Emission in a Hydrogen Flame.
Bull. Am. Meteorol. Soc., **34**, 163–9 (1953).
C. A., **47**, 9142c (1953).

An app. is described which measures the no. of Na-contg. particles in the surrounding air. The air is introduced into a nonluminous flame and the resulting pulses of light are detected and recorded by a photocell and related circuit. Cf. Soudain, *J. Sci. Météorol.* **1951**, Oct.-Nov.

4543. VORSIN, A. N.
Use of an Impulse Discharge for Excitation of Elements Difficult to Excite.
Trudy Sibir. Fiz.-Tekh. Inst. Tomsk. Univ., **1953**, No. 32, 63–6.
Referat. Zhur., Fiz., **1955**, No. 3070.
C. A., **50**, 3144h (1956).

The development and utilization of an impulse system for the purpose of spectral analysis is discussed. The greater duration of the max. current provides greater sensitivity in the analysis. This discharge can be used for elements that are difficult to excite as halogens and S.

4544. VUL'CHIN, E. I.
Quartz-forming Systems.
Uchenye Zapiski L'vov. Gosudarst. Univ. im. Ivana Franko, Ser. Geol., **23**, No. 6, 135–69 (1953).
C. A., **51**, 15344i (1957).

Concn., temp., pressure and compn. of quartz-forming systems are experimentally studied by using the liquid and gas inclusions in quartz, Na, K, Ca, and Cl are found to be predominant in these inclusions. The secondary inclusions are found to contain mainly Na^+, K^+, Ca^{++}, Mg^{++}, Al^{+++}, iron, sometimes Mn and anions Cl^-, SO_4^{+}, BO_3^{---}. Usually Na > K > Ca. The amt. of salts in inclusion liquids is found to be up to 30–35%. Concn. of SiO_3^{++} reaches 6–12% (CO_3^{---} was apparently not analyzed). Analyses were conducted colorimetrically and spectrographically. Several examples of PT-diagrams for possible quartz-forming systems are given. References.

4545. WAGER, L. R. AND MITCHELL, R. L.
Trace Elements in a Suite of Hawaiian Lavas.
Geochim. et Cosmochim. Acta, **3**, 217–23 (in English) (1953).
C. A., **47**, 10420e (1953).

The concns. of trace elements in the Hawaiian lavas from olive basalt to trachyte are compared with those in the Skaergaard intrusion of East Greenland. The latter series arose from the fractional crystn. of

basic magma. The semiquant. similarity supports the thesis that both series arose from fractional crystn. of melts.

4546. WAHR, J. C., MCCORMICK, W. W., AND SAWYER, R. A.
Emission Characteristics of Vacuum Spark Discharges.
J. Opt. Soc. Amer., **43**, 151–6 (1953).
C. A., **47**, 5244i (1953).

A study of the total radiation in the visible region from vacuum spark discharges between electrodes of Al, Mg, Cu, and C has been made. With a capacitance of 21.6 microfarads charged to potentials up to 20 kv., and inductance variable from 2.4 to 45 microhenrys, peak currents up to 65,000 amp. were obtained. Oscilloscope traces of the output voltage from a photocell show that for the under-damped discharge the light output closely follows the current oscillations, dropping to zero between current cycles. The max. light intensity in a single spark train varies as the 3rd to the 7th power of the peak discharge current, or with the 3/2 to the 7/2 power of the discharge energy, depending on the electrode material and the inductance. For a given electrode material, the exponent increases as the inductance is decreased, while at const. current the max. light intensity decreases slightly as inductance is decreased. With Al electrodes ranging from $^1/_2$ to $^1/_{10}$ in. in diam., the max. light intensity varies inversely with the electrode cross-sectional area. Estimates of c.ds. as high as 100,000 amp./sq. cm. in a 10,000-amp. Al spark were made from measurements of the anode spots on the electrodes. Bursts of luminous vapor from the anode, apparently not a part of the current-carrying column, appear to constitute the principal source of light in the critically damped Al spark.

4547. WALKER, W. G. AND BAKER, S. C.
Symmetrical Cathode Follower Bridge Circuit for Direct Spectrochemical Analysis.
J. Sci. Instr., **30**, 328–30 (1953).
C. A., **48**, 1079b, (1954).

A d. circuit, free from drift, is described for comparison of spectral line intensities. No loss in accuracy occurs with power-line fluctuations.

4548. WARD, W. AND HARTLEY F.
The Spectrographic Analysis of Glass-making Sands.
J. Soc. Glass Technol., **37**, 113–23T (1953).
C. A., **47**, 11679i (1953).

A series of expts. were used to det. the best choice of standards; the best internal standards and the most suitable concns.; the most appropriate line pairs; the types of photographic plates; and the conditions of excitation. The resulting method of analysis has been in satisfactory use for 2 years, during which period 7000 samples have been analyzed.

4549. WARING, C. L. AND ANNELL, C. S.
Semiquantitative Spectrographic Method for Analysis of Minerals, Rocks, and Ores.
Anal. Chem., **25**, 1174–9 (1953).
C. A., **47**, 12121c (1953).

A 10-mg. sample is mixed with 20 mg. of graphite and placed in a wax-sealed electrode cup. Unknowns are arced in the d.-c. arc for 60 or 120 sec., depending on their volatility. Spectra of pure Fe and of an Al alloy are placed on each plate. Spectra are photographed with a 21-ft. Wadsworth-mounted grating spectrograph. Two adjacent plates cover the 2250 to 4750 A. range. The quantities of unknown elements are estd. by visual comparison of certain lines with those of standard plates. Results are reported in ranges: 1–10, 0.1–1, 0.01–0.1, 0.001–0.01, and 0.0001–0.001%. The 68 elements detd. in 1 exposure are: Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Eu, Er, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mo, Mn, Na, Nb, Nd, Ni, Os, P, Pb, Pd, Pr, Pt, Rb, Re, Rh, Ru, Sb, Sc, Si, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr. F requires a separate exposure for which $CaCl_2$ soln. is dried on the electrode before the sample is added. The method has been applied to a wide variety of minerals, rocks, alloys, and residues. A chem. check of 500 detns. showed 92% in agreement.

4550. WARING, C. L., AND MELA, H., JR.
Determination of Small Amounts of Rare Earths and Thorium in Phosphate Rocks.
Anal. Chem., **25**, 432–5 (1953).
C. A., **47**, 5302d (1953).

The work was suggested by the possibility of rare earths occurring in the phosphate minerals from Florida and western U. S. A. After removal of Fe as $FeCl_3$ by extg. the HCl soln. with either, the rare earths and Th are concd. by a double oxalate pptn. with Ca^{++} as carrier. The rare earths are sepd. from Ca^{++} by NH_4OH pptn. with a definite quantity of Al^{3+} as carrier. The Al also serves as an internal standard in the final spectrographic analysis. The method will det. 0.02–2 mg. of each rare earth and Th within 10% of the truth. Detailed directions are given.

4551. WARING, C. L. AND WORTHING, H.
A Spectrographic Method for Determining Trace Amounts of Lead in Zircon and Other Minerals.
Am. Mineralogist, **38**, 827–33 (1953).
C. A., **48**, 13528g (1954).

The Larsen Method (Cf. *C. A.*, **47**, 77i)

for detg. the ages of rocks requires the specgraphic detn. of Pb in amts. down to 0.5 p.p.m. Standards were prepd. by adding $Pb(NO_3)_2$ to Pb-free silicic acid and mixing this with 3 times the wt. of Na_2CO_3 to which had been added 0.05 to 0.1% Bi, the latter serving as internal standard. Special Pb-free graphite electrodes and d.-c. arc were used, the lines 2833.1 (Pb) and 2898.0 (Bi) being compared. Data on standards indicate an error of 6–10% in the range 0.5–1000 p.p.m. Pb in analyses made directly without any chem. sepns.

4552. WEBER, J. JR., HEIDEL, R. H., KEHRES, P. W., COOK, H. D., AND FASSEL, V. A.
Excitation Stand for Spectrographic Analysis. A New Design.
Spectrochim. Acta, **5**, 345–9 (1953).
C. A., **47**, 6192c (1953).

An excitation stand for spectrographic analysis is described which possesses the following features: (*a*) a symmetrical-action electrode-jaw system which supports electrodes varying in diam. from 0.3 cm. to 0.9 cm. in self-centered alignment; (*b*) isolation of control and adjustment system, electrode water-cooling system, and elec. terminals from the excitation chamber to facilitate cleaning and decontamination; (*c*) mounting of electrode jaws toward the operator rather than toward the spectrograph for easier loading; and (*d*) use of a novel kinematic linkage for operation of the electrode-jaw system.

4553. WEHNER, G. AND BUNGE, W.
Experience in the Flame Photometric Analysis of Some Technically Important Alkali and Alkaline Earth Compounds.
Chem. Tech. (Berlin), **5**, 251–3 (1953).
C. A., **48**, 6903b (1954).

A tech. method for the detn. of Na in K_2CO_3, KOH, and KCl and Ca in $BaCl_2$ by flame photometry is described. As the approx. content of the Na or Ca was usually known, it was sufficient to use 2 comparison solns., that is, one soln. with a slightly higher content than in the sample under examn. and a 2nd one with a somewhat lower concn. This is in accordance with a method previously described by Schinkmann (*Silikat Tech.*, **2**, 163–6 (1951)). The solns. were acidified with HCl to a pH between 2 and 5. The Ba in the $BaCl_2$ solns. was pptd. with $(NH_4)_2Cr_2O_7$, and the supernatant soln. used without filtration for the Ca detn. It is important that the comparison solns. contain also the foreign anions of the sample soln., for instance KCl in the case of Na detn. in K_2CO_3. The results of numerous analyses are tabulated and compared with those obtained by gravimetric methods. The accuracy is sufficient for industrial control purposes.

4554. WERNER, O.
Material Testing in Forensic Science with Particular Emphasis on Spectroanalysis.
Angew. Chem., **65**, 69–78 (1953).
C. A., **47**, 4240c (1953).

A comprehensive review covering identification and detn. of mineral poisons, traces of paint, metallic components, and investigations in connection with shooting injuries.

4555. WEVER, F., KOCH, W., AND WIETHOFF, G.
Flame-Spectrum Analytical Investigation of Heavy Metals to Determine the Ferrite Composition in Steels.
Arch. Eisenhüttenw., **24**, 383–91 (1953).
C. A., **48**, 1880e (1957).

The advantages of flame-spectrum analysis for the quick detn. of the compn. of steels are pointed out and the principles of application are described with particular reference to the compn. of the ferrite dissolved in the citrate electrolyte in the electrolytic isolation of the carbides in Cr-Mn steels. An arrangement of especially high measuring sensitivity was developed which permits the detn. of Fe, Cr, and Mn in presence of considerable alkali salts originating from the electrolyte. The influence of the compn. of the electrolyte and that of the combustion gases of the flame of the intensity of the flame spectrum is discussed and an example for a complete detn. of the distribution of Cr and Mn in carbide and ferrite is given.

4556. WILLIAMS, T. R. AND MORGAN, R. R. T.
Determination of Calcium in Plant Material With the Flame Photometer.
Chemistry and Industry, **1953**, 970.
C. A., **48**, 3190c (1954).

A standard graph is developed for use in the routine detn. of Ca. A standard soln. contg. 0.2 mg. Ca in 1 ml. is prepd. Vols. of the standard soln. ranging from 100 to 1000 γ are pipetted into centrifuge tubes, and a satd. soln. of $(NH_4)_2C_2O_4$ is added to ppt. the Ca. The ppt. is then dissolved in 0.04 *N* HNO_3. The photometer is calibrated for zero deflection with the acid and a max. reading is obtained with the 1000 γ standard. The intermediate standards are also plotted to complete the graph. The plant materials (1–5 g.) are digested in HNO_3 and $HClO_4$, then dissolved in hot water and made up to a convenient vol. Aliquots of these solns. are treated in the centrifuge exactly as the standards. The Ca readings are then detd. from the standard graph. A comparison of this method with the macro-volumetric method showed close agreement.

4557. WILSON, S. R. AND YOUNG, W. A.
Investigation of the New Anniversary-Bucky Pegmatite, Gunnison County, Colo.

U. S. Bur. Mines, Rept. Invest., No. **4939**, 7 pp. (1953).
C. A. **47**, 3194h (1953).

Two diamond-drill holes were drilled. The beryl-producing zone of muscovite-feldspar-quartz pegmatite was cut only in hole 2 from 29.5 to 31 ft. in depth. Spectrographic analysis of sludge verified the presence of quartz, feldspar, and muscovite, but showed no trace of Be, Th, Nb, or Ta. Forty-one core and sludge samples assayed for each interval less than 0.005 oz. Au/ton.

4558. WILSON, T. C. AND KROTINGER, N. J.
Flame Photometric Determination of Magnesium Oxide in Portland Cement.
ASTM Bull. No. **189**, 56–8 (1953).
C. A., **47**, 6629d (1953).

The same cement soln. prepd. for the detn. of the alkalies can be used for detg. MgO with the Beckman Model DU flame photometer, operating on C_2H_2 and O_2. The emission is in a broad band at 383 mμ; this permits the use of wide slit. Great care must be taken to prevent the atomizer-burner from clogging.

4559. WINER, A. AND KUHNS, D. M.
Calcium Determination by Flame Spectrophotometry. A Rapid Method For 0.1-cc. Samples.
Am. J. Clin. Pathol., **23**, 1259–62 (1953).
C. A., **48**, 1464b (1954).

Measure 0.1 cc of serum or urine into a volumetric flask and slowly dil. to vol. with a mixt. of 70% of acetone, 20% of glacial HOAc, and 10% of a 2% nonionic detergent (Sterox, Aloe Scientific Co., St. Louis, Mo.). Invert several times, place an aliquot in a 5-cc. beaker, fill the beaker with 5% Sterox, and atomize directly into the oxyacetylene flame. Compare with standards. The results agree well with those obtained by the Clark-Collip permanganate method (*C. A.*, **19**, 2217).

4560. WOLF, M.
Variation of Sodium and Potassium Adsorption by Resins as a Function of the Speed of Their Intestinal Transit.
Thérapie, **8**, 775–8 (1953).
C. A., **48**, 6576b (1954).

The ingested cationic resins were sepd. from the feces by flotation and ashed, and Na and K were detd. by flame photometry. In cases of fast intestinal transit the resins fixed principally Na, but in cases of constipation chiefly K was fixed.

4561. ZAGÓRSKI, Z.
Recent Soviet Developments in Instrumental Chemical Analysis.
Wiadomości Chem., **7**, 193–215 (1953).
C. A., **47**, 12093e (1953).

Includes visible spectrum absorptiometry, fluorometry, infrared and ultraviolet absorption spectroscopy, emission spectrography, mass spectroscopy, potentiometric titration, electrolytic analysis, polarography, and amperometric titration. 123 references.

4562. ZAK, B., MOSHER, R. E., AND BOYLE, J.
A Review of Flame Analysis [Sodium, Potassium, Calcium, Magnesium] in the Clinical Laboratory.
Am. J. Clin. Path., **23**, 60–77 (1953).
C. A., **47**, 3391a (1953).
66 references.

1954

4563. ABRAMSON, I. S. AND MANDEL'SHTAM, S. L.
Transactions of the IXth All-Union Conference on Spectroscopy.
Some Problems of the Photoelectric Methods of Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **18**, 635–43 (1954).
C. A., **50**, 7585c (1956).

The use of photoelec. receivers increases the accuracy to 0.5% requiring a specially precise light source consisting of an interrupted arc discharge, the principle of which is described. Since photoelec. response depends on the flux and not on the illumination in the spectrograph, the requirements on its construction are not the same as for photographic work. It is shown that counters have the sensitivity ≈ 10^{-9} erg./sec. (200 quanta/sec.) and photomultipliers 2000 quanta/sec. However, owing to larger quantum output it is possible to work with the photomultipliers at lower light levels and the accuracy is better with photomultipliers than with counters. Three amplifier circuits of the photoelec. current are described.

4564. ACCIARIELLO, M.
Spectrographic Methods of Analysis in the Mining Metallurgical Industry.
Resoconti assoc. mineraria sarda, **58**, No. 8, 5–22 (1954)
C. A., **52**, 14413b (1958).

App. and applications to the purity analyses of Zn, Pb, Cd metals, poor ores, and slags are described.

4565. ADDINK, N. W. H.
Quantitative Spectrochemical Analysis with the Direct Current Carbon Arc.
Chem. Weekblad, **50**, 885–8 (1954).
C. A., **49**, 6021e (1955).
Cf. *C. A.*, **47**, 12100e.

Some of the inadequacies of Harvey's procedure (*C. A.*, **42**, 4498g.) are outlined briefly and a no. of improvements are suggested. Two basic factors should be stressed in any attempts to improve the accuracy of the d.-c.

arc: (*1*) the introduction of as much C into the arc stream as possible (this will increase the arc temp.) and (*2*) the reduction of volatilization losses. The following have been found helpful: Use of C powder to reduce spattering; use of pure quartz to reduce losses of the easily excited elements such as Pb, Ag, Cu, and Sb; use of Ni powder to accelerate the volatilization of the more difficultly excited elements; use of $BaCO_3$ to increase cond. and excitability of other elements in the matrix. Modified matrix factors are suggested. For semiquant. work the use of a standard paper d. scale is proposed as a means of measuring line d. Some typical results obtained on a sample of 18–8 Cr-Ni steel, magnet steel, and emission carbonate mixts. are cited.

4566. ADELSTEIN, S. J. AND VALLEE, B. L.
The Effect of Argon Atmospheres on the Intensity of Certain Spectral Lines.
Spectrochim. Acta, **6**, 134–8 (1954).
C. A., **48**, 4966i (1954).

Pure A, pure He and A-He mixts. were employed as environments for the d.-c. C arc to evaluate spectral line intensities of metals at different concns. in a $CaCO_3$ powd. graphite matrix. Relative intensities of 37 lines characteristic of 28 different elements were detd. for 3 different ambient gases as lines definitely, equivocally, and not enhanced in A. In many instances an A atm. markedly increases the sensitivity of spectrochem. analysis with the d.-c. arc. The spectral line enhancements due to A are most striking for volatile elements, especially Zn, Cd, Pb, and Ag.

4567. AHRENS, L. H.
Quantitative Spectrochemical Analysis of Silicates.
Pergamon Press, London (England) (1954). 122 pp.
C. A., **49**, 11508b (1955).

A scheme of quantitative d.-c. arc analysis of the silicate minerals, rocks, soils, and meteorites is described in a discussion of standards, lognormal distribution of spectrochemical error, the determination of alkali metals, the volatile group (Pb, Ga, Ag, Cu, Tl, Zn, Sn, Ge, In, Bi, Hg, As, and Sb), the involatile elements (V, Ni, Co, Zr, Cr, Y, Sc, La, Nd, Sr, Ba, Mo, B, Be, Ti, Ca, Fe, Mg, Si, and Mn), fluorine by means of CaF bands, and common elements other than Na and K. Many analysis lines and internal-standard lines are listed and some working curves are reproduced. Distillation curves for some of the volatile elements are shown. All observations were made by burning samples in carbon arcs operated by currents of 3 or 7 amperes supplied by a motor-generator of 220–240 volts.

4568. ALEKSANDROV, S. N., MALAKHOVA, G. P., AND SHMULYAKOVSKIĬ, Y. E.
Spectroanalytical Determination of Sodium in Aluminosilicates.
Neftyanoe Khoz., **32**, No. 12, 64–7 (1954).
C. A., **49**, 4449e (1955).

Details are given for detg. Na in Al silicates in the range of 0.05–0.25% Na_2O. Higher Na_2O content can be detd. after suitable diln. of the samples.

4569. ALLEN, J. E. AND BALK, R.
Mineral Resources of Fort Defiance and Tohatchi Quadrangles, Arizona and New Mexico.
N. Mex. Bur. Mines and Mineral Resources Bull., **36**, 192 pp. (1954).
C. A., **49**, 6048c (1955)

This includes descriptions of coal beds, with proximate and ultimate analyses of 7 samples. Chem. analyses are given of 11 waters, 4 of which are high in sulfate. The igneous rocks include 9 plugs and some dikes, and include kimberlite tuff. Chem. analyses are given of 4 rocks of chrome-diopside (Cr_2O_3 1.24%), and of titanchlinohumite. Optical and spectrographic analyses are given for olivine (2), chrome-diopside, garnet (3), and titanchlinohumite; Co, Ni, V, Cr, Ga, Pb, Ba, and Sr were detd. in these.

4570. AMSTUTZ, G. C.
Geology and Petrography of the Eruptive Rocks of Glarner Freiberg in Verrucano.
Publ. Stift. Vulkaninst. Immanuel Friedländer, No. **5**, 149 pp. (1954).
C. A., **49**, 6790h (1955).
Cf. *C. A.*, **47**, 9869b; **48**, 4388a, 5043f.

Petrographic data, 6 chem. analyses, spectrographic analyses, and measurements of radioactivity are given for spilites and keratophyres.

4571. ANDERSON, C. H. AND BEATTY, C. D.
Spectrographic Determination of Sodium and Potassium in Coal Ashes.
Anal. Chem., **26**, 1369–71 (1954).
C. A., **49**, 587d (1955).

A spectrographic method was developed for detg. Na and K that is applicable to the analysis of coal ashes, tapped slag, fly ash, and tube deposits. The alkali lines in the near ultraviolet (3303.0 and 3302.3 for Na; 4044.1 and 4047.2 for K) were of proper intensity to be used at concn. levels of 0.3–5%. The Na lines were relatively free from interference, but interference with the K lines from CN bands and the Fe 4045.8 line had to be reduced by dilg. the sample with Li_2CO_3 buffer. The Rb line 4215.6 was investigated as an internal standard but could be used for K only because the Na-Rb ratio varies irregularly. More accurate was the Li 3232.6 line as internal standard for Na detns. The effect of one alkali on the detn. of the other was also studied. As K increases the intensity of the

Na line and decreases the Li line the method used by Duffendack (Cf. *C. A.*, **30**, 41[7]) for eliminating this effect was applied by including a fixed amt. of K_2SO_4. The sample (200 mesh) was mixed with buffer and internal standard. For the K detn. a sample to buffer ratio of 1 to 4 was used, for Na a ratio of 1 to 6. The results of analyses of coal-ash samples when analyzed spectrographically and chemically were compared, and a tendency for the spectrographic results to be consistently lower than the chem. values was noted.

4572. ANDERSON, L. C. AND ASCHENBRENNER, B. C.
Spectrographic Determination of Calcium Oxide and Magnesium Oxide in Limestone and Dolomite.
Bull. Am. Assoc. Petroleum Geol., **38**, 1803–8 (1954).
C. A., **49**, 15625c (1955).

Samples are dissolved in 10 ml. HCl; a 1-ml. aliquot is dild. to 10 ml. with an internal standard soln. consisting of 10 g. $SrCl_2$ in 1 l. of 0.1*N* HCl. A 0.02-ml. aliquot of this resulting soln. is evapd. on the flat top of an electrolytic Cu electrode a quarter inch in diam. The unknown is sparked for 30 sec. without pre-spark. Ds of lines 3179.3 Å. for Ca and 2802.7 Å. and 2798.0 Å. for Mg are measured with a microphotometer and compared with working curves prepared from standards. Per cent error for CaO ranges from minus 9.9 to plus 9.5 and for MgO from minus 9.4 to plus 8.7. As many as 45 samples can be analyzed in 8 hrs., including sample prepn. and reporting of results.

4573. AZEVEDO, L. H. DE P., SPECHT, A. W., AND HARNER, R. S.
Double Chamber Electrode for Spectrochemical Determination of Chlorine and Other Halogens.
Spectrochim. Acta, **6**, 331–3 (1954).
C. A., **49**, 669i (1955).

A double-chamber, graphite electrode, suitable for d.-c. arc detn. of halogens by means of the alk. earth halide bands, is described. An upper chamber holds the alk. earth compd. and an interconnected, lower chamber holds the halogen compd. This arrangment assures that there will be an abundance of alk. earths in the arc by the time the halogen is volatilized from the lower chamber, and thereby promotes max. emission of the alk. earth halide bands.

4574. BAKER, G. L. AND JOHNSON, L. H.
Effects of Anions on Calcium Flame Emission in Flame Photometry.
Anal. Chem., **26**, 465–8 (1954).
C. A., **48**, 6839e (1954).

Acids were selected as a means of introducing the appropriate anions after the H-ion influence had been shown to be negligible. HCl, AcOH, H_3BO_3, HNO_3, and HIO_4 were found to have very little effect. H_3PO_4, H_2SO_4, and H_3AsO_4 have a depressant action, while HClO increases the Ca flame intensity. The results observed when various combinations of SO_4^{--}, PO_4^{---}, $Cr_2O_7^{--}$, and ClO_4^- are added to standard $CaCl_2$ soln. have led to the conclusion that SO_4^{--} and PO_4^{---} are not directly responsible for the depressant effects noted. It is suggested that $S_2O_7^{--}$ and $P_2O_7^{--}$ are the intermediate ions to which the decrease in Ca flame intensity might be attributed.

4575. BAKER, S. C.
Direct-Reading Spectroscopy with a Direct-Current Arc.
Brit. J. App. Phys., **5**, 215–19 (1954).
C. A. **48**, 11972f (1954).

Self-electrodes are held in massive brass supports with the anode uppermost and the arc run until large molten globules form and stabilize on both electrodes. A selected pair of spectrum lines is presented to a pair of photomultiplier tubes mounted on the plateholder. Optical details are shown and a new amplifier bridge circuit, which is balanced rapidly and easily, is explained. Total time for a detn. is about 2 min. Line intensity ratio measurements can be made with an error less than 0.5%. Working curves for Mn in steel are given.

4576. BARDÓCZ. Á.
Light Sources for Spectrum Analysis. V. High - Voltage Spectrographic Spark Source with Electronic Control.
Acta Tech. Acad. Sci. Hung., **8**, 99–107 (In English) (1954).
C.A., **48**, 9812a (1954).

A fixed spark gap and thyratron-tube circuit control the spark source The thyratron tube initiates the discharge and is controlled by a pulse generator. The charging voltage of the condenser does not pass through the thyratron tube but is uniformly distributed between the controlling and analytical gaps. The current flow is started by a pulse to the thyratron tube, which causes first the controlling spark gap and then the analytical gap to spark over. Finally the entire condenser energy passes through the 2 spark gaps. Characteristic operation curves are given. Cf. *C.A.*, **47**, 10910e; **49**, 4h.

4577. BARDÓCZ, Á.
Investigation of Light Sources for Spectral Analysis. An Electronically Controlled Spark Generator.
Acta Phys. Acad. Sci. Hung., **4**, 90–120 (in German) (1954).
C. A., **49**, 5970b (1955).
Cf. *C. A.*, **48**, 9812b

A review on electronically controlled spark sources including B.'s own thyratron-controlled spark generators. Diagrams of circuit parameters and performance characteristics

are given. Oscillograms of controlled spark pulses are also shown.

4578. BARDÓCZ, A. AND VARSÁNYI, F.
Spectrographic Analysis of Platinum-Rhodium Alloys.
Magyar Kém. Folyóirat, **60**, 292–6 (1954).
C. A., **52**, 2648f (1958).

The detn of 1–25 atom % Rh was accomplished by excitation in soln. This was done by means of a rod electrode turning in a spark directed electronically at 1000 v. The av. precision was ±2.8%, the av. reproducibility ±1.8%, relative to the content of the alloying metal.

4579. BARNEY, J. E.
Spectrochemical Determination of Copper in Turbine Oils.
Anal. Chem., **26**, 567–8 (1954).
C. A., **48**, 7887h (1954).

Detn. of 0.1 to 50 p.p.m. Cu in turbine oil is possible by use of a Littrow spectrograph and a comparator-densitometer. Oil contg. Cu is ashed in spectrograph electrode cups dropwise with standard drops until 2–10 drops have been ashed depending on Cu concn. Sample wt. is known from wt. of one standard drop. Cu is then sparked and the intensities of the resultant 3274 Å. Cu lines are compared *vs.* (background intensities—one intensity unit). This ratio is used to obtain Cu wt., and then wt. Cu/sample wt. gives Cu concn. in the oil tested. 6 references.

4580. BELYAEV, Y. I. AND PAVLENKO, L. I.
Determination of Small Amounts of Chromium in Soils and Plants by Spectrum Analysis.
Trudy Biogeokhim. Lab., Akad. Nauk S.S.S.R., **10**, 60–3 (1954).
C. A., **49**, 10794i (1955).

Combustion of specimens is done in a cavity of a C electrode in d.-c. arc and use is made of the 2677.159 Å. line for Cr in soils, or 4254.34 Å. line for Cr in plants (the latter is more sensitive). In soils the value ranged up to 0.1%, in plants up to 0.09%.

4581. BERTRAND, G. AND BERTRAND, D.
The Rubidium Content of Coffee.
Compt. rendus. **238**, 1684–5 (1954).
C.A., **48**, 10254a (1954).

The following contents of ash (in %) and Rb (in p.p.m.) were found for 25 samples of green coffee grains, resp.: I—caffeine-rich species: *Coffea arabica*, (from 10 different localities) 3.62–5.09, 9.0–78.8; *C. canephora* 4.36, 30.0; *C. bertrandii* 2.29, 31.9; C. liberica (from 3 localities) 4.06–4.50, 30.2–68.0; *C. stenophylla* 5.17, 45.0; *C. congensis* 3.82, 141.0; II—caffeine-poor species: *C. mauritiana* 2.41, 78.0; *C. laurina* (probably a hybrid of *mauritiana* and *liberica*) 3.69, 37.0; III—caffeine-free species: *C humblotiana* (2 samples) 2.93–3.62, 15.2–35.5; *C. bonnieri* 3.58, 29.4; *C. mogenetii* 3.55, 28.5; *C. galienii* 4.20, 37.0. The av. Rb content found for all the samples above (40.6 p.p.m.) was significantly higher than that found for seeds from 159 species of other plants from the French Flora (10 p.p.m.).

4582. BIERTHER, W. AND DEGENS, E.
Geochemical Examination of Country Rock Bordering Hydrothermal Ore Veins in the Schiefergebirge.
Neues Jahrb. Geol. u. Paläontol, Monatsh., **1954**, 398–411.
C. A., **49**, 3744g (1955).

Sediments bordering siderite veins contain a higher Mn content than sediments in which such veins are absent. This is explained by migration of Mn from the veins. The Mn content of the veins is 4.5–5.0%, whereas that of the country rock ranges from 0.07 to 2.5%. Mn gradually increases towards siderite-bearing Pb-Zn veins. Zn is absent in the wall-rock of Pb-Zn veins, but Pb was found to a max. distance of 30 m. 51 spectrographic analyses for Mn are given.

4583. BIRKS, F. T.
The Application of the Hollow-Cathode Source to Spectrographic Analysis.
Spectrochim. Acta, **6**, 169–79 (1954).
C. A., **48**, 5711h (1954).

The construction and operation of a water-cooled hollow cathode for quant. spectrochem. analysis and its attendant rare-gas circulation system are described. The cathode design enables rapid sample changes to be made so that the method can be applied to analyses on a routine basis. Samples can be in the form of powd. solids or dried out from soln. directly in the cathodes. The halogens can also be detd. in nonvolatile org. materials without any pretreatment of the samples. The effects of variations in current and in rare-gas pressure on the analytical results were studied and factors which limit the method are discussed. The results obtained with the halogens and the alkali metals are summarized, and the precision attained is of the order of ±10%.

4584. BLUM, H. AND EDER, A.
Determination of Low-Boron Contents in Steels.
Radex Rundschau, **1954**, 123–32.
C. A., **49**, 6027f (1955).

Subject the oxidized steel soln. to electrolysis with a Hg cathode. The B present in the electrolyte is transformed by carminic acid into an org. color complex. The B is detd. photometrically. Good results were also obtained spectrographically by using a Fuess quartz spectrograph employing Pfeilsticker a.-c. arc excitation.

4585. BONDORFF, K. A.
Rapid Methods for the Determination of Potassium.

Potassium Symposium, Ann. Meeting Board Tech. Advisers Internatl. Potash Inst., Zurich, *Proc.*, **1954**, 199–205 (in English) (1954).
C. A., **49**, 10557h (1955).

A suitable flame photometer is described.

4586. BOROVIK-ROMANOVA, T. F., KOROLEV, V. V., AND KUTSENKO, Y. I.
Spectrographic Determination of Strontium and Lithium in Natural Waters.
Zhur. Anal. Khim., **9**, 265–9 (1954).
J. Anal. Chem. U.S.S.R., **9**, 295–9 (Engl. translation) (1954).
C. A., **49**, 3448i (1955).

Sr and Li were detd. in a large no. of water samples of different origin. The detns. were made in a fulgurator with an activated a.-c. 120-v. arc of approx. 2 amp. The fulgurator is a quartz dish 2 cm. diam. and 1 cm. deep having at the bottom a foot or holder into which fits a C electrode. A canal drilled through the axis in the electrode and ending in 2 passages on either side of the electrode near the base serves to convey the analyzed liquid by capillary force into the arc. A Cu spiral delivers the current to the base of the electrode. For Sr the line 4607.331 Å. was used and for Li 6707.844 Å. Lines 4593.103 Å. and 6723.279 Å. were used for comparison. In the samples studied the amt. of Sr found was $1 \times 10^{-5} = 1 \times 10^{-3\%}$, and of Li $1 \times 10^{-7} = 1.10^{-4\%}$. The ratio of Ca: Sr was indicative of the origin of the water, marine or continental.

4587. BRABSON, J. A. AND WILHIDE, W. D.
Flame Photometric Determination of Calcium in Wet-Process Phosphoric Acid.
Anal. Chem., **26**, 1060–1 (1954).
C. A., **48**, 10480c (1954).

Ca is sepd. from P by an ion-exchange resin. The resin is collected on a filter paper, transferred to a Pt dish, and ignited with NH_4NO_3 at a low temp. The ash is digested with $HClO_4$. $SrCl_2$ is added as an internal indicator and the Ca is detd. photometrically. Tests showed that the effect of Na on the Ca detn. is linear at concns. of Na_2O from 0 to 4 g. per 1.

4588. BRABSON, J. A. AND WILHIDE, W. D.
Flame Photometric Determination of Calcium in Wet-Process Phosphoric Acid (A Note).
Anal. Chem., **26**, 1663 (1954).
C. A., **49**, 1472e (1955).

Fe, in its usual concn. in wet-process H_3PO_4, does not interfere in the flame-photometric detn. of Ca. However, it has been found that 50 mg. of Fe_2O_3 per 100 ml. of soln. is equiv. to 1 mg. CaO. The effect of the Fe is linear, and the detn. of the Fe content can be made the basis for a correction.

4589. BRECKPOT, R.
Spectral Control of Melts Converted in O_2/H_2O.
Compt. rend. 27th congr. intern. chim. ind. (Brussels), **1954**, 2.
Ind. Chim. belge, **20**, Special No., 360–2 (1955).
C. A., **51**, 10334c (1957).

For the control of the Thomas process, special equipment was devised to record the ratio of red and violet intensity, and thus distinguish the stages of dephosphorization, during which P oxidation proceeds at max., and peroxidation, during which dephosphorization slows down because of consumption of part of 0 by the iron. Tests were conducted with air, O-enriched air, and O_2/H_2O mixt. and an O_2/CO_2 mixt. Casting controlled by the app. varied in compn. within the following limits: Si 0.13–0.56; P 1.63–2.46; C 2.92–3.54%.

4590. BRECKPOT, R. AND DE CLIPPELEIR, K.
Direct Reading Spectrographic Analysis with the Line Profile.
Congr. Groupe. avance. méthodes anal. spectrog. produits mét. 17th Congr. (**1954**), 179–85.
C. A., **50**, 1378d (1956).

A direct-reading spectrograph is described. A series of phototubes are mounted behind exit slits in the focal plane of a prism spectrograph. Each exit slit and phototube is situated near the image of a spectrum line to be measured. The spectrum is then swept past these exit slits by a slight lateral motion of the entrance slit. The profile of each line is traced by a pen recorder. The method is applied to the detn. of Mn, C, P, Cu, and Si in steel by means of both spark and d.-c. arc excitation.

4591. BREHM, R. K. AND FASSEL, V. A.
Direct Reading Spectrochemical Analysis with a Rapid-scanning Spectrometer.
Spectrochim. Acta, **6**, 341–72 (1954).
C. A., **49**, 3580d (1955).

The optical, mech., and electronic features of a rapid-scanning spectrometer for direct reading spectrographic analysis are described. In this spectrometer the spectra are rapidly and repeatedly scanned past a single exit-slit, detector assembly, and the individual voltage pulses arising from the particular lines to be measured are electronically isolated, measured, and time integrated. Components of the instrument which are described in detail are as follows: a linear, variable-speed scanning mechanism; circuits for the cathode-ray tube presentation of wave length versus intensity traces, or actual line spectra; circuits for the electronic isolation of the spectral lines of interest, i. e., master trigger pulse generator and circuits for the delay univibrators, gate univibrators, gate-position indicator, and gated amplifiers;

the spectral line intensity or pulse-height measuring unit with its assocd. scaling circuits and pulse counters; and an automatic intensity ratio computer and recorder. Typical analytical results obtained with the present version of the instrument for flame, d-c. arc, and spark discharges are described.

4592. BRODY, J. K, FRED., M., AND TOMKINS, F. S.
Spectroscopic Assay of Lithium Isotopes. I. Measurements at High Intensity. II. Measurements on Small Samples at Low Intensity.
Spectrochim. Acta, **6**, 383–412 (1954).
C. A., **49**, 3723g (1955).

A method for detg. the natural Li^7/Li^6 abundance ratio is described in which measurements are made at relatively high intensity. The correction applied for self-absorption was developed from theoretical considerations and observations on the Li^7 doublet intensity ratio. A liquid air-cooled hollow-cathode source was used to reduce the Doppler broadening. The 6707 Å. lines were resolved with the Argonne 30-ft. Paschen-Runge spectrograph. The Fabry-Perot interferometer was also studied as the high-resolution instrument. The problems involved in making precise intensity measurements with both high-resolution instruments were studied and appropriate instrumental corrections made. The Li^7/Li^6 ratio found for normal Li in lab. Li reagents was 13.5 ± 0.2. The isotope assay method described in Part I has been modified so that detns. can be made on 2-γ samples. With the new source 6707 Å can be observed without self-absorption as shown by the doublet intensity ratio 2.04 ± 0.02 found for Li^7. With mixts. of sepd. isotopes it is shown that the intensity ratio is identical with the abundance ratio in the range of normal Li. The Li^7/Li^6 ratio in lab. reagent Li salts was found to be 13.5 ± 0.2. This result is identical with that found in Part I but is somewhat higher than the presently accepted value.

4593. BROIDA, H. P., MOROWITZ, H. J., AND SELGIN, M.
Optical Spectroscopic Determination of Hydrogen Isotopes in Aqueous Mixtures.
J. Research Natl. Bur. Standards, **52**, 293–301 (1954), *Research Paper No.* **2503**.
C. A., **48**, 11972d (1954).

Extension of the optical spectrographic method of isotope analysis of gaseous mixts. of H and D to mixts. of water and heavy water provides a direct method for detg. the total water content of materials. The intensities of the β-line of the Balmer series of H and D are used for the analysis. A detn. can be made on a sample of less than 0.1 ml. in less than 10 min. to an accuracy of a few percent. By using a sample of at least 1 ml., an accuracy of about 0.1% is obtained in an hr. or less. This paper describes the system and the investigation of optimum operating conditions and the effect of variations in operating conditions on precision and accuracy of the measurement, as well as limitations of the technique. The optical spectroscopic method can be used to det. the water content of most materials, whether in the solid, liquid, or gas phase, and can be applied to analyze blood or serum.

4594. BROOKS, L. S. AND BRYAN, F. R.
A Spectrographic Method for the Determination of Phosphorus in Steels.
Spectrochim. Acta, **6**, 413–17 (1954).
C. A., **49**, 3728c (1955).

A photographic procedure has been developed for the detn. of 0.003–0.061% P in steels. Samples and standards in rod form are prepd. as $^7/_{32}$ in. diam. electrodes, and chip samples, weighing 0.1 g., are placed in a C cup electrode. An a.-c. arc of 2.4 amp. at 4000 v. is used to excite spectra that are recorded with a large Littrow quartz spectrograph. The P line 2149.11 Å. is recorded on Ilford Q-2 plates and the emulsion is calibrated by means of Fe lines between 2100 and 2175 Å. This procedure provides improved detectability which can be attributed to the favorable characteristics of the particular ultraviolet-sensitive emulsion employed. Both precision and accuracy are sufficient to make the method useful in process-control labs.

4595. BROWN, H. C.
Application of the ARL Quantometer to Production Control in a Steel Mill.
J. Metals, **6**, *AIME Trans.*, **200**, 349–52 (1954).
C. A., **48**, 4265c (1954).

The use of the ARL production-control quantometer for the analysis of stainless, Si, and plain C steels is discussed.

4596. BRUMBAUGH, R. J. AND FANUS, W. E.
Determination of Lithium in Spodumene by Flame Photometry.
Anal. Chem., **26**, 463–5 (1954).
C. A., **48**, 6906b (1954).

Ignite 0.5 g. of finely ground ore to 1040° for 0.5 hr. After cooling, treat the ignited residue with HF and H_2SO_4. Evap. the soln. to dryness and dissolve the residue in 0.7*N* H_2SO_4. The resulting soln. and the standards necessary for bracketing are burned in consecutive order. The burning is repeated until adjacent sets check within about 0.4%. All standards are made to contain 270 p.p.m. of Al and to be 0.7*N* in H_2SO_4. Small amts. of Fe, Ca, and Mg do not interfere. As much as 6% Na_2O and 12% K_2O in the sample can be tolerated.

4597. BUCCHERI, A.
Quantitative Spectrographic Control of the

Stage of Zinc Removal During Refining of Lead by the Method of the Institute of Technological Researches (Inst. pesquisas tecnol., São Paulo, (Brazil)).
ABM (Bol. assoc. brasil. metais) (São Paulo), **10**, 283–7 (1954).
C. A., **49**, 13827h (1955).

B. describes a spectrographic method which is used as a routine control of Zn removal during refining of Pb in samples contg. 0.002–0.6% Zn. A sample weighing 100 g. is cooled to 350° while removing the top skin from the molten metal. A glass tube 20 cm. long and of 5 mm. internal diam. is submerged in the molten metal and vacuum applied so that the molten metal ascends the tube and solidifies instantly. Thus, a cylindrical sample 8–12 cm. long is obtained. It is then used in a Zeiss spectrograph with a photoelec. microphotometer. The following wave lengths were used: Zn 3345 Å. and Pb 3220 Å. The required exposure time for samples contg. 0.03–0.6% Zn is 10 sec. and for samples contg. less than 0.03% Zn 60 sec. For comparison, 7 standard samples contg. Zn from 0.002 to 0.595% were prepd.

4598. BÜCKERT, H
Industrial Spectrograph for Direct Measurement.
Metall, **8**, 940–5 (1954).
C. A., **49**, 2790c (1955).

A description of the app., its application, and the limitations of the method. Its low limits of sensitivity are as follows: in pure Zn — Cd 0.0005, Cu 0.0002, Pb 0.001, Fe 0.005; in pure Cu-Fe 0.005, Si 0.003, Al 0.0001, Mn 0.001; in pure Al—Fe 0.0008, Cu 0.0005, Zn 0.0005, Pb 0.0001, Ni 0.001; in steels—Pb 0.001, B 0.0002, Al 0.001%. The range over which various elements can be detd. is given for steel, Al, and Al alloys, and Cu and Cu alloys. It is applicable for Cu alloys with Zn as high as 40, Ni 30, Al 16%, for Al alloys with Mg as high as 14, Si 13, Zn 12%, and for steel with Cr as high as 30, Ni 30%.

4599. BURRIEL MARTÍ, F., JIMÉNEZ GÓMEZ, S., AND ALVAREZ HERRERO, C.
Simultaneous Determination of Exchangeable Cations in Soils by Spectrographic Analyses.
Anales edafol. y fisiol. vegetal (Madrid), **13**, 327–38 (1954).
C. A., **49**, 551b (1955).

The possibility of making simultaneous detns. of exchangeable cations in a soil ext. by spectrographic means was investigated. When Ca concn. is low (0.1–0.63%) Na, K, Mg, Pb, and Mn as well as Ca can be detd. in the range of 2700–4300 Å. When the Ca concn. is high (>0.63%) the range of best detn. is 3000–6250 Å. Mg can be detd. is soils of low Mg and high Ca content but Ca must be detd. separately for accuracy. Mn can be detd. in high-Ca soils providing Mn content is intermediate.

4600. BURRIEL MARTÍ, F, JIMÉNEZ GÓMEZ, S., AND ALVAREZ HERRERO, C.
Spectrographic Analysis of Exchange Cations in Soils. I. Study and Preparation of Standards.
Anales real soc. españ. fís y quím. (Madrid), **50B**, 663–72 (1954).
C. A., **49**, 1255f (1955).

It was found that spectrographic methods are more suitable than chem. methods for detg Na, K, Mg, Pb, Mn, and Ca in soils. The detn. is made on the dry residue of a *N* NH_4OAc ext. of the soil. Arc excitation with Cu electrodes is then used in 2 spectral zones: 2700–4300 Å. and 3000–6250 Å. with spectral lines of Fe as internal standard. The former zone gives better results except for Ca. No previous sepn. of individual ions is required. The standards are purified by repeated crystn. from water or alc. (with pptn. of carbonates). The standards are prepd. with CuO (diluent) contg. 10% Fe_2O_3. Essentially straight-line concn. curves are obtained for Na, K, Mg, and Pb down to 0.01% and for Ca and Mn down to 0.1%.

4601. BUR'YANOVA, E. Z.
Analcime Sedimentary Rocks from Tuva (S. Siberia).
Doklady Akad. Nauk S.S.S.R., **98**, 261–4 (1954).
C. A., **49**, 3751g (1955).

Spectral analysis of the analcime shows, besides Si, Al, and Na, some Ca, Mg, Fe, Mn, Ga (0.01–0.001%), and Ba (about 0.01%). (*See C. A.* for complete abstract).

4602. BUTLER, J. R.
Spectrographic Estimation of Lead in Twig Samples.
Analyst, **79**, 103–4 (1954).
C. A., **48**, 5018b (1954).

The air-dried twig is trimmed to a standard size, held in a pair of Ni crucible tongs, and introduced into a C arc. As little as 5 p.p.m. of Pb can be detected.

4603. BUTLER, R. J.
Trace-Element Distribution in Some Lancashire Soils.
J. Soil Sci., **5**, 156–66 (1954).
C. A., **49**, 2656i (1955).

Seven soil profiles with parent materials were studied: Triassic drift (2), Carboniferous drift (3), Carboniferous shale (2). The soils were poorly drained and gleyed, with the exception of the one on Carboniferous drift. Elements identified by a spectrographic examn. of finely crushed whole soil were: B, Ga, Cr, V, Sn, Li, Ni, Co, Zr, Mn, Yt, Sr, Pb, B, Rb. The max. concn., in the six soils supporting permanent pasture, of the elements Fe, Ga, Cr, V, Li, Ni, Co, Zr, Yt, Sr, Ba, and Rb occurred in the lowest soil

horizon. All the soils showed Sn and Pb concd. in the surface layers. Sn can be concd. in org. matter, whereas Pb is a trace element in barite assocd. with some Lancashire soils. The minor element concn. differences in the two Upper Carboniferous shales and their soils show the variability of the parent material.

4604. BUTT, E. M., NUSBAUM, R. E., GILMOUR, T. C., AND DIDIO, S. L.
The Use of Emission Spectrograph for Study of Inorganic Elements in Human Tissues.
Am. J. Clin. Pathol., **24**, 385–94 (1954).
C. A., **48**, 7731e (1954).

The spectrographic results were found to be reproducible. Cu is a normal constituent of all tissues and has its greatest storage value in liver. The av. values in the following tissues for the various metals in mg. per 100 g. of dry tissue were: liver: Cu 2.76, Zn 21.92, Fe 47.66, Mn 0.532, and Pb 0.517; kidney: Cu 1.77, Zn 19.04, Fe 27.38, Mn 0.301, Pb 0.362; heart: Cu 1.83, Zn 11.85, Fe 23.39, Mn 0.147, Pb 0.195; brain: Cu 2.07, Zn 4.93, Fe 20.47, Mn 0.132, Pb 0.082: lung: Cu 1.21, Zn 8.63, Fe 103.34, Mn 0.117, Pb 0.234: spleen: Cu 1.03, Zn 8.57, Fe 112.45, Pb 0.275. The standard error for Fe ranged from 0.84 to 8.49, and for the other metals, from 0.008 to 0.70. It is believed that Mo is a normal constituent of human liver and spleen, but not enough data are yet available. A knowledge of metal contents and storage values may be useful in the study of enzyme systems. 28 references.

4605. CANNERI, G. AND COZZI, D.
The Determination of Rare Metals in Zinc Blends by Spectrographic and Polarographic Methods.
Chimica e industria (Milan), **36**, 354–7 (1954).
C. A., **48**, 13570i (1954).

Sphalerite from Cadore, concd. by flotation, contained Ge 45, Tl 95, Ga 5, and In 0.03 γ/g. Ge and Tl were detd. spectrographically on the crude sample, but Ga and In had to be concd. by quant. copptn. with $Fe(OH)_3$. Indium was further concd. by copptn. with ZnS in dil. HOAc (sepn. from Fe) and finally with $Al(OH)_3$. The dried and powd. ppts. were mixed with Cu powder and pressed to form electrodes. The internal standard was Fe for Ge, Tl, and Ga, and Co for In. The spectrographic results for Ge and Tl were confirmed polarographically after chem. sepns. in which Tl was copptd. with MnO_2 and $Al(OH)_3$ and Ge was distd. with 6 *N* HCl and copptd. with $Al(OH)_3$. Details of procedure are given. The geochem. significance of the results is discussed. The high Tl content points to a low-temp. hydrothermal origin.

4606. CARLSSON, C. G.
A High Precision Slit and Photocell Arrangement for Spectrochemical Analysis.
Spectrochem. Acta, **6**, 211–15 (1954).
C. A., **48**, 10477a (1954).

In attempting direct-reading detn. of P in steel by means of a quartz spectrograph of medium dispersion it was found necessary to use narrow exit slits (20μ) and align them accurately. The slit and photocell arrangement described has 4 exit slits. The position along the focal plane of each of these slits can be adjusted individually from the outside of the spectrograph with an accuracy of 1–2. Each slit can be adjusted separately to coincide with the focal plane and to be parallel to the spectral line.

4607. CARLSSON, C. G. AND DANIELSSON, L.
Direct Reading Spectrographic Determination of Phosphorus in Steel and Iron Ore.
Spectrochim. Acta, **6**, 418–33 (1954).
Jerkontorets Ann., **138**, 383–403 (1954).
C. A., **48**, 10488b (1954).

A medium-size quartz spectrograph with electron multiplier was used. The slits had to be adjusted with great precision, and a slit arrangement of new design was used. A triggered low-tension a.-c. spark gave high sensitivity and good precision. P down to 0.005% can be detd. in both steel and ore. Cu below 0.4% does not interfere.

4608. CARLSSON, C. G. AND LARSSON, A.
Spectrochemical Determination of Rare Elements in Coke Ash and Steel.
Jernkontorets Ann., **138**, 737–43 (1954).
C. A., **49**, 3728e (1955).

The d.-c. method, the carrier method, and the double-arc method were used. After dissolving the samples in HCl the bulk of Fe was removed by a double ether extn. first as Fe^{++}, and then as Fe^{3+}. The ether soln. from the first extn. contg. Ga, Mo, and other elements, and the H_2O soln., from the second extn., were used for analysis. The resulting soln. was analyzed spectrographically after evapn. on pure C electrodes. The same method was used for the quant. analysis of a few elements of special interest. Ge was detd. separately by this method after it had been pptd. as sulfide from an H_2SO_4 soln. with Cu as a carrier element.

4609. CAROBBI, G. AND CIPRIANI, C.
Geochemical Research on Mineral Waters of Montecatini Terme (Pistoia, Italy).
Rend. soc. mineralog. ital., **10**, 226–52 (1954).
C. A., **49**, 1994h (1955).

To complete old chem. research on main elements, minor elements (Ag, Be, Co, Cr, Cu, Ga, Mn, Ni, Pb, Ti, V, and Zn) were spectrographically estd. in the water of 5 springs (Leopoldina, Tamerici, Regina, Tet-

tuccio, and Rinfresco) of Montecatini Terme, and compared with those of 6 limestone and 6 sandstone samples believed to be penetrated by the waters. For Ni, Co, Cr, and Pb of the waters, spectrographical detns. gave the values 0.0004–0.016, traces, 0.0006–0.0014, and 0.021–0.095 g. per metric ton, resp. Conclusion: The findings do not contrast the hypothesis that the Montecatini waters are the result of the diln. of fossil sea waters by surface waters circulating in the surrounding limestone and sandstone.

4610. CAROLAN, R. J.
Analysis of Beet, etc., by Beckman Flame Photometer.
Intern. Sugar J., **56**, 189–91 (1954).
C. A., **49**, 651c (1955).

Water exts. of dried beet were analyzed for Na, K, and Ca by the Beckman flame photometer. Standard curves for K and Na can be detd. with sugar solns. or correction factors can be calcd. With the use of the latter, direct flame photometry applied to the beet ext. gives results in reasonably good agreement with those obtained by chem. analyses of the sulfated ash. It is more rapid and much simpler.

4611. CATON, R. D. JR. AND BREMNER, R. W.
Some Interferences in Flame Photometry.
Anal. Chem., **26**, 805–13 (1954).
C. A., **48**, 9257e (1954).

A study was made of the effect of viscosity of the solns. used for flame photometry. The effect of sucrose, glucose, urea, and gelatin on the detn of Na, K, and Ca was examd. The interference caused by these org. contaminants cannot be explained by viscosity alone. For similar compds. the depressing effect on the flame intensity is a function of mass rather than molarity of contaminant.

4612. CAVELL, A. J.
Rapid Method for the Determination of Nitrogen, Phosphorus, and Potassium in Plant Materials.
J. Sci. Food Agr., **5**, 195–200 (1954).
C. A., **48**, 6911b (1954).

The sample is digested with a mixt. of concd. H_2SO_4, Na_2SO_4, and $CuSO_4$. N is detd. as NH_3 in the usual way. P is detd. colorimetrically as the phosphovanado-molybdate and K is estd. with a flame photometer. Factors in the detn. of P were studied: effect of temp. on color development, of variation of H_2SO_4 concn. in 3.5% Na_2SO_4 soln., of variations in the Na_2SO_4 concn., and of other ions. Other ions were shown not to interfere with the detn. of K.

4613. CHANDLER, A. B.
Flame Photometry—A New Approach to Alkali Process Control.
Foote Prints, **26**, No. 1, 11–14 (1954).
C. A., **51**, 6959e (1957).

Use of the flame photometer is described in a method of quick and accurate alkali process control.

4614. CHEN, P. S. JR. AND TORIBARA, T. Y.
Some Errors in the Determination of Calcium in Aged Blood Serum Eliminated by Flame Photometry.
Anal. Chem., **26**, 1967–8 (1954).
C. A., **49**, 4774g (1955).

In fresh serum, Ca can be pptd. quantitatively by oxalate, but in aged serum which is partially denatured or cloudy, part of the Ca is combined with protein and fails to ppt. Removal of protein with CCl_3CO_2H releases protein-bound Ca, which can be recovered quantitatively by oxalate pptn. from the CCl_3CO_2H filtrate. Estn. of the Ca by means of the oxalate content of the ppt. is attended by several difficulties, and flame photometry is recommended as more reliable. This can be performed directly on the CCl_3CO_2H filtrate, but for the most accurate work, pptn. with oxalate should precede the flame photometric measurement. Prepn. of standards is then simpler, since Na, K, and phosphate are no longer present.

4615. CLAYTON, H. R.
Spectrographic Analytical Control.
Progr. in Phot. 1951–4, **2**, 276. (1954).
C. A., **49**, 1457d (1955).

In spectroscopy used for analytical control in industry the tendency over the past two years has been to increase the speed of analysis and to widen the scope of the method. that is the range of concentrations of a given element over which it is applicable. Both these developments call for replacement of the photographic recording of spectra by direct measurement of spectrum line intensities by photo-electron multipliers. By this means the time taken for an analysis is reduced as the whole photographic and microphotometric process is eliminated and the range of application of the method is extended since the spectrum lines used need no longer be subject to the same restrictions in intensity and wavelength. For many purposes the photographic technique is still to be preferred since it gives a permanent record of the analysis and shows up all the constituents of the sample whether or not they are being sought at that particular time; in this way unexpected impurities may be detected which would be missed by a rapid direct-reading apparatus set to record only the elements whose presence is suspected. (*See also Progress in Photography*, **1**, 369 (1940–1950)).

4616. CLIFFORD, P. A. AND WINKLER, W. O.
Determination of Sodium in Foods. Gravimetric and Flame Photometric Methods.
J. Assoc. Offic. Agr. Chemists, **37**, 586–600 (1954).
C. A., **48**, 10241g (1954).

The conventional Zn uranyl acetate method was adapted to the detn. of Na in foods. The presence of interfering quantities of K is detected by the application of the $HClO_4$ qual. tests and is eliminated by isolating the Na salt from the mixed perchlorates by a butanol-EtOAc extn. Detailed directions are presented for the detn. of Na in foods with the Beckman DU spectrophotometer with the flame accessory and the Perkin-Elmer model 52 C flame photometer. The sample soln. is prepd. for flame photometry so as to eliminate Ca and phosphate and the interference of K is evaluated and the appropriate corrections are applied for each instrument. Cf. *C. A.*, **48**, 8961eg.

4617. CLOSE, P. AND WATSON, M. T., JR.
Determination of Potassium in Glass with the Hydrogen Flame Photometer.
J. Am. Ceram. Soc., **37**, 235–8 (1954).
C. A., **48**, 7861c (1954).

The app. used was a Beckman Model DU spectrophotometer with a No. 9200 flame attachment and a No. 9240 H atomizer-burner. It was operated with an O pressure of 15–20 lb./sq. in. and a fuel pressure of 4–5 lb./sq. in. The sample soln. was atomized directly into the flame through a Pd capillary. Calibration was accomplished by atomizing into the flame a soln. of the element in question and recording the wavelength setting at max. photometer response. The glass sample was prepd. by decompn. in HF and $HClO_4$, volatilization of SiO_2 (and B_2O_3), and conversion of the bases to perchlorates. Fe and Al (and Mn) were removed, when necessary, by pptn. with $CaCO_3$, and the soln. was filtered into a volumetric flask. An aliquot equiv. to 0.1 g. was dild. to 100 ml., and K detd. at the 767 mμ wavelength. Details of procedure are given. Results of detns. made on known glasses showed an accuracy of ±2%. Substantial variations in Na, Ca, Mg, Fe, and Al in the sample did not appreciably affect the detn. In large amts. (12%) Ba raised the flame background, but in amts. of 2% of less it had no significant effect. For best results Zn should be removed because it is troublesome. Usually the removal of Fe and Al is not necessary, but the standard curves should then be prepd. with the Fe and Al in the standardizing soln. After prepn. of the sample the detn. of K can be made in 10 min.

4618. COENEN, C. B. AND URNER, R. S.
New Analyses for Complex Greases.
Petroleum Refiner, **33**, No. 12, 212–14 (1954).
C. A., **49**, 2719a (1955).

Emission spectrography, the observation of the behavior on treatment with solvents, and conventional methods such as sapon. no., acid no., color, odor, and consistency are recommended for the preliminary qual. inspection of complicated greases. The following 3 general methods were successfully used for the sepn. of the major components: solvent partitioning with and without preliminary hydrolysis, chromatography, and centrifugation. While standard methods are satisfactory for identifying soaps and petroleum oil components, other lubricating components such as silicone and fluorocarbon oils, aliphatic diesters, and polyalkylene glycols are readily identified by their infrared spectra. Solid inorg. fillers can be identified by X-ray diffraction methods.

4619. COHEN, S. P. AND WIENER, D. A.
Spectrographic Analysis of Spores of Bacillus Megatherium.
Appl. Spectroscopy, **8**, No. 1, 23 (1954).
C. A., **48**, 7100c (1954).

Samples of spores that had been grown 5 days on liver broth were digested with HNO_3 and HCl, dried and ashed, and burned in a 12-amp. d.-c. arc to photograph the spectrum. Relative to synthetic standards the spores were found to contain about 130 p.p.m. Mn.

4620. COLWELL, D. L. AND TICHY, O.
Direct-Reading Spectrograph Gives Accurate Control in Aluminum Production.
J. Metals, **6**, 343–5 (1954).
C. A., **48**, 4398a (1954).

Discussion of use in secondary Al recovery and refining.

4621. CONVEY, J. AND HURWITZ, J. K.
The Spectrum of Steel. A Table for the Selection of Homologous Spectral Lines.
Can., Dept. Mines and Tech. Surveys, Mines Branch, Rept. No. **848**, 55 pp. (1954).
C. A., **48**, 7488a (1954).

Fundamental and practical information concerning the ultraviolet spectrum of steel alloys is tabulated. Its application will lead to greater facility in selecting homologous line pairs employed for accurate and rapid quantitative analysis of a wide variety of steel alloys. Wavelengths from 2327.39 to 4383.55A are given for nearly 2500 lines of Fe, Mn, Si, Ni, Cr, Mo, V, and Cu. For most of these lines spectral origin, excitation potential and estimated relative intensities are also indicated, and some possible mutual interferences are shown.

4622. COULLIETTE, J. H.
Interpretation of Spectra for the Analysis of Matter.
Eng. Progr. Univ. Florida, **8**, No. 9, 19–26 (1954).
C. A., **52**, 4386b (1958).

A review which emphasizes quant. analysis. General methods, the mutual standard method, the internal standard method, and the direct method are described. Spectrographic analysis of stainless steel is used as an example.

4623. CROWTHER, P. C. AND RAYMOND, W. D.
The Analysis of Soil and Foliage Material in Connection with Sickle Leaf Disease of Cacao in Ceylon.
Colonial Plant and Animal Products (London), **4**, 257–9 (1954).
C. A., **49**, 5591b (1955).

Spectrographic analysis showed that the Zn content of foliage from a healthy tree was higher than that from an unhealthy one; this supports the theory of Greenwood, et al. (Cf. *C. A.*, **47**, 1789g) that sickle leaf disease is due to a deficiency of Zn in the soil. The healthy tissue was higher in Cu and Ca and lower in Mn and Fe. The soil beneath the healthy tree contained greater amts. of plant nutrients than that under the diseased tree. Because of improper soil sampling, the findings are inconclusive.

4624. ČŮTA, F. AND RAUSCHER, K.
Spectrographic Determination of Small Amounts of Cobalt in Nickel Salts.
Chem. Listy, **48**, 1616–22 (1954).
C. A., **49**, 4446d (1955).

For the spectrographic detn. of 0.005 to 0.1% Co in Ni salts, the lines Co 2378.6 Å. and Ni 2379.7 Å. are recommended. The optimum working procedure is described in detail.

4625. DANILOVA, V. I. AND SONCHIK, V. K.
Method of Quantitative Spectrum Analysis of Intermediates and Tailings in Tin Production.
Trudy Sibir. Fiz.-Tekh. Inst. 1953, No. **32**, 81–91.
Referat. Zhur., Khim., 1954, No. **48559**.
C. A., **50**, 4708h (1956).

Slags were analyzed for Sn, Si, Ca, Fe, Al, and W, and tailings for Sn and Fe by using 3 standards wherein a 2-g. sample was fed for 2 min. through the discharge zone between C electrodes with the aid of a special mechanism. For comparison, there was added to the sample 30% Cu as CuO. The activated arc was of 6 amp.; parallel to the condenser was inserted a 18–20 microfarad capacitance; and the distance between the electrodes was 2 mm. In the analysis of slag for 0.11–4% Sn the lines Sn/Cu 2863/2825, 2840/2825, and 2572/2618 (relative error 6–9%) were used. For 0.11–17% Sn the lines Sn/Cu 2572/2492 (9.6%), and 2661/2618 (±24%) were used. For 6.5–15.0% Al the lines Al/Cu 3082/3108 and 3092/3108 (±20%) were used. For 8–30% Ca the lines Ca/Cu 3179/3108 and 3158/3108 (±7 to ±30%) were used. For 0.90–34% Fe_2O_3 the lines Fe/Cu 3047/3064 (20%) and 2973/2961 (10%) were used. For 0.8–8.5% WO_3 the lines W/Cu 3215/3064 and 2947/2961 (12–16%) were used. For Si the lines Si/Cu 2881/2825, 2528/2492, and 2435/2592 were used. The duration of a slag analysis is 3 hrs. In the analysis of tailings for 0.90–4.5% Sn the lines Sn/Cu 2863/2825 were used (relative error 25%) and 2840/2825 (10–15%). For 6–21% Fe_2O_3 the lines Fe/Cu 3047/3064 (10–15%) were used. No calibration curves were made for As since its concn. in tailings changed very little. The method was tested on various Sn concentrates and was found suitable for detg. As, W, Pb, Bi, Sb, and Zn.

4626. DEAL, S. B.
Flame Photometric Determination of Sodium and Potassium in Zinc Cadmium Sulfide Phosphors.
Anal. Chem., **26**, 598–9 (1954).
C. A., **48**, 6908d (1954).

Dissolve 5 g. of phosphor in 10 ml. of $HClO_4$ and 10 to 15 ml. of HNO_3. Evap. the soln. to small vol. and then dil. to 100 ml. Analyze the soln. with a flame photometer. Calibration curves are obtained from solns. contg. known concns. of Na and K.

4627. DEINUM, H. W.
The Electrical Spark as an Excitation Source in Spectrochemistry.
Chem. Weekblad, **50**, 881–4 (1954).
C. A., **49**, 5970h (1955).

The effect of capacity, self-induction, resistance of elec. circuit, and electrode distance upon the nature of the spark discharge is described. A hypothetical relation between the character of the discharge and the nature of the spark spectrum is briefly discussed.

4628. DENSON, J. R.
Flame Photometric Determination of Electrolytes in Tissue and of Calcium in Serum.
J. Biol. Chem. **209**, 233–40 (1954).
C. A., **48**, 10826d (1954).

A flame spectrophotometric method was developed for the simultaneous detn. of Ca, Mg, Na, and K in tissue. A rapid method for the detn. of Ca in blood was also worked out. The values obtained by the flame method for Ca and Mg are comparable with those obtained by chem. methods. The recovery values for all 4 cations are satisfactory.

4629. DEUCHLER, W.
Spectrographic and X-Ray Investigations on Graphite Spheroids Isolated from Nodular Cast Iron.
Giesserei, **41**, 745–9 (1954).
C. A., **49**, 10817b (1955).

A magnetic and a nonmagnetic type of nodular graphite were extd. from a cast iron analyzing: C 3.8–4.0, Si 2.2–2.4, Mn 0.3, Ni 0.8, Mg 0.05, P and S, $< 0.005\%$. The magnetic variety was found to contain finely dispersed ferrite. X-ray analysis of the nonmagnetic fraction showed reflections which were not typical of a graphite lattice. No identification of these was possible.

4630. DIPPEL, W. A., BRICKER, C. E., AND FURMAN, N. H.
Flame Photometric Determination of Phosphate.
Anal. Chem., 26, 553–6 (1954).
C. A., **48**, 6915e (1954).

Treat a sample of phosphate rock with 10 ml. of concd. HCl and 5 ml. of concd. HNO_3. Heat for 1 hr., then evap. to dryness, and bake for about 15 min. Take up the dry residue in 2 drops HCl and 20 ml. of water. Pour into the top of an ion-exchange column through a filter. Wash the filter until a total of 85 ml. of effluent is collected in a 100-ml. volumetric flask. Add 10 ml. of standard 10,000 p.p.m. of Ca soln. to the flask and dil. the soln. to the mark. Measure the intensity imparted to the flame by this soln. on the flame photometer at 422.7 mμ. Construct a calibration curve by adding known amts. of standardized H_3PO_4 to solns. contg. 1000 p.p.m. of Ca. The curve is linear in the concn. range between 0.005 and 0.012*M* H_3PO_4.

4631. DORFMAN, S. I.
The Spectrochemical Analysis of Cerebrospinal Fluid in Disseminated Sclerosis.
Infektsionnye i Toksicheskie Zabolevaniya Nervnoi Sistemy (Irkutsk; Knizh. Izdatel.) (**1954**), 20–4.
Referat. Zhur. Khim., Biol. Khim., **1955**, No 15856.
C. A., **51**, 11544g (1957).

A simultaneous study was made of the blood and of the cerebrospinal fluid (I) in 27 patients with disseminated sclerosis. In 51.6% of the patients the protein of the I was increased. The spectrochem. analysis of I showed: Mn, 0.0–1.0; Cr, 0.0–0.1; Pb, 0.0–1.0; and Ag, 0.0–0.1 mg. %. Pb, Cr, and Co in some patients were present in I but not in the blood; Sn and Li were found in the blood but not in I. No particular pattern of the content of the microelements in the I in disseminated sclerosis could be discerned.

4632. DREVON, B.
Sensitivity and Precision of Very Rapid Methods for the Determination of Blood Calcium.
Trav. Soc. Pharm. Montpellier, **14**, No. 3, 171–8 (1954).
C. A., **49**, 9077b (1955).
Cf. *C. A.*, **48**, 7097b.

The complexometric method, involving titration with Na ethylenediaminetetraacetate in the presence of murexide as indicator, and the flame spectrophotometric method for Ca in blood serum were compared with the permanganimetric method used as a method of reference. The first two are about equally sensitive, requiring a min. of 0.5 ml. serum as compared with 1–2 ml. for the reference method. Both show a precision of about 1%. The complexometric method is the most rapid and gives results in close agreement with the reference method. Results of the flame spectrophotometric method are about 2% too high.

4633. DUTRA, C. V. AND MURATA, K. J.
Spectrochemical Determination of Thorium in Monazite by the Powder-Direct-Current Arc Technique.
Spectrochim. Acta, **6**, 373–82 (1954).
C. A., **49**, 3725i (1955).

Th in monazite is detd. by a d.-c. C arc technique with Zr as the internal standard. The analytical curve for Th II 2870.413 Å./Zr II 2844.579 Å. is established by means of synthetic standards contg. graduated amts. of ThO_2, and 0.500% ZrO_2 in pegmatite base (60 parts quartz, 40 parts microcline, and 1 part ferric oxide). Monazite samples are dild. 14-fold with pegmatite base that contains 0.538% ZrO_2, so that the zirconia content of the resulting mixt. is also 0.500%. In addn., both the standards and the dild. monazites are mixed with one-half their weight of powd. graphite. Approx. 25 mg. of the prepd. samples are arced to completion at 15.5 to 17.5 amp. With the 14-fold diln. employed, the accurate range of the method is 3 to 20% ThO_2 in the original monazite. The coeff. of variation for a single detn. is 4% at the 7% ThO_2 level. Tests with synthetic unknowns and chemically analyzed monazites show a max. error of ±10% of the thoria content. If Nb is substituted for Zr as the internal standard, there is a loss in precision. Pt as the internal standard gives results of good precision but introduces marked sensitivity to matrix effects.

4634. EDGCOMBE, L. J. AND HEWETT, D. R.
Rapid Flame-Photometric Method for the Determination of Calcium in Coal Ash and Coke Ash.
Analyst, **79**, 755–8 (1954).
C. A., **49**, 3507f (1955).

To 0.1 g. of ash in a Pt crucible, add 5 ml. 20% H_2SO_4 and an equal vol. of 40% HF. Heat in an air bath until dense fumes are evolved, cool and dil. with 50 ml. of water. Methods for removing interfering elements are described and for detg. the CaO by direct comparison with the flame photometer reading for a standard soln. contg. 50 p.p.m. of CaO. The results obtained in 10 analyses of samples contg. 1.00 to 6.68% CaO were all good.

4635. EISENBRAND, J.
Differentiating Various Types of Vinegar with the Aid of Flame Photometric Measurements.
Z. Lebensm.-Utersuch. U.-Forsch., **98**, 196–205 (1954).
C. A., **48**, 7813e (1954).

An app. is designed for flame spectral detn. of K in the ash of vinegars. The apparent

limits of K_2O content in mg./g. of HOAc of various vinegars are: wine vinegar 4–50 (most at 13–20), wine vinegar blend 1–15 (most at 2.5–5), alc. vinegar 0.1–2.5 (most at 0.4–0.8), and essence vinegar 0.02–0.25. The classification of vinegars on the basis of content of HOAc, K_2O to HOAc ratio, nonvolatile acids, and $KMnO_4$ decolorization is demonstrated.

4636. EISFELDER, H. W.
Trace Elements and Their Relation to Homeopathy.
J. Am. Inst. Homeopathy, **47**, 265–8 (1954).
C. A., **48**, 13163h (1954).

A spectrographic study was made of the percentage (if present) or absence of each of 20 elements in each of 20 drug plants used in homeopathic medicine. The biochem. functions of certain trace elements are discussed.

4637. ENNS, J. H.
Excitation in spectrochemical analysis.
Eng. Progr. Univ. Florida, **8**, No. 9, 13–18 (1954).
C. A., **52**, 4386a (1958).

A review with 21 references.

4638. ERDEY, L. AND GEGUS, E.
Spectrochemical Method for the Elimination of the Interfering Effect of Cyanogen Bands.
Acta Chim. Acad. Sci. Hung., **5**, 43–63 (in German) (English Summary) (1954).
C. A., **49**, 8727b (1955).

The use of the C electrode in spectrographic work is frequently limited by the appearance of strong cyanogen bands in the region 3300–4600 Å. The use of $K_2S_2O_7$ or $KBrO_3$ is suggested to reduce the arc temp. and to promote an oxidizing atm. In addn., the use of the interrupted arc is recommended. Under these conditions, the interference of the CN bands is largely eliminated. Qualitatively, the method is useful in the examn. of the rare earths; in $Al(OH)_3$ contg. Fe, Pb, and Mo; and in CaCO contg. traces of Sr and Ba. Quantitatively, the method is applicable to the detn. of Cr, Pb, and Fe in NaCl in the concn. range 0.001–1.0%, 0.003–3.0%, and 0.001–1.0%, resp. In both qual. and quant. studies, lines occurring in the cyanogen band region are used.

4639. EWING, G. W.
Instrumental Methods of Chemical Analysis. McGraw-Hill Book Co., Inc., New York, N. Y. (1954). 434 pp.
C. A., **49**, 2259a (1955).

The present text has been prepared to teach college seniors and first-year graduate students the methods and uses of modern analytical techniques. (exclusive of the precision balance). Among 20 chapters, the following involve radiation spectra: Emission Spectroscopy, The Absorption of Radiation, Infrared Absorption, The Absorption and Diffraction of X-rays.

4640. FALLER, F. E.
Analysis of Purest Aluminum With Special Consideration of Practical Requirements.
Z. Erzbergbau u. Metallhüttenw., **7**, 473–9 (1954).
C. A., **49**, 2249d (1955).

The methods of analysis of pure Al and its alloys are spectrographic, by using either metallic specimens or solns., polarographic, photometric, and gravimetric or volumetric, particularly for the detn. of alloying elements. Details of these methods are given.

4641. FARRELL, F.
Simplified Line-Width Procedure for Measuring Dense Spectrum Lines.
Spectrochim. Acta, **6**, 442–3 (1954).
C. A., **49**, 3656c (1955).

One of the difficulties encountered in spectrochem. analysis is that dense spectrum lines cannot be read directly on a microphotometer. It is standard practice to overcome this by the use of two or more lines to cover a given range of concn. or by using a rotating step-sector, or by using the method of line-widths. Dense spectrum lines are read after opening the slit of the microphotometer wider than the line image. These readings are proportional to line-widths and hence to concn. When the Na doublet at 5890 Å. has wide lines, the gap between the lines is read.

4642. FAUL, H., GOTT, G. B., MANGER, G. E., MYTTON, J. W., AND SAKAKURA, A. Y.
Radon and Helium in Natural Gas.
Congr. Geol. Intern., Compt. Rend. 19th Session Algiers 1952, **9**, 339–48 (in English) (1954).
C. A., **49**, 5230e (1955).

Analyses of gas from several hundred wells in the Texas Panhandle field show Rn contents of 10 to 520 micromicrocuries per 1. Measurements under conditions of transient gas flow indicate that the Rn originates close to the bore in most wells. Uraniferous asphalt and petroleum residues have been found in dolomite from above the gas producing zones, and spectrographic analyses of 5 of these show up to 1.6% U as well as As, Bi, Co, Cu, Ni, Pb, and V. Spent acid from acidized wells showed ratios of Ra/U about 11 times the equil. ratio. There is no clear correlation between the content of Rn and that of He.

4643. FIELDS, M., SWINDALE, L. D., RICHARDSON, J. P., and MCDOWALL, I. C.
Analysis of Soil Clays and Other Silicates.
New Zealand J. Sci. Technol. **35B**, 433–9 (1954).
C. A., **48**, 14069f (1954).

From a 0.2-g. sample, SiO_2 is removed with HF. Fe_2O_3 and TiO_2 are detd. by conven-

tional procedures, CaO, MgO, K_2O, and Na_2O by flame photometry, and SiO_2 and Al_2O_3 by difference. Complete analyses require one man-day per sample. Accuracy compares with conventional methods.

4644. FINKELSTEIN, N. A.
Instrumentation for Emission Spectrochemical Analysis.
Eng. Progr. Univ. Florida, **8**, No. 9, 5–12 (1954).
C. A., **52**, 4386c (1958).
A review.

4645. FORD, C. L.
Determination of Sodium and Potassium Oxides by Flame Photometry in Portland Cement Raw Materials and Mixtures and Similar Silicates.
Anal. Chem., **26**, 1578–81 (1954).
C. A., **49**, 2253i (1955).

Na_2O and K_2O in acid-insol. silicates can be detd. by flame-photometry techniques in common use for cement by sintering and extg. the material by the classical J. Lawrence Smith method, removing the unknown amt. of Ca in the ext. with $(NH_4)_2CO_3$, and substituting a known amount of Ca and HCl approximating that found in the standard solns. used in the methods for cement. In using this method, it is not necessary to prep. special solns. or alter the flame-photometric technique used for portland cement.

4646. FORD, O. W.
Potash in Fertilizers.
J. Assoc. Offic. Agr. Chemists, **37**, 363–70 (1954).
C. A., **48**, 9001h (1954).

Cf. *C. A.*, **47**, 2918f and preceding abstr.
The presence of minor-element additives (Cu, Mn, Co, and others) at 40, 50, and 58% levels resulted in increased variations in K_2O results by the Perrin method (Cf. *C. A.*, **44**, 1215a) and by the Lindo-Gladding method (A.O. A.C. *Methods of Analysis, 7th ed.* (1950), *C. A.*, **45**, 2824e). Little interference was reported with the same samples examd. for K_2O by the flame-photometer method, probably because of removal of interfering ions in the prepn. of the solns.

4647. FORTESCUE, J. A. C.
Germanium and Other Trace Elements in Some Western Canadian Coals.
Am. Mineralogist, **39**, 510–19 (1954).
C. A., **49**, 13846e (1955).

Spectrographic analyses were made of the ash of 24 coal samples from British Columbia, the Yukon, and the Northwest Territories. Traces of Ge were found in 6 of the 24 samples tested. One sample (Hornaday River, N. W.T.) had Ge > 0.1%. The distribution of Ge in the samples was erratic. Other elements detd. were B, Mn, Mg, Pb, Sn, Si, Be, Mo, Ni, Ca, V, Cd, Cu, and Zn. Fewer elements were detected in samples ashed in a Bunsen flame than in ash of the same coal samples ashed in a muffle furnace. All samples were ashed in a muffle furnace at not over 430°, but some Ge may have been lost at this temp. The ashing problem is discussed.

4648. FREDERICKSON, L. D., JR. AND CHURCHILL, J. R.
Spectrochemical Analysis of Aluminum Alloys with Molten Metal Electrodes.
Anal Chem., **26**, 795–800, 1166 (1954).
C. A., **48**, 9864h (1954).

Tests were evaluated with direct-reading equipment. Induction melting of disk samples required less than 20 sec. at 900°. The special 4-turn, H_2O-cooled Cu coil provides shape control of the molten globule by having the top coil spaced $^3/_4$ in. from the others and wound in the opposite direction. An effective agitation results from the elec. field. This permits the mixing of standards to obtain intermediate values. The spark excitation has the parameters: 12,000 v. peak voltage, 90 mh. inductance, 0.007 mfd. capacitance, 6 amp. (radiofrequency) discharge current and a discharge train frequency of 240 per sec. An air blast, opposite in direction from the light path to the spectrometer, was applied to the analytical gap. Other melting techniques studied, which proved inferior, were: source-power melting (Feussner spark) required excessive time, gave low temps., excessive oxidation, and alkali losses; an auxiliary horizontal-arc was cumbersome, required crit. positioning and special circuits; resistance heating methods for melting included: a tube furnace, a hot-plate arrangement (required a melting-sparking sequence) and a heated core furnace (globar elements.) The use of molten sample electrodes is more practical than thermal treatment prior to analysis of complete melting and recasting of the sample.

4649. FRISH, S. E.
Quantitative Spectral Analysis of Gas Mixtures.
Vestnik Leningrad. Univ., **9**, No. 8, *Ser. Mat., Fiz. i Khim.*, No. **3**, 157–62 (1954).
C. A., **49**, 7447a (1955).

A short review of the methods developed by the Physical Inst. for the quant. spectral analysis of gas mixts.

4650. FRY, D. L. AND SCHREIBER, T. P.
Selection of Line Pairs for the Spectrographic Analysis of Low Alloy Steel.
J. Opt. Soc. Amer., **44**, 159–62 (1954).
C. A., **48**, 4365i (1954).

Analytical line pairs have been selected for use in the spectrographic analysis of low alloy steel. Lines were paired on the basis of similar excitation potentials and wavelength sepn. When excitation potential of the individual members of a pair were within $^2/_3$ or $^3/_2$ of each other, high accuracy and reproducibility

were obtained even under conditions of considerable matrix variation and within these limits min. wavelength sepn. between the lines becomes more important than a closer match in excitation lines selected and deviations obtained by using these lines under considerable matrix variations are given in tabular form.

4651. FUJITA, S., YOSHINAGA, H., AND MINAMI, S.
An Automatic Correction Circuit of the Quantometer.
Technol. Repts. Osaka Univ., **4**, Nos. 93–109, 33–43 (1954).
C. A., **49**, 6665a (1955).
Cf. *C. A.*, **49**, 6776e.

The drift of the photometric circuit of the quantometer during long-term analysis was found to be caused by the zero-point drift of the d.-c. amplifier and the slow change of the dark current of the multiplier phototube. The former was reduced to a negligible order of magnitude by using a symmetrical connection and manganin-wire-wound resistors for the amplifier. The latter was effectively eliminated by a circuit composed of "memory" condensers for the dark currents, difference amplifiers, and a group of switches to change the circuit conditions. The circuit memorizes the amt. of dark currents during short periods of time between measurements, and a combination of difference amplifiers indicates the ratio of the required photoelec. current. The quantometer was shown to be fairly stable for routine work in recording automatically the amts. of many elements.

4652. FUWA, K.
Spectrochemical Analysis of Fluorine by the Band Spectrum of Calcium Fluoride. III.
J. Chem. Soc. Japan, Pure Chem., Sect. **75**, 1257–9 (1954).
C. A., **49**, 13561e (1955).

F contained in the sediments and soils of Tamagawa Hot Springs in Akita Prefecture was detd. by visual spectroscopic method. Contents of 0.001–0.05% F were found.

4653. GANTZCKOW, H.
The 50-Cycle Luminous Arc in Spectrochemical Analysis—an Oscillographic Method for Quantitative Trace Analysis.
Metall, **8**, 528–31 (1954).
C. A., **48**, 13521e (1954).

The spectrum characteristics of the 50-cycle luminous arc between metallic electrodes are reproduced, and applications in trace analysis with the use of an oscillograph is described.

4654. GAZMURI, R., CANESSA, M., AND GARCIA, H.
Flame-Photometric Determination of Sodium and Potassium in Normal Human Serums.
Rev. méd. Chile, **82**, 49–51 (1954).
Excerpta Med. 9, Sect. **VI**, 874 (1955).
C. A., **50**, 14070c (1956).

Normal serums contained 135–149.2 m eq.Na/l. and 4.3-6.2 m equiv. K/l., the values most frequently found being 143 and 5.5 m equiv./l., resp.

4655. GAZZI, V.
Quantitative Spectroanalysis by a Method of Increments.
Chimica e industria (Milan), **36**, 249–53 (1954).
C. A., **49**, 93g (1955).

An extension of work reviewed previously by the author (*C. A.*, **47**, 996f) on qual. spectroanalysis where it was demonstrated that some spectral lines are enhanced by the presence of other elements. Exptl. work reported confirms the results reported previously by Duffendack (*C.A.*, **32**, 2867[4]), Pierce (*C. A.*, **36**, 361[9]), and Gatterer (*C. A.*, **35**, 6205[8]).

4656. GEE, A., DOMINGUES, L. P., AND DEITZ, V. R.
Determination of Inorganic Constituents in Sucrose Solutions.
Anal. Chem., **26**, 1487–91 (1954).
C. A., **49**, 1488g (1955).

Rapid analytical procedures were given for detg. K, Na, Ca, Mg, Cl, SO_4, PO_4, and sol. silicate without ashing of the com. sugar. The inorg. constituents were detd. in a 5° Brix soln. by flame photometry. The H_2 flame was better than C_2H_2 because of lower radiation interferences. The flame-photometric results for Ca + Mg agreed with values obtained by titration with ethylenediaminetetraacetic acid, but the advantage was with the latter in many instances. Cl was detd. by a conductometric titration and SO_4 by a turbidimetric procedure as $BaSO_4$. Sol. silicate and inorg. PO_4^{3-} were detd. by modification of the molybdenum blue method.

4657. GEHRKE, C. W., RUNYON, C. V., AND PICKETT, E. E.
A Quantitative Spectrographic Method for the Determination of Tin, Copper, Iron, and Lead in Milk and Milk Products. The Effect of Storage on the Concentration of These Metals in Evaporated Milk.
J. Dairy Sci., **37**, 1401–8 (1954).
C. A., **49**, 4196h (1955).

A rapid reliable, and accurate spectrographic method has been developed for the detn. of Sn, Cu, Fe, and Pb in milk and evapd. milk. These metals can be analyzed simultaneously on a single sample. The precision of the method for the respective elements is from ±5 to ±8%. Graphite was added to the arcing mixt. This was to ensure a more nearly complete volatilization of the samples and to prevent the formation of a refractory

Ca oxide bead. The concn. of tin in evapd. milk was found to increase rapidly when stored at either 37° or room temp. This was found to be true for milk stored in either the electrolytic or hot-dipped plated cans. The av. concn. of Sn in evapd. milk as received was about 20 p.p.m.; after 50 days of storage at 37° in electrolytic cans the Sn concn. increased to 97.4 p.p.m., and after 340 days to 215 p.p.m. The rate of soln. of Sn was faster in the electrolytic cans than in the hot-dipped cans when stored at 37°. At room-temp. storage the concn. increased at about the same rate in both types of plated cans. The Fe content of evapd. milk increased with storage from 6.5 p.p.m. (0–50 days) to 16.5 p.p.m. (340 days) as an av. for 22 and 12 cans, resp. No significant increase was found in the concn. of Cu or Pb when the evapd. milk was stored in either type of can at room temp. of 37° for as long as 340 days. The mean values were 0.68 p.p.m. for Cu and 0.35 p.p.m. for Pb as an av. for 35 cans. The rate of change of pH was faster in milk in cans stored at 37° than in those stored at room temp. A decrease in pH, from 6.20 to 5.55, occurred within a period of 300 days. Flippers developed more rapidly in the electrolytic cans. Darkening occurred, and fat sepn. was evident in both types of cans after 81 days of storage at 37°. Corrosion occurred in all cans stored at 37°, and after about 300 days of storage all of the Sn coating was gone and only the Sn-Fe alloy layer remained.

4658. GERASIMOV, F. M.
Transactions of the IXth All-Union Conference on Spectroscopy.
Spectral Characteristics of Soviet Diffraction Gratings.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., 18, 662–3 (1954).
C. A., **50**, 7585e (1956).

Gratings are made with 200, 300, 600, and 1200 lines per mm. It is shown that resolution of 0.01 Å. can be obtained on hyperfine components of line Hg 4358 Å. "Ghosts" are practically absent.

4659. GERBER, W. O., JR. AND TOBIN, W. H.
A Spectrochemical Method for the Analysis of M-252 Nickel-Base High-Temperature Alloy and the Preparation of Standards by Powder Metallurgy.
Appl. Spectroscopy, **8**, 120–5 (1954).
C. A., **49**, 777f (1955).

Previously, a complete analysis of this complex alloy, by wet methods, required one to two weeks of elapsed time. Now it can be performed within two hrs. by instruments. Mo, Co, Fe, and Cr are detd. by X-ray fluorescence (*C. A.*, **47**, 3755c); Ti, Al, Mn, and Si by ultra-violet emission spectroscopy, C by the high-frequency induction furnace, and the remaining Ni is detd. by difference. The spectrochem. results are obtained with a point to plane spark discharge, a 3.4-m. concave grating spectrograph, a nonrecording densitometer, and synthetic standards prepd. by mixing pure powd. metals, briquetting into $^1/_2$-in. diam. pellets, and melting by induction heating in a reducing atm. (Cf. *C. A.*, **46**, 6988e, 11014g).

4660. GILLETTE, J. M.
Spectrochemical Analysis. I. Spectrochemical Determination of Trace Metals in Synthetic Plant Ash Materials. II. Direct Reading and Spectrographic Analysis of Lubricating Oils Using the Rotating Disk Electrode. III. The Quantometric Determination of Phosphorus in Low-Alloy Iron.
Univ. Microfilms (Ann Arbor, Mich.), Publ. No. **9073**, 107 pp.
Dissertation Abstr., **14**, 1518 (1954).
C. A., **49**, 2934a (1955).

4661. GILLETTE, J. M., BOYD, B. R., AND SHURKUS, A. A.
Spectrochemical Determination of Metallic Elements in Nonmetallic Samples.
Appl. Spectroscopy, **8**, 162–8 (1954).
C. A., **49**, 5199d (1955).

In attempting to develop methods for accurate quant. analysis of metallic elements in nonmetallic samples the high-speed methods of analysis that have been so successful for metals cannot be applied directly because nonmetallic samples lack elec. cond. A method for arc analysis of wear products and additive metals in lubricating oils by means of a cooled rotating-disk electrode is described. Standards prepd. from metallo-org. salts dissolved in high purity oil base have provided instrument calibration for the analysis of oils from locomotive crank cases for the following wear products: Si, Pb, Ca, Fe, Cu, Cr and B. Cements can also be analyzed directly on a rotating electrode made by mixing the sample with flake graphite or powdered copper and pressing a briquet. For highly variable minerals and ores furnace fusion of the sample is recommended. The sample is crushed and sieved, and fused with a $Li_2CO_3-B_2O_3$ mixture. The resulting bead is ground, screened, and briquetted with flake graphite to form an electrode. The application of this technique to the analysis of Ni ores for Ni, Si, Fe, and Cr is described.

4662. GILLIS, J. AND EECKHOUT, J.
Determination of Small Amounts of An Element in a Powder Without the Aid of Standard Samples.
Appl. Spectroscopy, **8**, No. 2, 81–4 (1954).
C. A., **48**, 11235c (1954).
Cf. *C. A.*, **47**, 12100c.

Published in *Spectrochimica Acta*, **5**, 409–16 (1953) and reprinted in *Applied Spectroscopy* by permission of the Editor.

4663. GJEMS, O. AND LYDERSEN, D.
Removal of Aluminum in the Flame Photometer Determination of Calcium.
Z. Planzenernähr. Düng., Bodenk., **64**, 36–41 (1954).
C. A., **48**, 7484b (1954).

Reduction of the Ca flame intensity in the presence of Al is verified. Ca reading are reduced by one third to one half. Removal of Al by pptn. with benzoate gives full intensity readings for Ca with Al/Ca < 50:1. Increases in Ca intensity of soil exts. are indicated where Ca is sepd. from Al by pptn.

4664. GLADUSHCHAK, V. I.
Absolute Sensitivity of the Spectrum Analysis of Copper.
Sbornik Studenches. Nauch. Rabot Tadzhik. Univ. **1954**, No. **1**, 69–72.
Referat. Zhur., Khim., **1955**, No. **7624**.
C. A., **51**, 940f (1957).

A min. of 5×10^{-5} mg. Cu was detd. by using the spectrum range 3270–2760 Å.

4665. GODOLI, G.
Methods for the Quantitative Analysis of the Atmospheres of Stars Pertaining to the First Spectral Types.
Ricerca sci., **24**, 799–813 (English summary) (1954).
C. A., **48**, 9859c (1954).

The following data were used for a quant. analysis of stellar atm.: (*a*) expt. values for the total absorption in all the spectral lines; (*b*) the quantum no. of the last, still sepd. Balmer line; (*c*) the approx. value of the temp. as deduced from the Kuiper-Unsöld scale. From these data, by a procedure of successive approximation, there was found (*a*) the no. of atoms of each element per sq. cm. of the photosphere; (*b*) the concn. of electrons; (*c*) the electronic pressure; (*d*) the ionegation temp; (*e*) the effective gravitational acceleration.

4666. GOLDSTEIN, S. W. AND SANDERS, D. P.
The Application of Flame Photometry to the Assay of Some N. F. and U.S.P. Solutions.
Drug Standards, **22**, 137–48 (1954).
C. A., **48**, 13161f (1954).

Practical procedures and techniques utilizing the Beckman Model DU spectrophotometer with flame attachment for the detn. of metallic salts in the following official solns. are described: isotonic NaCl soln. U.S.P., dextrose and NaCl injection U.S.P., NaI injection N.F., KI soln. N. F., K citrate soln. N.F., $CaCl_2$ injection N. F., Ca levulinate injection N.F., $MgSO_4$ injection N.F.

4667. GORBACH, G., AND VIOQUE-PIZARRO, A.
Determination of Trace Elements in Edible Oils.
Fette u. Seifen Anstrichmittel, **56**, 177–80 (1954).
C. A., **49**, 14221h (1955).

A method is described in which an electrically heated block is used to ash the samples with $Mg(ON_3)_2$ prior to spectroscopic examn.

4668. GOTO, H. AND YOKOYAMA, Y.
Determination of Germanium. I. Intermittent Arc Method.
J. Chem. Soc. Japan, Pure Chem., Sect. **75**, 1305–8 (1954).
C. A., **49**, 13823c (1955).

The ore is decompd. by HNO_3 and Ge is distd. with HCl. The distillate is absorbed by C electrodes which are excited by an intermittent arc. NaCl is added to the sample to suppress the CN band, and to increase the line intensity of Ge. Cu is used as the internal standard and the line pair used is Cu 2618.32-Ge 2651.18 Å. Ge 0.0005–0.008% can be detd.

4669. GREEN, M. AND POLK, M. L.
Logarithmic Sector *vs.* Photoelectric Densitometer in Measuring Intensity Ratios.
Appl. Spectroscopy, **8**, 126–30 (1954).
C. A., **49**, 726h (1955).

The relative intensities of a group of ten lines of the spectrum of a H discharge tube have been measured both by conventional photoelec. densitometry and with a logarithmic sector. A statistical analysis of the results showed that photoelec. densitometry is slightly more accurate than logarithmic-sector intensitometry; the former method gave an av. coeff. of variation, in the measurement of intensity ratio, of 2% whereas the latter method gave an av. coeff. of variation of approx. 4%. However, for a great many applications in spectrochem. analysis the latter method appears to be sufficiently accurate, at the same time having many advantages. It is faster and simpler; intensity ratios are obtained directly without the need of a calibration curve; the method is self-calibrating; it does not involve a considerable amt. of complicated equipment that requires frequent attention; and intensity ratios can be made over a much greater range for a single exposure of the spectrum.

4670. GREENSTEIN, J. L. AND TANDBERG-HANSSEN, E.
The Abundance of Beryllium in the Sun.
Astrophys. J., **119**, 113–19 (1954).
C. A., **48**, 4966b (1954).

The intensities in the solar spectrum of the Be I and Be II lines at 3321 and 3131 Å., resp., as derived from spectrophotometric measurements at the Utrecht Observatory, have been analyzed to det. the abundance of Be in the sun. The following ratios have been found: Be/H = 10^{-10}, Be/Li = 8, Be/Ca = 6×10^{-5}. The solar abundance of Be is about the same as its meteoric and terrestrial abundances so that the high Be/Li ratio indicates a severe depletion of Li in the sun

relative to Be and also Ca. There is a depth in the solar envelope, about halfway out from the center, where Li but not Be is rapidly destroyed by thermonuclear reactions. If above this region the mixing of the solar gases is slow the Be excess can be accounted for.

4671. GRIFFITTS, W. R.
Beryllium Resources of the Tin-Spodumene Belt, North Carolina.
U. S. Geol. Survey, Circ. No. **309**, 12 pp. (1954).
C. A., **48**, 7504d (1954).

Pegmatites of the area consist chiefly of albite, microcline, quartz, and spodumene, with accessory muscovite, apatite, beryl, cassiterite, and garnet. Spectrographic analyses show that the pegmatites all contain about 0.05% BeO. Since albite contains up to 0.01% and microcline up to 0.002% BeO, probably 80% of the Be is present as beryl. Calcns. indicate that the pegmatites of the entire belt, to a depth of 300 ft., contain 823,000 tons of beryl.

4672. GUNN, E. L.
Nonmetal Analysis of Microquantities of Solids by Emission Spectrum.
Anal. Chem., **26**, 1815–19 (1954).
C. A., **49**, 2933d (1955).

The technique of the spectrographic detn. of S and halogens by fabrication of the sample into a Ag pellet which is subjected to a high-energy elec. discharge (Cf. *C. A.*, **54**, 7468a) has been adapted to employ a com. spectrographic source unit (Model 4700, Applied Research Labs.). The internal standard is KBr. Calibration curves for Cl and S are given, based on the ratios Cl 3622.8/Br 3506.5 and S 3497.3/Br 3506.5, resp. The application to a no. of samples, e.g., *engine deposits, surface films, and paints*, is described.

4673. GUNN, E. L.
Determination of Additive Elements in Lubricating Oils by Emission Spectrographic Methods.
Anal. Chem., **26**, 1895–99 (1954).
C. A., **49**, 4273b (1955).

Ba and Ca are detd. by a C-matrix procedure with Co oleate as the internal standard. A high-voltage spark is employed with the primary voltage set at 80 v. The Ba 3891.8-Co 3894.1 Å. spectral-line pair and the Ca 3179.3-Co 3409.6 Å. pair are measured. No correction is made for background. The Fe spectrum is used to det. the emulsion response. P is detd. by the porous-cup method with C as the internal standard reference (P(I) 2535.65-C(I)2582.88 Å.). Measurements 2–4 Å. to the right of each line are used to correct background d. The av. deviation from synthetic values is 4.7 for Ba, 8.0 for Ca, and 6.1% for P. The Ba-Co and Ca-CO intensity ratios vary with oil viscosity and with voltage input.

4674. HAHN-WEINHEIMER, P.
Spectrochemical Investigations of Roman Window Glass.
Glastech. Ber., **27**, 459–64 (1954).
C. A., **49**, 3493g (1955).

Quant. and semiquant. spectral analyses of 44 Roman window-glass samples were made; the intensities of the characteristic ultraviolet emission lines of P, Cu, Pb, Sn, and Sb were used as indicators to draw conclusions on the manufg. methods applied by the ancient Roman glassmakers of the first 3 centuries A.D. The results of photometric and the standard paper d. detns. agree for some glasses of a particular historical importance (from Pompeii, Cologne). For Pb, Cu, Sn, Sb the addn. method of Addink and de Groot (Philips tech. Rundschau **12**, 341–52 (1951) is accurate, with In_2O_3 as inner standard (Ahrens). The fact is particularly important that nearly all of the investigated Roman glasses are free from Co; blue or bluish green glasses exclusively contain Cu, with Fe and Mn. The P_2O_5 contents agree with the results of Geilmann and Jenemann (*C. A.*, **48**, 967g). The small amts. of Pb and Sn are evidently introduced as contaminations of the Cu compds. used deliberately as color pigments, and are therefore not specific. The contents in Sb_2O_3 are usually higher than those in PbO, varying in the limits from 1:01 and 1:0.7 for the ratio of both oxides. Glasses with high Sb_2O_3 contents originate, probably, from the glass center of Cologne. It is also probable that Sb and Pb were deliberately added for the production of yellow glass, but the use of Sb_2O_3 for fining was evidently not known.

4675. HANSON, N. W.
Some Painting Materials of J.M.W. Turner (English Painter, 1775–1851).
Studies in Conservation, **1**, 162–73 (1954).
C. A., **49**, 7259h (1955).

Identifications are reported of 63 specimens which include dry pigments, pigment pastes, varnishes, and thinners. Some details of the semimicro, spectrographic, colorimetric, and chem. methods used are given. Several infrared absorption spectra of org. exts. from pigment pastes are shown. T. employed, as vehicle, a drying oil and there is evidence that often a natural or treated resin was used with the oil. He used dammar resin in turpentine as varnish. Some of the pigments identified, like HgI_2, do not appear to be orthodox painting materials and they may account, in part, for the degeneration of many of T.'s paintings.

4676. HARLEY, J. H. AND WIBERLY, S. E.
Instrument Analysis.
John Wiley & Sons, Inc., New York, N. Y. (1954), 440 pp.

This book was written as a text for a course in instrumental analysis given to seniors and graduate students at Rensselaer Polytechnic

Institute. More than half of the book is devoted to spectroscopy. Besides a short chapter on spectral theory, there are longer chapters on absorption in the visible, ultraviolet, and infrared, Raman spectroscopy, apparatus for emission spectroscopy, qualitative emission spectroscopy, quantitative spectrographic analysis, flame photometry, and X-ray analysis.

4677. HARRIS, P. G.
Spectrochemical Determination of Germanium in Silicates.
Anal. Chem., **26**, 737–9 (1954).
C. A., **48**, 8693d (1954).

Evap. enough powd. mineral to contain 0.1–2.0γ of Ge to fumes with HF and H_2SO_4 in a Pt dish and then to dryness twice with H_2SO_4. Dissolve the residue in water, add HCl, and distil the Ge into dil. NH_4OH. Add 3–5 drops of H_2SO_4 and 500γ of Sn^{++} to the Ge soln. in a centrifuge tube. Pass H_2S into the soln. and leave it corked overnight. Decant the supernatant liquid after centrifugation and dissolve the ppt. in NH_4OH and H_2O_2. Transfer the soln. dropwise to a warmed electrode. Excite the sample in the anode (7 amp., 220v.) for 30 sec. The sepns., at a const. d. of 0.6, of the blackening curves (log I/I_0 *vs.* log relative exposure) for Ge 3039.06 Å. and Sn 3032.77 Å., are referred to concn. curves.

4678. HATEM, S.
Radioactivity of Zircons from the Frontier of Siam.
Compt. rendus, **239**, 290–1 (1954).
C. A., **49**, 1435i (1955).

Zircons of various colors from Chantaboun (I), Pailin, and Bokéo were heated and changes in color noted. Spectrographic analyses disclosed the presence of variable trace quantities of Fe, Al, Mg, Ca, and Cu, with certain Samples from I also showing Mn. With a Geiger counter these latter samples indicated the presence of β-activity. Ionization chamber examn. of the same sample did not disclose any α-activity, although an autoradiograph showed the presence of a weak α. The presence of α- and β-activity in only the samples from I is attributed to their origin from a recent basaltic lava.

4679. HAUSNER, H. AND ROST, F.
Spectral-Analytical Determination of Ferric Oxide in Glass Sands.
Glastech. Ber., **27**, 160–2 (1954).
C. A., **48**, 9031c (1954).

The accurate detn. of Fe_2O_3 in high-grade glass sands is demonstrated by using spectral analysis, with a.-c. arc burning on two filled C electrodes. The accuracy is very high, and may easily be better than 0.002 to 0.003% of the oxide if the conditions are kept well controlled. The reproducibility of the results is very satisfactory (3 to 4% of the abs. results, if the concns. are not below 0.010%). The results are also in agreement with those of the best analytical methods (colorimetry with KCNS). The checking curves for the following spectral lines (in pairs) are given: the sensitive last line of Fe 3020.6 Å., combined with Ni 2992.6; Ni 3019.1; Ni 2987.7 Å. For higher concns. of Fe_2O_3 the Fe line 2966.9 Å. is suitable, combined with Ni 2987.7 Å. The av. error curve is discussed, as a function of the log concn. of Fe_2O_3.

4680. HEGEMANN, F. AND KOSTYRA, H.
Determination of Trace Elements in Zinc Blende.
Metall, **8**, 768–72 (1954).
C. A., **49**, 1476i (1955).

A spectrographic method has been developed for detg. trace elements in Zn blend. A mixt. of finely ground sample and C powder is vaporized in a drilled C electrode by means of an emission arc. The sample electrode is made the cathode and the arcing time is limited to 40 sec. Fe is used as a standard element, its compn. being detd. by chem. methods and, if necessary, addn. Fe_2O_3 is added to give a reference standard of 20% Fe. Visual evaluation of the spectrum obtained is made by use of comparative tables showing the location of homologous lines. By rapid visual evaluation, the reproducibility of each element is between ±20 and 30%, and by photometric evaluation between ±3 and 12%. A special method is given for detg. Tl.

4681. HEGEMANN, F. AND LEYBOLD, C.
The Quantitative Spectrochemical Analysis of Pyrites.
Z. Erzbergbau u. Metallhüttenw., **7**, 108–13 (1954).
C. A., **48**, 6902d (1954).

The spectrochem. analysis of pyrites by means of a d.-c. C arc is described. The easily volatile elements were detd. by combustion of a cathodically connected porous C with a combustion time of 25 sec. To det. the medium- and high-boiling elements the analysis electrode is made anodic and the total combustion time is 0–80 sec. Detection of Ti is by a special method in which the sample is mixed with KCl to avoid the disturbing effect of cyanogen bands. The sensitivity and reproducibility for a no. of elements are given.

4682. HEGEMANN, F. AND PFAB, B.
Correction Methods for the Determination of Sodium by Flame Photometry in the Presence of Calcium.
Glastech. Ber., **27**, 189–92 (1954).
C. A., **49**, 8036i (1955).

Errors in the flame-photometric detn. of Na are often caused by the transmittance of the glass filters for Ca radiation and by interactions of Ca and Na in the mechanism of emission. The errors depend as well on the concns. of Na and Ca and on the total concns. of

the solns. The interpolation between the curves of the emission intensities of Na and Ca, plotted *vs.* the concns., is only of restricted value. Standard Na solns. may also be used with a correction for the Ca contents of the glasses, with an accuracy of ±0.5% of the Na_2O content but only for a restricted range between 0.023 and 0.027% Na in the soln.

4683. HEID, R. L. AND DIEKE, G. H.
Intensity Measurements in the Arc Spectrum of Nickel.
J. Opt. Soc. Amer., **44**, 402–10 (1954).
C. A., **48**, 8040e (1954).

The relative intensities of 478 Ni arc lines were measured photoelectrically between 3359 and 5893 Å. with an accuracy of better than 1% for the good lines. The d.-c. arc was operated under steady conditions at a current of 2 amp. Corrections for self-absorption were detd. The influence of arc fluctuations was minimized by recording always the ratio of the output of a scanning tube to that of a fixed tube placed on a control line.

4684. HEINEN, E. J.
Analysis of Sodium in Plants.
J. Assoc. Office. Agr. Chemists, **37**, 714–16 (1954).
C. A., **48**, 11240g (1954).

Further comparative results are given for detg. Na in various plant materials by the A.O.A.C. $MgUO_2$ acetate method (A.O.A.C. Methods of Analysis, 7th ed., 1950, 6.12 (*C. A.*, **45**, 2824e)) and a flame photometer method with and without removal of Ca. High Na values were obtained in some cases by the flame method when Ca was not removed. Cf. *C. A.*, **47**, 12115h.

4685. HERNES, I.
Eclogite-Amphibolite on the Molde Peninsula, Southern Norway.
Norsk Geol. Tidsskr., **33**, 163–84 (in English) (1954).
C. A., **50**, 5482i (1956).

A petrological account is presented of the Cambrian-Silurian rocks of the Molde Peninsula (chiefly gneisses, with bodies of subsilicic eclogite, eclogite-amphibolite, amphibolites, and calcite marble). The mineralogy, chemistry, metamorphism, mineral facies, and manner of formation of the eclogite-amphibolite are discussed. Optical data are given for plagioclase, pyroxene, garnet, and amphibole, and 3 new spectrochem. analyses of the garnet and 2 new chem. analyses of eclogite-amphibolites are presented. The sub-silicic rocks have passed through an increasing metamorphism up to the eclogite facies, followed by diaphtoresis down to the epidote-amphibolite facies.

4686. HIGAZY, R. A.
A Geochemical Study of the Regional Metamorphic Zones of the Scottish Highlands.
Congr. geol. intern., compt. rend. 19th Session Algiers 1952 **15**, 415–30 (in English) (1954).
C. A., **49**, 5227i (1955).

Chem. and spectrographic analyses are given of 5 rocks, one from each metamorphic zone, namely chlorite-, biotite-, garnet-, and staurolite-schists and sillimanite-gneiss. The data include detns. of Rb, Li, Ba, Sr, Cr, Co, Ni, Zr, La, Y, Cu, Ga, Pb, Sc, Mo, Be, and Ag. The ratio Fe (III)/Fe(II) and Fe(III)/Mg increase regularly with increasing grade of metamorphism; the ratios K_2O/Al_2O_3 and $(FeO + Fe_2O_3)/(FeO + Fe_2O_3 + MgO)$ show little change.

4687. HIGAZY, R. A.
Trace Elements of Volcanic Ultrabasic Potassic Rocks of Southwestern Uganda and Adjoining Parts of the Belgian Congo.
Bull. Geol. Soc. Am., **65**, 39–70 (1954).
C. A., **48**, 3863d (1954).

The distribution of the trace elements, detd. spectrographically, in a series of analyzed rocks characteristic of the Toro-Ankole and Birunga-Bufumbira volcanic fields is given. Characteristic ultrabasic potassic rocks include katungite, ugandite, mafurite, kivite, limburgite, and members of the potash ankaratrite-mela-leucitite series. (*See C. A.* abstract for detailed results.)

4688. HIGAZY, R. A.
The Trace Elements of the Plutonic Complex of Loch Doon (Southern Scotland) and Their Petrogenetic Significance.
J. Geol., **62**, 172–81 (1954).
C. A., **48**, 7510c (1954).

The trace element compns. of a series of analyzed rocks, including country-rock sediments, graywacke, hornfels, "norite," opdalite, granodiorite, diorite, and biotite-adamellite, and representing different stages of feldspathization and basification, are studied spectrographically and their petrogenetic significance is assessed. Variations in the concns. of the trace elements in p.p.m. are, for Rb, 50–380; Ba, 600–2000; Sr, 200–2200; Li, 15–350; Cr, 70–450; Ni, 35–200; Co, 48–5; V, 100–200; Cu, 3–320; La, < 30–60; Y, 40–100; Ga, 25–45; Zr, 290–1100. Zn and Pb are more abundant in pyroxene-bearing rocks than in granitic types, whereas Ag is the reverse; variations in Sc and Mo are not detectable and Tl, Be, Ge, and In occur in amts. below their respective limits of sensitivity. The adamellite, diorite, and granodiorite are unusually rich in Cr, Ni, and V and the relationship Cr > Ni > Co in these is also found in the country sediments. The basic rock types contain lower Cr, Ni, and Cr/Fe^{3+}, but higher Li and Li/Mg than in intermediate types. The evidence appears to support a metasomatic origin for the plutonic complex. Spectrographic analyses and one

new chem. analysis (biotite-adamellite) are given. Cf. *C.A.*, **46**, 7482g.

4689. HITCHCOCK, R. D. AND STARR, W. L.
Spectrographic Techniques as Applied to the Analysis of Sea Water.
Appl. Spectroscopy, **8**, No. 1, 5–17 (1954).
C. A., **48**, 6902b (1954).

Six methods of examg. sea water spectrographically are discussed critically. The methods are identified as rotating-disk, flame-excitation, porous-cup, impregnated-electrode, open-cup-residue, and briquet-excitation methods. It is demonstrated that quant. detns. of the metallic ions, Na, Mg, Ca, K, Sr, and Al may be made by direct examn. of sea water or residual salts. The concns. range from 10,000 p.p.m. for Na to 0.58 p.p.m. for Al. Recourse to special sepn. methods is necessary for spectrographic detn. of trace elements, Fe, Cu, Ba, Li, Ag, and any others whose concns. are less than those of Al, or whose detectabilities are seriously affected by the presence of major sea-water cations.

4690. HODGKINS, C. R. AND HASEN, J.
Spectrochemical Determination of Copper in Crankcase Drainings.
Anal. Chem., **26**, 1759–62 (1954).

The spectrochem. method of detg. Cu in crankcase drainings is faster and more reliable than standard wet methods of analysis. Co is used as an internal standard and calcium sulfonate as a carrier-buffer because its ash is resistant to fusion and is easily removed from the porcelain crucibles. The method covers a range of 5 to 500 p.p.m. of Cu in the oil, and results are within 10% of those found by chem. methods.

4691. HOLDT, G. AND SCHÄFER, H.
Reduction of Errors in Spectrographic Analysis by the Use of a Specific Weight of Reference Element.
Z. Naturforsch., **9b**, 506 (1954).
C. A., **49**, 4441e (1955).

In detg. Sn (2863.3 Å.) in Nb_2O_5 by using Pb 2873.3 Å. as a reference line, expts. have shown that the relative standard error passes through a min. as the wt. of the reference element varies from 0.0 to 1.0%. At 0.55% Pb the relative standard error is 8% compared to 25% at 0.0% and 22% at 1.0%. Sample excitation was by d.-c. arc. A similar reduction in error was observed in detg. Sn and Hf in oxide mixts. with Nb and Zr as reference elements, resp., with d.-c. arc and with the detn. of Zn in an oxide mixt. with Cu as a reference and a mechanically interrupted arc. The relation was not valid when the controlled arc circuit described by Price (*C. A.*, **48**, 2519c) or the condensed-spark excitation method was used.

4692. HONMA, M. AND SMITH, C. L.
Quantitative Analysis of Organic Nitrogen by Flame Spectroscopy.
Anal. Chem., **26**, 458–62 (1954).
C. A., **48**, 6911f (1954).

The intensity of the $(CN)_2$ spectra is proportional to the concn. of N present in the soln. atomized into the inner cone of the gas flame, provided the C concn. is kept the same. Synthetic standards are prepd. by taking a pure known N compd. and dilg. with denatured EtOH. A series of 11 solns. is prepd. with varying concns. of N and these solns. are used to obtain points on the working curve for this compd. Measurements are made on the $(CN)_2$ band 3883 Å. as the analysis line and the CH band 3890 Å. as the internal standard. The log intensity ratios of these line pairs are plotted against log % concn. of N. The gas and air supply for the burner are regulated to obtain a stabilized flame. Concn. ranges of 0.02 to 34.2% N were studied, and the optimum working range was found to be 0.1–15% N. By this procedure, org. N can be detd. in the presence of atm. N.

4693. HURLBUT, C. S., JR.
Smithsonite from Broken Hill Mine, Rhodesia.
Am. Mineralogist, **39**, 47–50 (1954).
C. A., **49**, 12207c (1955).

Well-formed crystals are of two distinct habits. Spectrographic analysis of Type 1 gave impurities MgO 0.1, CaO 0.001; Type 2: MgO 0.5, FeO 0.4, CaO 0.05, CdO 0.05, PbO 0.1. Sp. gr. for Type 1 is 4.424; Type 2, 4.405; *ns* for both types are $\omega = 1.850$, $\epsilon = 1.623 \pm 0.002$. Unit-cell dimensions of Type 1 are $c = 14.96$, $\alpha = 4.65$ kX.

4694. HURWITZ, J. K.
Calculations in Spectrographic Microvolume Analysis.
Appl. Spectroscopy, **8**, No. 1, 28–34 (1954).
C. A., **48**, 6902f (1954).

Calcns. for use in spectrographic microvol. analysis were performed for a few typical traverses across regions in a specimen where very high concn.-ratio gradients (single and double boundaries) exist. In the case of a single-boundary traverse, consideration was given to the conditions that the length of the spectrograph slit's image on the photographic emulsion was less than or greater than the product of the width of the sparked crater on the specimen's surface and the ratio of camera speed to specimen speed. The usefulness of single-boundary traverses as a method for testing new traversing equipment or new procedures was indicated. It was suggested that a double boundary would be a reasonable model of some types of segregates and that quant. analyses of those segregates could be obtained even where they are considerably narrower than the width of the sparked crater. The primary purpose of the traverse theory was to design the analytical procedure to be employed for metallurgical diffusion studies.

4695. HURWITZ, J. K.
Calculation of Integrated Intensities in Spectrographic Microanalysis.
J. Opt. Soc. Amer., **44**, 30–4 (1954).
C. A., **48**, 3839g (1954).

A spectrographic technique to study the distribution of alloying elements and impurities in metallic specimens must provide analytical results which accurately reveal this distribution. The ability of a moving plate and traversing spark procedure to discriminate between two adjacent areas of different compn. has been shown to be limited by 4 factors, namely, the width of the sparked crater on the surface of the specimen, the lengths of the spectrograph and microphotometer slits, and the ratio of the photographic plate speed to the specimen speed. The change in integrated intensity occurring when a spark traverse is made across a region in which a very high concn. gradient exists has been calcd. The theory which was developed accounted for the effect of sparked-vol. size, spectrograph and microphotometer slit-lengths, and the ratio of the camera speed to the sample speed. Three separate assumptions regarding the shape of the sparked vol. were made, *viz.*, a circular disk of uniform thickness, a cap of a sphere, and a paraboloid of revolution. The disk gave good agreement only if the sample speed was sufficiently high: at lower speeds this was not true since the spark discharge remained upon any one point long enough to etch out a crater of microscopically observable size. The latter two shapes were satisfactory for all practical conditions. It is suggested that this theory may be extended to the analysis of segregates in metals and alloys even though the segregate may be considerably smaller than the sparked vol.

4696. HUTTENLOCHER, H., HÜGI, T., AND NOWACKI, W.
X-Ray and Spectrographic Analysis of Bazzite from Val Strem, Canton Graubünden, Switzerland.
Experientia, **10**, 366–7 (in German) (1954).
C. A., **49**, 788e (1955).

Spectrographic analysis showed principal components to be Be, Si, Al, Mg, Fe, Sc (about 3%), Na, Ca; further components include Ga, V, Sn, Cu, Yb, Y, Ag, Sr, Ba. This and X-ray analyses suggest that the bazzite crystal has a structure of the beryl type.

4697. HUTTER, J. C.
The Influence of the Addition of Graphite Upon the Spectral Emission of Impurities in the Quantitative Spectrographic Analysis of Alumina.
Congr. groupement avancement, méthod. anal. spectrog. produits mét., 17th Congr., **1954**, 141–51.
C. A., **50**, 2364h (1956).

To 100 parts Al_2O_3 is added 80 parts graphite contg. 0.1% Li and 0.01% Sn. The mixt. is run on graphite electrodes in a 220 v. d.-c. arc. The added Li serves as an internal reference for the detn. of Na, the Sn is used in the detn. of Cr, Ca, Ti, Zn, Na, V, Ga, Mg, Mn, Fe, and Si.

4698. IIDA, C. AND YAMAZAKI, K.
Spectrochemical Determination of Trace Elements in Silicates by the Use of a Large Glass Spectrograph. I.
J. Chem. Soc. Japan, Pure Chem. Sect., **75**, 189–92 (1954).
C. A., **48**, 11236e (1954).

A glass spectrograph of Mannkopff type was constructed for the detn. of trace elements such as Ba, Ce, Co, Cr, La, Mn, Mo, Nd, Ni, Pb, Pr, Sr, Ti, V, and Zr in silicates. A visual comparison method with a d.-c. arc and cathode-layer method was applied. Standard samples were prepd. by adding oxides of elements to the base material consisting of silica 100, alumina 20, and Fe_2O_3 3 parts.

4699. IIJIMA, H.
Photographic Density of Spectral Line and Errors in the Internal-Standard Method. *I.* Theoretical.
Bunkô Kenkyû, **3**, No. 1, 15–21 (1954).
C. A., **51**, 13637h (1957).

The quantity which is used to make an analytical curve in the quant. spectrographic analysis, Seidel intensity, log (Δ_0/Δ_1-1), is theoretically discussed. It is compared with the normal d., log (Δ_0/Δ_1), where Δ_0 and Δ_1 are the readings of microphotometer traces. The slope of the analytical curve is always steeper in the Seidel scale than in the normal one, but it is not correct to use the Seidel scale only for this reason. The normal d. is simpler and better for making the analytical curve in the concn. range in which the normal d. is linear, and even in the case of low concn. if a line pair with comparable intensity can be chosen between the line of the element to be analyzed and the line of the main component. Calibration by the Seidel scale is more favorable only when such a line pair cannot be used, and the slope of the analytical curve in the Seidel scale is extremely steeper than in the normal one.

4700. IIJIMA, H.
Photographic Density of Spectral Line and Errors in the Internal-Standard Method. II. Quantitative Spectrographic Analysis of Elements of Low Concentration in Steel.
Bunkô Kenkyû, **3**, No. 1, 21–6 (1954).
C. A., **51**, 13638a (1957).

The analysis of As in steel (0.03–0.10%) by spark spectrum can be performed with the normal d. because in the concn. range described above the analytical curve is linear in the normal as well as in the Seidel scale. For the analysis of Si in steel (0.015–0.06%) by arc spectrum, the Seidel scale provides

more accurate results, because only the Seidel scale gives a straight line as far as 0.015% in concn. of Si. However, for the analysis of Si (0.06–0.30%) by the Feussner spark spectrum there is no advantage in the Seidel scale because both curves have almost equal slope.

4701. IIJIMA, H.
A Method for Eliminating the Constant γ in Quantitative Spectrographic Analysis.
Bunkô Kenkyû, **3**, No. 7, 23–8 (1954).
C. A., **51**, 13638d (1957).

By measuring the intensities of a spectral line of an element to be analyzed and of 2 lines of the main component, an analytical curve was drawn between log $(\Lambda_x/\Lambda_1)/(\Lambda_1/\Lambda_2)$ and log x, where Λ_x, Λ_1, and Λ_2 are the readings of the microphotometer traces of the line of the element of concn. x and of the 2 lines of the main component element. The concn. of the element in unknown samples is readily obtained on this curve by taking spectra of the samples. This method has the following advantages: (*1*) the curve is independent of the const. γ of the photographic plates; (*2*) it does not need to use an internal standard; (*3*) the analytical curve is a straight line, so that the curve can be drawn easily and accurately; and (*4*) the procedure is very simple. The method was applied to the analysis of Mn in steel. The results agreed with those by chem. analysis within a deviation of ± 0.06% in the concn. of Mn for the samples contg. Mn of 0.20–0.96%.

4702. IIJIMA, H.
Accuracy of Quantitative Spectrographic Analysis. I. Errors Caused by Nonuniform Sensitivity of Photographic Plates.
Bunkô Kenkyû, **3**, No. 2, 33–45 (1954).
C. A., **51**, 13638f (1957).

After exposing photographic plates to a white-light lamp (2 candle power), 3 m. from the plate, and developing them carefully, the blackness was measured by microphotometer at every 2-cm. width and at every 1-cm. length. The standard deviation of the blackness was found to be 3–4% for new plates and 6–15% for older ones. As was expected, the deviation was large near the edge of the plates. With an ultraviolet filter transparent to 310–400 mμ, the deviation still increased to 4–10% for new plates and 7–10% for older ones. The deviation was reduced to 1–2.5% by taking, for each point, the ratio of the intensities of the two points, 1 mm. apart, which indicated that the internal standard method was preferable for the quant. analysis. The error of 1.5% due to the nonuniformity of the plate emulsion including the irregularity due to the handling of development is the lowest limit of the accuracy of the spectrographic analysis. For minimizing the error of the measurement it seems more effective to improve other factors such as discharge condition.

4703. IKEDA, N.
Chemical Studies on the Hot Spring of Nasu. IV.
J. Chem. Soc. Japan, Pure Chem. Sect., **75**, 463–5 (1954).
C. A., **48**, 14051f (1954).
Cf. *C. A.*, 48, 11685f.

Bi, Cd, and Ag contents of Motoyu Spring were estd. by spectrographic methods to be of the order of 0.1, 0.1, and 1 γ/l. V, Cr, and Mo content were detd. to be 510, 4.4. and 0.86 γ/l., resp. V. *Ibid.* 465–8.—Zr and Ti contents of Motoyu Spring were estd. to be 1γ/l. and 0.000168 g./l., resp. VI. *Ibid.*, 468–71.—Water of Motoyu Spring contained SO_3^{--} 0.0006, $S_4O_6^{--}$ 0.002, SO_4^{--} 2.029g./l., $NO_2^- < 1$ γ/l., $NO_3^- < 1$ γ/l., F 0.000355 g./l. Br and I were not detd. They were less than 20 and 2 γ/l., resp.

4704. INSALL, A. J. AND DRINKWATER, J. W.
Photography in Oil Research I.
Petroleum (London), **17**, 350–4, 382 (1954).
C. A., **49**, 597c (1955).

Applications of high-speed and infared photography, oscillography, and spectrography are described.

4705. ISHIDA, R. AND FUJISHIRO, Y.
Flame Photometry.
J. Japan Chem., **8**, 163–73, 202, 239–43 (1954).
C. A., **49**, 15604a (1955).

A review with 61 references.

4706. IVANOV, D. N.
Flame-Photoelectric Method for Determination of Calcium in Solutions.
J. Anal. Chem. U.S.S.R., **9**, 383–92 (Engl. translation) (1954).
Zhur. Anal. Khim, **9**, 344–53 (1954).
C. A., **49**, 4445i (1955).

Ca in soln. is detd. from the specific lines it gives in an acetylene-air flame. An air-jet atomizes the soln. contg. Ca, the air-vapor mixt. is mixed with acetylene, and the whole is burned. In the flame, Ca gives a line at 4227 Å. and 2 bands in the region of 5500 and 6200 A.; the bands are used in the procedure outlined. The app. is illustrated and described. Al lowers the results greatly as does SO_4^{--}. In prepn. of calibration curves solns. should be used which resemble in compn. the analyzed ones as much as possible. The effect of other ions is discussed. Soil exts., dissolved soil fusions, and plant exts. were analyzed by this method (Cf. *C.A.*, **47**, 7144i).

4707. JACQUINOT, P.
The Luminosity of Spectrometers with Prisms, Gratings, or Fabry-Perot Étalons.
J. Opt. Soc. Amer., **44**, 761–5 (1954.)
C. A., **49**, 727g (1955).

Formulas have been established which express the flux given by a spectrometer as a

function of the effective resolving power and of the dimension of the dispersive system (area of the base of the prism, or area of the grating, or area of the plates of the étalon). It is thus possible to compare the luminosities of the 3 types of instruments with, in each case, equal resolving power and equal dimension. This comparison reveals a great superiority of the grating over the prism for all regions of wave lengths and a great superiority of the étalon over the grating. In the case of the étalon, the overlapping can be overcome by the use of several étalons in series.

4708. JENKINS, L.
Determination of Potassium and Sodium in Siliceous, Argillaceous, and Phosphatic Rocks by the Flame Photometer.
U. S. Atomic Energy Comm., **TEI-453**, 17 pp. (1954).
C. A., **49**, 3725a (1955).

Ignite a 0.5-g. sample gently in Pt to remove org. matter. Add 10 ml. 7.5*N* HNO_3, 3 ml. $HClO_4$, and 5 ml. HF. Evap. to 5 ml. on a steam bath and then to 1 ml. on a hot plate. Cool, add 25 ml. of water, digest on a steam bath, and transfer to 100-ml. volumetric flask. Dil. to vol. Read the transmission on a Beckman DU spectrophotometer with Beckman flame attachment at 777 mμ for K_2O and at 594 mμ for Na_2O, bracketing the unknown soln. with nearest higher and lower standard of K_2O and Na_2O, resp. A correction is applied to the value obtained for Na_2O for the enhancing effect of K_2O present. No sepn. is necessary. An accuracy of $\pm 3\%$ is claimed.

4709. JORDAN, J. H., JR.
Copper Analysis by Flame Photometry.
Petroleum Refiner, **33**, No. 3, 158 (1954).
C. A., **50**, 8182c (1956).

Cu in gasoline (*I*) is extd. with 10 ml. of 4*N* HCl. If the Cu content is $\leqq 0.05$ mg./1. of *I*, 1000 ml. of sample is used; if the Cu content is > 0.05 but <0.5 mg./1., 100 ml. sample is used. The acid ext. is then atomized and tested for Cu in a H flame with a quartz spectrophotometer with a photomultiplier attachment. The method requires 15–20 min. and gives results with an accuracy of $\pm 10\%$.

4710. KACHALOV, N. N. AND VARGIN, V. V.
Ancient Russian Glasses.
Doklady Akad. Nauk S.S.S.R., **96**, 1033–6 (1954).
C. A., **49**, 682c (1955).

Russian glasses of the Xth to the XIIth Century comprise mosaic cubes of sealing wax red, bright green, and blue color, partly covered with Au, of the Kiev Sophia Cathedral, also black, poorly homogenized glasses from tombs, turquoise colored beads from excavations in the Kiev district, the Volga Don area, etc., or bracelets with Au and Ag enamels. Few samples of colorless glass were found. Complete chem. analyses and qual. spectrochem. detns. are given for 27 different glass samples. (*See C. A.* for complete abstract.)

4711. KAISER, E. P., HERRING, B, F., AND RABBITT, J. C.
Minor Elements in Some Rocks, Ores, and Mill and Smelter Products.
U. S. Atomic Energy Comm., **TEI-415**, 119 pp. (1954).
C. A., **49**, 4466h (1955).

A tabulation of nearly a thousand spectrographic analyses of minerals, mill, and smelter products from all parts of the U. S. and Canada. The elements detd. include Ag, Be, Bi, Nb, Cd, Co, Ga, Ge, Hg, In, La, Mo, Pt, Re, Sb, Sn, Ta, Tl, V, W, and Zr.

4712. KAR, B. C.
Determination of Small Amounts of Aluminum in Steel by a Spectrochemical Method.
J. Sci. Ind. Research (India), **13B**, 855–6 (1954).
C. A., **49**, 13831a (1955).

A method is described for the spectrochem. detn. of small amts. of Al in steels employing a medium quartz spectrograph and synthetic standards.

4713. KATO, K., MAEDA, H., AND KATO, T.
Black Stones in Glass Melt.
Research Repts. Nagoya Munic. Ind. Research Inst., No. **12**, 14–16 (1954).
C. A., **50**, 5253f (1956).

The spectral analysis showed that Ti, V, Ni, and Fe were present besides the components contained in the uncolored region in the black or dark-brown spots of a glass melt.

4714. KEHRES, PAUL W. AND POEHLMAN, W. J.
Spectrochemical Analysis of Beryllium in Ore, Air, and Solutions.
Appl. Spectroscopy, **8**, No. 1, 36–42 (1954).
C. A., **48**, 6904c (1954).

A spectrographic method is described for the detn. of BeO in ores contg. 6–13% Be. The sample is mixed with Fe_2O_3, Li_2CO_3, and graphite; briquetted, and excited in the a.-c. spark. The amt. of Be is detd. by comparing the d. of Be 3321.343 line to Fe 3021.973A. In addition, the method of Cholak and Hubbard (*C. A.*, **43**, 3310b) for detg. Be has been extended to a wide variety of industrial solns. and its sensitivity increased to 0.00025 γ of Be per ml. of soln.

4715. KENNEDY, W. R.
Direct Spectrographic Analysis of Cerium in Cast Iron.
Engr. Progr. Univ. Florida, **8**, No. 9, 27–9 (1954).
C. A., **52**, 4395e (1958).
Cf. *C. A.*, **49**, 8040d.

4716. KENNEDY, W. R.
Revised Mutual Standard Method for Spectrographic Analysis of Stainless Steels.
Eng. Progr. Univ. Florida, **8**, No. 9, 30–5 (1954).
C. A., **52**, 4386f (1958).
Cf. *C. A.*, **38**, 528[1].

A method of analysis for Si, Mn, Cr, Ni, Mo, Cu, Ti, Nb, C, S, P, and Fe is described. Samples in the form of rods or cast ingots are excited with a low-voltage spark or an a.-c. spark, and spectra are recorded on Eastman S. A. #1 film. Standards of known compn. are used for calibration of ratios of line intensities, with Fe lines as references. The accuracy is 2–4%, depending on the element.

4717. KEY, C. W. AND HOGGAN, G. D.
Spectrographic Method for Analyzing Lubricating Greases.
Anal. Chem., **26**, 1900–2 (1954).
C. A., **49**, 4273i (1955).

The rotating-disk-electrode principle was applied to the detn. of Ca, Li, Na, Al, and Ba in lubricating greases. The Al standard was prepd. by adding Al stearate to the grease. The other standards were prepd. from the corresponding 2-ethylhexanoates. Sr 2-ethylhexanoate was used as a buffer and as an internal standard for Ca and Ba. Co 2-ethylhexanoate was the internal standard for Li, Na, and Al. A grease diluent was prepd. from mineral oil 28, heavy naphtha (b. 355–385°F.) 10, Sr 2-ethylhexanoate soln. (10% Sr in naphtha) 60, Co 2-ethylhexanoate soln. (1% Co in naphtha) 1 g., and 1% by vol. AmOAc. A 4-g. sample was dissolved in 16 g. diluent. The soln. was transferred from a porcelain boat to the discharge gap of a high-voltage spark by the rotating disk. Reproducibility was approx. ±19% for Li, ±8% for Ca, ±5% for Na, ±10% for Ba, and ±6% for Al.

4718. KICK, H.
The Flame Photometric Determination of Calcium, Magnesium, and Manganese in Plant Ashes and Soil Extracts.
Z. Pflanzenernähr. Düng. Bodenk., **67**, 53–7 (1954).
C. A., **49**, 1472d (1955).

For the flame photometric detn. of Mg and Mn in the presence of Fe and K, Mg and Mn were pptd. in the presence of tartaric acid as Mg- and Mn-NH_4 phosphates and the ppt., dissolved in HCl or HNO_3, was used for the measurement. To eliminate the influence of PO_4^{3-} and Al^{3-} ions on the Ca detn., mix the HNO_3 soln. of the ash with 10 cc. 0.1 *N* $AlCl_3$ soln. in a 100-cc. graduate flask, boil, and with ammonia free of carbonate neutralize against methyl red, and after cooling, dil. to the mark with 10% NH_4OAc soln., filter, and measure the Ca by the flame test.

4719. KINGSLEY, G. R. AND SCHAFFERT, R. R.
Micro Flame Photometric Determination of Sodium, Potassium, and Calcium in Serum with Organic Solvents.
J. Biol. Chem., **206**, 807–15 (1954).
C. A., **48**, 5263f (1954).

Evidence is presented for the advantageous use of an org. solvent mixt. for the direct, accurate microdetn. of Na, K, and Ca of serums and urine by flame photometer in specimens as small as 0.000005, 0.0005, and 0.0006 cc. resp., as detd. by diln. The greatest enhancement of emission spectra of Na and K occurs with Me_2CO followed by MeOH, EtOH, PrOH, and iso-PrOH in the order named. Me_2CO increased the spectral emission of Na 17-fold as compared with the aq. solvent. Addn. of bovine serum albumin, NH_4OH, HCl, and H_2O_2 to the org. solvents had no effect on the emission spectra.

4720. KNISELEY, R. N., AND FASSEL, V. A.
Effect of Stray Light in Prism and Grating Spectrographs on Emulsion Calibration Curves and its Significance in Spectrographic Analysis.
J. Opt. Soc. Amer., **44**, 390–3 (1954).
C. A., **48**, 8112e 1954.

Several investigators have observed that emulsion calibration curves obtained from spectrograms exposed in Littrow mounting prism spectrographs exhibit a smaller slope than the corresponding curves obtained from spectrograms exposed in Wadsworth mounting grating spectrographs. A study of the nature of this difference has shown that stray light originating from direct reflection and lens flare at the collimating-camera lens in the Littrow prism spectrograph is responsible. Since the magnitude of the integrated stray light radiation falling on any area of the emulsion is dependent on the no. and proximity of exposures, the slope of the emulsion calibration curves obtained from Littrow spectrograph exposures may change with placement on the plate, unless focal-plane diaphragming is employed. The significance of this stray-light factor in spectrographic analysis and in relative intensity measurements is discussed.

4721. KOEHLER, W.
A New Special Stand for Spectral Analysis.
Spectrochim. Acta, **6**, 223–7 (1954).
C. A., **48**, 10385g (1954).

A new sample stand for the spectrochemical analysis of small areas is described. It is fitted with a binocular microscope for observing the counter-electrode and the spot to be tested; this serves not only to locate the spark but can be used to observe the spark while it is running. The sparked area can be restricted to a diam. of 0.2 mm. for a 2-min. exposure. Examples are given of the application of this instrument to the analysis of inclusions and of intermetallic layers.

4722. KOIZUMI, Y.
Spectrographic Analysis of Erythrocyte Membrane.
Yokohama Med. Bull., **5**, 398–406 (in English) (1954).
C. A., **49**, 7626d (1955).

Red cells, previously washed with isotonic saline, were hemolyzed and the insol. material was sepd. by centrifugation and purified by washing with H_2O. This material, called red cell membrane (*I*), was dried, hydrolyzed with HCl, ashed, and analyzed for mineral elements by means of emission spectrography between 2300 and 5000 Å. In *I* of human, cat, rabbit, horse, ox, and pig blood the following elements were found: Si, P, Mg, Cu, Ca, and Al, but K and Na were not observed, and Mn was found only occasionally. The analysis of the remainder of *I* after extn. of lipide material by a mixt. of EtOH-Et_2O gave the same result.

4723. KONTA, J.
Petrographic and Chemical Study of the Bauxites of Markušovce (eastern Slovakia).
Rozpravy česk, Akad. věd., **64**, No. 4, 11–64 (1954).
C. A., **49**, 2961e (1955).

Chem. analyses, differential thermal analyses, and X-ray powder data are given for 48 samples. The bauxites contain boehmite, kaolinite, and hematite in variable proportions; no gibbsite was identified. Al_2O_3 ranged from 23.7 to 56.5, av. 36.7%. Qual. spectrographic analyses showed in nearly all the samples Mg and Mn in tenths of a percent, K, Na, Ca, Ni, V, and Cr in hundredths, Cu, Pb, and Ga in thousandths, Zn, Sc, Pa, and As in traces. Quant. detns. gave 0.02 to 0.08% V_2O_5 in 5 samples. The minor elements indicate that the bauxites were formed by the laterization of basic to ultrabasic rocks high in Ni, Cr, and Cu.

4724. KRYUGER, G. AND SHVANGIRADZE, R. R.
Spectrochemical Determination of Praseodymium in Lanthanum and Europium in Samarium with a Medium Dispersion Spectrograph ISP-22.
Zhur. Anal. Khim, **9**, 11–21 (1954).
J. Anal. Chem. U.S.S.R., **9**, 9–19 (Engl. translation) (1954).
C. A., **48**, 6907i (1954).

Pr (0.3–10%) in La and 0.02–10% Eu in Sm were detd. with a spectrograph of medium resolving power with an av. deviation from the mean of ±0.074% for Pr and ±3.1% for Eu. For detns. mix 1 part of rare earth oxide sample with 4 parts of $KHSO_4$, sinter the mixt., and take 30 mg. of it for analysis. Pr was detd. from the ratio of intensities of its line 3908 Å. and of La 3936.2 Å. Eu (0.02-1.0%) was detd. from the ratio of intensities of its line 3930.50 Å. and Sm 3900.9 Å. For 0.1–10% of Eu the lines Eu 2814.0 Å. and Sm 2796.8 Å were used. The analyses were made with Cu electrodes with a 3-mm. gap between them and a 9 amp. a.-c. arc. The exposure was 60 sec. for Pr and 80 sec. for Eu.

4725. KUDELYA, E. S. AND SUBBOTOVSKIĬ, V. P.
Spectral Investigation of the Structure and Uniformity of Weld Metal.
Avtomat. Svarka, **7**, No. 3 (Whole No. 36), 74–81 (1954).
C. A., **49**, 13061e (1955).

A method is developed for the qual. spectral analysis of high alloy weld metal for Cr, W, V, Mn, Mo, Ni, Si, and C. Varying welding current from 230 to 475 amp. and the voltage from 24 to 40 v. did not materially affect the compn. of the weld metal. It is shown that, when several beads of weld metal are put on, the compn. of the base metal influences the compn. of the weld metal only in the first two beads.

4726. KUEMMEL, D. F. AND KARL, H. L.
Flame Photometric Determination of Alkali and Alkaline Earth Elements in Cast Iron.
Anal. Chem., **26**, 386–91 (1954).
C. A., **48**, 7482i (1954).

A flame photometric method for detg. small quantities of Na, Ca, Mg, and Li in cast iron is described. The sample is dissolved in HCl, the insol. residue of C and silica removed by filtration, and most of the $FeCl_3$ extd. with ether. The aq. ext. is then analyzed by the flame photometer. P interferes but can be compensated for if the approx. P content is known. Interferences from other elements are negligible. The method is believed comparable in accuracy and precision to existing chem. and spectrographic procedures.

4727. KUROYANAGI, S.
Spectrochemical Studies of Woods and Trees. V. Quantitative Spectrographic Analysis of Wood, Tree, and Soil Samples by the Internal Standard Method.
Sci. Repts. Fac. Agr. Okayama Univ., No. **4**, 50–7 (1954).
C. A., **48**, 14190f (1954).

The concns. of elements in wood, tree, and soil samples could be detd. quantitatively by comparison of line intensities with internal standard of Sn or C. For practical purposes some standard spectrographs are desired, and the loss of samples from the spark and the penetration of soln. into the C electrode should be avoided.

4728. KUTINA, J.
The Combination of Ore Microscopy and Spectrography in Geochemical Investigation of Ore Veins.

Congr. geol. intern., Compt. rend. 19th Session Algiers 1952, **12**, 55–71 (in English) (1954).
C. A., **49**, 5222d (1955).
Cf. *C. A.*. **48**, 4385b.

4729. KUZNETSOVA, L. V.
Spectrographic Determination of The Content of Manganese In Organs and Tissues of Animals.
Gigiena i Sanit. **1954**, No. **10**, 48–50.
C. A., **49**, 1909d (1955).

All tissues of rabbits kept under the usual conditions were found to contain Mn. Subcutaneous introduction of Mn salts leads to its accumulation in all the organs, mainly in the kidneys, liver, brain, and especially blood. Inhalation of Mn aerosol leads to increased concn. of Mn in lung tissues, cerebrum, and especially in the blood. In normal controls the level of Mn ranges from 0.03 to 0.4 mg. % in the various tissues. For the detn. of Mn spectroscopically the following lines are recommended: 2576.1, 2593.7 and 2605 Å., and a const. amperage arc method was employed.

4730. LACOMBLE, M. AND D'OR, M. L.
Comparison of Various Methods for the Determination of Total Aluminum in Steel.
Compt. rend. 27e congr. intern. chim. ind., Brussels, 1954, 2.
Industrie chim. belge., **20**, Spec. No., 401–11 (1955).
C. A., **50**, 15328b (1956).

A statistical analysis was made of results of 1200 analyses of Al in steel by 4 different methods; gravimetric, colorimetric by using Ferron, spectrographic by using Fe as an internal standard, and an abs. spectrographic method. The expts. were planned to allow differences arising from sampling to be distinguished. The following conclusions were reached: the abs. spectrographic method showed a precision of ±0.0015%; the colorimetric method and the spectrographic method with Fe reference showed a precision of ± 0.003%; and the gravimetric method showed a precision of ±0.007%. Small differences arising from lack of homogeneity of the steel castings were detected with the abs. spectrographic method but not with the other 3 methods which are less precise.

4731. LANDIS, F. P. AND COONS, M. C.
A Rapid Spectrographic Method for the Determination of Beryllium in Air.
Appl. Spectroscopy, **8**, No., 2, 71–5 (1954).
C. A., **48**, 11238b (1954).

A method has been developed for detg. Be in air-dust samples at the rate of 11 man-min. per sample. The method involves the use of a small filter-paper sample which is inserted into a cupped graphite electrode and arced in a conventional d.-c. arc. Certain treatments are necessary to ensure optimum excitation of the sample, including the addn. of a $BaCl_2$ carrier and internal standard. The method is sensitive to 0.002 γ of Be on the filter paper, and the range of analysis extends to 0.1 γ.

4732. LAPPI, L. AND MÄKITIE, O.
Spectrographic Determination of Minor Elements in Soil Samples.
Acta Agr. Scand., **5**, 69–75 (1954–55).
C. A., **49**, 7787d (1955).

The method of Ahrens (*C. A.*, **45**, 7469a) was used. Its sensitivity was sufficient to det. all the minor nutrients in ordinary samples. In poor soils the Mo and Co detns. were limited by sensitivity. In rich soils the samples can be portioned out and there is no practical upper limit of percentage for detns. The analyses can be made routinely with an accuracy of 10% for the common trace elements and as a semiquant. test for the others, including major constituents.

4733. LEE, T.
The Design and Construction of a 22-Foot Direct-Reading Optical Spectrometer.
Appl. Spectroscopy, **8**, 174–184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204 (1954).
C. A., **49**, 5129c (1955).

To meet a no. of spectrochem. problems involving relatively complex spectra, a versatile grating spectrometer having high resolution and dispersion and with photomultiplier tubes to measure the intensities of the spectral lines was constructed. A concave diffraction grating having a radius of curvature of 21 ft. 10 in. and ruled with 15000 lines per in. over a 5-in. surface was used in an Eagle mounting designed to cover continuously the range from 2000 Å. in the first order to 5800 Å. in the fourth order. Five feet of spectrum are available at any setting of the instrument. To minimize backlash and spurious motion, kinematic principles were used in the design of the adjustments. Vibration absorbers and dampeners were used to minimize the effects of vibration, and constructing the instrument in a completely enclosed room located within an air-conditioned area minimized the effects of temp. changes. Either visual or photographic means can be used to position the exit slits and to adjust the optics. Both scanning and integration techniques are available.

4734. LELONG, M. P. AND HODGE, E. S.
Spectrographic Examination of the Occurrence of Certain Alkali Elements in Calcite Marbles.
Am. Mineralogist, **39**, 647–53 (1954).
C. A., **50**, 9961e (1956).

Spectrographic analyses were made of 101 samples from 30 U.S. localities. Na ranged from 0.001 to 0.067%, K from <0.005 to 0.43%, and Li from none to 0.0018%. Rb was found in 4 samples with high K content. Study of replicate analyses indicated that the

sampling error was 2 to 5 times the film and analytical errors combined.

4735. LEUTWEIN, F. AND HERRMANN, A. G.
Crystal-Chemical and Geochemical Studies of the Occurrence and Distribution of Bismuth in Galena of the Pyrite-sphalerite Formation of the Freiberg Vein System.
Geologie (Z. Gesamtgebiet Geol., Mineral. sowie agnew. Geophys.), **3**, 1039–56 (1954).
C. A., **49**, 8050h (1955).

Spectrographic detns. show that the Bi content increases with depth in the mine. X-ray powder data indicate the Bi to be present as $AgBiS_2$ (matildite) in solid soln. in the galena, the unit cell decreasing from 5.922 Å. for pure PbS to 5.914 Å. for galena with 2 mole % $AgBiS_2$. Cu and Sb (as tetrahedrite), Zn, Cd, In, Tl (as sphalerite), Sn (as stannite), and (as tennantite) were present in the galena samples analyzed.

4736. LEUTWEIN, F. AND PFEIFFER, L.
The Possible Usefulness of Geochemical Prospecting Methods for Hydrous Nickel Silicate Ores.
Geologie (Z. Gesamtgebiet Geol., Mineral., sowie angew. Geophysik), **3**, 950–1008 (1954).
C. A., **49**, 2960d (1955).

Quant. spectrochem. analyses for Ni and qual. spectrochem. detns. of Co, Cr, Mn, V, Sn, Ge, Pb, Cu, Zn, Ag, As, Sb, Bi, and Ba were made on 677 samples, taken from 6 profiles that cut weathered serpentinites, high in Ni. The samples, ashed at 800° before analysis, included 231 soils, 136 samples of humus, and 290 plants. The latter included 22 varieties, most of the analyses being made on birch (*Betula verrucosa*), spruce (*Picea abies*), and pine (*Pinus silvestris*). The metal content of a given plant may vary greatly at different seasons and may be very different for needles, twigs, and bark. The results indicate that the method can be used, with proper precautions, as a means of prospecting. Ni contents (in g./ton) of more than 300 in soils, more than 500 in the ash of pine bark, more than 600 in the ash of birch leaves, and more than 1000 in spruce bark were observed only above rocks enriched in Ni. Qual. data indicate that Co and Cr could be used as indicators for Ni.

4737. LEYTON, L.
Phosphate Interference in the Flame-Photometric Determination of Calcium.
Analyst, **79**, 497–500 (1954).
C. A., **48**, 11973h (1954).

With an air-C_2H_2 flame, Ca detns. can be corrected for phosphate interference if the P concn. in p.p.m. is known or, in the presence of excess phosphate, Ca can be detd. directly if a calibration curve for Ca phosphate is available. With a coal-gas flame, the elimination of phosphate is essential and a method is suggested in which the Ca^{++} is adsorbed on a cation-exchange resin column, the Ca^{++} is subsequently eluted and is then free of phosphate.

4738. LINGARD, A. L.
Quantitative Spectrographic Method for the Determination of Beryllium in Minerals and Ores.
Proc. S. Dakota Acad. Sci., **33**, 191–3 (1954).
C. A., **50**, 724b (1956).

NiO is used as an internal standard. The face of a flat-tipped graphite electrode is dipped in a paste of sample, standard, graphite, and glycerol. When the glycerol is absorbed by the graphite, it is driven out by heating in a metal rack on a hot plate. An exposure time of 20 sec. is used. There is no error owing to difference in the volatilization rates of Be and Ni.

4739. LÖWE, F.
Optische Messungen des Chemikers und des Mediziners.
Theodor Steinkopff, 6 Auflage, pp. XX + 364 (1954).

The new edition of Löwe's well-known book devotes 174 of its 309 pages of text to applied spectroscopy, in addition to shorter chapters on other optical methods such as photometry, refractometry, and interferometry. As is inevitable in a book which first appeared some thirty years ago, descriptions of older methods and equipment occupy a larger space than would be granted them in a completely new book, but the fact that, for instance, Fastie's modification of the Ebert grating monochromator is illustrated, indicates that recent instrumental developments have not been ignored. The long chapter on spectroscopy is subdivided into sections on types of spectroscopes and spectrographs, absorption spectroscopy, and methods of spectrochemical analysis. The treatment of general principles and apparatus is better than that of specific analytical methods. One searches in vain for reference to such recently introduced but widely employed techniques as Feldman's porous cup solution spark method or any of the rotating-disk methods. In general the equipment described is of Zeiss origin, the author being particularly qualified to deal with this, but some illustrations of American apparatus are included.

This is a book for the advanced student or research worker who desires an overall picture of analytical possibilities and the type of apparatus required, rather than a laboratory manual of analytical techniques. The text is well documented, and there is a supplementary bibliography, which has a European bias. Unfortunately, numerous errors in authors' names and page references have been observed: occasional slips are unavoidable, but the

number of persistently misquoted references in the literature which obviously originate from bibliographic sources is such that it is apparent that many workers rely on these, instead of consulting the original papers, and compliers of bibliographies must accept a certain responsibility. (Reviewed by R. L. Mitchell, *Spectrochimica Acta* **7**, 179.)

4740. LYAKHOVICH, V. V.
New Data on the Mineralogy of Achtaragdite of the Vilyui Formation.
Trudy Vostochno-Sibirsk. Filiala, Akad. Nauk S.S.S.R., Ser. Geol., **1**, 85–116 (1954).
C. A., **49**, 15678b (1955).
Cf. *C. A.*, **47**, 8596i.

The deposits at the Vilyui River basin are studied by chem. and spectrographic analysis, X-ray diffraction, and differential thermal analysis. Spectrographic analysis revealed moderate amts. of Be in addn. to the trace elements.

4741. MACKAY, D. C. AND DELONG, W. A.
Coördinated Soil-Plant Analysis. II. Accuracy and Precision of Flame-Photometric Methods for Cation Analysis.
Can. J. Agr. Sci., **34**, 451–9 (1954).
C. A., **49**, 5210e (1955).
Cf. *C. A.*, **48**, 923g.

Semimicro flame-photometric procedures were developed for exchangeable K, Ca, and Mg in soils, and total amts. of these elements in plant tissues. Results obtained with 16 standard soil samples distributed by the Natl. Soil Survey of Can. agreed closely with those obtained from collaborating labs. for K and Ca. Agreement was less satisfactory for Mg. The presence of PO_4 seriously depressed cation emission with solns. prepd. from wet ashing of plant tissue. By sepg. the cations by exchange resin, the av. differences between photometric values and those obtained by chem. methods were +1.0 and −5.0% for Ca and Mg, resp. Coeffs. of variability in triplicate analyses of 5 samples ranged from 3 to 6.

4742. MALAMAND, F.
Spectrographic Analysis of Nickel-Base Alloys of the 80–20 Type.
O.N.E.R.A., Pub. No. **73**, 33 pp. (1954).
C. A., **49**, 8737d (1955).

By using the app. described by Castro (*C.A.*, **42**, 826h) procedures for the detn. of Ti, Mn, Al, Fe, Si, Co, and Cr in Nimonic 80 have been developed. For Ti, Al, Fe, and Mn, the high-voltage a.-c. spark is used with a counter electrode of graphite and a point-to-plane technique. Si and small amts. of Mn and Co are best detd. with an a.-c. arc. Cr in the range of 18–22% is detd. by a transfer method. The sample is first sparked without photographing the spectra by using an Ag counter electrode with an 80-degree point and a high-voltage a.-c. spark without added inductance. The spectra of the deposit on the counter electrode is obtained by sparking point-to-plane with an Ag plate and by using an excitation contg. added inductance to decrease the background. A precision of 1.2% of the amt. of Cr present was obtained. A sample 25 mm. in diam. and 10 mm. thick was used.

4743. MARÉCHAL, J. R.
Application of Spectrographic Methods for the Study of Ancient Metals.
Congr. groupement avancement méthod. anal. spectrog. produits, mét., 17th Congr., **1954**, 347–61.
C. A., **49**, 15610b (1955).

A standard curve was made by plotting I_{Cu}/I_{Zn} against % Zn for a range of brass alloys of known compn. The Zn content of a brass belt ornament from Trémont and another from Villey-St.-Etienne were found to be 37.6 and 38.4%, resp. Bronzes (Cu-Sn) were analyzed in the same way. Of special interest are the analytical results on the celebrated bronze crater from the Hallstat tomb from Mont-Lassois at Vix (France) (given in tabular form for 12 elements on 8 samples from different parts of the crater). The Sn content varies from 7.09 to 11.32% in the cast parts. Analyses were also made on other ancient objects including bronze rings, bronze axes, and Iberian figurines. The ancient metal arts of tinning, of making brass by the cementation of Cu with Zn ore (calamine), and of fire (mercury) gliding are discussed. Some details of analytical methods for different types of objects are given.

4744. MARFORI, R. T.
Spectrographic Determination of Zinc in Plant Materials.
Univ. Microfilms (Ann Arbor, Mich.) Publ. No. **7854**, 104 pp. (microfilm, paper enlargement).
Dissertation Abstr., **14**, 919–20 (1954).
C. A., **48**, 10102a (1954).

4745. MÁRIÁSSY, M., BORSICZKY, V., AND SOMOGYI, I.
Determination of the Silicic Acid and Calcium Content of Cryolite and Other Compounds Containing Fluorine by Spectrum Analysis.
Kohászati Lapok, **9**, 267–70 (1954).
Hung. Tech. Abstr., **7**, No. 1, 6 (1955).
C. A., **51**, 14483g (1957).

Two methods have been elaborated for detg. the SiO_2 content of materials with a high-F content by spectrum analysis. In the 1st method, detn. is made by means of a fulgurator with a soln. obtained after digestion. One g. of material is digested with an 8-fold amt. of soda; the melt is elutriated with water and topped to 250 ml. Analysis is effected with a fulgurator; spectrally pure C is used as a counter electrode. The internal standard is Cr (a soln. of K_2CrO_4), the advance

sparking 30 sec., exposure 80 sec. Pairs of lines for evaluation are Si 2881.6/Na 3302.3-Si 2881.6/Cr 3593.0. The 2nd method is a powder analysis with a rotary electrode. This Soviet method, by Emel'yanov (Cf. *C. A.*, **45**, 6967g), uses a rotary electrode. The latter, as well as the counter electrode, are made of electrolytic Cu. The material to be analyzed should be pulverized. Pairs of lines for evaluation are Si 2881.6/Fe 2175.5-Si 2881.6/Na 3302.3. Advance sparking is 60 sec. for 60-sec. exposure. The electrode speed is 60 r.p.m. The rotary electrode method can also be used for the detn. of Ca. The speed is 60 r.p.m. with a primary voltage of 220 v., advance sparking 60 sec., exposure 15 sec. Pair of lines for evaluation are Ca 3558.87/Na 3302.3.

4746. MASLEN, V. W., MEHARRY, M. R., AND WILLIAMS, S. E.
Measurement of Spark Spectrum Intensities in the Vacuum Ultraviolet with a Photomultiplier Sensitized to Fluorescence.
Nature, **173**, 76–7 (1954).
C. A., **48**, 4967g (1954).

A type E.M.I. 6094 photomultiplier with sodium salicylate-coated cathode window is used to measure spark and pulsed discharge intensities down to 480 Å. The tube output, measured by a peak voltmeter, actuates a galvanometer whose spot is photographically recorded. Lines of O, S, and N have been recorded.

4747. MATHIS, W. T.
Methods Involving Emission Spectroscopy.
J. Assoc. Offic. Agr. Chemists, **37**, 721–3 (1954).
C. A., **48**, 11235h (1954).

Discussion of the methods utilizing d.-c. arc and a.-c. spark excitation for the detn. of K, Ca, P, Mg, Mn, Fe, Al, Na, Cu, and B in plants are given in detail (*J. Assoc. Offic. Agr., Chemists*, **37**, 83–8 (1954)). Cf., *C. A.* **47**, 12668h.

4748. MAVRODINEAU, R. AND BOITEUX, H.
L'Analyse Spectrale Quantitative par la Flamme. T. I. Propriétés de la Flamme. T. II. Analyse des Émissions dans la Flamme.
Masson et Cie., Paris (France) (1954). 247 pp.
C. A., **48**, 11252c (1954).

Chapters on properties of the flame, some properties of acetylene and oxygen, regulation and measurement of gas flow and pressure, burners, feeding the flame, apparatus for the analysis of radiations, the photographic plate, constitution and manipulation of apparatus for excitation, interferences in the emission of the flame, direct photometry of radiation from the flame, analysis of emissions in the flame, the theory of atomic and molecular spectra, the emission spectra of air-acetylene and of oxygen-acetylene flames, the spectra of elements excited in these flames, and the excitation of chemical elements in the flame.

4749. MAZZAMARO, P. AND TATOIAN, G.
Determination of Small Concentrations of Sodium.
Anal. Chem., **26**, 1512–13 (1954).
C. A., **49**, 1476a (1955).

A method is described for detg. small amts. of Na with a Barclay flame photometer by using the "abs. or direct" method. Concns. as low as 6×10^{-7} *N* Na can be detd. easily and accurately.

4750. MCCULLOH, K. E. AND HARRIS, W. C.
A Modulated-Beam Microdensitometer.
Proc. Iowa Acad. Sci., **61**, 265–8 (1954).
C. A., **49**, 2788b (1955).

This paper is concerned with the use of an amplifier on a microdensitometer to improve the precision of the higher density readings. In the course of this investigation the principle of modulated-beam operation was ultimately adopted. Densities have been measured with this instrument as precisely in the range 1–2 as in the lower 0–1 range. The precision is approx. ±0.01 at a density of 2. No zero drift has been observed, but the expectation that the instrument would not respond to extraneous light, such as that encountered in a normally lighted room, has not been fully realized. This is apparently due to overloading the amplifier on half of the chopper cycle. Finally, it is pointed out that this arrangement would be well suited for use on a recording densitometer, since the circuits were originally designed for recorder application.

4751. MEGGERS, W. F.
Emission Spectroscopy.
Anal. Chem., **26**, 54–8 (1954).
C. A., **48**, 3186d (1954).

A review of progress in standard wavelengths, intensities, Zeeman effect, forbidden lines, term analysis, hyperfine structure, isotope shifts, and spectrochemical analysis during 1952 and 1953, based on 147 spectroscopic papers and books.

4752. MELLICHAMP, J. W.
Spectrochemical Determination of Impurities in Manganese Dioxide.
Anal. Chem., **26**, 977–9 (1954).
C. A., **48**, 11975h (1954).

A spectrographic method gives semiquant. results for 23 elements that occur in MnO_2. The sample is mixed with an equal wt. of graphite and burned in a deep, thick-walled, graphite electrode in a d.-c. arc. The buffering effect of MnO_2 and of the powd. graphite largely eliminate selective volatilization. Na, K, Sr, and Ba are detd. on one spectrogram and 19 elements from a second spectrogram. Results are reproducible to within ±20%.

4753. MELLICHAMP, J. W.
Semiquantitative Analysis of Elemental Selenium.
Appl. Spectroscopy, **8**, 114–17 (1954).
C. A., **49**, 775h (1955).

A spectrochem. method is given for the semiquant. detn. of 24 impurity elements that may appear in elemental Se. The method is simple, rapid, and adequate for the classification of Se into various purity grades. Synthetic standards are used in place of chemically analyzed standards. A 50-mg. sample is burned directly in the direct current-arc. From the standard spectrograms, the line-to-background ratios of the impurity elements are established to obtain analytical working curves. The elements sought, their analytical spectral lines, and their min. detectable amts. are tabulated.

4754. MELOCHE, V. W., RAMSAY, J. B., MACK, D. J., AND PHILIP, T. V.
Determination of Indium in Aluminum Bronze Alloys by Flame Photometry.
Anal. Chem., **26**, 1387–8 (1954).
C. A., **49**, 11496g (1955).

A Beckman flame photometer with photomultiplier and H burner, modified for full-scale measurement of the analytical radiation, was used and the line of In at 451.1 mμ was chosen for comparison. A series of standard solns. contg. In, Cu, and Al were made up, and a curve for intensity *vs.* p.p.m. In was plotted and found to be linear for the 451.1-mμ line. Then, by using 0.1000-g. samples of alloy, dissolving in HNO_3, boiling, and dilg. to 100 ml., the emission of the unknown soln. was detd. with the flame photometer and the In in the alloy detd. by interpolation from the standard curve. Calcn. of percentage In is direct when a 0.1000-g. sample is used and dild. to 100 ml., since 1 p.p.m. ~ 0.1% In in the alloy. The photometer slit was set at 0.04 mm., and the wave-length dial adjusted for max. emission for the 451.1-mμ line.

4755. MELOCHE, V. W. AND SHAPIRO, R.
Determination of Calcium and Magnesium in Lake Waters by Means of a Rotating Silver Disk Electrode.
Anal. Chem., **26**, 347–50 (1954).
C. A., **48**, 6053f (1954).

A metallic electrode system rather than a graphite system is preferred from the standpoint of sensitivity and absence of $(CN)_2$ interference. The range of concn. studied was 0.1 to 30 p.p.m. The best internal standard was 45 p.p.m. Mn. Exposure conditions were 24-sec. prespark period, 24-sec. exposure, and 30% grating aperture. The const. were 0.021 microfarads of capacitance, 180 mhos of inductance, and 10 amp. of radio-frequency spark current (225 to 235 v., input). The accuracy of the measurement depended on the spectral line pair employed as well as upon the concn. The same electrodes could be reused after rinsing them in concd. HCl.

4756. MERKER, W. AND HERRMANN, R.
A Source of Error in the Determination of Calcium in Serum.
Ärztl. Wochschr., **9**, 1196 (1954).
C. A., **49**, 4062f (1955).

Samples for flame photometry should be measured out immediately after prepn. of the serum, as the Ca tends to settle out in the course of time.

4757. MIKHALEVSKIĬ, V. D. AND MOCHALOV, K. N.
Spectroscopic Investigation of the Illumination of Torch Discharge and Its Temperature.
Trudy Kazan. Khim-Tekhnol. Inst. im. S. M. Kirova, **18**, 35–41 (1954).
C. A., **51**, 15248i (1957).

Expts. were carried out to det. the temp. of torch discharge and its distribution along the heights (20 cm.) of the torch flame, and its relation to certain characteristics of the discharge (frequencies). Temp. was measured by two independent methods: hydroxyl spectrum and at. lines of Sn spectrum.

4758. MITCHELL, R. L.
Spectrochemical Analysis of Plant Materials.
Congr. intern. botan., 8e Congr., Paris 1954, Colloq. analyses plantes et problèmes engrais minéraux, 48–67 (in English) (1954).
C. A., **50**, 15667d (1956).

Sampling and prepn. of plant material for analysis and destruction of org. matter are discussed. The range of contents to be detd., the presentation of analytical results, and the choice of spectrochem. methods are covered. Values are given for trace elements in grass, oats, beet, apple, and tea leaves, turnips, peas, and conifer needles. The limitations of the method are discussed.

4759. MITCHELL, R. L.
Trace Elements in Scottish Peats.
Intern. Peat Symposium, Dublin, **1954**, Sect. B. 3, 9 pp.
C. A., **50**, 7682i (1956).

This is a preliminary spectrochem. analysis of profiles. Analyses were made for P, K, Na, Mg, Ca, Cr, Ba, Co, Ni, Mo, Fe, Pb, Sn, Zn, V, Ti, Cr, Ca, and Mn. In the Red Moss profile, major increases in the lowest level 400 cm. under the upper level were in Ba, Co, Ni, Mo, V, Cr, and Cu; and major decreases in Mg and Na. In the Aird's Moss profile, major increases in the lowest level 200 cm. under the upper level were in Ba, Fe, Zn, and Mn. In the Coll Moss profile, major increases in the lowest level 150 cm. under the upper level were in Co, V, Cr, and Cu; and major decreases in K, Sr, and Sn. In the Westerdale profile, major increases in the lowest level 250 cm. under the upper level

were in Co, Fe, and Mn. Comparison in all cases showed no contamination with neighboring rocks and no correlation between metal content of peat and overlying vegetation. Semiquant. spectrochem. analyses for Be, Ga, La, Y, Yb, Zr, and Ge are incomplete.

4760. MITCHELL, R. L.
Trace Elements in Some Constituent Species of Moorland Grazing.
J. Brit. Grassland Soc., **9**, 301–11 (1954).
C. A., **49**, 14117b (1955).

Five replication of grass samples secured at four dates from late May to early September, for two years, were analyzed for Cu, Ni, Mo, Zn, Pb, Sn, Co, Fe, Ti, Mn, Ba, and Sr. Mixed herbage samples and *Narthecium ossifragum*, *Carex panacea*, *Anthoxanthum odoratum*, *Molinia caerulea*, *Scirhus caespitosus*, and *Calluna vulgaris* species were included in all or a part of the samplings. *Narthecium* and *Calluna* were relatively high in Co, and *Carex* and *Anthoxanthum* in Mo, while *Narthecium* was highest in Cu. The suggestion is made that selective grazing by animals might result in a Co deficiency.

4761. MONNOT, G. A.
Spectral Analyses of Natural Minerals. Silicon in Fluorspars; Fluorine in Silicates.
Spectrochim. Acta, **6**, 153–7 (1954).
C. A., **48**, 5730e (1954).

Spectrographic methods for the detection and detn. of silica in spars and F in silica rocks are described. Spark spectra of pulverized samples are photographed and the elements are detd. by comparing intensity ratios of lines with those exhibited by synthesized standards. For Si the intensity ratio Si 2516/Ca 2721 is measured, but since at. spectra of halogens are not excited in ordinary sparks, F is detd. from visible bands due to CaF_2. The precision is $\pm 10\%$ in the range of concns. between 0.5 and 5%.

4762. MONNOT, G. A.
Spectral Determination of Silicon in Biological Products.
Spectrochim. Acta, **6**, 158–60 (1954).
C. A., **48**, 5257i (1954).

A simple spectrochem. method involving sparks between sample solns. dried on a graphite electrode and a Cu counterelectrode is described. The detn. of Si in biol. products is carried out between the limits of 10 γ and 1000 γ SiO_2 in tissues. The min. amt. detectable under these conditions is 0.3 γ SiO_2, and the error is $\pm 15\%$.

4763. MUIR, S. AND AMBROSE, A. D.
A Solution Method of Spectrographic Analysis.
J. Iron Steel Inst. (London), **177**, 400–5 (1954).
C. A., **48**, 11236f (1954).

Prepd. graphite is impregnated with a soln. of the sample. Excitation is by an uncontrolled a.-c. condensed spark. Working details and comparisons with chem. analyses are tabulated for low alloy steel, Fe ore, blast-furnace slag, Monel metal, bearing metal, bronze, and a corrosion product. SiO_2 and TiO_2 are fused with a mixt. of Na_2CO_3 and $Na_2B_4O_7$ and extd. in dil. HNO_3 to give the soln. for excitation. 17 references.

4764. MÜLLER, S.
Silicon Purification by Crucible-Free Zone-Melting.
Z. Naturforsch., **9b**, 504–5 (1954).
C. A., **49**, 700i (1955).

The procedure for recrystn. of Si by zone melting previously described by Keck and Golay (*C. A.*, **47**, 8452a) and Emeis (*ibid.*, **67**, 9a), was improved by means of direct heating in a high-frequency field, after the Si is heated first to red heat with a graphite coil. Thus, no impurities can be introduced into the Si by the heating arrangement. An ultraviolet spectral analysis showed that all impurities except B transfer toward the end of the specimen and it is suggested that this procedure can be used for Si of low B content or after the B is removed chemically.

4765. NAGATA, M.
Spectrographic Analysis of Minor Elements in Tea Leaves. III.
J. Chem. Soc. Japan, Pure Chem. Sect., **75**, 401–4 (1954).
C. A., **48**, 11675b (1954).

Hot-water ext. and residue of tea leaves were analyzed. Na, K, and Ni were all extd., while Si, Al, Mg, Ti, Mn, Zr, and Cu were equally distributed in the ext. and the residue. As the leaves become older, Si, Fe, P, Ca, and Ba become less sol. Cf. *C. A.*, **48**, 2839d.

4766. NAGATA, M.
Minor Inorganic Elements in Plants.
Sci. Repts. Osaka Univ., **3**, 53–70 (1954).
C. A., **49**, 14110c (1955).

The amts. of elements in various parts of 100 kinds of plants were detd. spectroscopically and the results were described for Si, Al, Fe, Ca, Na, K, Mg, Ti, Mn, P, Ba, Zr, Sr, V, Ni, Cu, Co, Sn, Zn, Pb, Mo, Ga, B, Ge, Be, Sc, and Ag.

4767. NAGIBINA, I. M. AND GEL'DERMAN, I. A.
Use of Carbon Electrodes in Spectral Analysis of Solutions.
Sbornik Stateĭ Leningrad. Inst. Tochnoĭ Mekh. i Optiki 1954, No. **11**, 108–15.
Referat. Zhur., Fiz. 1955, No. **20403**
C. A., **50**, 13646e (1956).

Three methods of introducing soln. into C electodes of the arc. of a.-c. (satn. of the electrode by soln. in a bath; placing a drop on the face plane of the heated C; preliminary treatment of the electrode by a 3% soln. of poly-

styrene in benzene with the subsequent placing and drying of the drop of the soln. to be analyzed) were investigated. In a soln. contg. Mn and Mg, the different character of the burning down of these elements in the various methods of introducing soln. in the discharge is shown and is explained by the differences in interaction of the soln. with C in the 1st 2 methods and by the absence of such interaction in the 3rd method. In the 1st method, the calibrated graph constructed by using the coördinates log (I_{Mn}/I_{Mg}), log $C_{relative}$, has little slope, and the dispersion of current is great. In the 3rd method, the graph up to great relative concns. has a 45° slope, and the dispersion of the curve is significantly less. The best of the methods studied is the 3rd. By this method, calibrated graphs were obtained for solns. contg. Mn-Mg, Fe-Cu, and Cd-Zn, at wide intervals of relative concn. For the 1st soln. the graph is straight in the region of concn. 0.01–10% (tangent of the angle of inclination $b = 1$), for the 2nd at intervals of 0.03–3%, $b = 0.56$, for the 3rd at intervals of 0.1–1%, $b = 0.92$, and at intervals of 1–300%, $b = 0.56$.

4768. NAKAJIMA, T. AND SHIBUYA, S.
Controlled Spark Apparatus.
Bunkô Kenkyû, No. **8**, 14–22 (1954).
C. A., **51**, 13477c (1957).

A controlled spark app. was made based on the scheme of Maresca-Simons-Raiskiĭ (Maresca, *Phys. Zeit.*, **4**, 9 (1902); Simons, *Ann. Phys.*, **13**, 1044 (1904); Raiskiĭ, *C. A.*, **34**, 2709[4]; *Spectrochim. Acta*, **2**, 235 (1947–49)). The app. has a control gap parallel to the analytical gap to make the break-down potential const., and an inductance in series with the analytical gap to wipe off the arc after the spark discharge. Passage of air through the analytical gap was effective in removing the ions remaining after the discharge. Illumination of the gap with ultraviolet light made the discharge condition stable. The effects of remounting the control gap electrode, of the length of the analytical gap, of the primary voltage and primary resistance, and of the control gap electrode shape were investigated. A reproducibility of 2.4% expressed as a standard deviation was obtained for the analysis of Ni in Ni steel, the lines used being Ni I 3414/Fe I 4325.

4769. NALIMOV, V. V. AND IONOVA, K. I.
Role of Diffusion in Electrode Reactions Occurring in Spectrum Analysis with Spark Discharge.
Zhur. Anal. Khim., **9**, 76–84 (1954).
J. Anal. Chem. U.S.S.R., **9**, 87–96 (Engl. translation) (1954).
C. A., **48**, 6902e (1954).

A crit. review of the literature of the effect of the "third element" (Filimonov, *C. A.*, **46**, 5479i; **47**, 3171e). To reduce drastically the effect of third elements it is necessary to destroy the crystal lattice, i. e., to melt the sample. Also, to prevent oxidation-reduction processes on the surface of the sample, it should either be completely oxidized or completely reduced (Frederickson and Churchill, *Spectrochim. Acta*, **5**, 507 (1953)).

4770. NEUMANN, R.
Determination of Potassium in the Presence of Sodium by Means of a Flame Photometer.
Časopis Lékařů Českých, **93**, 1229–31 (1954).
C. A., **49**, 5203f (1955).

If the Na concn. in the sample is higher than 1%, the height of the galvanometer deflection becomes practically independent of small variations of the Na level. A standard curve for K in the "Na flame" is not linear and does not run through the origin, but it can be used in the full range of K concns. The air required for the functioning of the flame photometer can be provided from a low-pressure compressor; the air pressure can be controlled by means of a flowmeter or, alternatively, by means of an open Hg manometer.

4771. NICKEL, E. H.
The Distribution of Major and Minor Elements Among Some Coexisting Ferro-Magnesian Silicates.
Am. Mineralogist, **39**, 486–93 (1954).
C. A., **49**, 13842h (1955).

Coexisting chlorite, biotite, and hornblende from schist from the Michipicoten District, Ont. (Canada) were analyzed spectrographically for major and minor constituents. Portions of the schist were conglomeritic in appearance, suggesting a clastic origin. The relative amts. of the elements in the 3 minerals are explained by a consideration of their electro-negativities. The amt. of Al in the Si positions seems to depend upon the relative electronegativities of the oxygens surrounding the site, which in turn is governed by the degree of polymerization in the silicate structure and other structural differences. The extent to which Al replaces Si in the tetrahedra influences the concn. of elements in the octahedral sites. The elements with similar electronegativities behave in a similar fashion. Co, Ni, Cr, Ti, and V are iron-like. Mn, Zr, and Sc are more like Mg.

4772. NICKEL, E. H.
The Distribution of Iron, Manganese, Nickel, and Cobalt Between Coexisting Pyrite and Biotite in Wallrock Alteration.
Am. Mineralogist, **39**, 494–503 (1954).
C. A., **49**, 13842g (1955).

Pyrite and biotite samples from a schist body enclosing scheelite veins in the Michipicoten district, Ontario, Canada, were analyzed spectrographically. Co and Fe in the biotite showed a distinct decrease in the areas where

pyrite has been developed, indicating that the metallic elements of the pyrite were probably derived from the wallrock. No W or Mo was detected in the wallrock silicates, although both elements are abundant in the veins. The distribution of Co, Ni, and Mn in coexisting biotite and pyrite is taken as an indication of their relative thiophile characters. Co is hence the most thiophile of these elements, followed in order by Ni and Mn.

4773. NISHIKAWA, K., YAMAGUCHI, N., AND KAWAZU, S.
Calcium Tungstate Phosphor. II. Evaluation of Several Purification Methods of Tungstates by Means of Chemical Spectroscopic Analysis.
J. Chem. Soc. Japan, Ind. Chem. Sect., **57**, 531–3 (1954).
C. A., **49**, 6732g (1955).

The spectroscopic examns. were worked out for raw and purified Na_2WO_4, I, H_2WO_4, $(NH_4)_2WO_4$, etc. to detect the minute impurities. Al, As, Cu, Fe, Mg, Si, etc. have been detected in each compd., irrespective of the purification procedures used.

4774. NUFFIELD, E. W.
Brannerite from Ontario, Canada.
Am. Mineralogist, **39**, 520–22 (1954).
C. A., **49**, 13840h (1955).

Brannerite was found in the Blind River area, on the north shore of Lake Huron about 80 miles east of Sault Ste. Marie. The mineral occurs as reddish brown grains of near-microscopic size, more or less altered to a dense white to yellowish white radioactive product. The brannerite is metamict and before ignition often gives the X-ray powder pattern of either rutile or anatase. After momentary ignition at red heat, a pattern identical with that of brannerite from Idaho is obtained. A semiquant. spectrographic analysis of typical matrix material gave: Y 0.1 to 1.0%, Ce 0.05 to 0.5, Yb trace, La trace, U 0.1–1.0, Th trace, Ti 1.0–10, Cb trace, Ta none. Minerals assocd. with the brannerite are uraninite, thucholite, monazite, zircon, galena, and chalcopyrite.

4775. OFTEDAL, I.
Regional Distribution of Lead in South Norwegian Granitic Rocks.
Norsk Geol. Tidsskr., **33**, 153–61 (in English) (1954).
C. A., **50**, 5486b (1956).

The Pb contents, detd. by spectrochem. analysis in alkali feldspars from 39 localities of granitic rocks (Østfold-Akershus gneiss area, Oslo region, Kongsberg-Bamble formation in Sørland, and Telemark granite region), are tabulated. The spectrochem. methods used are discussed. The results indicate the existence of regional differences in the Pb content of granitic rocks in southern Norway, related to palingenetic processes and granitilization.

4776. OHASHI, K., YASUI, E., AND SUZUKI, H.
Spectrographic Determination of Potassium in Iron Synthetic Ammonium Catalysts by Means of the Flame Method.
J. Chem. Soc. Japan, Ind. Chem. Sect., **57**, 16–18 (1954).
C. A., **49**, 775c (1955).

Kallman's method of detg. K (*C. A.*, **41**, 48g) in minerals was improved and applied to catalysts. A spectrographic analysis of K is also described. Dissolve 2 g. of catalyst in a mixt. of 40 cc. $HClO_4$ (60%) and 30 cc. concd. HCl, add 5 cc. more of $HClO_4$, and slowly heat to dryness. Dissolve the ppt. in 20 cc. BuOH, add 10 cc. of Smith's reagent (*C. A.*, **19**, 1548) dropwise, and gently heat for 3 min. Wash the resulting ppt. produced with BuOH (with HCl), dry at 110°, and exam. spectrographically. The calibration curves of d. of spectrum and K concn. are given. The accuracy of the flame method in the lab. was ±0.07%. The routine tests of the K content in the industrial catalysts have shown an accuracy of ±5%.

4777. OHTA, N., MIYANO, Y., AND SHIMAZAKI, K.
Spectrochemical Determination of Cyanides.
Science and Crime Detection, **7**, 11–13 (1954).
C. A., **49**, 6038c (1955).

KCN (89–90%) present in organs can be recovered by the picric acid method.

4778. OIKAWA, H.
Analysis of Impurities in Germanium.
J. Coal Research Inst. (Japan), **5**, 335–40 (1954).
C. A., **49**, 6060f (1955).

A review with 14 references.

4779. OLSON, K. B., HEGGEN, G., EDWARDS, C. F., AND GORHAM, L. W.
Trace Element Content of Cancerous and Noncancerous Human Liver Tissue.
Science, **119**, 772–3 (1954).
C. A., **48**, 10207c (1954).

Twelve trace elements were studied by a spectrographic method in the livers of 6 persons dying of noncancerous disease, 2 dying of carcinoma of the esophagus and portal cirrhosis of the liver, 4 dying of gastrointestinal cancer with metastasis to the liver, and 1 case of acute lymphatic leukemia. A significant increase in Zn occurred in the uninvolved portion of the liver in all cases with metastatic malignancy. Cu was elevated in the liver in 2 cases with portal cirrhosis and no cancer in the liver. Fe, Zn, Cr, and Co were significantly elevated in the liver in one case of acute lymphatic leukemia with hepatic involvement. Zn is increased 112% in the noncancerous portion of the livers with tumor as compared with non tumorous livers.

4780. ORTEGA, M.
Flame Photometric Determination of Sodium and Potassium in Milk.
Anales Bromatol. (Madrid), **191**, 423–7 (1954).
C. A., **50**, 498b (1956).

The mean values for K and Na in pure cow milk were 177.0 and 31.2 mg./100 g., resp. The ratio of K to Na serves to detect adulteration with H_2O or addn. of NaCl and $NaHCO_3$. In human milk, the av. values were 46.8 mg. K and 20.7 mg. Na/100 g. In ass milk, 64.4 and 44.4 mg./100 g., resp., were found.

4781. OTA, K., OGO T. AND SASAI, K.
Salt Injury to Crops. VII. Relation Between Metallic Element Metabolism and Salt Injury.
Sci. Repts. Fac. Agr. Okayama Univ., No. **4**, 1–6 (1954).
C. A., **48**, 14076i (1954).

From spectroscopic analysis of wheat plant, excluding the root, for Fe, B, Si, P, Mn, Mg, Ca, Cu, Na, and K, Na was most heavily accumulated in the stalk, next in the leaves, and the least in the ears. K was far less accumulated, and the other elements tended to decrease as the plant grew. The so-called salt injury seemed to be due to the combined effect of all the salts in high concns. and also to the secondary or tertiary effects of some combinations between different salts.

4782. OTO, Y.
Influence of Extraneous Coexistent Elements for Quantitative Spectroanalysis. II.
Nippon Kinzoku Gakkaishi, **18**, 480–2 (1954).
C. A., **52**, 10794i (1958).
Cf. *C. A.*, **47**, 11069c.

Expts. were performed to remove the influence of Zn added to Al-Mg alloy (Mg 0.30–3.54%) on the calibration curve of Mg and to raise the accuracy in quant. analysis. As a result of these expts., the influence of Zn was eliminated by using Zn, Cd, or Pb as the counterelectrode. By application of this method to general quant. analysis, the reproducibility of measuring values was increased. For instance, the deviation coeff. for the quant. analysis of Cu in Al-Cu alloy was cut from 6.1% to 5.4% and for the quant. analysis of Mn in steel from 6.9% to 4.6%.

4783. OTO, Y., MATSUMOTO, C., AND MANAGUCHI, T.
Spectrographic Determination of Sodium in Silumin Alloys.
Nippon Kinzoku Gakkaishi, **18**, 477–9 (1954).
C. A., **52**, 9852a (1958).

A small quantity of Na was added to modify Silumin alloy (13% Si-Al). This Na could be detd. by spectroanalysis by means of illumination with a metallic electrode with an a.-c. intermittent arc. For sampling, the soln. method was adopted with a porous-cup electrode of graphite. Cu was used as the internal standard in the standard sample series. A series of standard sample solns. (having a known content-ratio of Na to Al) and several metal specimens were prepd. With such solns., the spectral lines were photographed on the plate (Fuji panchromatic process) and the quantity of Na in the standard metal electrode was detd. by the concn. ratio method. The lower limit of quant. analysis of Na in Silumin by spectrography was 0.005% when 5895.A was used as a bright line of Na; the standard deviation was 8.10%. The yield of Na in Silumin was nearly proportional to the amt. added, and the yield ratio was about 2.5–4.5%.

4784. OTSUKA, S.
Quantitative Spectrochemical Analysis of Nickel-Plated Iron and Steel Wire.
Bunkô Kenkyû, **3**, No. 1, 26–31 (1954).
C. A., **51**, 13649d (1957).

The C electrodes were dipped for 30–60 min. into a soln. of the sample made by dissolving 0.11 g. of the sample in 5 cc. of 20–60% HNO_3. After the electrodes were dried, spark discharge was passed between the electrodes across a gap distance of 3 mm. by Feussner generator with $C = 0.003$ microfarad and $L = 0.08$ millihenry. The spectra were taken with a medium quartz spectrograph with an exposure of 80 sec. after 30 sec. predischarge. The line pair used was Fe I 3047.61/Ni I 3050.83. Standard deviation was about 3%, and in good agreement with the result of chem. analysis. This method showed the irregularity in the thickness of Ni plate on Fe sheet.

4785. PACHEVA, Ĭ.
The Quantitative Spectral Determination of Tungsten in Ores.
Izvest. Bŭlgar. Akad. Nauk., Otdel. Fiz.-Mat. i Tekh. Nauki, Ser. Fiz. **4**, 73–83 (Russian and French summaries) (1954).
C. A., **51**, 3362b (1957).

The method of paper strips was used for the spectral analysis of W in ore samples and the av. error was 3.7–4.2%. The effect of sample size and W compd. on the results was detd. It was established that the amt. of sample introduced on the paper strip has an effect on the precision. The introduction of $CaWO_4$ in place of WO_3 in the standardization samples gives a slight parallel displacement of the Fe/W lines on the calibration graph.

4786. PANEBIANCO, B.
Analysis of Aluminum and Its Alloys by a Quantometer.
Alluminio, **23**, 145–50 (1954).
C. A., **48**, 11975d (1954).

More than 1200 detns. of primary Al can be made in a day with higher precision than that usually obtained and with labor saving.

4787. PAUFLER, H.
New Timing Device for Spectrochemical Analyses (in German).
Feingeratetchnik, **3**, 148–9, Apr. (1954).

Spectrochemical analysis today provides precise and rapid production control in iron and light metal industries. In making routine analyses automatic control is important. For the purpose of controlling the presparking and observing times of metal electrodes according to fixed working procedures a time-control apparatus manufactured by the V.E.B. Rathenower Optical Works is described. It permits the selection of pre-sparking times from 0 to 4 min., and of exposure time from 0 to 6 min; it can be inserted in all types of spectrographs.

4788. PEŠIĆ, D. S.
Spectrographic Determination of Yttrium, Lanthanum, and Cerium.
Bull. Inst. Nuclear Sci. "Boris Kidrich," **4**, 49–53 (in English) (1954).
C. A., **49**, 4450i (1955).

The Cu-spark method of Fred, et al. (*C. A.*, **41**, 3707e) is applied to the detn. of Ce in the range of 10^{-6} to 10^{-5} g., and Y and La in the range of 2×10^{-7} to 2×10^{-6} g. The following line pairs are used: Y/Sr 4309.63/4215.52, Ce/Mo 4137.65/3902.96, and La/Mo 4333.73/3902.96 Å.

4789. PETRUN, V. F.
Interrelations of the Color Distribution in Vein Quartz with Rhythmic Processes of Vein Formation.
Zapiski Vsesoyuz. Mineralog. Obshchestva, **83**, 226–33 (1954).
C. A., **49**, 2957i (1955).

The colored quartz veins are observed in the Ulu-Tau Mts. (Central Kazakhstan); milky quartz is colored lilac-violet in the salbands of Devonian clayey sandstones by very fine intergrowths of micropoikilitic rutile or geothite. Spectral analysis showed that Fe and Mn compds. are the most frequent pigments; the clayey sandstone contains 1% Fe and 0.1% Mn, the violet quartz 0.1% Fe and 0.01% Mn, and the milky white vein quartz 0.01% Fe and 0.001% Mn. Similar phenomena have been described by Mügge (*C. A.*, **24**, 5671). The country rock is often discolored along the salbands, and a direct interrelation is evident between the rhythmic banding of the pigment distribution with the peculiar columnar arrangement of the vein quartz by the tectonic mechanism of the vein formation, which is much more complex than Mügge's expts. have made probable.

4790. PINTA, M.
Flame Photometry.
Chim. anal., **36**, 126–30 (1954).
C. A., **48**, 8112i (1954).

The use of the nonluminous flame as a source of spectrographic excitation was suggested by Gouy (*Ann. Chim. Phys.*, **18**, 5 (1879)), and P. has described recently (*C. A.*, **47**, 6192i) a convenient app. for carrying out the work. In this brief review, its application to the analysis of alkalies and the alk. earths is discussed.

4791. PINTA, M.
Several Applications of Emission Spectrography to Agriculture.
Congr. groupement avancement, méthodes anal. spectrog. produits mét. 17th. Congr, **1954**, 153–69.
C. A., **50**, 2352b (1956).

Flame photometry with filters is used to det. Na, K, Ca, Al, Fe, and Mg in soils and in plants. The analysis for minor constituents utilizes a 9-amp. d.-c. arc. Soil concentrates are mixed with powd. graphite and K_2SO_4 and with Ag and Cr for internal control for Mn and Cu detns. The analysis for Ni, Co, Mo, Zn, and Ti utilizes Fe as an internal control. Fe and Al detns. for plant material utilize Ag as an internal control in material that has been heated to 450°. Li, Rb, Cs, Sr, and Ba in both plants and soils are detd. with a flame photometer.

4792. PITANCE, T.
Determination of Alkali Metals by Flame Photometry.
Compt. rend. 27e congr. intern. chim. ind. Brussels, **1954**, 2.
Industrie chim. belge, **20**, Spec. No., 508–11 (in French) (1955).
C. A., **50**, 14437b (1956).

In analyzing blends, pegmatite, and spodumene for alkali metals, Al^{+++} is added to the soln. to eliminate changes in emission due to the presence of acids; in HCl soln. 11.5% HCl (12 *N*) + 5 g. Al/1. for blends; in H_2SO_4 soln. contg. 5% H_2SO_4 + 5 g. Al/1. Anion interferences, except for PO_4^{---}, are negligible. Cations must be examd. at their max. probable concn. Radiation errors and addn. errors in Na analysis at 589 mμ (48 mg./1.) are: K (1%), +3.4 and 0.0%; CaO (1%) −0.9 and 1.2%; MgO (1%) 0.0 and 0.0%; Mn (1%) 0.0 and 0.0%; Fe (5%) −1.7 and 1.1%, resp. For K at 768 mμ (48 mg./1.), Na (1%) + 3.5 and 0.0%; CaO (1%) 0.0 and 0.0%; MgO (1%) + 0.5 and 0.0%; Mn (1%) 0.0 and 0.0%; Fe (10%) + 2.27 and 1.1%, resp. In analysis for Li, Na interference is noticeable above 200 mg. One hundred mg. Li, K, Fe, and Al do not affect the results.

4793. PLUMMER, N., SWINEFORD, A., RUNNELS, R. T., AND SCHLEICHER, J. A.
Chemical, Petrographic, and Ceramic Properties of Four Clays from the Dakota Formation in Kansas.
State Geol. Survey Kansas, Bull. **109**, 153–216 (1954).
C. A., **49**, 13040g (1955).

A detailed study of 4 clays. Chem. analyses are given of the whole clays, and of the fractions minus 2 μ, 2 to 8, and greater than 8μ. The coarsest fractions were very high in SiO_2 (93.4 to 96.2%). Spectrographic detns. are given for Mn, V, Cr, Mo, Ni, Ga, and Cu. The clay minerals present were identified by X-ray powder diagrams, electron-microscope study, and differential thermal analysis. The accuracy of the mineralogical detns. by various methods is discussed. Ceramic test data given include water of plasticity, shrinkage water, specific surface, pH, and viscosity. Correlations were observed between the green properties and both water of plasticity and specific surface. The ceramic properties can be deduced from the chem. and mineralogical data.

4794. PLZÁK, F. AND LÍZAL, B.
Spectrographic Determination of Carbon in Steels.
Hutnické Listy, **9**, 715–19 (1954).
C. A., **49**, 9439g (1955).

4795. POHL, F. A.
Spectrochemical Determination of Impurities in Very Pure Substances.
Angew. Chem., **66**, 603–4 (1954).
C. A., **49**, 772g (1955).
The analysis of pure Al is used to demonstrate that as little as 0.00001% can be detd.

4796. POHL, F. A.
Spectrochemical Microanalysis of Iron and Steel.
Mikrochim. Acta, **1954**, 258–62 (in German) (1954).
C. A., **48**, 6314b (1954).
Dissolve 1–2 mg. of steel borings in acid and ext. $FeCl_3$ from 6.5*N* HCl soln. After reduction with $Na_2S_2O_6$ soln., the elements that follow the $FeCl_3$ into the ether are extd. as their thiocyanate complexes. It is impossible to sep. Au, Sb, As, and Tl from Fe by this method. The thiocyanate exts. are added to the original HCl soln. and studied spectroanalytically by the Feussner procedure. The method can be used for Mn, Cu, Ni, Cr, V, W, Al, Ti, Zn, Sn, and Zr as well as for some elements of little importance in steel analysis.

4797. POHL, F. A.
Methods for the Spectrochemical Detection of Traces. III. Tests on Stones and Samples of Soil.
Z. anal. Chem., **141**, 81–6 (1954).
C. A., **48**, 5020i (1954).
A scheme of analysis is described which starts with an extractive enrichment and ends with spectroscopic examn. In a sample weighing only 1 g. the elements Ag, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, and V in 1 γ quantities and Bi, Pb, Xn, and Zn in 5–10 γ portions can be detected. The trace elements are sepd. from alkalies, alk. earths, silica, Fe, Al, and Ti, the SiO_2 is fumed off as SiF_4, Fe^{+++} is removed as combination chloride and thiocyanate, and the traces are thrown out of the residual soln. selectively with NH_4 pyrrolidinodithiocarbamate and dithizone and extd. with $CHCl_3$.

4798. POHL, F. A.
Determination of Traces. IV. Spectrochemical Determination of Traces of Impurities in Very Pure Aluminum.
Z. anal. Chem., **142**, 19–27 (1954).
C. A., **48**, 9260f (1954).
Two procedures are described in detail for the examn. of very pure Al metal after sepg. the impurities from the main mass of Al by pptn. In the first method, thioacetamide in NaOH soln. ppts. sulfides of Cd, Co, Cu, Mn, Ni, Pb, and Zn and hydroxides of Ca, Cr, Mg, and Ti. Tl^+ is used to catch the small ppts. In the second method, the pptn. of Cd, Co, Cu, Fe, Ga, Mo, Ni, Sb, Sn, V, and Cr (as well as Cr, Mn, Pb, and Ti partially) are pptd. with the NH_4 salt of pyrrolidinedithicarbamate, likewise in the presence of Tl^+. Starting with 1 g. of sample, the presence of 0.01–0.00001% of each impurity can be detected. Cf. *C. A.*, **48**, 895i, 6314b.

4799. POSSIDONI DE ALBINATI, J. F. AND CAPACCIOLI, J. H.
Separation of the Alkaline and Alkaline Earth Metals from Uranium and Their Determination by Flame Spectrophotometry.
Anales asoc. quím. argentina, **42**, 115–31 (1954)
C. A., **49**, 6773i (1955).
The sample is dissolved in HNO_3, and $UO_2(NO_3)_2$ is extd. with Et_2O. The aq. residue is concd., and the alk. and alk. earth metals are detd. by flame spectrophotometry. Formulas are given for the calcn. of the quantities of metal present together.

4800. PRATT, P. F. AND HOLOWAYCHUK, N.
A Comparison of Ammonium Acetate, Barium Acetate, and Buffered Barium Chloride Methods of Determining Cation-Exchange Capacity.
Soil Sci. Soc. Amer., Proc., **18**, 365–8 (1954).
C. A., **49**, 5743f (1955).
Total exchangeable cations of several soil profile samples were detd. and used to evaluate the 3 methods of detg. cation-exchange capacity. The NH_4OAc method underestd. the exchange capacities of all soil samples. The $Ba(OAc)_2$ method gave values which were equal to the sum of exchangeable cations, except with highly acid soils where it gave low values. The $BaCl_2$-buffer method gave values that were nearly equal to the sum of exchangeable cations for all samples. The latter 2 methods, in which Ba was replaced by 0.05 *N* HCl and the Ba detd. by a flame photometer, could not be used for some samples because

of Ca interference. Some slightly acid soils gave sufficient Ca release during HCl extn. to interfere in the Ba detn. This interference was removed by washing the soil with HCl before leaching with the $BaCl_2$ buffer and by replacing the Ba with NH_4OAc.

4801. PRO, M. J. AND MATHERS, A. P.
Metallic Elements in Wine by Flame Photometry.
J. Assoc. Offic. Agr. Chemists, **37**, 945–60 (1954).
C. A., **49**, 2258a (1955).

The inorg. constituents of wine are of forensic interest. Wines are ashed for the flame-photometric detn. of Ca, Mg, and Na; K is detd. directly at a 200-fold diln. Detailed methods and sensitivity ranges are given (Beckman instrument, oxyhydrogen flame, photomultiplier tube). Results are checked by chem. procedures. Cointerference of these cations is investigated, as are the effects of acetate, HCO_3^{-3}, Cl^-, NO_3^-, phosphate, and sulfate. Org. interferences (sugar, Et-OH) are studied. Dextrose markedly decreases inhibiting effect of phosphate upon Ca and Mg emission. Practical suggestions are given for flame operation.

4802. PROCHÁZKOVÁ, V.
Spectrographic Determination of Tungsten in the Residues After the Extraction of Tungsten from Tin-Tungsten Concentrates.
Chem. Průmysl, **4**, (29) 127–31 (1954).
C. A., **49**, 5205h (1955).

A method was developed for detg. W in the residues contg. 0.1–2.0% WO_3. The material in powder form was ground to pass a sieve of 0.03-mm. mesh size, well homogenized, mixed with 2 parts of water-free Na_2CO_3, and filled into the crater of a C electrode. As internal standard a Ge salt addn. was made. Ge is preferred over Cd which was originally used. The spectra was initiated by a condensed low-tension spark according to the method of Sinclair (*C. A.*, **42**, 5280a). The following lines were taken as representative: λ 2946, 98 Å., λ 2947, 36 Å. λ 2944.40 Å. The accuracy of the detns. was within 5%.

4803. PROKOF'EV, V. K.
Transactions of the IXth All-Union Conference on Spectroscopy.
New Spectral Apparatus.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **18**, 643–61 (1954).
C. A., **50**, 7585d (1956).

Description of spectrographs for the vacuum ultraviolet, high light output spectrographs, spectrographs with high resolution (down to 2 Å./mm.), visual instruments for analysis, spectrophotometers, and instruments for infrared spectrometry recording directly on photosensitive paper and auxiliary equipment.

4804. RAMÍREZ-MUÑOZ, J. AND BURRIEL-MARTÍ, F.
The Cd 3261 Line as Internal Standard Line in the Spectrochemical Determination of Zinc on Electrodes of Electrolytic Copper.
Anales real soc. españ. fís. y quím. (Madrid), **50B**, 387–98 (1954).
C. A., **49**, 1477b (1955).

Data are given for detg. Zn on electrodes of electrolytic Cu, with Cd and Fe being employed as internal spectrographic standards. A comparison of Al_2O_3 and CuO as diluents is included. Best values are obtained with Cd as the standard and CuO as the spectrographic base.

4805. RICARD, R.
Spectrographic Analysis of Silicon.
Congr. groupement avancement méthod. anal. spectrog. produits mét., 17th Cong. 1954, 119–29.
C. A., **50**, 2362e (1956).

A method for the quant. spectrochem. analysis of materials contg. up to 100% SiO_2 is given. The material to be analyzed is mixed with powd. Ni, graphite, and B_2O_3 and is run in C electrodes in a 240 v. d.-c. arc. The Si lines at 2514 Å. and 2528 Å. are used, together with the Ni comparison line at 2540 Å.

4806. RICARD, R.
The Carbon Effect in the Spectrographic Analysis of Refractory Materials.
Appl. Spectroscopy, **8**, No. 2, 75–80 (1954).
C. A., **48**, 11236b (1954).

The spectral effect of adding graphite to mixts. of refractory powders volatilized in the crater of a C arc has been studied for various proportions of graphite. The refractories were enamel, alumina, and a mixt. of Al_2O_3 and TiO_2 with $CuCO_3$ added to each. In general, the spectral lines of the less volatile elements, Al, Mg, Si, and Ti are enhanced when graphite is added, but the lines of Cu and Sb remain nearly const. in intensity. This may be due to the reduction of the refractory oxides by the graphite and also to the inhibition by the graphite of globule formation in the crater of the arc, resulting in more rapid volatilization of the powder. Cf. *C. A.*, **47**, 11685c.

4807. RICO, F. R.
The Spark Spectrum of Molybdenum in the Extreme Ultraviolet. The Fundamental Quintets of Mo III.
Anales real soc. españ. fís. y quím. (Madrid), **50A**, 185–200 (1954).
C. A., **50**, 7581h (1956).

The spark spectrum of Mo was photographed from 2200 to 3400 A. Thirty-six spectral lines belonging to Mo III were identified. Analysis of these lines has led to the assignment of the following terms (term symbol, electronic configuration, and energy in $cm.^{-1}$

given): even levels: $^5D_4$, $4d^4$, 1500.0; $^5F_1$, $4d^35s$, 32,045.7; $^5F_2$, $4d^35s$, 32,470.2; $^5F_3$, $4d^35s$, 33,079.3; $^5F_4$, $3d^35s$, 34,756.3; odd levels: (all are $4d^35p$): $^5G_2°$, 73,480.2; $^5G_3°$, 74,351.7; $^5G_4°$, 75,443.6; $^5G_5°$, 76.740.2; $^5G_6°$, 78,316.4; $^5D_0°$, 75,063.0; $^5D_1°$, 75, 599.2; $^5D_2°$, 76,464.0; $^5D_3°$, 77,897.4; $^5D_4°$, 79,124.2; $^5F_1°$, —; $^5F_2°$, 77,684.4; $^5F_3°$, 79,135.6; $^5F_4°$, 79,722.7; $^5F_5°$, 79,970.2.

4808. RIESZ, R. AND DIEKE, G. H.
The Analysis and Purification of Rare Gases by Means of Electric Discharges.
J. Appl. Phys., **25**, 196–201 (1954).
C. A., **48**, 5727i (1954).

Through the phenomenon of cataphoresis in gas discharges, impurities are carried toward the cathode and cond. there. This can be used for the purification of rare gases, and for the removal of traces of one rare gas from another rare gas. The technique is simple and completely automatic. The same technique can be used for the analysis of rare gases. The high concn. of the impurities near the cathode increases the sensitivity by a large factor. One part of Ne in 200 million parts of He has been detected without difficulty.

4809. ROBINSON, A. M. AND OVENSTON, T. C. J.
Determination of Lithium in Magnesium-Lithium Alloys by Internal-Standard Flame Photometry.
Analyst, **79**, 47–50 (1954).
C. A., **48**, 3192f (1954).

A double-beam flame photometer of simple design serves to det. 11–14% of Li in MgLi alloys with the app. already described (*C. A.*, **45**, 8356b). The internal-standard technique is used, and its general application to the detn. of alkali metals as major constituents is discussed. Here the internal standard selected is K which, when added in sufficient quantity to give a relatively high concn., minimizes errors caused by variations in alloy compn. In the triplicate analysis of 3 alloys contg. 12–13% Li, the results were within 0.06% of the true value.

4810. RODRÍGUEZ PÉREZ, A. AND BURRIEL-MARTI, F.
Spectrochemical Analysis of Magnesium in Nodular Iron.
Inst. hierro y acero, **7**, 345–8 (1954).
C. A., **49**, 2252h (1955).

Five control solns. were made by using Fe wire and $MgSO_4.7H_2O$ to contain from 0.1 to 1.6% Mg. The mixt. was treated with 1cc. H_2SO_4, evapd., treated with 3-4 cc. of NH_4OH, and heated to remove NH_3. A few decigrams of unknown was dissolved in H_2SO_4, evapd., neutralized with NH_4OH, and evapd. to remove NH_3. A Hilger spectrograph with ordinary Ilford plates was used and developed in 1D-2 at 18°. A Hilger microphotometer was used to measure the lines chosen Mg 2802.71/Fe 2813.29 and Mg 2795.54/Fe 2788.11. The results obtained on unknowns were lower than those obtained by other methods such as sepg. the Fe with ether or by electrolytic sepn. of Fe.

4811. RODRÍGUEZ, A.
Determination of Boron in Soil by Spectroanalysis
Anales edafol. y fisiol. vegetal (*Madrid*), **13**, 893–901 (1954).
C. A., **49**, 8541c (1955).

The content of B in soils (used in bett production) can be detd. spectro-chemically with a lower limit of detection of 1.9 γ of B if an amt. of Si equal to that found in the soil ext. is included in the standard soln.

4812. ROESCH, K.
The Effects of Various Elements on Graphitizing and Their Spectroscopic Determination.
Giesserei, **41**, 338–40 (1954).
C. A., **48**, 12609g (1954).

Iron castings can be rapidly analyzed for certain trace components by means of a simple glass spectroscope employing an opposing electrode of Cu or Ni. The selected line is simply matched visually with one of several neighboring Fe, Cu, or Ni lines. For the strong carbide forming elements, lower limits with the "Steeloscope" are 0.01% Cr, 0.02% Ti, and 0.1% V. Mg can be detd. in a concn. as low as 0.01%. A tabulation of the effect of a no. of elements on cementite stability is included.

4813. ROSE, H. J., JR., MURATA, K. J., AND CARRON, M. K.
A Chemical-Spectrochemical Method for the Determination of Rare Earth Elements and Thorium in Cerium Minerals.
Spectrochim. Acta, **6**, 161–8 (1954).
C. A., **48**, 5717i (1954).

In a combined chem.-spectrochem. procedure for detg. rare earth elements in Ce minerals, Ce is detd. volumetrically, a total rare earths plus ThO_2 ppt. is sepd. chemically, the Ce_2O_3 content of the ppt. is raised to 80.0 % by adding pure ceria, and the resulting mixt. is analyzed for La, Pr, Nd, Sm, Gd, Y, and Th spectrochemically with a d.-c. C arc. Spectral lines of singly ionized Ce are used as internal standard lines in the spectrochem. detn. which is patterned after Fassel's procedure (*C. A.*, **43**, 2889a).

4814. ROSENDAHL, F. AND KAISER, H.
Periodic Processes in the Spark Treatment of Beryllium Bronze.
Naturwissenschaften, **41**, 497 (1954).
C. A., **49**, 11399b (1955).

Cylindrical rods of Be bronze (2% Be), 5 mm. diam., semispherical ends, 3 mm. electrode distance, cooled holder, were treated with sparks from a condenser discharge for $^1/_2$ hr., 100 sparks per sec., 4500 pf. capacity,

17 kv. charge, inductivity 5 microhenry. During the process the ratio of intensities of the Be line 2650 was continuously compared with Cu line 3247 A. In the 1st 100 sec. the ratio decreases considerably, after a few min. periodic ups and downs in ratio occur at fairly regular frequency. With 1 graphite electrode the periodicity continues but at slightly lower frequency. With N blown into the spark (hollow graphite) the periodic variations stop. With air blown in they come back; evidently the effect is due to periodic oxidation phenomena.

4815. ROSS, C. S., FOSTER, M. D., AND MYERS, A. T.
Origin of Dunites and of Olivine-Rich Inclusions in Basaltic Rocks.
Am. Mineralogist, **39**, 693–737 (1954).
C. A., **50**, 9959g (1956).

Pure minerals were sepd. from olivine nodules in basaltic rocks from 10 localities and from dunites from 5 localities. Complete chem. and spectrographic analyses and sp. gr. detns. are given for 13 olivines, 12 enstatites, 11 diopsides, and 12 spinels and chromites. The compns. of the minerals from the inclusions were nearly identical with those from the dunites, the major difference being in the much higher Cr_2O_3 content of the spinels from the dunites. Among the minerals, Ni is highest in olivine, Cr increases from olivine to enstatite to diopside to spinel, and Mn is nearly const. in all. The origins of the olivine inclusions and of the dunites are discussed; the data indicate that both have come from the peridotite layer of the Earth's crust.

4816. ROST, F. AND KAUCZOR, H. W.
Spectral-Analytical Determination of Silica in Fluorspar Concentrates Containing Quartz.
Z. Anal. Chem., **142**, 199–204 (1954).
C. A., **48**, 10489b (1954).

The simplest way is to evap. the fluorspar concentrate in a cavity on charcoal and then apply an elec. arc. An a.-c. arc proved better than a d.-c. one. It is convenient to use the Ca line for comparison. It is well to prep. a standard curve for 0.01–10% SiO_2.

4817. ROUIR, E. V.
The Problem of Standard Samples in Spectrochemistry.
Congr. groupement avancement, méthodes anal. spectrog. produits mét. 17th Congr. **1954**, 131–9.
C. A., **50**, 2352e (1956).

A discussion and review of the various types of reference standards and their prepn. The direct excitation of synthetically prepd. solns. is suggested as the most precise and economical method.

4818. ROUIR, E. V.
Direct Quantitative Spectrographic Analysis of Solutions.
Ind. chim. Belge, **19**, 1159–70 (1954).
C. A., **49**, 3719e (1955).

The advantages of the direct use of standard solns. in spectrographic analysis are shown.

4819. ROWE, E. A.
Procedure for the Spectrographic Determination of Copper, Tin, and Titanium in Iron and Steel.
Univ. Microfilms (Ann Arbor, Mich.) Pub. No. 6857, 45 pp. (microfilm, paper enlargement).
Dissertation Abstracts, **14**, 228 (1954).
C. A., **48**, 5718f (1954).

4820. ROYNETTE, A. AND BARON, J.
Alkali Analysis by Flame Spectrophotometry.
Bull. soc. franç. céram., No. **22**, 5–16 (1954); *Ceram. Abstr.*, **38**, 94 (1955); *C. A.*, **51**, 11915h (1957).
Cf. *C. A.*, **49**, 9433b.

The influence of the interfering ions Al^{+++}, Fe^{+++}, Ca^{++}, and Mg^{++} on the analysis of Na^+ and K^+ in refractory products was studied. They interfere with the precision. Accurate results can be obtained regardless of disturbing ions by controlled addns. of NH_4NO_3.

4821. ROYNETTE, A. AND BARON, J.
Determination of Alkalies by Flame Spectrophotometry.
Bull. soc. franc. céram., No. **24**, 3–14 (1954) *Publs. inst. recherches sidérurg. (St.-Germain-en-Laye), Ser. A.*, No. **94**.
C. A., **49**, 9433b (1955).

The effects of anions upon flame spectra are discussed. Results are given for the effect of various concns. of oxalate, nitrate, sulfate, and chloride upon the detn. of Na and K. The energy requirements for partial and complete ionization of both cations and anions are discussed and the supression of cation emission is related to the energies required for such ionization. Methods for detg. Na and K in SiO_2-Al_2O_3 refractories, coke, ash, and SiO_2 bricks are outlined and a comparison is given for each between the decompn. by the methods of J. Lawrence Smith and HF attack. It is concluded that the former method should be used since consistently higher results are obtained.

4822. ROZSA, J. T. AND GRONDIN, N. A.
Ultraviolet Irradiation for Air-Interrupted Spark Sources.
Anal. Chem., **26**, 2001–2 (1954).
C. A., **49**, 3582b (1955).

An app. is described for irradiating a tandem air-interrupted gap with a General Electric germicidal lamp. The irradiation technique results in increased stability. The period between resurfacing the gap electrodes is also extended.

4823. ROZSA, J. T. AND MOON, C. G.
A New Projection-Comparator Microphotometer.
J. Opt. Soc. Amer., **44**, 562–5 (1954).
C. A., **48**, 10440a (1954).

The design and performance of the "N.S.L. Spec-Reader" are described. Pertinent criteria of nonrecording densitometers are discussed, and conclusions drawn as to optimum features. The instrument provides 17-fold magnification of spectral lines, and d. measurement with a photocell whose photocurrent is amplified by the magnephot system and read by a milliammeter, in which the indicating needle has been replaced by a mirror.

4824. RUSANOV, A. K. AND ALEKSEEVA, B. M.
Horizontal Alternating-Current Arc as Spectrum Excitation Source for Ores and Minerals.
J. Anal. Chem. U.S.S.R., **9**, 203–11 (English translation) (1954).
Zhur. Anal. Khim., **9**, 183–92 (1954).
C. A., **49**, 11421h (1955).

Simultaneous evapn. of a sample from 2 C electrodes, with tips 8 mm. long and 3 mm. in diam. and with 2-mm. openings drilled into them, are used in the horizontal a.-c. arc to produce spectra of ores and minerals. The sample is dild. 1:2 to 1:5 with a mix. of 5 parts $SrSO_4$ and 8 parts spectrographically pure graphite powder. The a.-c. arc used 15 amp. and 220 v. with a 4-mm. arc gap. The sample is burned to completion. A study of the distribution of line intensities in the a.-c.-arc flame shows an increase in both arc and spark lines near the electrodes, which is common to all elements. This increase occurs independently of the ionization potential and at. wt. of the elements and of the volatility of the material. The transition from bottom to top of the flame shows a regular increase followed by a weakening of the line intensity. This follows the temp. curve for the arc. The center of the flame is 5300°K. and reaches much lower temp. near the electrodes because of an increase of neutral atoms near the electrodes. A fall in temp. on passing from the arc center to the end of the flame leads to a more rapid weakening of the CN bands. This can be effected by replacing $SrSO_4$ with Na_2CO_3 but this also reduces arc temp. Use of the d.-c. arc leads to line intensities which are uneven and are dependent on the test compn. and properties of the elements. The polarity is also manifest as there is a concn. strengthening near the cathode.

4824a. SALPETER, E. W. AND BITTERLICH, W.
Photoelectric Measurement of Exposure in Photographing Spectra.
Ricerche spettroscop. Lab. astrofis. specola vaticana, **2**, 65–89 (1954).
C. A., **48**, 13409g (1954).

The circuit described gives a meter reading proportional to $\int I dt$, where I is the intensity of the undispersed light at time t. The improved uniformity of exposure thus attained permits more accurate visual comparison of trace element concn. between similar samples.

4825. SANDERS, D. P. AND GOLDSTEIN, S. W.
Application of Flame Photometry in Assay of Ringer Solution U.S.P.
Drug Standards, **22**, 200–3 (1954).
C. A., **49**, 2028b (1955).

A flame assay procedure is given and mutual interferences are discussed.

4826. SANDUZZI, J.
A Rapid Method for Determining Sodiums and Potassiums by Flame Photometry.
Am. J. Med. Technol., **20**, 375–8 (1954).
C. A., **49**, 7035g (1955).

Master curves for both Na and K were constructed from suitable standard solns. and were used as long as the Li standard in the Janke flame photometer lasted. A calibration chart was prepd. from both these curves to simplify calcn. To det. Na, set the filter on Na, open the funnel dial, and turn on the air pressure. Select a normal Na standard, such as 0.70 meq./l. Set the balance dial on the reading the master curve shows for this value. Pour the selected standard into the funnel and, as it empties, turn the zero-adjustment dial until the galvanometer registers zero. Keep adding the standard until the zero reading is const. Leave the zero adjustment dial in this position. Add the patient's dild. serum into the funnel and turn the balance dial until the galvanometer reads zero. Record the balance dial reading and obtain the Na value from either the master curve or the calibration chart. The K value is detd. in the same way, by using the K filter, the normal K standard (0.1 meq./l), and the K master curve or calibration chart. This technique should not be employed for routine Na and K detns. but for emergencies only.

4827. SCACCIATI, G. AND D'ESTE, A.
Spectrographic Analysis of Zinc and Zinc Alloys in the Laboratory of the Società Montevecchio of Porto Marghera.
Metallurgia ital., **46**, 189–94 (1954).
C. A., **48**, 11241b (1954).

Industrial Zn products are analyzed mostly by spectrography. In this paper the methods of prepg. analytical samples and test bars, the layout of calibration lines, the particular working procedures, the sensitivity and the precision with reference to the individual cases, the time allowed for analysis, and similar consideration applying to an industrial lab. are described. A spark excitator, an arc generator, a quart spectrograph (useful from 2200 Å. to 4800 Å.), a microphotometer with 20 times magnification, and direct reading were used. For the various impurities,

the following wave lengths have been used: Pb 2833.07, Cd 2288.02, Cu 3246.54, Fe 2719.04, Ni, 3050.83, Sn 2839.99 A. A wide range of products from purest Zn (99.999%) to the various alloys for die casting, for zinc types, or for dry-cell cups have been examd. for the impurities and the main constituents.

4828. SCHARRER, K. AND JUNG, J.
Sources of Error in the Flame Photometric Determination of Calcium and Their Elimination.
Z. Pflanzenernähr. Düng. Bodenk., **67**, 240–8 (1954).
C. A., **49**, 2937a (1955).

In expts. with the flame photometric detn. of Ca, a disturbing influence mostly of PO_4^{---}, SO_4^{--}, and NO_3^- on the emissive power of Ca was found. Reproducible values could be obtained if a little of these anions was added to the standard soln. and analysis soln. Ash 2 g. of air-dried sample, take up with 10 cc. HCl (10%) and with hot distd. water. Filter into a 100-cc. flask, add 10 cc. H_3PO_4 soln. (5 mg. P/cc.), 5 cc. Na_2SO_4 soln. (4 mg. S/cc.), and 5 cc. $NaNO_3$ soln. (2 mg.N/cc.). A Zeiss flame photometer model III with the Ca filter "Zeiss 56" was used. The flame was supplied by acetylene and compressed air.

4829. SCHATZ, F. V.
The Spectrochemical Determination of Impurities in Copper and Copper Alloys by Means of a Spark-Ignited Arclike Discharge.
Spectrochim. Acta, **6**, 198–210 (1954).
C. A., **48**, 10481e (1954).

A spectrochem. method of analysis of Cu and Cu alloys with a sensitivity capable of detecting Pb, Sn, Fe, Ni, Si, Bi, and Al at 0.001%; Te, As, and P at 0.004%; and Zn at 0.01% is described. This method differs from the conventional arc analysis in that it is based on the excitation in a selected region in the vicinity of the cathode when using a triggered discharge of the Applied Research Laboratories' Multisource. If the circuit consts. of the Multisource are adjusted to give a heavily, over-damped discharge, and if the sample is made neg. a narrow region of enhanced sensitivity exists for certain elements in the vicinity of the cathode. This region has been demonstrated to be equiv. to the cathode layer in the d.-c. arc. Variations in the relative sensitivities of certain elements, as well as variations in the excitation temp. have been investigated for various points across the discharge gap. Seven observed causes for calibration-curve shifts are listed: (*1*) changes in the matrix; (*2*) changes in the length of exposure time; (*3*) changes in background intensity relative to line intensity; (*4*) changes in relative intensity of an impurity line due to the presence of other elements; (*5*) changes in relative intensity due to the effect of a change in concn. of the specific impurity line on the intensity of the matrix element line; (*6*) changes in the volatility of the brass alloy with increasing amounts of Zn; (*7*) changes due to metallurgical effects.

4830. SCHLEICHER, J. A. AND HAMBLETON, W. W.
Spectrographic Investigation of Germanium in Kansas Coal.
State Geol. Survey Kansas, Bull. **109**, 113–24 (1954).
C. A., **49**, 13038f (1955).

Spectrographic analyses with Bi as internal standard were made of the ash of 24 samples from 6 seams. The Ge content of the ash ranged from 36 to 680 p.p.m. and of the coal from 6.9 to 48 p.p.m. Ge.

4831. SCHNEIDER, R.
Flame-Photometric Determination of Calcium in Plant Ashes.
Landw. Forsch., **6**, 200–1 (1954).
C. A., **48**, 10480d (1954).

A method was developed by which the influence of P was eliminated. Ten g. of dry plant substance was ashed at 600°. To sep. silicic acid, about 5 ml. HCl (20%) was added and the mixt. was evapd. twice to dryness on a sand bath. Then it was taken up with 1 ml. concd. HCl, washed with hot water into a 200 ml. measuring flask, and dild. to the mark after cooling. After standing for 12 hrs. it was filtered and 50 ml. of the filtrate was heated with the pptg. reagent (NH_4 citrate soln.: MgO = 4:1). After repeated shaking and standing for some hrs., it was filtered and measured with a photometer. Satisfactory results were obtained in detg. Ca in hay.

4832. SCHRENK, W. G.
Factors Influencing the Applications of Flame Photometry.
Trans. Am. Assoc. Cereal Chemists, **12**, 64–71 (1954).
C. A., **48**, 6903a (1954).

The discussion covers forms of atomizers, spectral isolation, detection of radiation, interference effects, internal standard technique, and the application to analysis of various materials.

4833. SCHROLL, E.
The Geochemical Analysis of East Alpine Lead-Zinc Ores. I.
Mitt. oesterr. mineralog. Ges., Sonderheft No. **3**, 1–85 (1954).
C. A., **50**, 7015i (1956).
Cf. *C. A.*, **47**, 11083f; **49**, 785g; **50**, 4704a.

Spectrographic analyses are given of 349 sphalerites, 226 galenas, and 1 tetrahedrite, mainly of samples from the Eastern Alps. Data are given for Mn, Fe, Co, Ni, Ag, Cd, Hg, Ga, In, Tl, G, Sn, As, Sb, and Bi. The trace-element contents are correlated with types of deposits and regionally. 76 references.

4834. SCHUHKNECHT, W. AND SCHINKEL, H.
Flame Photometric Determination of Small Quantities of Potassium, Sodium, and Lithium in the Presence of Large Quantities of Alkaline Earths.
Z. anal. Chem., **143**, 321–30 (1954).
C. A., **49**, 1475i (1955).

The alk. earths interfere in detg. small quantities of K, Na, and Li by flame photometry. This interference can be prevented by the addn. of $Al(NO_3)_3$ soln. to the soln. of the sample. It seems probable that difficultv sol. alk. earth aluminates are formed by this treatment.

4835. SCHÜLER, H. AND REINEBECK, L.
Emission Spectroscopy of Organic Substances with the Aid of Electron Impact Excitation in the Glow Discharge II.
Spectrochim. Acta, **6**, 288–301 (1954).
C. A., **49**, 721d (1955).
Cf. *C. A.*, **44**, 10505h.

A survey of the results of emission spectroscopy of org. materials in the low pressure discharge is given, which shows that they do not correspond, as expected, to the transformations between highly excited states of the mols. introduced, but instead indicate the fragmentation of these mols. The fact that the elec. excitation of mols. breaks them into large fragments emerges as the main result of the spectroscopy of org. complex mols. The main problem of intepreting these spectra is that of identifying these fragments. Among the possible explanations are the appearance of complex fragments and free radicals, and the formation of new mols. from these fragments, sometimes of unexpected compn.

4836. SCHWARTZ, S.
Abundances of Metals in the Solar Chromosphere.
Astrophys. J., **119**, 296–7 (1954).
C. A., **48**, 5641g (1954).

A tabulation is presented of the relative abundances, by nos. of atoms, of Na, Mg, Al, Ca, Cr, Fe, Ni, Cu, and Sr in the sun's chromosphere as derived from recent calcns. Similar results by others are given for comparison.

4837. SEIBERT, SISTER A. M.
Principles and Techniques of the Spectrophotometer and the Flame Photometer.
Am. J. Med. Technol., **20**, 166–77 (1954).
C. A., **48**, 13792i (1954).
A review with 11 references.

4838. SEITH, W. AND DE LAFFOLIE, H.
An Electronic Timing Circuit for Spectral Analysis.
Spectrochim. Acta, **8**, 216–22 (1954).
C. A., **48**, 10477b (1954).

An electronic timing circuit is described that will automatically control all the usual operations in the recording of spectra. It also includes controls for the interrupted arc. The presparking and exposure times can be adjusted continuously in the range of 2 sec. to 8 min., and these times are reproducible with a precision of 0.3%.

4839. SERVIGNE, M. AND GUÉRIN DE MONTGAREUIL, M.
Some Results in the Determination of Elements by Flame Spectrophotometry.
Chim anal., **36**, 115–17 (1954).
C. A., **48**, 8113a (1954).

A suitable app. is described and the theory explained. The detn. of Al is given in detail, and the effect of Al on the detn. of other elements explained.

4840. SHAĬLIKOV, A. S., KAZANTSEV, G. V., AND PROSKURIN, N. V.
Opyt Raboty Spektral'noĭ Laboratorii Geologicheskogo Upravleniya (The Work of the Spectroscopic Laboratory in the Field of Geology).
Gosgeoltekhizdat, Moscow (U.S.S.R.) (1954). 28 pp., k. 55.
C. A., **50**, 16596b (1956).

4841. SHANKLIN, D. R.
Cation Analysis of Woods Hole Sea Water.
Nature, **173**, 82 (1954).
C. A., **49**, 7302h (1955).

Sea water drawn from the Woods Hole pumping system was analyzed for Na and K with the Toner-Pitts flame photometer, for Ca by the permanganate method, and for Mg by pptn. as $MgNH_4PO_4$-$6H_2O$. The respective amts. found were, in millimols., Na 534.0, K 18.2, Mg 56.2, and Ca 5.8. Conversion of these values yields a figure of 39.32 g./l. for total dry salts.

4842. SHAW, D. M.
Trace Elements in Pelitic Rocks. I. Variation During Metamorphism.
Bull. Geol. Soc. Am., **65**, 1151–66 (1954).
C. A., **49**, 3751a (1955).

Spectrographic analyses of trace elements in 63 samples from the pelitic Devonian Littleton formation of New Hampshire are presented. The samples represent all grades of metamorphism and include shale, slate, argillite, phyllite, schist, and gneiss. Detailed descriptions of the spectrographic methods used to det. the nonvolatile elements (Be, Cr, V, Mo, Ni, Co, Sc, Zr, Y, Sr, and Ba) and volatile elements (Ga, Sn, Li, Cu, Ag, and Pb) are given and the statistical treatment of the results obtained is described. The analytical results for the individual samples are grouped according to whether the rocks are the products of low-, medium-, or high-grade metamorphism. The av. concns. and standard deviations for all samples are: Ga 19, 6.3; Cr 110, 33; V 120, 39; Li 110, 104; Ni 64, 26; Co 18, 6.6; Cu 18, 18; Sc 14, 7.4; Zr 200, 73; Y 45, 20; Sr 710, 310; Pb 24, 12. In only a few samples was the amt. of Be, Mo, Sn, Ag, and La determinable; the Ba

content was almost always too high for accurate detn. In order to investigate possible compositional trends during regional metamorphism the range in compn. in the unmetamorphosed slates and shales was detd. and a considerable range in compn. was found. The concn. of most elements remained const. during the regional metamorphism but Ni and Cu show a tendency to decrease with increasing metamorphism, while Li and Pb in the high-grade rocks show increases of the order of 100% over the low-grade rocks. Differences in the trace elements compn. of the light and dark layers of 2 banded gneisses are explained on the basis of mineralogy and it is suggested that the gneisses originated through metamorphic differentiation rather than magmatic injection.

4843. SHOJI, K. AND NAKATA, S.
Rapid Determination of Potassium, Calcium, and Magnesium in Plant Material by Hydrogen-Flame Spectrophotometry.
Proc. Am. Soc. Hort. Sci., **64**, 299–306 (1954).
C. A., **49**, 10120c (1955).

The combination of Beckman Model DU spectrophotometer with a No. 9200 flame photometry attachment, No. 9240 H-O burner, and I P28 photomultiplier tube, permits satisfactory measurements of K, Ca, and Mg. K presents no problem because there is little or no interference from the cations present in plant materials. For the detn. of Ca and Mg compensating solns. had to be used. The compn. of the solns. varies with the ions likely to be present in the material. The method was applied successfully to banana, sugar cane, and macadamia nuts.

4844. SKUPÍNSKI, S., ŹIDKIEWICZ, A., AND SMOLUCHOWSKA, B.
Determination of Sodium, Potassium, and Calcium in Siliceous Materials with the Flame Photometer.
Prace Inst. Mech., **3**, No. 11, 3–8 (1954).
C. A., **49**, 5204b (1955).

Solns. of Na and K are prepd. by heating the material with NH_4Cl and $CaCO_3$, and extg. with hot water. Ca solns. are prepd. by $NaCO_3$ fusion, dissolving in dil. HCl, and pptg. Fe, Al, and Ti with NH_4OH. These solns. are atomized with compressed air, and introduced into the acetylene flame of the Zeiss flame photometer. Na, K, and Ca emit characteristic spectra, which are sepd. by a color filter, then fall on a photocell, activating a galvanometer. The deflection can be calibrated against the concn. of the element in the soln., provided all working conditions are const. Interference is caused by Fe, Ti, Mg, Al, and H_2SO_4.

4845. SMIT, C.
Quanta-Counter and Spectral-Analyzer.
Chem. Weekblad, **50**, 889–94 (1954).
C. A., **49**, 5970i (1955).
Cf. *C. A.*, **47**, 3121i; **48**, 8032d.

Two new instruments for direct spectrometry are described. In the quanta-counter the number of photons falling upon the indicating phototube per unit time is compared to those falling upon the reference tube. In the spectral-analyzer, the current from the photomultiplier tube actuates a servomotor which in turn controls the setting of an optical wedge. This instrument is of null point design; the quanta-counter in contrast, makes use of separate counters for reference and element lines. The optical and elec. design of both instruments is shown in schematic form. The performance of the spectral-analyzer in the detn of Cu with Ag as a reference element is briefly outlined.

4846. SMIT, J. A., MILATZ, J. M. W., AND SMIT, C.
An Integrating Spectrometer for Measuring Spectral Intensities by the Counting of Photoelectrons.
Physica, **20**, 39–40 (in English) (1954).
C. A., **48**, 8032d (1954).

A brief description of the app. is given.

4847. SOBOTKA, J.
Aurostibite, $AuSb_2$, in the Ore Veins of Krasna Hora and Milešov. First Macroscopical Occurrence.
Rozpravy česk. Akad. věd., **64**, No. 7, 43–60 (1954).
C. A., **49**, 2955c (1955).

Chem. and spectrographic analyses and optical and X-ray powder data are given. For synthetic $AuSb_2$, $a_0 = 6.656 \pm 0.002$ Å., for aurostibite, $a_0 = 6.660 \pm 0.002$ Å. Assocd. minerals include Sb, stibnite, pyrite, arsenopyrite, chalcopyrite, quartz and calcite. Where Au is present, it is older than aurostibite (difference from the Canadian occurrences).

4848. SPECHT, A. W., SMITH, P. F., AND RESNICKY, J. W.
Simultaneous Spectrographic Procedure and Its Evaluation for Analysis of Plant Materials.
Congr. intern. botan., 8e Congr., Paris 1954, Colloq. analyses plantes et problèmes engrais minéraux, 68–77 (in English).
C. A., **50**, 16007e (1956).

The spectrochem. method used at the Plant Industry Station, Beltsville, Md., gives trends comparable to those given by rapid chem. methods for P, Mg, and Ca. Trace elements can be detd. at the same time. A high degree of correlation for the "among treatments" relation exists between the two methods.

4849. SPITZ, E. W., SIMMLER, J. R., FIELD, B. D., ROBERTS, K. H., AND TUTHILL, S. M.
Spectrographic Determination of Certain Rare Earths in Stainless Steels.

Anal. Chem., **26**, 304–7 (1954).
C. A., **48**, 7487a (1954).

Rare earths added to stainless steels can be detd. by electrochem. and chem. sepns. followed by spectrographic analysis. Electrolytic sepn. with a Hg cathode removes the major interfering components, and the rare earths remaining in soln. are concd. by pptn. with NH_4OH, with Fe^{+++} as a carrier. The combined hydroxides are dissolved in HCl and the rare earths detd. spectrographically with U as internal standard and NaCl as the buffer. As little as 50 γ of total rare earths can be detd. in a 1-g. sample, and further modifications should make it possible to det. 0.0005% total rare earths.

4850. STALLWOOD, B. J.
Air-Cooled Electrodes for the Spectrochemical Analysis of Powders.
J. Opt. Soc. Amer., **44**, 171–6 (1945).
C. A., **48**, 4257e (1954).

A controlled source of excitation has been developed to eliminate selective volatilization and element interference effects encountered in the spectrochem. analysis of powders with the d.-c. arc. A circular air jet, concentric with the sample electrode, was used to cool the unburned portion of the sample throughout the exposure and to stabilize the arc by surrounding it with a directed current of air. The effectiveness of the air jet was increased by placing the samples in deep narrow craters drilled in high-purity graphite electrodes. Uniform volatilization of even the volatile constituents was achieved, and the spectral sensitivity of the elements was made relatively independent of the sample matrix. A max. deviation from the mean of less than a factor of 2 was obtained for the sensitivity of any element when detd. in a no. of matrix materials including graphite, SiO_2, NaCl, Al, and Zn. A significant improvement was made in the linearity of the intensity-concn. curves.

4851. STEYN, J. G. D.
Spectrographic and X-Ray Data on Some Fluorites From the Transvaal, South Africa.
Mineralog. Mag., **30**, 327–32 (1954).
C. A., **48**, 6327a (1954).

The common minor elements in fluorite are Fe, Mg, Sr, Cu, Al, Mn, Si, Sb, and some of the rare earths. Be, Pb, Na, P, and Ba are rare in fluorite. Elements not detected in any fluorite, are Mo, In, Ga, Cd, Li, K, Rb, Cs, Bi, Hg, V, Zn, Co, Ni, Cr, Ti, As, Zr, Nb, Pt, Os, U, W, Th, Ge, Te, B, Pr, Er, Sm, and Sn. Although a large no. of minor elements were detected, substitutions showing an increase in the size of the cube edge of at least 0.0055 A. were noted in only 3 samples, all very dark purple in color and contg. considerable Sr.

4852. STONE, H.
Effects of Inert Atmospheres on Emission Spectra in the Interrupted Arc.
J. Opt. Soc. Amer., **44**, 411–13 (1954).
C. A., **48**, 8040c (1954).

The spectra of several elements produced in the interrupted arc in He, He-O mixts., A, and air were compared. The differences observed in the spectra were not uniform, but varied according to the ionization states of the spectral lines, those lines requiring large energies for excitation being more intense in a rare gas atm. than in air, and those lines requiring small energies for excitation being more intense in air than in rare gas. With the interrupted arc, the use of rare-gas atm. cannot lead, except in isolated cases, to an improvement in the sensitivity of emission spectrographic analysis.

4853. STONEHOUSE, H. B.
An Association of Trace Elements and Mineralization at Sudbury.
Am. Mineralogist, **39**, 452–74 (1954).
C. A., **49**, 13844f (1955).

The Ti, Mn, Ni, V, Co, and Ga concns. in 330 samples of norite taken adjacent to mineralized areas in the Sudbury basin, have been detd. spectrographically. Assocd. with the mineralization which produced the ore bodies there is a relative concn. of Ti, V, Mn, Ni, and Cr adjacent to the mineralized zone, which decreases as the distance from the zone increases. There is a slight peak concn. in the case of Ti and V away from the mineralized zone, but over-all along the traverse the concn. of these two elements decreases. Ga is depleted close to the mineralized zone and cond. further away. The Co content of the rock appears to be unaffected with relation to the mineralized zone. Cu concn. is erratic, probably owing to chalcoypyrite disseminated throughout the rock. The distribution of the Mn and Ni and the constancy of the Ti to V ratio show that there has been no significant differentiation of those portions of the norite covered by this sampling.

4854. STRASHEIM, A. AND NELL, J. P.
Flame Photometric Determination of Calcium in Plant and Biological Materials.
J. S. African Chem. Inst., **7**, 79–89 (1954).
C. A., **49**, 11758c (1955).
Cf. *C. A.*, **48**, 6839f.

The accuracy of the detn. of Ca in plant and biol. materials by the flame photometer has been investigated and results indicated that (*1*) values for Ca from the internal standard flame photometric values could be repeated within ±1%; (*2*) those obtained from direct flame photometric values could be repeated within ±2%; (*3*) the internal standard flame photometric values agreed with chem. values to within ±2%; and (*4*) the direct flame photometric values did not agree too well with chem. values. Interferences

which limit the accuracy of this analysis included: air and acetylene pressures, anionic interference from the addn. of acids in the digesting procedure, and the presence of Ba, Zn, Fe, Mg, Al, Na, K, and P. These have been discussed in detail. To overcome the suppressing action of P for Ca contents in the range of 0–20 p.p.m., it was found best to add excess P to all samples and standard solns. to make the P/Ca concn. ratios equal or greater than 2. The abs. sensitivity of the method was found to be ±0.25 p.p.m. Ca, but it was found best not to det. Ca concns. lower than 2 p.p.m. in the final analytical solns.

4855. STRICKLAND, R. D. AND MALONEY, C. M.
Indirect Method for Determination of Serum Inorganic Sulfate by Flame Spectrophotometry.
Tech. Bull. Registry Med. Technologists, **24**, 190–2 (1954).
Am. J. Clin. Pathol. **24**, 1100–2 (1954).
C. A., **49**, 417d (1955).

The procedure is based upon pptn. of the sulfate as the Ba salt by the addn. of a known amt. of Ba, and subsequent flame spectrophotometric detn. of the residual Ba.

4856. STROCK, L. W.
Some Experimental Evidence of Collision Processes in Spectrochemical Analysis.
Appl. Spectroscopy, **8**, 105–14 (1954).
C. A., **49**, 770g (1955).

Synthetic silicate melts of $CaSiO_3$ and $CaMg(SiO_3)_2$ and 20 intermediate mixts. were used as standards for calibrating a spectrochem. analysis method for CaO and MgO by Ge metal diln. method previously described (*C. A.*, **47**, 11068g). The slope of log *RET:* log *C* curves showed large departures from unity, as follows: 0.82, 0.73, 0.62, and 0.24, resp. for Mg I 2779, Mg I 2776, Mg II 2795, and Mg II 2798 A. Curves for all Si lines showed slopes greater than unity: 1.27, 1.8, 4.22, and 6.39, resp., for Si I 2528, Si I 2987, Si I 2881, and Si I 2631 A. These results had earlier been interpreted as evidence for the effect of collisions of the second kind on intensity of light radiated by a d.-c. arc source, whereby Mg and Si atoms collide and excitation energy is transferred from Mg to Si. Si intensity is enhanced and Mg weakened as the population of Mg atoms increases in the arc. The exptl. log *RET:* log *C* curves are presented for the series of diopside:pseudo wollastonite standards. The only variable in the standards is the MgO/CaO ratio. The amts. of these 2 substances vary such that their sum remains approx. const. The Ge matrix and atm. are const. and SiO_2 content is nearly so. Since the slopes of the Ca line curves are nearly unity, Mg and Si atoms are thought to be involved in the energy exchanging collisions.

4857. SUMIN, N. G.
Materials for the Geochemistry of Borates.
Trudy Mineralog. Muzeya, Akad. Nauk S.S.S.R., **1954**, No. **6**, 152–8.
C. A., **51**, 4220g (1957).

Qual. spectral analyses are given for many samples of sussexite, ludwigite, pinakiolite, fluoborite, eremeyevite, rhodizite, howlite, hambergite, boracite, lagonite, szaibelyite, bakerite, larderellite, colemanite, priceite, inyoite, kaliborite, borax, kernite, ulexite, hydroboracite, and probertite. Precipitants of borate may be not only Mg, Ca, and Fe, but also Ti, Al, and Si. Ti is particularly widely distributed among borates. B is largely assocd. with volcanic action. Ti-bearing minerals, present in the region of borate mineralization, are stable, insol., and resist weathering, which accounts for the relatively low concn. of Ti in the borate minerals.

4858. SVEJDA, H.
Forms of Electrodes and Their Application in Emission Spectral Analysis.
Österr. Chem.-Ztg., **55**, 117–27 (1954).
C. A., **48**, 11907a (1954).

Review with 74 references.

4859. SYRKINA, P. E.
Spectrographic Determination of Silicon in the Blood.
Gigiena i Sanit., **1954**, No. **6**, 45–7.
C. A., **48**, 11531h (1954).

A detn. of blood Si, giving results within 10% is described. This employs the 2516.1- and 2881.5-Å. lines of Si; the upper electrode is solid Cu, the lower one is a thin Cu tube through which is fed the test soln. by means of a capillary tube and under slight pressure The background of Fe lines is produced by solns. of $K_3Fe(CN)_6$ which is used for the accurate location of Si lines. The actual method depends on the formation of Si spectrum on excitation of specimen in a condensed spark with an Fe spectrum background. The calibration curve is prepd. from pure $K_2SiO_3O.H_2O$.

4860. TAKAHASHI, T. AND YOSHIDA, D.
Flame-Photometric Determination of Calcium.
Japan Analyst, **3**, 207–11 (1954).
C. A., **49**, 4445h (1955).

The effects of cations, org. and inorg. acids, alcs., and phosphoric acids to the flame-photometric detn. of Ca were studied. The sensitivity of Dr. Lange's photometer (model 3) was improved by using a highly sensitive photocell and a multiflex galvanometer. Interference of PO_4^{3-} was eliminated by adding H_2SO_4 to the sample soln. The method was applied to the detn. of Ca in tobacco leaves with good accuracy. The rapid method proposed is as follows: grind the dry leaves to pass 0.5-mm. mesh, then treat the weighed sample (1 g.) with 100 ml. *N* H_2SO_4 for 1 hr.

with intermittent shaking. Det. the Ca in the filtrate by flame photometry.

4861. TAKEI, T.
Spectrographic Determination of Small Amounts of Silicon and Tin in Iron and Steel by the Intermittent Arc Method.
Nippon Kinzoku Gakkaishi, **18**, 582–3 (1954).
C. A., **52**, 9862a (1958).

The Pfeilsticker intermittent arc app. was modified by incorporating small glass bobbins and by using a higher sparking voltage (Cf. Pfeilsticker, *Z. Elektrochem.*, **43**, 719 (1937)) to det. 0.008–0.163% Si and 0.010–0.145% Sn with standard deviations of ±0.0131 Si and ± 0.0038% Sn.

4862. TAKUBO, J. AND TATEKAWA, M.
Distribution of Minor Elements in Pegmatites and Granites from Oku-Tango District, Kyoto Prefecture, Japan. I. Distribution of Barium and Strontium.
Kobutsugaku Zasshi, **1**, 301–14 (1954).
C. A., **51**, 157f (1957).

Distribution of Ba and Sr in granites, purified K-feldspars, and purified biotites in granites was tested by spectroscopic analysis. The Ba content in K-feldspar from pegmatite is lower than that from granite, and the Sr content is equal in the minerals from pegmatite and granite, Ba content in biotite from pegmatite is lower than in that from granite, and a small amt. of Sr is observed in both biotites. The distribution of the two minor elements is discussed.

4863. TARNOVSKIĬ, G. N.
Polychromic Tourmaline from Pegmatite Veins of Borshchovochnyĭ Ridge (Eastern Transbaikalia).
Trudy Mineralog. Muzeya, Akad. Nauk S.S.S.R., **1954**, No. 6, 158–64.
C. A., **51**, 4223b (1957).

A large (1-kg.) crystal of polychromic tourmaline was examd. crystallographically. Its chem. compn. was detd. by spectrum analysis. Al and Si lines are very strong, Mn, Li, and Fe are strong, Ca and Ga are less strong, Na, Mg, Be, Sn, and Pb are weak, Zn and Sr are present in trace concns.

4864. TASAKA, S., YOSHITOSHI, Y., KITAMURA, I., ENDO, Y., MAEDA, T., NAGASAKA, M., FUKUSHIMA, H., MASUYAMA, Y., AND TAKAHASHI, M.
Experiments on the Flame-Photometric Determination of Electrolytes in Blood Plasma and Urine.
Sogo Igaku, **11**, 129–34 (1954).
C. A., **51**, 13986c (1957).

Fundamental techniques for detg. Na and K in blood plasma or urine were introduced. It is suggested that the compn. or viscosity of the sample to be tested are important factors, and it is valuable to prep. the most suitable standard solns. according to the variation of the above factors.

4865. TATEKAWA, M.
Spectrographic Distribution of Minor Elements in the Quartz and Feldspars Contained in Granites and Pegmatites of Oku-Tango District, Kyoto Prefecture.
Mem. Coll. Sci., Univ. Kyoto, Ser. B, **21**, 183–92 (in English) (1954).
C. A., **49**, 13030c (1955).

Spectrographic analyses in terms of relative intensities are given for quartz (14 from granites (I), 12 from pegmatites (II)), K feldspar (12 from I, 10 from II), and plagioclase (6 from I). In quartz, Ti, Al, Mg, and Na are higher in samples from I, and Sn about the same in samples from I or II. K feldspars from I contain more Ba, Mn, and Mg, but less Pb, Sn, and V than those from II. Sr, Mn, Mg, and Sn are concd. in the plagioclases.

4866. THOMSON, S. J. AND WARDLE, G.
Diffusion of Helium in Sodium Chloride.
Trans. Faraday Soc., **50**, 1051–6 (1954).
C. A., **49**, 5914b (1955).

The diffusion of He from natural NaCl crystals was studied in air at 25° and in vacuum between 96° and 147°. Spectrographic analysis of NaCl gave the following results in % by wt.: K 0.05, Pb 0.0001, Ca 0.001, Cu 0.00005, Mg 0.005, Fe 0.0005, Si trace, Mn 0.0002, Ni 0.0001, Ag 0.001, Al trace.

4867. TODD, H. E. AND TRAMUTT, H. M.
Flame Photometric Determination of Rubber Solids Deposited on Cords and Fabrics.
Anal. Chem., **26**, 1137–40 (1954).
C. A., **49**, 15275i (1955).

The best way to obtain and control consistently good adhesion is by detg. % latex solids picked up (% SPU). The flame photometric method has wider application to all types of fibers than do previously employed mech. and chem. methods. After digestion of the dried latex, treated cord, and untreated cord by HNO_3, the Na contents are detd. by means of a Beckman DU flame photometer at 589 mμ. SPU is calcd. as follows: SPU (%) $= 100(P - C)/(R - C)$, where P, C, and R are p.p.m. of Na in treated cord, raw cord, and latex, resp.

4868. TOMKINS, F. S. AND FRED, M.
The Argonne Thirty-Foot Spectrograph.
Spectrochim. Acta, **6**, 139–43 (1954).
C. A., **48**, 4979i (1954).

The new Argonne spectroscopy lab. includes a 30-ft. Paschen-Runge mounting, utilizing either photographic plates or photocells. Construction details are presented of noteworthy items, e. g., the interchangeable fixed slits, grating holders, and source optical

benches. For photoelec. detection the exit slit assembly is pulled along the continuous plate rail by a selsyn drive. Optimum masking of the grating was established by scanning Hg^{198} lines. Typical spectra are reproduced.

4869. TÖRÖK, T. AND WESZPRÉMY, B.
Film Cassette for Spectrographs.
Spectrochimica Acta, **6**, 235 (1954).

Film adapters for the plate holders of Zeiss Qu24 and Hilger Littrow E 478 spectrographs are described. These are provided with a perforated backing-strip for the film, through which suction is applied so that the films are pressed against a surface accurately matched to the focal plane of the instrument. The whole width of the film can be used, and lengths up to 20 m can be inserted.

4870. TRICHÉ, H. AND SALFATI, P.
The Emission Mechanism in a Tesla Spark.
Compt. rendus, **238**, 1654–6 (1954).
C. A., **48**, 10422g (1954).

A Tesla coil discharge between Fe or W electrodes, in circulating and noncirculating gases such as H, O, N, NO, and air, was found to depend on the nature of the gas as well as on the kind of electrodes and the characteristics of the discharge circuit. The intensities of the electrode lines varied both with the efficiency of the gaseous ions in pulverizing the electrode material and with the specific coeff. of ionization of the gas. The higher the specific coeffs., the more rapid was the sputtering of the electrodes.

4871. UCHASTKINA, Z. V.
The Spectral Analysis of Paper.
Bumazh. Prom., **29**, No. 7, 10–11 (1954).
C. A., **48**, 14199i (1954).

Emission spectrum analysis (Hilger Quartz Spectrograph) of 50 paper samples from a variety of sources gave the following results (element, % of samples contg. the element, and min. and max. amts. in g./ton of paper, are given): Si, 100%, 500 to 16,800; Al, 100%, 324 to 16,800; Mg, 100%, 50 to 16,800; Ca, 100%, 34 to 16,450; Fe, 100%, 5 to 2,000; Mn, 100%, 0.5 to 2,660; Ti, 100%, 0.7 to 1000; Cu, 100%, 0.5 to 400; Pb, 96%, 0.94 to 200; Na, 92%, 7.0 to 1,129; Ba, 92%, 1.5 to 1,129; Sn, 92%, 0.05 to 4.00; Ag, 70%, 0.05 to 4.0; Zr, 60%, 1.65 to 16.84; Zn, 54%, 5.0 to 165; Ni, 54%, 0.05 to 40; P, 44%, 50 to 404; Ga, 42%, 2.8 to 14; Cr, 36%, 0.5 to 93; V, 33%, 0.3 to 10; Y, 20%, 0.47 to 17; Sr, 20%, 1.28 to 32; Bi, 12%, 0.35 to 1.4; Co, 4%, 0.17 to 0.2; As, 4%, 2.7 and 9.6; W, 2%, 16.8; Si, 2%, 3.7; and Li, 2%, 28.8.

4872. VALLEE, B. L.
Simultaneous Determination of Sodium, Potassium, Calcium, Magnesium, and Strontium by a Multichannel Flame Spectrometer.
Nature, **174**, 1050–1 (1954).
C. A., **49**, 5204d (1955).

Na, K, Ca, Mg, and Sr are detd. simultaneously through use of a flame spectrophotometer fitted with a grating monochrometer and entrance and exit slits of 0.4 mm. width. The exit slits, which coincide with the more prominent lines of these elements (with Ca as CaO), are fitted with photomultiplier tubes and microammeters. The interference of these elements with each other is due to the superposition of their monochromatic emission upon heterochromatic back-ground radiation. By moving the photomultiplier tube it is possible to correct for this background radiation to obtain results correct to 1–3%.

4873. VANSCHOUBROEK, F. AND OYAERT, W.
Study of a Flame Photometric Method for the Determination of the Inorganic Constituents of Milk.
Zootechnia, **3**, 326–37 (1954).
C. A., **49**, 14216a (1955).

The optimal conditions for the prepn. of milk samples were studied. In samples directly atomized, a diln. of 1 part milk and 14 parts distd. H_2O gave the highest values for Na, K, and Ca. A fat content of 23, 43, 53, and 63% had no effect in the detn. of these elements. Considerable loss of K which increases inconsistently with a rise of temp. occurs during ashing above 400°. The amt. of K found decreased when HNO_3 ashing was increased, while the Na was unaffected. Addn. of HNO_3 decreased the Ca to a const. value. There was no mutual interference of Ca, Na, and P upon K; or Na and K upon Ca; P upon Na; Mg upon K, Na, and Ca; a neg. effect was observed with P upon Ca and a pos. effect with K upon Na and Ca upon Na. The following ashing procedure was adopted. Dry 10 ml. of milk for 24 hr. at 100° and heat the residue 24 hr. in an elec. furnace. Digest the ash with 10 ml. of 10% HNO_3 for 4 hr. and then dil. to 100 ml. Atomize this soln. into the flame and compare the galvanometer readings with those obtained from a series of standard solns. made in 1% HNO_3 from K oxalate, NaCl, and $CaCO_3$. Ca and K salts were added to the Na standard, and a P salt was added to the Ca standard.

4874. VINNICHENKO, E. N., ZAĬDEL, A. N., AND KALITEEVSKIĬ, N. I.
Spectroscopic Determination of Lanthanum by the Method of Homologous Lines.
Vestnik Leningrad. Univ. 9, No. 11, Ser. Mat., Fiz. i Khim., No. **4**, 119–25 (1954).
C. A., **50**, 6250d (1956).

Emission spectra were produced by spark excitation of $LaCl_3$ samples (small aliquots of aq. solutions evapd. to dryness) contg. Y as internal standard, between Cu electrodes. The blackenings on photographic plates due to the homologous lines of La (3794.8 Å.), and Y (3774.3 Å.) were measured densito-

metrically, yielding the values S_n and $S_{ref.}$, resp. For a series of La solns., with concns. $C_1 = c_0 + c_1$, $C_2 = c_0 + c_2$, . . . $C_n = c_0 + c_n$, the corresponding quantities $\Delta S_1 = S_1 - S_{ref.}$, $\Delta S_2 = S_2 - S_{ref.}$, . . . $\Delta S_n = S_n - S_{ref.}$ were plotted *vs.* c_1, c_2, . . . c_n. Extrapolation to ΔS_0 yielded c_0', as the first approximation of the sought for (gravimetrically detd.) concn. c_0. A total of 8 approximations (plots of ΔS_n *vs.* $c_n + c_0'$, $c_n + c_0''$, etc., extrapolated to ΔS_0) were needed to cause the point $\Delta S_0, c_0$ to fall on the straight line $\Delta S_n = f$ (log $[c_n + c_0^{viii}]$). The quantity log S_n/S_{ref} could be used instead of ΔS_n. Analyses for La were within 6–11% of the gravimetric detns. within the concn. range $7.1 \times 10^{-4} - 1.00\%$.

4875. VIOQUE, A. AND POHL, F. A.
Determination of Trace Elements in Pickled Olives and Their Brine.
Grasas y aceites (Seville, Spain), **5**, 111–14 (1954).
C. A., **49**, 8522f (1955).

Methods are given for a spectrographic detn. of trace elements. The averages in p.p.m. on a dry basis found for olives and brine, resp., were Al 0.7, 0.4; Cd 0.08; 0.08; Cu 9.5, 6.2; Fe 9.0, 5.6; Mn 1.2, 1.0; Zn 7.8, 8.6.

4876. WADIA, B. H. AND MANRIQUE, E.
Determination of Impurities in Some Refined Metals by Emission Spectroscopy.
Bol. soc. quím. Peru, **20**, 5–16 (1954).
C. A., **49**, 93g (1955).

Samples of refined Ag, Bi, Cu, Pd, and Zn are examined for impurities by burning solutions of the metals for 90 sec. in a 12 amp. arc between purified carbon electrodes, and photographing the spectra with a large Littrow quartz spectrograph. Quantitative determinations are made by visual comparison of the impurity lines with their intensities in synthetic standard solutions recorded in the same manner. Analysis lines are listed for Ni, Ag, Zn, Cu, Cd, Bi, Pb, Tl, Sb, Mn, Fe, and Te. In 1952 more than 52,000 determinations of impurities in 12,600 samples were made in the laboratory of the Cerro de Pasco Corporation at a cost of 2.5 man-hours per sample.

4877. WARING, C. L. AND TUCKER, W. P.
Effect of Ashing Temperature on the Volatility of Germanium in Low-Rank Coal Samples.
Anal. Chem., **26**, 1198–9 (1954).
C. A., **48**, 12390 (1954).

Three coal samples contg. approx. 1, 0.6, and 0.01% Ge in the ash were subjected to 4 heating procedures: gradual heating to 1000°; rapid heating to 800°; rapid heating in wide Pt dishes (large surface exposed to the air); and rapid heating in J. L. Smith crucibles (small surface area). Spectrographic detn. of Ge in the ash indicated no detectable loss of Ge under any of the above conditions.

4878. WARK, W. J.
Spectrographic Analysis of Minor Elements Extracted from Plants and Soils as Dithizonates.
Anal. Chem., **26**, 203–5 (1954).
C. A., **48**, 5718i (1954).

To det. Cu, Co, and Zn, soil and plant ash samples are first fused with Na_2CO_3. The acid soln. of the melt is adjusted to pH 8.3 in the presence of citrate and extd. with a $CHCl_3$ soln. of dithizone. The $CHCl_3$ soln. of metal dithizonates is evapd. to dryness, the residue is taken up in $CHCl_3$, and the soln. is again evapd. to dryness, this time in the presence of very pure, fine-grained graphite. The graphite collector is ignited in a muffle at 450° for 15 min., mixed with Li_2CO_3, and transferred to the crater of a graphite electrode for spectrographic examn. Li has been found the best internal standard.

4879. WEEKS, A. D. AND THOMPSON, M. E.
Identification and Occurrence of Uranium and Vanadium Minerals from the Colorado Plateaus.
U. S. Geol. Survey Bull., **1009-B**, 13–62 (1954).
C. A., **49**, 4464i (1955).

The report is designed for use of field geologists and others, and contains mineralogical identifications and field tests for 29 U and 19 V minerals in the ores of the area. The former includes oxides, carbonates, sulfates, phosphates, arsenates, vanadates, and silicates, while the latter includes oxides, vanadates, and silicates. The descriptive material includes phys. properties, X-ray data, some chem. and spectrographic analyses, as well as a list of mine locations from which the minerals have been identified.

4880. WEILL, A. R.
Analysis of Copper and Lead Fragments from the Roman Wreck, Called Grand-Conglue.
Rev. Mét., **51**, 459–66 (1954).
C. A., **49**, 2795g (1955).

Various corroded Cu nails and Pb fragments found in a wreck from a 300-B.C. vessel in the Bay of Marseille were analyzed spectrographically and by X-ray diffraction. The Cu nails seemed to be made from an ore from Cyprus. The purity of the uncorroded nails was found to be 99.5%.

4881. WILKINSON, P. R., GIBSON, J. A., JR. AND HEADLEE, A. J. W.
Spectrochemical Study of Gravimetric Procedure for Barium, Strontium, and Calcium.
Anal. Chem., **26**, 767–9 (1954).
C. A., **48**, 8692d (1954).

Material balance studies by spectrochem. analyses were used for detg. the merits of the concd. HNO_3 method for sepg. Ca and Ba and Sr and of the chromate method for sepg.

Ba from Sr. The sepn. and detn. of Ba are accurate within the limits of accuracy for routine analyses. However, this accuracy is due to a compensation of errors since the impurities present in the ppt. are nearly equal to the losses due to the soly. of the Ba compds. Double pptn. of $BaCrO_4$ produces a copptn. error much less than that of single pptn. and losses due to soly. are negligible if the vol. of soln. is kept at a min. Sr copptn. increases with increasing Sr concn. Sepn. of Ca from Ba and Sr is incomplete. The Sr content of the $BaCrO_4$ and CaC_2O_4 represents a loss of 6–11% of the total Sr present. Gravimetric analyses for Sr are erratic because of the Sr lost in the sepns. A comparison of gravimetric and material balance values shows that the latter are in better agreement with the theoretical and differ from it by not more than 0.4% except in the Sr data. Gravimetric results can thus be corrected spectrochemically to give nearly theoretical percentages.

4882. WILLIAMS, J. P. AND ADAMS, P. B.
Flame Spectrophotometric Analysis of Glasses and Ores. I. Lithium, Sodium, Potassium, Rubidium, and Cesium.
J. Am. Ceram. Soc., **37**, 306–11 (1954).
C. A., **49**, 4447g (1955).

The alkali elements were rapidly detd. without making chem. sepns. in a wide range of glass and feldspar ore compns. Flame photometer response to Li, Na, and K is little affected by the presence of most of the glass constituents in concn. ranges commonly found in com. glasses. The mean deviation in abs. percent between chem. and flame photometer analyses for 29 glass and ore samples is approx. 0.15%. Evaluation of the Rb and Cs results was not possible since chem. analyses for these elements were not available.

4883. WILLIAMS, S. E., MEHARRY, M. R., MASLEN, V. W., AND FALCONER, R. L.
Measurement of Spark Spectrum Intensities in the Vacuum Ultraviolet with the Fluorescence-Sensitized Photomultiplier.
J. Opt. Soc. Amer., **44**, 654–8 (1954).
C. A., **48**, 11907c (1954).

The fluorescence-sensitized photomultiplier has been combined with a peak-reading pulse voltmeter to record intensities from a source of the Lyman continuum operated at a repetition frequency of about 2 cycles/sec. Intensities can be measured on a linear scale to within a few percent. The variation of intensity with time during the 100 microsec. following the pulse discharge has also been examd. by using Na salicylate and Ca tungstate as fluorescent materials.

4884. WINER, A. D. AND ERNST, K. F.
Flame Photometry in the Clinical Laboratory.
U. S. Armed Force Med. J., **5**, 823–30 (1954).
C. A., **48**, 8850f (1954).

Methods for detg. Na, K, and Ca are described. 19 references.

4885. WRIGHT, H. D., BIELER, B. H., SHULHOF, W. P., AND EMERSON, D. O.
Mineralogy of Uranium-Bearing Deposits in Boulder Batholith, Montana.
U. S. Atomic Energy Comm., **RME-3095**, 80 pp. (1954).
C. A., **49**, 3745e (1955).
Cf. *C.A.*, **49**, 1495f.

Rock alteration assocd. with the siliceous reef deposits is characteristic of moderately low-temp. veins in granite rocks. The distribution of strong silicic and sericitic development, kaolinite, and montmorillonite is similar to that described for many other districts. The abundance of open space filling in veins and vugs suggests a rather low-pressure environment fairly near the surface. The rock alteration and vein mineralogy appear similar in siliceous reefs and base-metal deposits. Autoradiographs and β-γ counts of variously colored silicas in intricately brecciated and veined structures show a definite tendency for U concn. in the dark gray and black silica. Semiquant. spectrographic analysis shows no tendency for concn. of Al, Fe, Ca, Mg, Au, B, Ba, Be, Cs, Ga, Ge, K, P, Pt, Sb, Sr, Th, W, and Zr in any one color variety. There is a definite tendency for concn. of Ag, As, Co, Cu, Mn, Mo, Ni, Pb, and Sn in the dark Silicas which also contain the most U. The similarity of chalcedony assocd. with U in base-metal and siliceous reefs suggests contemporaneous deposition in both.

4886. YOSHINAGA, H.
Apparatus for Quantitative Spectroscopic Analyses.
Japan. Patent 7974, Dec. 4, 1954.
C. A., **50**, 7522e (1956).

4887. YOSHINAGA, H., FUJITA, S., AND MINAMI, S.
Quantitative Analysis of Steel and Iron with the Quantometer.
Technol. Repts. Osaka Univ, **4**, Nos. 93–109, 21–31 (1954).
C. A., **49**, 6776f (1955).
Cf. Yoshinaga, *et al.*, *C. A.*, **47**, 7830i.

Si, Mn, Cu, Ni, Cr, Ti, Al, Mo, As, Sn, C, and P in steel samples and Mg in Fe samples were detd. with the quantometer constructed by the authors. C in steel can be analyzed within a concn. range of 0.1–1% if Ni, Cr, and W are absent. Analysis of P in steel was indicated to be possible unless C is present. Mg in nodular Fe can be detd. by using the mean value of irregular readings for pin-type samples. Reproducibility was satisfactory for short periods but less reliable for long term analysis because of the spark source. This method of analysis was shown to be speedy and accurate as compared with the photographic method.

4888. YOSHINAGA, H., FUJITA, S., AND MINAMI, S.
Rapid Determination of Carbon in Steel with a Quantometer.
Nippon-Kinzoku-Gakkai-Shi (J. Japan Inst. Metals), **18**, 354–7 (1954).
C. A., **50**, 12746g (1956).

C in some steel was analyzed with a homemade quantometer. The error of photometry with this instrument was as small as ±0.4%. A Feussner's spark generator was used to excite the samples, and the spectral line of the C used in analysis was C III, 2297.59 Å.; which was measured together with the line Fe I, 2297.8 Å. In a short-term analysis, the percentage standard deviation of analysis for the samples (concn. 1 ~ 0.1%) was about 2% and for the samples of low C (concn. 0.1 ~ 0.05%) it was about 4 ~ 6%. In a long-term analysis (as in the case of routine work) the deviation increased to about 10%. A method of analysis for the sample contg. Ni and Cr is explained. Weak lines of these elements overlapped the C line and it was impossible to sep. them. The quantometer was found practically useful for rapid detn. of C in some kinds of steel.

4889. YOUNG, A. W.
Spectroscopy for Copper Alloys.
Steel, **134**, No. 24, 112–13 (1954).
C. A., **48**, 8696g (1954).

Description is given of equipment and procedure for rapid detn. of 14 elements in Cu and Cu alloys.

4890. YOUNG, L. G., BERRIMAN, J. M., AND SPREADBOROUGH, B. E. J.
Spectrographic Analysis of Brass and Other Materials by the Porous-Cup Method.
Analyst, **79**, 551–61 (1954).
C. A., **49**, 97i (1955).

A method of spectrographic analysis by spark excitation of a soln. has been applied to the detn. of major constituents in alloys. Details are given of the app. and procedure for detg. Zn in brass. Numerous exptl. results are given. In detg. 36% Zn, the results varied from 35.3 to 37.3%.

4891. YOUNG, L. G., SPREADBOROUGH, B. E. J., AND REID, P. M.
Tables of the Arc and Spark Spectra of Graphite in Air Observed at Medium Dispersion.
Spectrochim. Acta, **6**, 144–52 (1954).
C. A., **48**, 4967b (1954).

A disadvantage in spectrochem. analysis with the porous C cup technique was the lack of complete information regarding the identity of mol. bands and at. spectral lines due to the electrode and the atm. Tables of interfering bands or lines have been prepd. from arc and spark discharges between graphite electrodes photographed with a Hilger medium spectrograph. One table presents the wavelengths (2296.89 to 4737.1 Å.) of 57 band heads and 6 at. lines observed in a graphite arc. The bands are identified with C_2, CN, NH, or OH, and the lines with C I, C II, and C III. A second table contains the wavelengths and origins of nearly 200 at. lines observed in the graphite spark spectrum between 2145.27 and 8235.41 Å. The lines are ascribed to successive spectra of C, N, and O.

4892. ZEEMAN, P. B.
Notes on Electrode Preparation.
Spectrochim. Acta, **6**, 334–7 (1954).
C. A., **49**, 670c (1955).

In quant. spectrographic analyses it is essential to keep all parameters const. from one exposure to the next. When the d.-c. arc is used the electrodes must be accurately shaped and purified. A new cutting tool for motor-driven electrode cutters is described, and also a modified Soxhlet app. for the chem. purification of cut com. C and graphite electrodes. Boiling in HNO_3 exts. the Ca, Mg, Fe, Cu, and Si impurities, but does not remove B.

4893. ZUL'FUGARLY, D. AND ZIZIN, V.
A Spectral Method for Determining Sodium in Alumosilicate Catalysts.
Novosti Neft. Tekh. **1954**, No. 2, 9–11.
Referat. Zhur., Fiz., **1955**, No. 5771.
C. A., **50**, 3151e (1956).

A spectral method is developed for making a detn. of 0.01–1.0% Na in alumosilicate catalysts. It is based on a measurement of the abs. intensities of the 3302 and 3303 A. lines of a Na doublet (the intensity of a line with regard to the background spectrum is assumed for abs. intensity). The amt. of Na is detd. on the basis of the graduated curve for the relation of optical d. of the plate's blackness to the log of Na concn., which is obtained by measuring the spectrum for standard prepns.

1955

4894. ABRAMSON, I. S. AND MOGILEVSKIĬ, A. N.
Transactions of the IXth All-Union Conference on Spectroscopy. The Operation of Photoelectric Installations with an Enlargement of the Spectrum.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 49–52 (1955).
C. A., **50**, 3886g (1956).

4895. ADDINK, N. W. H.
Methods Without the Use of Standard Samples.
Mikrochim. Acta, **1955**, 703–8.
C. A., **49**, 11483c (1955).

A discussion of methods of accuracy by

which satisfactory results for traces of substance in a powder can be obtained when no standard samples are available. At least 6 methods are cited and others are suggested in the general discussion.

4896. ADDINK, N. W. H.
An Improved Method for the Spectrochemical Determination of Zinc in Blood.
Rec. trav. chim., **74**, 197–205 (in English) (1955).
C. A., **49**, 10407g (1955).

The method involves 10-mg. blood ash, a const. arc temp. independent of Na content, and a rotating anode.

4897. ADDINK, N. W. H., DIKHOFF, J. A. M., SCHIPPER, C., WITMER, A., AND GROOT, T.
Quantitative Spectrochemical Analysis With the Direct Current Carbon Arc.
Spectrochim. Acta, **7**, 45–59 (1955).
C. A., **49**, 8727g (1955).

A complete description of the "const. temp. arc" method of quant. analysis is given, with tables of empirically detd. K-values of 235 spectral lines of 38 elements. The concn. is equal to the K-value of a spectral line times its measured intensity. The method consists of completely volatilizing 5 mg. of a powd. sample in a shallow anodic crater of a C arc, with the addn. of materials to modify the rate of volatilization if necessary. Spectra are photographed from 2450 to 3500 Å. with prism spectrographs and exposures of 6–8 min. The line intensities are calibrated by comparison with selected Fe lines so as to get comparable analytical results. The calcns. required are illustrated by several examples which also indicate the accuracy of the method.

4898. ALEKSANDROVA, A. S. AND DAVYDOV, S. P.
Spectrum Excitation with a High-Power Impulse Spark for Analyzing Tin Bronze.
Tekhnol. Trans. Mashinostroenie, **1955**, No. 4, 51–3.
Referat. Zhur. Khim., **1956**, Abstr. No. 25982.
C. A., **52**, 2650b (1958).

The analysis of Sn bronzes for Zn, Pb, Sn, Ni, and Fe is accomplished with the help of a generator for powerful impulse discharges of low voltage (the scheme is given). The method is developed with samples BrOTsS 3.5–5–6 and BrOTsSN 3–7–5–1. The sample is cast in a metallic mold, the cast is then cut into 2 pieces after its faces have been machined. Before the analysis, the machined surface of the sample is coated for insulation with a thin layer of a paste (35% rosin, 50% ozocerite, 7% asphalt, and 8% petrolatum) and to it is glued a plastic disk (diam. 15 mm., thickness 1 mm). which has 4 uniformly located holes with diams. of 1.2 mm. With the help of a special press with pegs, the disk is tightly pressed to the sample, the insulation is heated, and the 4 openings cleaned from the insulation. The spectra are photographed by a 3-step reducer by using the ISP-22 spectrograph with a slit 0.03 mm. wide and a spherical condenser. A sharpened C electrode serves as the pos. pole and the sample as the neg.; the distance between the poles is 1.5 mm. The analytical lines are: Sn 2840.0 + Cu 2824.4 Å.; Pb 2833.0 + Cu 2824.4 Å; Fe 2755.7 + Cu 2824.4 Å; Zn 2502.0 + Cu 2529.4 Å.; Ni 3050.8 + Cu 3036.4 Å. The 3-step reducer permits the analysis of 5 elements in a single spectrum. Working according to the 3 standards, the root-mean-square deviation is ±5.2 with Pb, ±4 Sn, and ±5.4% with Zn.

4899. ALKEMADE, C. T. J. AND MILATZ, J. M. W.
Double-Beam Method of Spectral Selection with Flames.
Appl. Sci. Research, **4B**, 288–99 (1955).
C. A., **49**, 12966h (1955).

A nondispersive, optical-elec. filter instrument with resolving power of approx. 0.1 A. is described. The method is based on the balance of 2 light beams emitted by the source and periodically chopped in opposite phase. A flame, contg. vapor of some element, is placed into one beam, making the balance crit. for wavelengths specifically absorbed by this vapor. Tests are described with a const. absorbing flame and variable source and a const. monochromatic light source and variable elements in the flame.

4900. ANDREEVA, L. P.
Transactions of the IXth All-Union Conference on Spectroscopy. Applications of Spectral Analysis Methods in the Kuznetsk Metallurgical Combine.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 160–1 (1955).
C. A., **50**, 3890b (1956).

4901. ARGYLE, A.
Direct-Reading Spectrography with Reference to the Analysis of Ferrous Metals with the Quantometer.
J. West. Scott. Iron Steel Inst., **62**, 27–53 (1954–55).
C. A., **50**, 3017d (1956).

A review of the development of spectrographic techniques used in metallurgical analysis with emphasis on quantometers. A complete description is given of the operational use of an A.R.L. 1.5-m. production control-type quantometer.

4902. ASTAF'EV, N. V., RUBINOVICH, R. S., AND YAKOVLEVA, S. A.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Determination of Nickel, Vanadium, Chromium, and Copper in Clay.

Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 192–3 (1955).
C. A., **50**, 3890i (1956).

4903. BADALOV, S. T.
New Data on Hydrothermal Anhydrite from Central Asia.
Izvest. Akad. Nauk S.S.S.R., Ser. Geol., **1955**, No. 1, 114–17.
C. A., **50**, 8403b (1956).
Cf. *C. A.*, **49**, 2956h.

A brief review of data now available. 14 references and a table of results of a spectral study of anhydrite are given.

4904. BAISTROCCHI, R. AND GAZZI, L.
Employment of the Alternating-Current Arc in the Quantitative Spectrographic Analysis of Bronzes.
Chemica e industria (Milan), **37**, 175–6 (1955).
C. A., **49**, 11485g (1955).

The a.-c. arc (2200 v.) is applied to the detn. of Sn in Cu-Sn alloys contg. 1–20% Sn. With C electrodes, about 8 mg. of bronze sample is pre-arced for 20 sec. to fuse the sample. The spectra of the arc are then recorded for 75 sec. For concns. of 1–15%, the couple Sn 2863/Cu 2882 is used; for concns. of 6% to 20%, the couple Sn 3034 Cu 3063 is used. The max. error is 6%.

4905. BAKER, M. R. AND VALLEE, B. L.
Cyanogen-Oxygen Flame as a Spectrochemical Source.
J. Opt. Soc. Am., **45**, 773 (1955).

A brief discussion in which the properties of the hydrogen-oxygen and cyanogen-oxygen flames are compared. The latter flame produces higher temperatures and better sensitivities. Technical details are to appear later.

4906. BAKER, R. W. R.
Determination of Calcium in Serum by Flame Photometry.
Biochem. J., **59**, 566–71 (1955).
C. A., **49**, 9075i (1955).

An internal standard flame photometer for estn. of Ca, Na, and K in serum with diln. as the only pretreatment of the sample has been devised. The flame was obtained with acetylene and air, yielding 30 times the energy of coal gas. This was sufficient for the sensitivity of the Schwartz photoconductive cells at concns. of Ca 1, K 2, and Na 30 mg./100 ml. The photometric detns. gave results which agreed well with those obtained titrimetrically and showed an av. difference from theoretical of less than ±2%.

4907. BAKER, R. W. R.
Photometric Estimation of Calcium.
Rec. trav. chim., **74**, 502–6 (in English) (1955).
C. A., **49**, 15612f (1955).

Modifications are given of a flame photometer and spray device previously described (*C. A.*, **49**, 9076a) with a review of flame photometric methods for the detn. of Ca. 18 references.

4908. BARBANOV, V. F. AND STUPKINA, L.
Solid Inclusions in Topaz from Sherlova Mountain.
Vestnik Leningrad. Univ., **10**, No. 10, Ser. Biol., Geograf. i Geol. No. **4**, 97–109 (1955).
C. A., **50**, 7678b (1956).

The topaz crystals are filled with inclusions to make them completely opaque, or enamel-like with a distinct zoning. Crystallographic data are given; d. is 3.513. Chem. compn. of a clear crystal: SiO_2 33.26; Al_2O_3 54.80; Fe_2O_3 0.36; H_2O 0.47; F_2 20.18%, corresponding to a 96.6% F topaz. Spectral analysis shows Mg, Ca present; weak: Cu, W, Ge; traces: Be, Mn, Sn, Ga, Mo Ti Ag, As, Pb. . . The Fe ore contains besides Si, Mn, Al, Mg, Ca, also spectroanalytic traces of Mo, Cu, Pb, Ag, Sr, As, Sn, V, Ti, Zn, Co, Ni, Zr, Cr. . . . (*See C. A.* for complete abstract).

4909. BARDÓCZ, Á.
Interrupted Arc Source for Spectroscopy with Electronic Control.
Cong. groupe. avance. méthodes anal. spectrog. prod. mét., **18**, 313–39 (1955).
C. A., **52**, 2544f (1958).

An a.-c. arc featuring variable-frequency control permits excitation with very large currents.

4910. BARDÓCZ, A.
Investigations Concerning Light Sources for Spectrum Analysis. IV. High-Voltage Spark Sources with Electronic Control and its Electrical Characteristics.
Spectrochim. Acta, **7**, 307–20 (1955).
C. A., **50**, 6194i (1956).

The expts. on the improvement of the operating conditions of high-voltage spectroscopic spark sources resulted in an electronically controlled spark source. The control of the source is carried out by a thyratron tube-operated control spark gap, which can be single or double. The elec. circuit of the system is of such a design that the excitation energy does not pass through the thyratron tube, the only role of which is to operate the control spark gap. The thyratron tube is controlled by a pulse generator, owing to which the number of spark discharges/sec. can be varied. The new design spark source is suitable for producing low-energy ignitor sparks as well as high-energy excitation sparks. The elec. characteristics of the spark source are described.

4911. BARDÓCZ, Á.
Light Sources for Spectrum Analysis. VI. Electronically Controlled Low-Volt-

age Spark, Interrupted Arc, and Direct-Current Arc Source.
Acta Tech. Acad. Sci. Hung., **13**, 3–32 (in English) (1955).
C. A., **50**, 4643d (1956).
Cf. *C. A.*, **48**, 9812b.

The arc and spark circuits shown are of conventional design; they contain some thyratrons, and, furthermore, a special switch is provided in the ignitor circuit and in the pulse generator circuit, so that one can change from a first position, where direct and alternating polarity sparks and interrupted arcs are obtained, to a second position for rectified sparks and arcs, and then to a third position for rectified sparks, rectified interrupted arcs, and a d.-c. arc. An electronically controlled spark source serves for the ignition of both sparks and arcs; it contains a variable frequency pulse generator; whenever the selector switch is in the second position this generator will control also the thyratron which switches the arc and spark circuit. Once the arc to spark was discharged in this position, there was no longer a voltage at the analytical electrodes; thus, they are safe for handling. The excitation conditions are predetd. by varying the frequency of the pulse generator.

4912. BARDÓCZ, Á.
Investigations Concerning Light Sources for Spectral Analysis. VIII A Thyratron Tube Controlled Interrupted-Arc Source for Spectrum Analysis.
Acta Tech. Acad. Sci. Hung., 11, 65–84 (English summary) (1955).
C. A., **49**, 12885i (1955).

A new type of thyratron-tube controlled interrupted-arc source is described for spectrum analysis, consisting of an arc circuit, an ignitor circuit, and a pulse-generating circuit. The arc circuit is built up of conventional circuit elements. In the ignitor circuit the condenser energy necessary to ignite the arcs is controlled by a thyratron tube. The ignitor circuit allows the igniting energy to pass through the thyratron tube, without, however, overloading it and is a.-c. or d.-c. operated according to the required no. of ignitions, 50 and 100 per sec., resp., at the max. rate. The thyratron tubes of the ignitor circuits are controlled by pulse generators of variable frequency, delivering, at the max., 50 or 100 control signals per sec. A crit. survey of various electronically controlled ignitor circuits is given.

4913. BARDÓCZ, Á.
Investigations Concerning Light Sources for Spectrum Analysis. X. New Type of High-Voltage Spark Light Source With Mechanical Control
Z. angew. Phys., **7**, 523–7 (1955).
C. A., **50**, 7512b (1956).
Cf. *C. A.*, **48**, 9812b.

A new type of high-voltage spark generator with a mech. control for spectrographic work is described. The app. is controlled by means of a double-control spark gap. A mech. switch provides a means, in connection with the spark gap, to build up an overvoltage which is then discharged through the spark source.

4914. BARDÓCZ, Á.
Electronically Controlled Spectrographic Low-Voltage Spark, Interrupted Arc, and d.-c. Arc Source.
Spectrochim. Acta, **7**, 238–41 (1955).
C. A., **50**, 680a (1956).
Cf. *C. A.*, **48**, 4h.

A variable-frequency electronically controlled low-voltage spark, interrupted arc, and d.-c. arc source is described, which is capable of producing direct and alternating polarity sparks and interrupted arcs, rectified sparks and arcs, and d.-c. arc. The ignition is provided by a new-type spark source of electronic control, which is operated by a variable-frequency pulse generator. The pulse generator also controls the charging circuit of the source.

4915. BARDÓCZ, Á. AND VARSÁNYI, F.
Spectrochemical Analysis of Solutions with Rotating Pin Electrode Technique.
Acta Chim. Acad. Sci. Hung., **7**, 1–26 (in English) (1955).
C. A., **50**, 3943g (1956).

Methods used in the spectrochem. analysis of solns. are reviewed and evaluated. A new method is described. It consists in using one or more short C rods fixed as electrodes perpendicularly to a horizontal slowly rotating shaft (as spokes on a wheel). The ends of the electrodes dip during their rotation into the soln. to be analyzed. The C rods, thus moistened with sample pass C counter-electrodes spaced in such a manner that arc and spark excitation can take place. The equipment is described in detail. Data obtained on Pb base and Pt base solns. indicate an av. deviation of $\pm 1.53\%$ and $\pm 1.45\%$, resp. This technique of soln. analysis is thought to be superior to other soln. methods on the following points: (1) independence from electrode porosity and electrode heterogeneity, (2) electrode remains relatively cool during excitation, (3) ideal conditions for continuous feed. 49 references.

4916. BARDÓCZ, Á. AND VARSÁNYI, F.
Increase of Precision in Spectrochemical Analysis of Steels by Using Electronically Controlled High-Voltage Spark Sources.
Acta Tech. Acad. Sci. Hung., **13**, 409–20 (in English) (1955).
C. A., **50**, 7661h (1956).

Two electronically controlled high-voltage

spark sources and a rotary synchronous interrupter-controlled switch source are compared under identical conditions for steel analysis. The electronically controlled source of 100-cycles sparking frequency yields higher reproducibility and more uniform results for the individual elements, while the source of 50-cycle sparking frequency yields the same reporducibility as the rotary switch controlled source. The mean deviation resulting from 2 tests of 20 measurements each is ±1.7 and ±1.8%, resp., referred to the alloy content present for the 100-cycle sparking frequency as compared to ±2.9% obtained with the other 2 sources, by using in each case a Hilger, large Littrow-type spectrograph with quartz optics, a 30-μ slit width, a 1-mm. slit height, a 21,000-v. peak source, 10,000-picofarad capacitance, flat-surfaced samples with spectroscopically pure C counter electrodes, a 3-mm. spark gap, 1-min. presparking, and 2- or 4-min. exposures. Straight line working curves were obtained for the line pairs Si 2881.6/Fe 2929.0, Mn 2933.1/Fe 2929.0, Cu 3274.0/Fe 3277.3, Cr 2677.2/Fe 2689.2, Ni 3414.8/Fe 3417.8, Mo 2816.2/Fe 2828.6, and V 3093.1/Fe 3009.6.

4917. BARDÓCZ, Á. AND VARSÁNYI, F.
Time Resolved Spectra of High-Frequency Spark Discharges of Low Energy.
Z. Naturforsch., **10a**, 1031–2 (1955).
C. A., **51**, 5537c (1957).
Cf. *C. A.*, **47**, 9778d; **49**, 5970b.

An app. is described to obtain time resolved spectra of spark discharges with a resolution of 1 microsec. by means of a rotating mirror. The individual discharges are initiated by a thyratron tube, the grid of which is controlled by amplified pulses from a photocell. The photocell in turn receives light pulses from a light source over the rotating mirror.

4918. BARDÓCZ, Á. AND VORSATZ, B.
Thermal Purifying Equipment for the Production of Spectroscopic Pure Carbon.
Acta Tech. Acad. Sci. Hung., **10**, 289–303 (1955).
C. A., **50**, 7431i (1956).

The importance of spectroscopic pure carbon and graphite is pointed out and the different ways of their use are described. Various carbon purifying procedures are discussed. The results of the preliminary experiments to produce spectroscopic pure carbons are presented as well as a detailed description of the final design of the thermal carbon purifying equipment consisting of a 45 kva. transformer capable to be triply overloaded, a magnet switch of 600 amp. and a carbon purifying stand in a fume hood. During purification the carbons are held in a vertical position by copper blocks intensively cooled by water. The upper holding device is suspended against a rope wheel counterweight, so that the expansion of the carbons during heating can be compensated for. An account is given of the development of carbon purification and of the experiences gathered with the equipment. 34 references.

4919. BARNETT, P. R., HULEATT, W. P., RADER, L. F., AND MYERS, A. T.
Spectrochemical Determination of Contamination of Rock Samples After Grinding with Alumina Ceramic.
Am. J. Sci., **253**, 121–4 (1955).
C. A., **49**, 6768i (1955).
Cf. *Am. J. Sci.*, **251**, 814–30 (1953).

Samples of quartz and quartzite ground between high-alumina grinding plates to −100 mesh showed increases in Mg (0.003%) and Ti (0.0001%) only. Contamination by Al was not found.

4920. BARNEY, J. E., II.
Determining Trace Metals in Petroleum Distillates—An Acid-Extraction Technique.
Anal. Chem., **27**, 1283–4 (1955).
C. A., **49**, 16414c (1955).

An oil contg. <0.5 p.p.m. of metals is extd. with concd. H_2SO_4 and a mixt. of concd. HCl, Me_2O, and H_2O, the ext. evapd. to dryness, the org. material removed by ignition, the inorg. residue dissolved in HCl, and the acidic soln., evapd. to approx. 0.2 ml. and transferred to graphite electrodes for spectrographic analysis in a d.-c. arc.

4921. BARTLET, J. C. AND FARMILO, C. G.
The Determination of the Origin of Opium. I. By Means of the Composition of the Ash.
Can. J. Technol., **33**, 134–51 (1955).
C. A., **49**, 11955h (1955).
Cf. *C. A.*, **49**, 566i.

By detn. of the compn. of the ash, the origin of samples of opium (I) can be detd. K, Ca, and Na were detd. by a flame photometric method, PO_4^{3-} by a molybdenum-blue method, Si, Fe, Mg, Al, Ti, B, Mn, Mo, Sn, Cu, and Pb spectrographically. The medium values as percentage of ash are as follows (given in order are country of origin, K (corrected), Ca (corrected), PO_4^{3-} (corrected), SiO_2, Fe, Al, Ti, total mixed oxides, Mg, Na, B, Mn, Mo, Sn, Cu, Pb, ratio 1, ratio 2: Yugoslavia, 35.9, 5.1, 12.7, 5.7, 1.4, 0.75, 0.04, 8.7, 1.2, 0.41, 0.018, 0.025, 0.0017, 0.14, <0.03, 0.034, 3.08, 2.79; Turkey (druggist) 25.0, 12.8, 12.9, 10.6, 0.6, 1.0, 0.10, 15.8, 1.4, 0.36, 0.036, 0.045, 0.0021, 0.020, <0.03, 0.008, 3.02, 1.90; Turkey (soft) 36.9, 4.8, 13.1, 2.0, 0.4, 0.4, 0.06, 2.9, 1.2, 0.25, 0.012, 0.014, 0.0020, 0.08, <0.03, 0.026, 2.77, 2.95; Iran, 35.2, 4.4, 13.6, 5.0, 0.6, 0.9, 0.06, 6.9, 1.2, 0.70, 0.022, 0.021, 0.0020, 0.95, 0.11, 0.021, 2.56. 2.50; India, 39.7, 3.1, 13.0, 5.3, 0.95, 0.85, 0.08, 10.9, 1.0, 0.39, 0.017, 0.022, 0.0033, 0.027, <0.03, 0.018, 2.84, 3.00;

Far East, 33.3, 4.8, 23.8, 13.5, 1.0, 3.0, 0.10, 24.1, 1.8, 0.46, 0.025, 0.050, 0.0017, 0.18, <0.03, 0.094, 1.60, 1.57. The corrected values given take into consideration accidental contamination and are calcd. as follows: % SiO_2 + % Fe_2O_3 + % Al_2O_3 + % TiO_2 = A; corrected % K = % K 100/(100 − A); corrected % Ca = % Ca 100/(100 − A); corrected % PO_4^{3-} = % PO_4 100/(100 − A). It was found that I with high K content had low Ca while high Ca ash had low K. The only anions detected were SO_4^{2-} and PO_4^{3-}. Ratio 1 = equiv. % (K + Ca + Na)/equiv. % PO_4; ratio 2 = % K/% PO_4. Other elements found spectrographically were Ag, Ni, Cr, V, and Be. Compn. profiles, scatter diagrams, and histograms are given.

4922. BAUER, F.
Pseudomorphs After Pyrite in the Dachstein-Mammut Cavern Near Obertraun.
Jahrb. oberösterr, Musealver., **100**, 351–8 (1955).
C. A., **50**, 732h (1956).

Goethite pseudomorphs 1–2 cm. on the edge are described. Spectrographic analyses of 2 samples showed 0.1 and 0.01% As, but no V, Mo, Ni, or Co.

4923. BEALE, H. J.
Spectrochemical Analysis of Chromium.
Australia, Dept. Supply, Defence Standards Labs., Tech. Note, No. **36**, 1–6 (1955).
C. A., **50**, 9933f (1956).

The sample is dissolved in as little 18*N* H_2SO_4 as possible, the soln. evapd. to dryness, and the residue crushed and mixed. This is then placed between graphite electrodes in a d.-c. arc for 30 sec. (2800–4600 Å.) or 2 successive 30-sec. exposures (2250–2900 Å) at a current of 4 amp. in a Hilger large quartz/glass automatic spectrograph. Synthetic standards contg. 10^{-4}–0.1% Cu, Ag, Sn, Pb, Ni, Co, Al, Fe, and Si were prepd. The estd. limit of detection ranged from 0.0001 to 0.005% for selected line pairs. Useful concn. ranges and index points for these line pairs are quoted.

4924. BEALE, P. T. AND POYNTER, D. A.
Application of Spectrographic Solution and Powder Methods to the Analysis of Miscellaneous Samples.
Metallurgia, **52**, 253–9 (1955).
C. A., **50**, 3144i (1956).

Soln. and powder methods of spectrographic analysis offer ease and reliability in the prepn. of synthetic standards. A no. of methods are described. 16 references.

4925. BEAUCHENE, R. E., BERNEKING, A. D., SCHRENK, W. G., MITCHELL, H. L., AND SILKER, R. E.
The Estimation of Amino Nitrogen by Determination of Bound Copper with the Flame Photometer.
J. Biol. Chem., **214**, 731–9 (1955).
C. A., **49**, 10799a (1955).

A simple, rapid method is described for the analysis of amino acids which form complexes with Cu. The Cu is detd. with a flame photometer. Sixteen amino acids were studied. Results obtained by the flame photometric method and by a spectrophotometric method were compared. The values for histidine were high. The application of the method to the detn. of amino acids in enzymically hydrolyzed plant tissue is described.

4926. BEAUDOUIN, P.
Assembly for Routine Spectrographic Analysis.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 259–69 (1955).
C. A., **52**, 2470b (1958).

A Fery prism spectrograph, a combined arc and spark source, and a spectroprojector for comparison of plates constitute an assembly recommended for its simplicity and ease of use.

4927. BEAVEN, G. H.
A Control Unit and Auxiliary Power Supply for Use With the Logarithmic-Cam, Moving-Plate Spectrograph.
Photoelec. Spectrometry Group Bull., No. **8**, 189–91 (1955).
C. A., **51**, 862b (1957).

A description is given of a power supply and control unit for all the operations with the Holiday logarithmic-cam, moving-plate device (*C. A.*, **31**, 5274[9]) in conjunction with a Hilger medium quartz spectrograph. This app. is advantageous in obtaining spectrograms for studying fine-structure details that elude the photoelec. spectrophotometer. A wiring diagram is given of the circuitry for supplying power to the various parts of the control unit.

4928. BEINTEMA, J. AND KROONEN, J.
General Method for the Spectrochemical Analysis of Non-conductors.
Mikrochim. Acta, **1955**, 345–57.
C. A., **49**, 11486h (1955).

The d.-c. arc would be a good light source for the spectrochem. analysis of nonconductors if it were possible to diminish the fractional volatilization of the sample and to keep the temp. in the arc column const. This can be accomplished to a high degree by mixing with considerable powd. graphite and Li_2CO_3. The homogeneous mixt. is charged into graphite electrodes of a special shape and covered with powd. graphite. In this way the effect of differences in the compn. of the main constituents in the chem. or phys. structure is largely eliminated. Consequently the calibrations can be made with synthetic samples.

4929. BELOZERSKAYA, V. I. AND ZORE, V. A.
Spectral Determination of Zinc in Atmospheric Dust.

Gigiena i Sanit., **1955**, 3, 43.
C. A., **49**, 9847d (1955).

The detn. is made in a.-c. arc with the 3345 Å. line; sensitivity is 0.001% with an abs. error of 3.2%.

4930. BELYAEV, Y. I. AND MIKHAĬLOVA, G. V.
Use of Color Photography for Interpreting Spectrograms from Diffraction-Grating Spectrographs.
Doklady Akad. Nauk, S.S.S.R., **104**, 38–9 (1955.)
C. A., **50**, 8371d (1956).

The present tendency in spectrum analysis is towards the use of diffraction-grating spectrographs. Diffraction gratings have the peculiarity of overlapping of the separate orders of spectra, and of the appearance of so-called ghost lines, and these two characteristics often make interpretation difficult. It is proposed to use spectrograms made by color photography, for then the overlapping orders have different colors, and "ghosts" are clearly recognizable. Lines from two orders, differing by 100 Å. in the red end, or 150 Å. in the green section, and 200 A. in the blue end are readily distinguished by their difference in color.

4931. BENNETT, H.
Recent Advances in the Analytical Chemistry of Silicate Materials.
Trans. Brit. Ceram. Soc., **54**, 319–32 (1955).
C. A., **49**, 15201e (1955).

The changing needs of the ceramic industry with respect to chem. analysis, and the development of rapid methods to meet them, are discussed. The reasons for the parallel development of "traditional" and "instrumental" methods are outlined. Foremost among the traditional methods are those using org. reagents; the detn. of SiO_2 and Al_2O_3 is dealt with in detail. Reference is made to several schemes for complete analysis in about 1–1$^1/_2$ days. The standardization of methods and the growing appreciation of the accuracy and precision of existing methods are dealt with in some detail. Flame photometric procedures, particularly the detn. of Na_2O, K_2O, Li_2O, and CaO are discussed. Brief reference is made to the spectrograph.

4932. BERGENDAHL, M. H.
Wavellite Spherulites in the Bone Valley Formation of Central Florida.
Am. Mineralogist, **40**, 497–504 (1955).
C. A., **50**, 8403c (1956).

Spherulitic aggregates of wavellite occur in the leached zone of the land-pebble phosphate field in Polk County. Optical, chem., and spectrographic data are given. The wavellite formed from apatite by reaction with Al-contg. solns.

4933. BERGERHOFF, G. AND NOWACKI, W.
The Crystal Structure of Bazzite and Its Relation to That of Beryl.
Schweiz, mineralog. Petrog. Mitt., **35**, 410–21 (in German (1955).
C. A., **50**, 7019g (1956).
Cf. *C. A.*, **49**, 788e, 12213f.

Sc found spectroscopically, replaces Al to about $^2/_3$, corresponding to a Sc content of about 10%, the distance Al, Sc-O being 2.10 against 1.95 Å. in beryl ($r_{Al} + r_0 = 1.89$, $r_{Sc} + r_0 = 2.15$). The Al atoms replaced by Sc or alkalies may probably replace sometimes in bazzite and beryl the Be atoms (Be-O = 1.54, 1.68, 1.67; $r_{Be} + r_0 = 1.56$ Å.). (*See C. A.* for complete abstract).

4934. BERMAN, E. L.
Transactions of the IXth All-Union Conference on Spectroscopy. Steelometer.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 38–40 (1955).
C. A., **50**, 3886f (1956).

4935. BERNEKING, A. D.
Factors Influencing Determination of Trace Amounts of Certain Metallic Ions by the Flame Photometric Process.
Univ. Microfilms (Ann Arbor, Mich.) Publ. No. 13591, 81 pp. (microfilm, paper enlargement.)
Dissertation, Abstr. **15**, 1735 (1955).
C. A., **50**, 1513g (1956).

4936. BERNHARDT, D. AND HERRMANN, R.
Improvements in Flame Photometric Analysis of Serum Calcium.
Ärtzl. Wochschr., **10**, 61–2 (1955).
C. A., **49**, 8364f (1955).
Cf. *C. A.*, **47**, 7020g.

In this preliminary report, results are briefly summarized of the author's efforts to decrease the relative and abs. errors in Ca flame-photometric analyses and to increase accuracy. They concern tech. precautions in procedure, addn. of Sr as radiation buffer, addn. of $(NH_4)_2HPO_4$ to eliminate PO_4^{-3} influence, and quality of filtration.

4937. BERTHOLD, M.
Spectroscope for Analysis of Alloys.
U. S. Patent 2,723,590, Nov. 15, 1955.
C. A., **50**, 1382h (1956).

The spectroscope described does not require an addnl. optical device for a 2nd (comparative) spectrum. The alloy constituents are detd. by direct observation of the emission spectrum. The electrode can be made of a material other than that to be analyzed, so that it is unnecessary to damage the material to be analyzed.

4938. BILGRAMI, S. A.
Manganese Amphiboles from Chikla, Bhandara District, India.
Mineralog. Mag., **30**, 633–44 (1955).
C. A., **50**, 5473f (1956).

Winchite, juddite, tirodite, and chiklite occur in a pegmatite which cuts Mn ore at the Sitasaongi Mine at Chikla. Chem. and spectrographic analyses are given. Winchite contains 0.99 atom of Na and K and a deficiency of Si and Al. Tirodite contains no TiO_2 and a very low water content, low CaO, and high MnO. Juddite contains 2.5 atoms of Na and high ferric ion. In chiklite all of the Na is in the X position and all the Ca in the Y position ($X + Y = 7$).

4939. BILLINGS, D.
The Determination of Calcium in Glass by Flame Photometry.
Glass Ind., **36**, 255–6, 280 (1955).
C. A., **49**, 15196f (1955).

Several schemes for the rapid chem. analysis of silicates have been proposed. Na and K have been successfully detd. in glass by flame photometry. Two procedures for detg. Ca by flame were tried. The interference of Al on the Ca emission was eliminated. Other interfering ions were either removed or compensated for. The routine detn. of Ca in glass is by the titration of the oxalate by permanganate. When Na and K are detd. by flame photometry from a 100-mg. sample, however, it is inconvenient to prep. a special glass sample for the Ca detn. It has been suggested that Ca can be detd. in glass by flame if interfering ions are either removed or compensated for. Two procedures were tested: (*a*) a method in which the Ca standards were carried through exactly the same procedure as the unknowns and (*b*) a method in which Ca in the unknown is pptd. as the oxalate, redissolved and compared to standards contg. Ca in dil. HCl soln.

4940. BIRKS, F. T.
The Spectrographic Determination of Lithium in Aluminum Metal.
Atomic Energy Research Estab. (Gt. Brit.), C/R 196, 2 pp. (1948).
C. A., **50**, 6250f (1956).

The metal was dissolved in aqua regia in a SiO_2 beaker, and the soln. evapd. to dryness and ignited. The oxide formed was thoroughly ground and 10 mg. was weighed into a graphite electrode. To the sample was added 0.02 ml. of a soln. contg. 0.2 mg. of NaCl. The electrode was dried and then arced for 15 sec. at 10 amp., with no pre-arc. For 2 to 100 p.p.m., the Li 6103.6 A. line d. was measured. For 100 to 700 p.p.m., the width of the 6103.6 A. line was measured by using a microphotometer stage. Standards were exposed on the same plate as the unknown and curves drawn from them.

4941. BIRKS, F. T.
The Spectrographic Estimation of Submicrogram Quantities of Beryllium by the Cathode-Layer Technique.
Spectrochim. Acta, **7**, 231–7 (1955).
C. A., **50**, 724c (1956).

Beryllium (2.0×10^{-11} g.) can be estd. by the cathode layer technique, by using a quartz Littrow spectrograph, and 0.01 γ can be detected by the line contour of Be 2348.61 Å.; the background structure can be traced by means of a recording microphotometer. Fe 2348.30 and 2348.10 Å. interfere if present in large amt., but 0.05 γ of Be can be detected in the presence of 50 γ of Fe. Traces of Be were sought in 3 different sources of high-purity graphite, but they were all below the detection limit.

4942. BOCHKOVA, O. P. AND SHREĬDER, E. Y.
Transactions of the IXth All-Union Conference on Spectroscopy. Application of the Impulse Discharge to the Spectral Analysis of Gas Mixtures.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 75–6 (1955).
C. A., **50**, 3887e (1956).

Measurements were made on discharges in narrow discharge tubes filled with mixts. of He-A, He-N, or Ne-air at 8 mm. pressure.

4943. BOCHKOVA, O. P. AND SHREĬDER, E. Y.
The Use of the Steeloscope for the Semiquantitative Spectral Analysis of a Mixture of Gases.
Zavodskaya Lab., **21**, 311–12 (1955).
C. A., **50**, 16556e (1956).

Small concns. of Ne in He (0.001–1%) can be detd. by observing with a steeloscope the light emitted from an elec. discharge tube contg. the mixt. The line Ne 6402 Å. first appears at a concn. of 0.001% and is equal in intensity to He 6678 at 0.08%. Other concns. are estd. by placing a stepped weakener in front of the slit and matching intensities of the different steps of the lines. The line He 6678 is too weak to interfere at these concns.

4944. BOCHKOVA, O. P. AND SHREĬDER, E. Y.
Spektral'nyĭ Analiz Gazovykh Smeseĭ (Spectral Analysis of Gaseous Mixtures).
Gosudarst. Izdatel. Tekh.-Teoret. Lit. Moscow (U.R.S.S.) (1955). 183 pp.
C. A., **51**, 4216i (1957).

4945. BONASTRE, J.
Procedures of Determining Potassium in Wines.
Ann. Fals. et Fraudes, **48**, 347–51 (1955).
C. A., **50**, 1257h (1956).

The following methods were compared and, except for the 1st method, the procedures are described.: (1) Pasteur-Reboul; (2) as $CO(NO_2)_3 3KNO_2 . 1.5\ H_2O$; (3) with tetraphenylborate by Reichard (*C. A.*, **48**, 2317*d*); and (4) by flame photometry. The 1st method tends to give slightly higher results than the others which are in rather close agree-

ment. Method 4 is fastest, method 3 can be performed in 3 hr. and saves time when compared with the traditional methods 1 or 2.

4946. BORBAT, A. M. AND LYAKHOVICH, N. G.
Transactions of the IXth All-Union Conference on Spectroscopy. Intersection of Graduation Graphs of Different Sets of Alloy Standards Having an Aluminum Base.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 169–70 (1955).
C. A., **50**, 3890d (1956).

Calibration graphs were made by using 9 different sets of Al alloy standards. The graphs for Si and Cu are 2 straight lines crossing at an angle of 5–20°. This is attributed to an error in the chem. analysis of the standards.

4947. BORBAT, A. M., SOSKIN, M. S., AND FINKEL'SHTEĬN, S. G.
Quantitative Spectral Analysis with the Help of the Steeloscope.
Zavodskaya Lab., **21**, 313–16 (1955).
C. A., **50**, 16556i (1956).

The measurement of burnout time as a method of quant. analysis (Sventitskiĭ and Taganov, *C. A.* **44**, 3833f) is made difficult by the occurrence of flickering toward the end of burnout. The difficulty is overcome by measuring the time until the intensity of the observed line is reduced to that of some line of the electrode metal. Current strength must be carefully held const. during both transfer and burnout; conditions during transfer should be chosen to maximize the amt. of sample transferred. A device is described in which several auxiliary electrodes are mounted radially on the circumference of a rotating disk. Numerous examples of the analysis of alloys are given. One test indicated a precision of ±3%.

4948. BORJAS, I. P.
Determination of Sodium, Potassium, and Calcium by Flame Photometry in Water from the Departments of Lima and Ica.
Anales fac. farm. y bioquím., Univ. nacl. mayor San Marcos (Lima), **6**, 533–7 (1955).
C. A., **52**, 14905f (1958).

Water samples (60) from rivers, wells, and hot medicinal springs were analyzed with the Beckman flame photometer. The contents, in potable water, of Na were 18.9–2180, K 1.0–8.4, and Ca 47.5–175; in Chilca spring water, Na 11,000–12,020, K 625–890, and Ca 875–1000 mg./l. A standard of 70 mg. Na, 5 mg. K, and 500 mg. Ca/l. was used for comparison.

4949. BOROVIK-ROMANOVA, T. F., KOROLEV, V. V., KUTSENKO, Y. I., AND FARAFONOV, M. M.
Transactions of the IXth All-Union Conference on Spectroscopy. On the Use of an Activated a.-c. Arc for the Spectroscopic Determination of Alkali and Alkaline Earth Elements in Natural Waters.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 196–7 (1955).
C. A., **50**, 3891a (1956).

A method of detn. of 1×10^{-5}% Sr and 3×10^{-6}% Li in mineral water with an error of ±6–8% is described.

4950. BORZOV, V. P. AND IL'INA, E. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Determination of the Thickness of Oxide Films on Aluminum Alloys.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 207–8 (1955).
C. A., **50**, 3891e (1956).

A filler ($K_2Cr_2O_7$) was introduced into the pores of the film. The thickness of the films was detd. by weighing with or without filler. Thus, the porosity could be detd. from the ratio Cr/Al detd. spectroscopically.

4951. BORZOV, V. P. AND IL'INA, E. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Quantitative Spectral Analysis of Impurities in Lubricating Greases.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 209 (1955).
C. A., **50**, 3891f (1956).

An analysis was made for the components of Cu alloys (Pb, Zn, Al, Sn, and Mn) in Vaseline oil. The Ni line 3080.8 Å. was selected as reference.

4952. BORZOV, V. P. AND IL'INA, E. V.
Spectral Method of Determining the Thickness of Galvanic Coatings.
Zavodskaya Lab., **21**, 327–31 (1955).
C. A., **50**, 11915c (1956).

Emission spectrum of metal-plated metals was recorded on moving photographic film. The rate of change in the intensity of lines was correlated to the thickeness of the coating. The method is suitable for multicoated surfaces. Curves showing the relation between the position of the max. intensity and thickness of the layer are presented for the following cases: Cr-, Ni-, Cu-, and Cd-plated steel of thickness of the coatings of 8.3, 9, 9, and 15 μ, resp.; 2.8 μ and 18 μ thick nickel-plated bronze; three different layers, Cu (22 μ), Ni (12.6 μ), and Cr (2.7 μ) on a steel base.

4953. BORZOV, V. P. AND SVENTITSKIĬ, N. S.
Transactions of the IXth All-Union Conference on Spectroscopy. Reproducibility of the Intensity Values of Spectral Lines in the Alternating-Current Activated-Arc Discharge.

Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 133–4 (1955).
C. A., **50**, 3889d (1956).

4954. BOVAY, E.
Determination of Potassium, Calcium, Magnesium, and Sodium in Ashed Vegetable Material by Flame Spectrophotometry; Determination of Total Nitrogen by Semimicrodistillation.
Mitt. Lebensm. Hyg., **46**, 540–68 (1955).
C. A., **50**, 8084b (1956).

The detn. of K, Ca, Mg, and Na by flame spectrophotometry has been adapted to the analyses of vegetable material. The detn. of K and Na is not influenced by elements normally present in the HCl soln. of plant ash. Standard curves of pure KCl and NaCl solns. can be used for comparison. The reference solns. contain 50 mg. K/l. and 5 mg. Na/l. Since Mg and Ca are influenced by phosphates, sulfates, silicic acid, and iron in the vegetable ash, buffers must be used to minimize the disturbing effect. The standard solns. for Mg and Ca contain 50 mg. Mg/l. and 50 mg. Ca/l., resp. The values obtained for Mg and Ca agree with those obtained by other methods. The total N is detd. semimicroanalytically in the presence of a special catalyst. H_3PO_4 is detd. colorimetrically by Molybdenum blue.

4955. BOYCKS, E. C.
Instrumental Studies in Flame Spectrophotometry.
Univ. Microfilms (Ann Arbor, Mich.), Publ. No. 14759. 257 pp. (microfilm, paper enlargement).
Dissertation Abstr., **15**, 2395 (1955).
C. A., **50**, 6247f (1956).

4956. BRECKPOT, R. AND DANIELS, A.
The Spectral Determination of Sulfur in Steel.
Compt. rendus 27e congr. intern. chim. ind., Brussels, 1954, **2**.
Industrie chim. belge, **20**, Spec. No., **352–4** (in French) (1955).
C. A., **50**, 11169h (1956).

Place a 1-g. sample of steel together with 1 g. of Sn in a quartz boat in a tube contg. H at a pressure of 1 mm. Hg. Ext. the S by induction heating, and in the presence of H_2, convert to H_2S. Excite a portion of this by high frequency in an adjoining tube, and record the intensity of the S II line of wave length 5453 Å. with an electron-multiplier photo tube in the focus of a glass-prism spectrograph. The detn. of S in Fe results from comparing the observed intensity of the S II spectral line with a working curve of intensity *vs.* concn. The precision is of the order of ±5%.

4957. BRECKPOT, R., HAINSKI, Z., AND JONCKERS, M. D. E.
The Spectrochemical Analysis of Manganese, Carbon, Phosphorus, and Silicon in Steel.
Compt. rendus 27e congr. intern. chim. ind., Brussels, 1954, **2**.
Industrie chim. belge, **20**, Spec. No., **355–9** (in French) (1955).
C. A., **50**, 11881i (1956).

A description of the instrumentations and techniques for spectrochem. detn. of Mn, C, P, and Si in steel. A recording photoelec. quartz prism spectrograph is used. Phototubes are placed behind exit slits in the focal plane, and the appropriate spectral lines are swept across each by a small lateral displacement of the entrance slit. Condensed spark, a.-c. arc, and d.-c. arc excitation are used in the analysis. Details of electrode prepns. are given.

4958. BRITE, D. W.
Flame Photometry of Organic Phosphorus.
Anal. Chem., **27**, 1815–16 (1955).
C. A., **50**, 2363e (1956).

P in organophosphorus compds. is detd. by flame emission measurements at 540 mμ of EtOH or kerosine solns. of the compds. A straight line plot of P concn. *vs.* % relative emission is obtained over a concn. range of 0.005 to 0.04*M* with a Beckman spectrophotometer equipped with a H burner and a photomultiplier attachment. Na and Ca cause pos. errors. N, S, I, and Cl do not interfere.

4959. THE BRITISH NON-FERROUS METALS RESEARCH ASSOCIATION
Spectrographic Analysis of Nominally Pure Lead (Report of the Lead Analysis Panel of The British Non-Ferrous Metals Research Association Spectrographic Research Committee).
Spectrochimica Acta, **7**, pp. 205 (1955).

Co-operative investigations have been carried out by a number of laboratories interested in the spectrographic determination of trace impurities in lead. Methods have been developed for the determination of Ni, Bi, Tl, Cd, Sb, Ag, As, Sn, Cu, Zn, and Te in the range 0.0005–0.005 per cent, with an accuracy of the order of ±10 per cent. The greater sensitivity of the triggered-arc type sources has been demonstrated, although acceptable results can be obtained with simple condensed spark circuits using prolonged exposures.

4960. BRITO, A. C. DE,
Spectrographic Study of Minor Elements in Portuguese Galenas.
Rep. Port., Direc-geral minas e serv. geol., Estud., notas, e trabal. serv. fomento mineiro, **10**, 78–90 (English summary) (1955).
C. A., **50**, 7015g (1956).

Semiquant. detns. are given for 55 samples for the following elements with % of samples

in which found: Ag 100, Al 100, As 100, B 3.6, Ba 1.8, Be 7.3, Bi 16.4, Ca 100, Cd 23.6, Co 1.8, Cu 100, Fe 100, Ga 9.1, In 54.5, Mg 100, Mn 100, Mo 25.5, Ni 14.5, P 32.7, Sb 100, Si 100, Sn 45.5, Ti 16.4, Zn 20. Au, Cr, Ge, Hg, K, La, Li, Na, Nb, Ru, Sr, Ta, Tl, V, W, and Zr were not found.

4961. BRITO, DE, A. C.
Spectrographic Study of Minor Elements in Portuguese Sphalerites.
Rep. Port., Direc.-geral minas e serv. geol., Estud., notas, e trabal. serv. fomento mineiro, **10**, 91–102 (English summary) (1955).
C. A., **50**, 7015h (1956).

Semiquant. detns. are given for 33 samples. Ag, As, Al, Cd, Cu, Fe, In, Mg, Pb, and Si were present in all. Other elements found and no. of samples in which present were B 2, Ba 15, Be 2, Bi 6, Ca 32, Co 12, Ga 32, Ge 24, Hg 5, Mo 1, Ni 5, Sb 24, Sn 23, Ti 7, and V 1.

4962. BRITO, DE, A. C.
Spectrographic Study of the Ash of Portuguese Anthracites.
Rep. Port., Estudos, notas e trabalhos serv. fomento mineiros, **10**, 236–50 (English summary) (1955).
C. A., **50**, 11001i (1956).

The coals were ashed at 550°. Semiquant. detns. are given for 101 samples of Ag, As, B, Ba, Be, Ca, Co, Cr, Cu, Ga, La, Li, Mg, Mn, Mo, Na, Ni, Pb, Sn, Sr, Ti, V, and Zr. These were present in all or nearly all samples except for Ag (62%), La (5%), Mo (84%), Pb (71%), and Sn (12%). Au, Bi, Cd, Ge, Hg, In, Nb, Rb, Sb, Ta, W, and Zn were not found.

4963. BRITO, DE, A. C.
Spectrographic Study of the Ash of Portuguese Lignites.
Rep. Port. Estudos, notas e trabalhos serv. fomento mineiros, **10**, 251–62 (English summary)(1955).
C. A., **50**, 11002g (1956).

Samples were ashed at 550°. Semiquant. detns. are given for 64 samples for As, B, Ba, Be, Co, Cr, Cu, Ga, Ge, Li, Mg, Mn, Mo, Na, Ni, Pb, Sn, Sr, Ti, V, W, and Zr. These were present in nearly all samples except Ge (37.5%), Mo (43.2%), Sn (19.8%), Sr (82.9%), W (22%), and Zr (9%).

4964. BRITSKE, M. E.
Transactions of the IXth All-Union Conference on Spectroscopy. A High-Current Impulse Arc.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 58–9 (1955).
C. A., **50**, 3886i (1956).

The intensity of ionic and at. spectral lines is const. throughout the whole interelectrode space. The temp. value is 8500°K. at 200 amp. as compared to 5100°K. at 5 amp.

4965. BROIDA, H. P. AND MOROWITZ, H. J.
Spectroscopic Determination of Total Water Content.
U. S. Patent 2,708,387, May 17, 1955.
C. A., **50**, 732d (1956).

A sample contg. water is mixed with heavy water in which the initial $H_2O:D_2O$ ratio (r) is about 0.99. The final mole ratio (R) is measured and the wt. fraction of water in the sample is calcd. by the formula: $(R - r)V/(1 + R)M$, in which V is the vol. of heavy water and M is the mass of the sample. R and r are detd. by exciting the flowing water vapor in an electrodeless discharge and scanning the light emitted with a rotating grating and a photomultiplier tube. The relative intensities of the Hα and Dα lines at 4861.3 and 4860.0 Å., resp., are proportional to the mole ratios. An accuracy of 0.1% was obtained when the method was applied to several hydrates. Application of the method to detn. of moisture in corn and other cereal products, textiles, and cement is mentioned.

4966. BRONSHTEĬN, A. N.
Transactions of the IXth All-Union Conference on Spectroscopy. Increase in Sensitivity of the Spectral Analysis of Powders.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 159–60 (1955).
C. A., **50**, 3890a (1956).

The sensitivity of Ga detn. (also In, Ge, Fe, Co, and Mn) is increased by dilg. the sample 4–5 times with ZnS (also SiO_2 or PbS).

4967. BRUCELLE, G.
The Influence of the Structural State of Steel on the Results of Spectrographic Analysis.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 183–90 (1955).
C. A., **52**, 2701h (1958).

Samples of a carbon steel and a Ni-Cr-Mo steel prepd. by varied heat and mech. treatments showed no effect of the structural variations thus produced on the av. analysis. However, hot-rolling decreased the dispersion of the Si analyses in the C steel and tempering at 850° increased the dispersion of Mo results in the Ni-Cr-Mo steel.

4968. BRÜCKEL, K. W.
Significance of Trace Elements in the Liver.
Deut. med. Wochschr., **80**, 1612 (1955).
C. A., **50**, 3611g (1956).

Liver biopsy samples from 31 patients were analyzed spectrographically for Fe, Cu, and Zn. In cirrhosis and chronic cholangiohepatitis hepatic Fe was low while Cu was elevated. Both Fe and Cu were below normal levels in fatty degeneration.

4969. BUCCHERI, A.
The Technique and Applications of Emis-

sion Spectra for Analysis.
Rev. eng. Mackenzie (Brazil), **40**, No. 126, 71–6 (1955).
C. A., **50**, 9929g (1956).

The use of the spectroscope for analysis of metals and alloys is described, especially in connection with product control.

4970. BÜCKERT, H.
Use of a Numbering Printing Device in the Measuring of the Blackening of Spectral Lines.
Mikrochim Acta, **1955**, 416–20.
C. A., **49**, 11329c (1955).

A description is given of a microphotometer which is coupled with a numbering printing device to increase the speed of operation, to avoid the reading and recording of the blackening values and to make it possible to print the Δ S directly. The demands made on the photometer with reference to stability and movement of the plate are also discussed with respect to insuring a more reliable working of the scriber—and greater working speeds.

4971. BURAVLEV, Y. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Application of the Method of Parallel Graphs in the Spectral Analysis of Steels.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 166–7 (1955).
C. A., **50**, 3890c (1956).

4972. BURAVLEV, Y. M.
Transactions of the IXth All-Union Conference on Spectroscopy. The Influence of Structure on the Results of the Spectral Analysis of Steels of Type P9, P18, and 38XMYuA.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 170–1 (1955).
C. A., **50**, 3890e (1956).

4973. BURELBACH, J. P. AND MARCH, R. J.
Determination of Impurity Elements in Ames Thorium Billet A-520.
U. S. Atomic Energy Comm., **ANL-5240**, 144 pp. (1953). (Declassified Oct. 20, 1955).
C. A., **50**, 16550g (1956).

A representative billet of Th metal prepd. at the Ames Lab. and distributed as milling chips was analyzed for impurity elements by 9 labs. participating in the Th analytical program of 1952–3. All analytical procedures used are described. Av. concns. of the different impurities are arbitrarily weighed according to the analytical method used, no. of samples analyzed, possible sources of contamination, and standards employed, and thus reflect relative, rather than abs. values. Av. concns., in p.p.m., with methods used, are as follows (the figures given in parentheses represent relatively inconsistent or insufficient data): Al 10, spectrographic (I) and (33), fluorometric (II); Sb (<5), I; Ba (<5), I; Be 70, I; Bi (2), I; B 0.3, I, and 0.4, colorimetric (III); Cd 0.1, I and (<0.2), III; Ca 15, I; C 390, combustion; Ce 25 I; Cl (15), nephelometric; Cr 10, I and III; Co (<2), I; Cu 4, I and III; Dy (<1), I; Er (<0.4), I; Eu (<0.3), I; Gd (0.35), I; Ge (<2), I; Ho (<0.15), I; H (10), vacuum fusion (IV); In (<5), I; Fe 55, I and 60, III; La 4, I; Pb (3), I and (12), polarographic (V); Li <1, flame photometer and I; Lu (<0.1), I; Mg (10), I; Mn 2, I and III; Mo (<2), I and (2), III; Nd 6, I; Ni 26, I and 27, III; N 60, Kjeldahl and (16), IV; O 1100, insol. residue and (1100), IV; Pr (<1.2), I; Sm (<0.5), I; Si <50, I and (46), III; Ag (0.2) I; Na (15), I; Sr (<1), I; Ti (<1), I; Tm (<0.15), I; Sn (<2), I; Ti (1), I and (7.5), III; U 2, II; V (<1), I; Yb (<0.1), I; Y (0.3), I; Zn <20, I, (3), III, and (4), V; Zr (400), I; total rare earths (57), sepns. The result of a danger-coeff. test is included, in which the Ames metal was compared with iodide Th prepd. at Battelle Memorial Institute, with use of the CP-2 reactor at Argonne. The thermal neutron absorption cross-section of the Ames Th exceeded that of the Battelle metal by 0.068 ± 0.010 sq. cm. An attempt was made to correlate this value with that calcd. from impurity levels of high absorbers as reported above. The attempt was unsuccessful because the analyses were not known with sufficient accuracy to give a calcd. cross-section valid enough for comparison with the exptl. value. It was, therefore, concluded that no gross errors or omissions of highly absorbing impurity elements had been made in the Ames Th metal.

4974. BURGESS, P. B. AND WYGANT, J. F.
Deposit Analysis in Lubrication Problems.
Lubrication Eng., **11**, 193–7 (1955).
C. A., **49**, 11991f (1955).

A scheme of analysis for deposits in lubrication systems is described. It is based on standard methods of solvent extn., X-ray diffraction, microscopy, spectroscopy, and chem. analysis.

4975. BURNETT, G. W. AND LOBENE, R. R.
The Composition of Teeth. II. Spectrochemical Analysis of Enamel and Dentine from Syrian Hamsters.
J. Dental Research, **34**, 814–19 (1955).
C. A., **50**, 4339a (1956).
Cf. *C. A.*, **48**, 12975d.

Quant. spectrochem. analysis was made of enamel and dentine from incisors and molars of adult hamsters. The enamel always contained: Ag, Al, B, Ba, Ca, Cr, Cu, Fe, K, Li, Mg, Mn, Na, P, Pb, Si, Sr; all these elements, except Cr and Pb, were always present in the dentine. The major constituents were Ca and P; the only other elements exceeding 0.1% were Mn, Na, and Fe. Other elements were present in some, but not all, samples.

4976. BURRIEL-MARTÍ, F., JIMÉNEZ-GOMEZ, S., AND ALVAREZ-HERRERO, C.
Simultaneous Determination of Exchangeable Cations in Soils by Spectrographic Analyses. II
Anales edafol. y fisiol. vegetal (Madrid), **14**, 213–27 (English summary) (1955).
C. A., **49**, 15137i (1955).
Cf. *C. A.*, **49**, 1255f.

Twenty g. of <2 mm. dry soil are washed with 200 ml. of distd. H_2O followed by 200 ml. *N* $NH_4C_2H_3O_2$ (pH 7). The mixt. is dild. to 250 ml. with H_2O, and a 20-ml. aliquot is evapd. to dryness in a tared capsule. An equal wt. of Fe_2O_3 and 10 times as much CuO are added, and the mixt. is ground in an agate mortar for 15 min. An aliquot is taken and cations are detd. spectrographically in the region 2700–4500 Å. Exchangeable Na, K, Mg, Mn, and Ca are given for 18 Spanish soils of various types. Detns. of the same cations in synthetic mixts. agree well with the calcd. addns.

4977. BURRIEL-MARTI, F. AND RAMÍREZ-MUÑOZ, J.
"Fotometria de Flama," Vols. I and II.
C. Bermejo Garcia Morato, Madrid (Spain) (1955). Vol. I, 132 pp., Vol. II, 106 pp.

Reviewed by R. Mavrodineanu, *Applied Spectroscopy*, **11**, No. 3, 38–9 (1957).

4978. BUYANOV, N. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Slags.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 89–93 (1955).
C. A., **50**, 3887i (1956).

Different methods of sample prepn. are critically reviewed in the light of industrial experience.

4979. BUYANOV, N. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Carbonaceous and Low-Alloyed Steels and of Pig Iron.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 174–8 (1955).
C. A., **50**, 3890e (1956).

A standard process specification is given.

4980. CALINICENCO, N., RUSCIOR, C., AND CIOBANU, C.
The Transfer of Substance in the Direct-Current Arc.
Bul. inst. politeh. Iasi, **1**, No. 1–2, 25–31, (1955).
C. A., **51**, 11840h (1957).

The authors have studied the transfer of material in a d.-c. arc and spark with Cu electrodes. It was found that this transfer in the arc follows the direction from the cathode to the anode. In the spark it occurs in the opposite direction, the anode being consumed. The amount of transferred substance is a function of the number of sparks and the oxidation of the anode.

4981. CALKER J. VAN AND WIENECKE, R.
Investigations of the Influence of Third Analysis Constitutents on Spectrochemical Analysis.
Forschugsber. Wirtschafts- u. Verkehrsministeriums Nordrheim-Westfalen, No. **141**, 25 pp. (1955).
C. A., **50**, 7000e (1956).

The concn. ratio of 2 elements is readily detd. from a working curve showing photographic blackening of spectral lines as a function of concn. The spectrochem. analysis may be in error by the presence of a 3rd element because of changes in the mechanism of the discharge, chem. conversions, or direct effect on the spectral excitation processes in the light source. Spectrochem. buffers can be employed to stabilize the discharge and a C counter electrode suppresses oxidation reactions in the spark gap. Excitation functions and intensity-time curves of spectral lines in sparks show that a 3rd element affects the light emission of other elements. These phenomena are illustrated by the spectrochem. detn. of Mg in Al when Zn is also present.

4982. CARRANCIO DE LA PLAZA, H. AND CAMUÑAS PUIG, A.
Spectrochemical Analysis of Steels. Elimination of the Effects of Other Elements Present.
Inst. hierro y acero, **8**, 755–64 (1955).
C. A., **50**, 6253b (1956).

A new method is proposed to det. the alloying elements present in steels (of low- and high-alloying content). The method is based on measuring the intensities of 2 lines of the same element. The values of the differences in blackening of both lines are interpolated graphically with the log of the concns. In a given concn. range of an element often others are present in large number with many different concns., which makes the use of classical methods difficult. Details are given of the lines used and detns. are made for Cr, Ni, and V. With this method the use of standard comparable steel electrodes is avoided.

4983. CHARLES, G. W., HUNT, D. J., PISH, G., TIMMA, D. L.
Preliminary Description and Analysis of the G., Spectrum of Polonium.
J. Opt. Soc. Amer., **45**, 869–72 (1955).
C. A., **50**, 56f (1956).

Purified Po has been excited by high-frequency electrodeless discharges of 10, 30, and 400 Mc/sec. at temps. ranging from 200° to 800° and in an enclosed spark source. One-hundred-thirty-nine lines have been found in the spectrum from the electrodeless discharge; 35 of these and 13 addnl. lines have

been observed in the spectrum of the spark discharge; 48 lines have been classified as transitions involving 24 energy levels of Po I. Four levels of the fundamental configuration $6p^4$ have been identified. The observations have been compared with theoretical predictions for this configuration. Sepns. are well represented by theory with the parameter $F_2=1096$ and $\zeta=12379$ cm.$^{-1}$ The abs. value of the lowest level $6p^4$ 3P1/2 has been estd. from the first 2 members of the series $6p^{3-}$ ($^4S^\circ$)ns. An estimate of 67980 K is obtained. This corresponds to an ionization potential of 8.43 v. for the neutral Po atom.

4984. CHATONIER, D.
Determination of Lithium in Several Mineral Waters of the Centre.
Bull. soc. pharm. Bordeaux, **94**, 29–32 (1955).
C. A., **50**, 17264a (1956).

Results of detns. of Li by flame photometry are compared with concns detd. earlier by chem. procedures.

4985. CHATONIER, D.
The Cation Ratios of Natural Waters.
Bull. soc. pharm. Marseille, **4**, 201–4 (1955).
C. A., **50**, 17262c (1956).

It is generally held that the chem. compn. of natural water is dependent on the mineral compn. of the strata through which it passes. C. detd. the Na/K ratios for a series of waters and geol. strata by flame photometry. The results indicate that a ratio of Na/K between 1 and 2 is obtained in basaltic rocks and their waters, and less than 1 in granites and their waters.

4986. CHILDS, E. B. AND KANEHANN, J. A.
Application of the Logarithmic Sector to Quantitative Spectrographic Analysis of Petroleum Ash Residues.
Anal. Chem., **27**, 222–5 (1955).
C. A., **49**, 9263i (1955).

Mix 10-mg. portion of the ash with 10 times as much Li_2CO_3. Add 1% In_2O_3 to the mixt. Arc the resultant mixt, in the d.-c. arc for 5 sec. at 7.5 amp. and 20 sec. at 16 amp. Place a $5^3/_{16}$ in. logarithmic sector disk rotating at 5000 r.p.m. in the optical path. Photograph the spectra with a Bausch and Lomb large Littrow spectrograph covering the 2500–3500 Å. range. The length of each line is a logarithmic measure of the intensity. Prep. a working curve from the ratios of the intensities of the internal standard (In) and of the element. The elements detd. were: Al, Mg, Pb, Sn, Si, Fe, Cr, Ba, Ca, Cu, and Ag.

4987. CHIRKINYANTS, G., GOS'DVASSER, L., AND SUVOROVA, V.
"Spektral'nyi Analiz Alyuminievykh Splavov" (Spectral Analysis of Aluminum Alloys).
Sudpromgiz, Leningrad (U.R.S.S.) (1955).
C. A., **51**, 4251d (1957).
40 pp.

4988. CHOW, T. J. AND THOMPSON, T. G.
Flame Photometric Determination of Strontium in Sea Water.
Anal. Chem., **27**, 18–21 (1955).
C. A., **49**, 5204e (1955).

Sr has been detd. in several sea-water samples from the Atlantic, Pacific, and Arctic Oceans. The Sr line at 460.7 mμ was employed. The flame background at 454 mμ is equal to that at 460.7 mμ; thus the difference between readings at these 2 wavelengths is used as a measure of the intensity of the Sr line. Of the ions present in sea water, only Ca^{++} interferes by overlapping the Sr emission at 460.7 mμ with a slit width of 0.02 mm. Mg^{++}, SO_4^{--}, Cl^-, Na^+, Ca^{++} and K^+ affect the excitation of the Sr line. These difficulties can be circumvented by adding equal aliquots of the sea-water sample to a series of standard solns. in which the Sr. concn. is varied and extrapolating to obtain the reading for a soln. in which the only Sr present is that in the sea water. The data show that Sr occurs in sea water in cont. proportion to the chlorinity; the Sr. chlorinity ratio is 0.0048 ± 0.0002.

4989. CHOW, T. J. AND THOMPSON, T. G.
Flame Photometric Determination of Calcium in Sea Water and Marine Organisms.
Anal. Chem., **27**, 910–13 (1955).
C. A., **49**, 11489i (1955).

The internal standards technique of flame photometry was applied to the Ca detn. Twenty ml. of the sample was dild. to one l. After thorough mixing, take 6 portions of this soln., each contg. 5 ml. To 1 portion, add 5 ml. of water and to the other 5 portions add different quantities of Ca^{++}. The emission intensity of these 6 portions was detd. in the Beckman flame photometer and plotted against the Ca concn. of the standards added. The Ca concn. of the dild. unknown was read graphically. Studies were made to det. the extent of band-width interference that might be caused by the presence of some of the constituents of sea water (Cl^-, Na^+, SO^{--}, Mg^{++}, K^+, Sr^{++}). None of these ions emitted any appreciable amts. of light at 422.7 mμ. The effect of radiation interference on the Ca recovery because of the presence of these ions was studied. Mg^{++} and SO_4^{--} greatly suppressed the Ca recovery. Cl^- and K^+ also gave a lower recovery but to a lesser extent. Na^{++} caused a high recovery. The method eliminated the interference from the major constituents of sea water. The Ca content of a series of samples of sea water and some marine organisms was detd. by the method. The Ca/Cl ratio found for the sea waters was 0.546 ± 0.002, which is in good agreement with previously reported data.

4990. CHU, C. Y.
Flame Spectrophotometric Sodium and Potassium Determination in Serums of

Normal and Gravidic Hyperemetic Pregnancies.
Anales fac. farm. y bioquím., Univ. nacl. mayor San Marcos (Lima), **6**, 134–40 (1955).
C. A., **52**, 9355h (1958).

The Na and K content in the serum of women with normal pregnancies, and of those with simple and incoercible vomits was, resp. 140.02, 5.03; 135.96, 4.99; and 127.46, 5.12 meq./l.

4991. CLARKE, S. A.
A Drum Attachment to a Travelling Microscope for Direct Wavelength Reading of Spectral Lines.
Spectrochimica Acta, **7**, 64 (1955).

This instrument was developed to enable the identification of spectral lines, by their wavelength, to be carried out relatively simply. A helical expanded distance scale was traced on the drum, which was geared to the thread of the Baker 64 travelling microscope, by fixing a pen to the pointer on the microscope stage. This helix was calibrated for wavelength.

4992. COATS, R. R.
Distribution of Uranium and Certain Other Trace Elements in Felsic Volcanic Rocks of Cenozoic Age of Western United States.
Proc. Intern. Conf. Peaceful Uses Atomic Energy, Geneva, 1955, **6**, 248–51.
U. S. Geol. Survey Profess., Paper **300**, 75–8.
C. A., **50**, 13670i (1956).

Fluorimetric analyses for U and spectrographic detns. of other elements were made of 116 rhyolitic and dacitic rocks. Good correlations were observed between the content of U (arithmetic mean 5 p.p.m.) and the contents of the following elements (arithmetic means in p.p.m. in parentheses): F (655), Nb (22), Be (5), Sn (5), La (40), and Li (46), but not with Pb (24) and Zr (139). Variations in different regions are discussed.

4993. CODINA-VIDAL, J. M.
Spectrographic Evaluation of an Element by Addition of a Quantity of it to a Given Substance.
Anales real soc. españ. fís. y quím. (Madrid), **51B**, 613–18 (1955).
C. A., **50**, 12727f (1956).

A known amt. of the element to be evaluated is added to the unknown sample. The intensity of certain lines of the element is then reduced by means of a rotating sector to the value before the addn. From this the compn. of the unknown can be derived. The limitations of the method are that the intensity of the special lines must be proportional to the concn. of the element and that the element must be one which can be easily added in known quantity.

4994. COMMISSION ON SPECTROSCOPY, U.S.S.R.
Transactions of the IXth All-Union Conference on Spectroscopy.
Izvest. Akad. Nauk. S.S.S.R., Ser. Fiz., **18**, No. 6, 627–741 (1954); **19**, No. 1, 5–138 (1955); **19**, No. 2, 147–225 (1955).
C. A., **50**, 3885–3892, 7585–7586 (1956).

Papers presented at the IXth Conference held at Tartu, Estonian SSR, July 5–11 (1954). Individual papers are listed under authors' names elsewhere in this Index. (Available in English translation, *Columbia Technical Translations*, Mt. Vernon, N. Y.).

4995. CORNU, A.
Determination of Lead and Cobalt in Organic Solution by the Porous-Electrode Method.
Congr. groupment avancement méthodes anal. spectrog. prod. mét., **18**, 331–9 (1955).
C. A., **52**, 2655b (1958).

A porous-cup electrode is used for the detn. of Pb and Co in oleic and naphthenic acid solns. with Cd as internal standard. Reproducibility is poor for the oleic acid solns. owing to the difficulty in penetrating the electrodes. Results are better with naphthenic acid, showing 95% confidence limits of ±3%.

4996. COX, D. S.
Flame Photometry and Spectrophotometry in Paint Analysis and Control.
Paint & Varnish Production, **45**, No. 9, 30–4, 79 (1955).
C. A., **49**, 15255c (1955).

The Beckman DU Quartz Spectrophotometer with Photomultiplier and Flame Photometer attachments were used. The analytical methods used for the various control operations are presented and discussed. Since the drying oils each have characteristic ultraviolet absorption curves, ultraviolet spectrophotometry can be used to identify these oils or alkyd resins made from them. The progress of alkyd resin reactions can be followed by ultraviolet absorption curves. The ultraviolet spectrophotometer can be used to det. phthalic anhydride in the presence of fumaric or maleic acid. Detns. with these instruments are simple and rapid.

4997. CROSSWHITE, H. M., DIEKE, G. H., AND LEGAGNEUR, C. S.
Hollow-Iron-Cathode Discharge as Source for Wavelength and Intensity Standards.
J. Opt. Soc. Amer., **45**, 270–80 (1955).
C. A., **49**, 7376h (1955).

A sealed-off hollow-cathode discharge tube with Fe electrodes and rare-gas filling is described, which will give an Fe spectrum with very sharp lines and intensities of high reproducibility. Extensive data are given of the dependence of the Fe intensities on the character of the rare gas, its pressure, and the

discharge current. For most purposes a Ne filling at about 3 mm. pressure is recommended. The lines of such a tube are recommended for wavelength standards. They may serve as intensity standards with the proper precautions.

4998. CUNDALL, C. M. AND CRAGGS, J. D.
Electrode Vapor Jets in Spark Discharges.
Spectrochim. Acta., **7**, 149–64 (1955).
C. A., **49**, 15449g (1955).

A description is given of exptl. observations on the properties of the electrode metal-vapor clouds emitted in spark discharges by using a simplified high-voltage supply circuit which provides rectangular current pulses. Measurements of jet propagation velocities and of rates of electrode erosion were made, and are discussed in terms of recent theories of electrode erosion. Image-converter photographs of the metal clouds were taken. The results will be of interest in the spectrochem. analysis of metals where spark-to-spark fluctuations in the light emission from the vapor jet set a limit to the accuracies obtainable. The metals (Mg, Zn, Cd, and W) chosen for this investigation represent a wide range of phys. properties. Single sparks of 600- and 200-amp. magnitude and 3- and 3.5 microsec. duration, resp., in one atm. of H were studied.

4999. ČŮTA, F. AND RAUSCHER, K.
Spectrographic Determination of Small Amounts of Cobalt in Nickel Salts.
Collection Czechoslov. Chem. Communs., **20**, 180–7 (in German) (1955).
C. A., **49**, 8033a (1955).
Cf. *C. A.*, **49**, 4446d.

5000. CYPRES, R. AND TULLEN, P.
Spectrographic Determination of Sodium and Potassium in Clays.
Compt. rend. 27e congr. intern. chim. ind., Brussels, 1954, **3**.
Industrie chim. belge, **20**, Spec. No. 40–4 (1955).
C. A., **50**, 11880i (1956).
Cf. Hasler, et al., *C. A*, **44**, 3691i.

Spectrographic analysis of clays and similar materials is impossible so long as the existence of different phys. structures in different samples affects the intensity of the emitted light. Fusion with Li_2CO_3 converts all samples, natural or synthetic, to the same structure (provided Li_2O is in excess over SiO_2), as shown by x-ray diffraction, and thereby overcomes this objection. The sample is ground with Li_2CO_3 in the ratio of 0.8:1 by wt., fused briefly at 1050–1200°, ground, mixed with an equal wt. of graphite, and placed in the hollow graphite anode of a d.-c. arc. Comparison of the 4044.1 Å. (K) and 5688.2 Å. (Na) lines with the 4972.2 Å. Li line makes possible the detn. of 0.6 to 20% K_2O and 0.03 to 5% Na_2O with a precision of 10–15%. There is no loss of Na or K by volatilization during fusion.

5001. CZAJLÓWNA, Z.
Spectrographic Method of Determining Magnesium in Spheroidal Cast Iron.
Przeglad Odlewnictwa, **5**, 46–50 (1955).
C. A., **49**, 8738c (1955).

By a spectrographic method C. detns. 0.03-0.5% Mg in spheroidal cast iron with an accuracy of 13%. C. uses a quartz spectrograph (I) with medium dispersion and graphite electrodes (each 6 mm. in diam. and 15 mm. long), 4 mm. apart. Dissolve 2 g. of cast iron in HCl, oxidize with HNO_3, and dil. to 100 ml. Place 1 drop of this soln. on the bottom electrode, dry in air, and apply 15,000 v. to form sparks between the electrodes. Measure photographically the intensities of the following spectrum lines Mg 2802.7 and Fe 2767.5Å. Compare their intensities with standard solns. contg. Fe and different amts. of Mg. 14 references.

5002. DAVIS, S.
A Flame Photometer method for the Determination of Plasma Magnesium After Hydroxyquinoline Precipitation.
J. Biol. Chem., **216**, 643–51 (1955).
C. A., **50**, 1117d (1956).

A new, accurate, sensitive flame-photometric method for the detn. of plasma Mg is described. Mg is sepd. quantitatively from blood plasma as the hydroxyquinolate, and adsorbed Na and K are removed by washing. A series of 24 detns. can be completed within 3 hr.

5003. DEAL S. B.
Spectrographic Determination of Lead in Oxygen-Free, High-Conductivity Copper.
Anal. Chem., **27**, 753–5 (1955).
C. A., **49**, 11491b (1955).

A procedure describing the direct arcing of metal samples and standards in an a.-c. arc and photometry of the resulting lines, which is well suited for production control, is proposed. Samples of Cu contg. known quantities of Pb are employed as standards. The Pb line, 2833.1 and the Cu line 2858.7 Å. are used.

5004. DEAN, J. A.
Flame Spectrophotometric Determination of Copper in Nonferrous Alloys.
Anal. Chem., **27**, 1224–9 (1955).
C. A., **49**, 15623b (1955).

For Al- and Zn-base alloys the samples are dissolved in 6 *N* $HClO_4$ or 8 *N* HNO_3. Excess acid is removed by evapn.; a standard soln. of Ag^+ is added and brought to vol. Prepd. solns. are volatilized in an oxyacetylene flame in a Beckman DU flame photometer with photomultiplier. Luminosities are obtained at the following wavelengths: Cu at 324.7, background at 325.0 and 327.0, Cu at 327.4, Ag at 328.0 and background at 328.3 mμ, resp. Comparable results are obtained when calcd., either from standard curves or by the internal Ag standard method. For Sn-

base alloys, samples are digested with HBr-Br_2 and $HClO_4$ acids. Replicates within 3% and good agreement with colorimetric and gravimetric methods are claimed.

5005. DEAN, J. A. AND BURGER, J. C. JR.,
Flame Spectrophotometric Determination of Iron in Siliceous Materials.
Anal. Chem., **27**, 1052–5 (1955).
C. A., **49**, 14563e (1955).

A Beckman Model DU spectrophotometer with photomultiplier is used for the rapid detn. of Fe in Al refractories, glasses, and limestone. A slit width of 0.050 mm. permits the resolution of the Fe 386.0-mμ line and of the Co 387.1-mμ line. Co is added as the internal standard. O and C_2H_2 are selected as the fuels. Background readings are taken at 386.5 mμ. HNO_3 and HCl are the preferred acids, but their max. concn. must be less than 2.5 *M*. A preliminary sepn. of Fe is required if considerable Mg, Ca, Ba, or K is present.

5006. DEAN, J. A. AND LADY, J. H.
Application of Organic Solvent Extraction to Flame Spectrophotometry. Determination of Iron in Nonferrous Alloys.
Anal. Chem., **27**, 1533–6 (1955).
C. A., **50**, 4706e (1956).

Samples contg. 5–35 mg. Fe are dissolved by conventional methods, dild. to 100 ml., and a 10-ml. aliquot is adjusted to pH 0.5–1.0 and extd. with 3 successive 10-ml. portions of acetylacetone. Completion of extn. is indicated by the disappearance of the red-colored Fe complex in the aq. layer. The combined exts. are dild. to 50 ml. with acetylacetone-satd. H_2O. Luminosity of Fe is detd. at 372.0 mμ, while background luminosity is detd. at 371.0 mμ. The sample luminosity is bracketed by a series of standards contg. Fe acetylacetonate in acetylacetone. Background readings are subtracted to obtain net luminosity. Fe concn. is read from a calibration curve. A Beckman DU spectrophotometer with flame photometer and photomultiplier attachments and O-acetylene flame were used. Since the Fe lines are very sharp, a 4:1 gear-reduction knob replaced the wavelength knob and the sensitivity knob was replaced by a 10-turn dial arrangement for accurate reproducibility of sensitivity settings.

5007. DEAN, J. A. AND THOMPSON, C.
Flame Photometric Study of Boron.
Anal. Chem., **27**, 42–6 (1955).
C. A., **49**, 4445b (1955).

The effects of 18 cations and 7 anions on the flame emission of B are reported. H^+ concn. above 0.5*M* depresses B emission. The emission intensity increases with increasing MeOH concn. The data reported are for 1:1 MeOH-water solns.

5008. DENNEN, W. H. AND FOWLER, W. C.
Spectrographic Analysis by Use of a Mutual Standard Method.
Bull. Gel. Soc. Amer., **66**, 655–62 (1955).
C. A., **49**, 12176h (1955).

Al_2O_3 is chosen as the variable internal standard and simultaneous detn. is made of SiO_2, TiO_2, Al_2O_3, total Fe (as Fe_2O_3), MnO, MgO, CaO, Na_2O, and K_2O with a relative deviation of about 10%. Minor elements, such as Co, Mo, V, Ni, Zr, Pb, Cu, Ga, La, Ag, and Zn can also be readily detd. from the plates. The method is based on the assumptions that (*1*) intensity ratio of 2 spectral lines is a function only of concn. ratio of the 2 emitting elements and (*2*) the elements sought comprise essentially all of the sample. Computation is based on the formula $A = 100/1+(B/A)+(C/A)+ \ldots .(X/A)$ where $A = \%\ Al_2O_3$, and B, C, ... X are % SiO_2, % TiO_2 .... % K_2O, resp. The ratio of % SiO_2/% Al_2O_3, etc., are obtained from working curves of intensity ratio *vs.* concn. ratio. Comparisons of chem. and spectrographic analysis and the application of the method to studies of the relative chem. changes in fractionation, weathering, and contact phenomena are given.

5009. DEVORE, G. W.
The Role of Adsorption in the Fractionation and Distribution of Elements.
J. Geol., **63**, 159–90 (1955).
C. A., **49**, 8056c (1955).

Spectrographic analysis of trace elements were made of hornblende, biotite, garnet, and chlorite. (*See C. A.* for complete abstract.)

5010. DIAMOND, J. J.
Flame Photometric Determination of Strontium in Portland Cement.
Anal. Chem., **27**, 913–15 (1955).
C. A., **49**, 11255e (1955).

A 1-g. sample of cement is dissolved in 5 ml. of concd. HCl, dild. with about 20 ml. of water, and filtered. The residue is washed thoroughly with water and the filtrate is then dild. to 100 ml. in a volumetric flask. This soln. is compared with a series of standards made up from a low-Sr cement. One-g. samples of the standard are prepd. as the sample was, and the required vol. of standard Sr soln. is added to each to give standards contg. 10, 20, 30, 40 and 100 p.p.m. of SrO, corresponding to 0.1, 0.2, 0.3, 0.4, and 1% SrO in cement. The comparisons are made by measuring the emission at 461 mμ and subtracting a background emission measured at 466 mμ. Analyses were made for the Sr content of 128 cements collected from 30 states and 2 foreign countries. The values obtained ranged from 0.02 to 0.39% SrO. Sr was also detd. in National Bureau of Standard's standard sample 1A, argillaceous limestone. By this method, standard sample 1A was found to contain 0.22% SrO instead of the

0.12% SrO indicated on the certificate of analysis. A value of 0.20% SrO was obtained by a flame photometric method of "standard addition." Redetn. of the Sr content of sample 1A by other workers at the National Bureau of Standards indicated substantial agreement with these flame photometric results.

5011. DIKHOFF, J. A. M. AND ADDINK, N. W. H.
Results of Intensity Determinations with the S.P.D. Scale.
Mikrochim. Acta, **1955**, 256–64.
C. A., **49**, 11485f (1955).

Addink (*C. A.*, **44**, 7181i) has described a simple method for the visual detn. of light intensities by the s.p.d. (standard paper density) scale. Here more attention is paid to the basic correction of the accuracy of the procedure and to several factors which may affect the measurements by the scale and the calibration of the scale. A short discussion is given of the scale lines with a new spectral linelike, blackened profile.

5012. DIPPEL, W. A. AND BRICKER, C. E.
Flame Photometric Determination of Manganese.
Anal. Chem., **27**, 1484–6 (1955).
C. A., **49**, 15616g (1955).

The intensity of the emission of the Mn line at 403.3 mμ is measured for this detn. Standard addn. techniques correct any enhancement or inhibition of this intensity. General background radiation can be detected from the av. intensity at 400 and 406 mμ. Correction for such interference can be applied without adverse effect upon the standard addn. procedure.

5013. DOBROVOL'SKIĬ, V. V.
Mineralogy of Carbonate Nodules in Quaternary Loams.
Zapiski Vsesoyuz. Mineralog. Obshchestva, **84**, 198–208 (1955).
C. A., **49**, 15674a (1955).

The spectrochem. analysis showed Ti, Zr, Sr, Ba, V, Cr, Mn; traces of Cu, Y, Be, Ga, Ni; and Sn, Pb as accessories, but Co, Zn, and Cd are absent.

5014. DORCHE, J. AND COSTET, C.
Distilled Water and the Containers Utilized in Flame Spectrophotometry.
Bull. Soc. pharm. Bordeaux, **94**, 18–20 (1955).
C. A., **50**, 16535e (1956).

Distd. water kept in glass containers takes up least Na from pyrex glass, and only very small amts. of K and Ca from the different glass containers used.

5015. DORCHE, J., ROLLET, M., AND COSTET, C.
Flame Spectrophotometry in the Analysis of Medicinal Substances. I. Apparatus and Methods.
Ann. pharm. franç. **283-7** (1955).
C. A., **49**, 16343g (1955).

The app. and precautions to be observed in the operation are described. II. Analysis of substances containing salts of alkali metals. *Ibid.* **288–97**.—The mutual influence of other elements present is evaluated.

5016. DOTSON, C. L.
A Rotating Electrode for Spectrographic Analysis of Metallic Samples.
Appl. Spectroscopy, **9**, 33–6 (1955).
C. A., **49**, 8030c (1955).

A rotating electrode for the spectrographic analysis of metal samples is described in detail. The method uses cast disk samples $2^1/_2$ in. in diam. from 0.25 to 0.5 in. thick. Samples are rotated in a plane perpendicular to the primary slit of the spectrograph at speeds up to 5 r.p.m. The method of supporting the sample necessitates machining only one surface of the sample to provide both the supporting and sparking surfaces and assures a const. analytical gap distance during rotation. Analytical results are given for the detn. of Sn and Al in Zn and are statistically analyzed for precision by the rotating and conventional methods of analysis. Excitation conditions, line pairs, and rotational speeds are given for the detn. of Al (0.07–0.2%), Pb (0.3–1.5%), Fe (0.005–1.5%) and Sn (0.2–2.0%) in Zn.

5017. DOW CHEMICAL CO., THE
Magnesium Laboratory Methods.
Dow Chem. Co., Midland, Mich. (1955). 146 pp.
C. A., **50**, 4466i (1956).

5018. DRESCHER-KADEN, F. K.
Metasomatic Serpentine Formation.
Naturwissenschaften, **42**, 342 (1955).
C. A., **50**, 11186i (1956).

Study of ophicalcite formations has shown that these rocks are of metasomatic character; Mg, SiO_2, and H_2O have displaced $CaCO_3$. It is most likely that normal serpentine rock is in many cases due to metasomatism of limestone and dolomite; examples are given. The progressive penetration of Ni and Cr in such slates can be followed by spectroscopy.

5019. DRUTSKAYA, L. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Alumina.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 103–4 (1955).
C. A., **50**, 3888c (1956).

The influence of impurities and hydration on spark and arc operation is described.

5020. DRUTSKAYA, L. V. AND REZNIKOV, I. L.
Spectrographic Determination of Magnesium in Limestone.
Zavodskaya Lab., **21**, 324–7 (1955).
C. A., **50**, 12740g (1956).

A rapid detn. of 0.5–5% MgO in limestone was developed by an emission method.

5021. DULCE, H. J.
Flame Photometric Determinations of Calcium and Magnesium in Urine.
Hoppe-Seyler's Z. physiol. Chem., **302**, 102–4 (1955).
C. A., **50**, 16953f (1956).

Ca and Mg in urine were sepd. by oxalate and di-NH_4 phosphate pptn. and then analyzed by flame photometry.

5022. DUSCHATKO, R. W. AND POLDERVAART A.
Spilitic Intrusion Near Ladron Peak, Socorro County, New Mexico.
Bull. Geol. Soc. Am., **66**, 1097-1108 (1955).
C. A., **49**, 14601b (1955).

Spilitic rocks (basalts, dolerites, albitites) from an intrusion in the siltstones and gypsum of the Yeso formation show a severe alteration that cannot be attributed to weathering alone. The alteration is of a patchy nature and chem. variations, as indicated by 5 new chem. analyses, are highly irregular. Spectrographic analyses are given for Ba, Sr, Ni, Cr, Co, Cu, Pb, and Ga. Zircons were sepd. from the main rock types, and the spilitic basalts and dolerites contain zircons in form and amt. comparable to those sepd. from normal basalts, dolerites, and gabbros. Most of the albitites are thought to be magmatic in origin on the basis of the zircons recovered, but one, contg. a majority of rounded zircons, is of mixed origin. The alteration process is described in detail, and it is suggested that the magma was spilitic at the time of emplacement; the introduction of hyperfusibles, especially sulfate, from the country rocks, accentuated the deuteric alteration.

5023. DUTRA, C. V.
Spectrochemical Determinations of Major and Minor Constituents in Minute Samples of Minerals. Complete Analyses of Lamprophyllite and Eudialyte.
Univ. Minas Gerais, Inst. pesquisas radioativas, Publ. No. **4**, 1–8 (English summary) (1955).
C. A., **50**, 9942c (1956).

On samples of less than 40 mg., Si, Fe, Al, Mn, and Na are detd. by the method of Jaycox (*C. A.*, **41**, 3707c) and Zr, Ti, Ca, and Sr by the total energy method. Samples are dild. in both methods with a mixt. of CuO and graphite. Complete spectrochem. results are given for the silicates eudialyte (Na, Ca, Sr, Mn, and Zr) and lamprophyllite (Na, Sr, Mn, and Ti).

5024. ECKER, G.
Periodic Phenomena in the Volatilization of Metal on the Surface of Alloys.
Spectrochim. Acta, **7**, 219–30 (1955).
C. A., **50**, 1398i (1956).

The volatilization of metal from an electrode of an alloy follows a characteristic time sequence during which regular periodic variations occur. By excluding irrelevant phenomena, a set of simultaneous differential equations can be derived from the volatilization process that permits the evaluation of the variation of the volatilization process with time. Important parameters are the relative volatilization probabilities of the two components of the alloy, the percentage compn., and the probability of energy dissipation in lower layers of the metal beneath the surface layer. These equations were numerically integrated for 4 examples, to show the effect of various parameters. Curves are derived that correspond to observations. and in particular to account for the periodic variations.

5025. EDWARDS, G. AND UREY, H. C.
Determination of Alkali Metals in Meteorites by a Distillation Process.
Geochim. et Cosmochim. Acta, **7**, 154–68 (1955).
C. A., **49**, 15609i (1955).

The alkali halides are distd. from silicates in an induction-heated crucible at 1300–1350° for 40 min. and then at 1400–1450° for a further 15 min. The distillate is collected on a water-cooled jacket and subjected to flame-spectrophotometric analysis. The consistency of recovery for Na less than 1% and K less than 0.1% is ±3%. Zn, Pb, Ga, and Ag are concd. in the volatile portion and absent in the residue. In chondrites, which showed no visible signs of weathering, the av. Na and K concns. were 0.70 and 0.088%, resp. The range of variation (Na, 0.66–0.74%; K, 0.084–0.095%) is much less than previously supposed. The carbonaceous chondrites and achondrites are more variable in compn. Rb ranged between 0.00040 and 0.00060% with an av. of 0.00052% is 5 chondrites.

5026. EICHHOFF, H. J. AND MAINKA, E.
The Accuracy of Spectrochemical Addition Procedures.
Mikrochim. Acta, **1955**, 299–304.
C. A., **49**, 11486d (1955).

The possible max. error in spectrochem. procedures is calcd. for several practically important cases and compared with exptl. findings.

5027. EIGNER, H. E.
How to Identify Steam-Water Cycle Deposits.
Power Eng., **59**, No. 1, 76–8 (1955).
C. A., **49**, 7160e (1955).

Many elements and compds. are listed which can be detd. more readily and rapidly by spectrophotometer, flame photometer, polarograph or spectrograph, and other instruments, than by chem. analysis.

5028. ELLESTAD, R. B. AND HORSTMAN, E. L.
Flame Photometric Determination of Lithium in Silicate Rocks.
Anal. Chem., **27**, 1229–31 (1955).
C. A., **49**, 15616b (1955).

Digest 0.5 g. of sample with H_2SO_4, HF, and HNO_3. Add basic $PbCO_3$ to neutralize excess free H_2SO_4 and to ppt. Fe and Al. Filter the soln. Det. Li in a Beckman DU spectrophotometer, by means of the 671-mμ line. Li standards contg. Na and K in approx. concns. previously detd. in the sample are used to prep. standard curves. Mg up to 360 p.p.m. does not interfere. Favorable agreement with spectrographic results and an accuracy to 0.001% are claimed.

5029. EVANS, D. V. AND JOHNSTON, D.
A Solution Method of Spectrographic Analysis
Metallurgia, **51**, 261–2 (1955).
C. A., **49**, 10791d (1955).

Owing to irregularities in metallic specimens particularly of light metals, the soln. method of spectrographic analysis is recommended, by using spark rather than arc methods of excitation. Details are described.

5030. EVLASHIN, L. S.
Transactions of the IXth All-Union Conference on Spectroscopy. Tin Analysis in the Complex Galvanic Covering of Radiator Tubes.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 206–7 (1955).
C. A., **50**, 3891e (1956).

Stainless steel probes are deposited in the tinning bath and the film is stripped from them.

5031. FAL'K, T. K.
Transactions of the IXth All-Union Conference on Spectroscopy. Apparatus with Photoelectric Registration.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 45–7 (1955).
C. A., **50**, 3886f (1956).

5032. FAL'KOVA, O. B.
Spectrographic Determination of Oxygen in Steel.
Zavodskaya Lab., **21**, 1083–7 (1955).
C. A., **50**, 9940i (1956).
Cf. *C. A.*, **50**, 3889f.

O in steel can be detd. spectrographically in an atm. of H of 40 cm. Hg (an atm. of He lowered the sensitivity of the O II 4641.8-Å. line) with a high-voltage intermittent spark and in an atm. of H at 70 cm. Hg with a low-voltage intermittent spark. An auxiliary C electrode (6.5 mm. diam.) ground to a truncated cone with a surface of 3 mm. diam. was used. Auxiliary electrodes of Fe and W gave scattered results.

5033. FAL'KOVA, O. B.
Transactions of the IXth All-Union Conference on Spectroscopy. Determination of Oxygen in Steel by Spectroscopy.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 149–50 (1955).
C. A., **50**, 3889f (1956).

A low-voltage pulse spark discharge in H at a pressure of 270 mm. is used. The O concn. is established by the intensity of the line 4641.8 Å. in the interval of concns. 0.05–0.2%.

5034. FASSEL, V. A. AND HETTEL, H. J.
Isotopic Assay of Lithium by Means of Hydride Band Emission Spectra.
Spectrochim. Acta, **7**, 175–8 (1955).
C. A. **49**, 15615i (1955).

A spectrographic method applicable to the detn. of the Li^6-Li^7 isotopic ratio is described. The procedure involves the low current d.-c. arc excitation of Li_2SO_4 samples in an atm. of 50% H_2 + 50% He. The intensity ratio of selected Li^6H and Li^7H band lines is plotted against the concn. ratio to yield linear analytical curves of unit slope. Although only the concn. range from 8 per cent to 25 per cent Li^6 is covered by the line pairs used in this investigation, it should be possible to extend the range up to 92% Li^6 with the same line pairs.

5035. FASSEL, V. A., QUINNEY, B., KROTZ, L. C., AND LENTZ, C. F.
Quantitative Spectrographic Analysis of Rare Earth Elements—Determination of Holmium, Erbium, Yttrium, and Terbium in Dysprosium, and Determination of Yttrium, Dysprosium, and Erbium in Holmium, and Determination of Yttrium, Dysprosium, Holmium, Thulium, and Ytterbium in Erbium.
Anal. Chem., **27**, 1010–14 (1955).
C. A., **49**, 11490e (1955).

The basic methods and the app. employed for the emission spectrographic detn. of the rare earths have been described previously (*C. A.*, **47**, 999b; *C. A.*, **42**, 5795f). Analytical curves were prepd. by plotting the intensity ratio of the spectral lines of the rare earth impurity to that of the rare earth matrix against the per cent rare earth oxide. The spectral line pairs selected were Tb 4318.85/Dy 4319.21; Y 3601.92/Dy 3611.90; Ho 3456.00/Dy 3443.46; Er 4007.97/Dy 4005.48; Y 4374.94/ Ho 4379.14 (Dy less than 2%); Y 3982.59/Ho 3966.85 (Dy more than 2%); Dy 4221.10/Ho 4221.62; Er 3906.32/Ho 3910.30; Y 4374.94/Er 4382.17; Dy 3898.54/Er 3891.65; Ho 3456.00/Er 3436.95; Tm 3362.61/Er 3328.30; Yb 3987.99/Er 3977.57 (less than 0.2% Yb);

and Yb 2970.56/Er 2986.69 (more than 0.2% Yb). The concn. range from the detectable limit up to 1% was recovered with an av. error of less than 5%.

5036. FELDMAN, C. AND ELLENBURG, J. Y.
Spectrochemical Determination of Boron in Carbon and Graphite.
Anal. Chem., **27**, 1714–21 (1955).
C. A., **50**, 2355g (1956).

The physicochem. properties of B_4C and the mechanism of the C arc are discussed as they affect the volatilization of B from a C electrode. B can be detd. by (*1*) mixing the sample with finely powd. Ir as an internal standard, loading this material into a carbon (not graphite) electrode and burning this electrode as the anode of a d.-c. arc in a 76 vol. % A-24 vol. % O_2 mixt., or (*2*) mixing the sample with 5000 p.p.m. Cu as anhyd. CuO loading the mixt. into a sifter electrode, and by using this as the upper electrode of a high-voltage spark discharge in A or air. (The sifter electrode is a bevel-bottom porous cup electrode whose sparking surface is perforated by 4 small holes. Its top opening is corked during an exposure to prevent upward ejection of the sample.) The sifter electrode procedure can probably be adapted to the detn. of other impurities in C or graphite. Sensitivity limits for the arc and spark procedures are 0.5 and 0.2 p.p.m., resp. The mean relative standard deviation for quadruplicates is 1.8% of the amt. present in both cases.

5037. FENOGLIO, M. AND RIGAULT, G.
Spectrographic Investigation of the Scheelite from Traversella.
Atti accad. nazl. Lincei, Rend., Classe sci., mat. e nat., **18**, 260–5 (1955).
C. A., **49**, 15650a (1955).

The scheelite of Traversella is particularly interesting because it contains rare earths. An unusually pure crystal of honey-yellow color was used for the spectrographic investigation. Nb, Ta, and rare earths were enriched by HCl sepn. from WO_3, and subsequent pptn. of the rare earths as oxalates. The spectrograms were evaluated by direct comparison of the d.-c. arc emission spectra with the Fe spectrum. Al, Cr, Mn, Fe, Ba, and Bi were absent; Mo, Mg, and a trace of Sr present, with a very slight trace of Cu. Nb was distinctly present, Ta subordinate. Among the rare earth elements present are Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Dy, and Yb; absent are Th, Sc, Tb, Tm, and Lu; very small traces are found of Ho and Er. Quant. estns. are difficult, but Nd is more abundant than Pr, and Y more than Ce, Nd, Sm, Eu, Gd, Dy, Yb, La, Pr, Ho, and Er. These facts agree with the previous results of photoluminescence methods; the Oddo-Harkins law of distribution is fulfilled. There is no distinct differentiation in the Ce and Y groups; the distribution of elements is similar to that in yttrofluorite and apatite. The isomorphic replacement conditions in scheelite are typical for the coupled substitutions of $Ca^{++}+(Wo, Mo)^{6+} \rightleftharpoons (Y, La, Ce. . .)^{3+}+(Nb, Ta)^{5+}$.

5038. FERRARI, C.
Chemical-Analytical Problems with the Minor Elements of the Life Cycle.
Minerva med., **1955**, II, 1833–4 (1955).
C. A., **50**, 6526e (1956).

A discussion of the importance of minor-element detn., with emphasis on the newer developments of colorimetry and flame-photometry.

5039. FERRARI, C.
Chemical Method to Evaluate Potassium in Soils.
Potassium Symposium, Rome, **1955**, 485–94 (1955).
C. A., **52**, 1530c (1958).

For series analyses to det. the state of K in a soil, only chem. procedures are practicable. Assimilable K in soil is extd. by means of H_2CO_3 by using a ratio soil to soln. of 1:2.5. An aq. suspension of soil is transferred to a conical pptn. flask, and CO_2 is bubbled through it during 1 hr. After eliminating nearly all of the simultaneously extd. Ca, the K in soln. is detd. by flame photometry. The filtered clear soln. is analyzed with a flame photometer by using (or not) Li as an internal standard. The method is fast: 2 lab. assistants can make daily several dozen analyses. The no. of soils in Italy which have to be considered as poor in assimilable K is rather great.

5040. FINK, A.
Use of Alcoholic Solutions in Flame Photometric Analysis.
Mikrochim. Acta, **1955**, 314–28 (1955).
C. A., **49**, 11486f (1955).

To increase the accuracy and sensitivity of the flame-photometric detn. of Ca and Mg, it is well to make use of solns. in an alc. For Ca and Mg, there is a 3-fold increase of the photocurrent of the Se instrument when AmOH rather than water is used as solvent. Very good results were obtained for as little as 0.02% $Ca(NO_3)_2$, but with Mg the results were not as good.

5041. FINKIN, K. Z.
Transactions of the IXth All-Union Conference on Spectroscopy. Influence of Graphite Powder on the Spectral Analysis of Ores.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 120–1 (1955).
C. A., **50**, 3888h (1956).

Graphite powder is added to the probe in a proportion of 1:1 to prevent melting.

5042. FISHMAN, I. S.
Transactions of the IXth All-Union Conference on Spectroscopy. A Real Value of the Reabsorption Coefficient *b* in a Spectrum Excited by a Condensed Spark Generator.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 135–6 (1955).
C. A., **50**, 3889d (1956).

Formulas are developed connecting *b* with the slope of graduation graphs, the evapn., the background blackening, the γ of the plates, and the diln. of the main component. *b* has been obtained for 13 lines of steel and dural components. $b=1$ for lines with an excited or metastable lower level.

5043. FISHMAN, I. S. AND STOLOV, A. L.
Calculation of Errors in Spectral Analysis by Current Measurements. II.
Uchenye Zapiski Kazan. Gosudarst. Univ., **115**, No. 12, 57–71 (1955);
Referat. Zhur. Fiz., 1957, Abstr. No. 7942.
C. A., **52**, 13517g (1958).

By the method of least squares expressions were obtained for the errors in the analysis with 3 standards and with a control standard. From these expressions it is predicted that in the 3-standard method: (*1*) given a no. of standards and given a concn., the min. error is obtained when the standards are placed at the ends of the interval, symmetrically relative to the middle; (*2*) for a given set of standards the error depends on the concn. of a given component and increases considerably for concns. lying at the boundaries of the interval; (*3*) it is always more advantageous to photograph spectra of a small no. of standards, but increase the multiplicity of the photography; (*4*) the accuracy of the analysis is best increased by increasing the multiplicity of the photography of the spectra of the specimen, not of the standards. The accuracy of the analysis by the control-standard method exceeds the accuracy of the 3-standard method for the same total no. of photographs.

5044. FLEISCHER, M.
Estimates of the Abundances of Some Chemical Elements and Their Reliability.
Geol. Soc. Amer., Spec. Paper **62**, 145–54 (1955).
C. A., **49**, 12233e (1955).
Cf. *C. A.*, **48**, 512d.

The figures generally cited for the abundances of Bi, Ge, Ga, and Y are reviewed. That for Bi, 0.2 p.p.m., is based on so few data that its reliability is unknown; that for the Ge, 7 p.p.m., is probably of the right order of magnitude but too high. On the basis of about 600 spectrographic analyses of rocks, the accepted figure for Ga, 15 p.p.m., is probably a little low; that for *Y*, 28.1 p.p.m., is probably in the range 40 ±10 p.p.m. 55 references.

5045. FORBES, G. B. AND D'AMBRUSO, M.
Determination of Sodium in Bone with the Aid of Cation-Exchange Chromatography.
J. Biol. Chem., **212**, 655–61 (1955).
C. A., **49**, 6361h (1955).

A new method is presented for the detn. of Na in bone. It consists of placing an acid soln. of bone ash on a Dowex 50 column (1.2 ×45 cm.). Elution with 0.7 *N* HCl gives a quant. recovery of Na (unaccompanied by P, K, Mg, or Ca) in the 100–300-cc. zone of the effluent. This fraction can then be analyzed directly for Na by flame photometry without correcting for interfering substances. The elution procedure, including reconditioning the column for the next run, requires about 7 hrs. The method will accommodate 0.3 to 2.0-g. samples of bone (wet wt.). Recovery of Na from synthetic mixts. was 100 ±3% and that of Na added to solns. of bone ash was 97 ±8%. Values for Na content of rat femur and tibia (approx. 1 g. wet wt.) detd. by this method are presented. Over the age range from 5 days to 6 months and over, the Na content of rat bone, on a wet-wt. basis, increases markedly, although the molar Ca-Na ratio remains fairly const.

5046. FORD, O. W.
Determination of Potash in Fertilizers.
J. Assoc. Offic. Agr. Chemists, **38**, 445–51 (1955).
C. A., **49**, 10566a (1955).
Cf. *C. A.*, **48**, 9001h.

Eight samples covering the extreme range of potash levels (6–63%) normally found in com. fertilizers were submitted to 24 collaborators for analysis by the gravimetric method normally used in their lab. and by a flame photometer method (I). Method I included the use of an interference buffer contg. NH_4 phosphate and sulfate, and some of the samples contained materials with possible interfering effect in method I. The max. variation and the standard deviation of the results for each sample by the 2 methods were of the same magnitude. Comparable results were obtained by the direct-intensity method and the internal-standard method.

5047. FOSLIE, S.
The Pyrite District Varaldsøy-Ølve in Hardanger, southern Norway.
Norg. Geol. Undersökelse, No. **147**, 106 pp. (in English, 86–106) (1955).
C. A., **49**, 9456b (1955).

The petrography of the area is described, with partial analyses of 7 rocks and complete chem. analyses plus spectrographic detns. of V, Cr, Cu, Ni, and Co on 4 rocks. Greenstones are the most important rocks of the area. The pyrite deposits are not described, but their history and production are given. Reserves are probably large.

5048. FOSTER, H. L. AND MASON, A. C.
1950 and 1951 Eruptions of Mihara Yama, O Shima Volcano, Japan.
Bull. Geol. Soc. Amer., **66**, 731–62 (1955).
C. A., **49**, 11517d (1955).

Chem. and spectrographic analyses of condensate, sublimate, and gas, and phys. measurements of temp. and viscosity of the flows are summarized.

5049. FRANCIS, G. H.
Zoned Hydrothermal Bodies in the Serpentinite Mass of Glen Urquhart (Invernessshire)
Geol. Mag., **92**, 433–47 (1955).
C. A., **50**, 5482c (1956).

These masses, rich in quartz, oligoclass, tourmaline, and micas, are mineralogically related to pegmatites and metasomatic bodies in the surrounding Moine sediments. It is believed that such rocks originate when moving hydrothermal solns. from granites cut ultrabasic rocks, rather than being crystn. products of late-stage sodic residual liquids left after the crystn. of most of the material of ultrabasic magmas. Three chem. and 3 spectrographic analyses are given.

5050. FRANCISZEK, K.
Flame Photometry.
Polski Tygodnik Lekarski, **10**, 1188–95 (1955).
C. A., **50**, 15325g (1956).

A review with 26 references.

5051. FRENCH, J. R.
Determination of Alkali Metal and Alkaline-Earth Elements by Flame Photometry, a Bibliography.
U. S. Atomic Energy Comm., **ORNL-2001**, 20 pp. (1955).
C. A., **50**, 13648i (1956).

5052. FRISHBERG, A. A.
Transactions of the IXth All-Union Conference on Spectroscopy. The Photometric Properties of "Spectral" Plates Types I, II, and III.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 131–2 (1955.)
C. A., **50**, 3889c (1956).

5053. FUWA, K.
Spectrochemical Analysis of Fluorine by the Band Spectrum of Barium Fluoride.
J. Chem. Soc. Japan. Pure Chem. Sect., **76**, 14–18 (1955).
C. A., **49**, 13828c (1955).

Band spectra of BaF at 4950.8 and 5000.6 Å. can be used for the detn. of F.

5054. GAMBLE, L. W. AND JONES, W. H.
Determination of Trace Metals in Petroleum.
Anal. Chem., **27**, 1456–9 (1955).
C. A., **49**, 16405d (1955).

Trace metals in petroleum distillates are more completely recovered by wet ashing than by dry ashing. A spectrographic procedure for 10–50-g. sample with $Mg(NO_3)_2$ has been developed for detn. of metals in the 0.1–2.0 p.p.m. range.

5055. GARCÍA-LLAURADO, J.
Application of the Flame Photometer to the Determination of Mineralocorticoids, Especially Deoxycorticosterone Acetate (DOCA).
Rev. clín. español., **58**, 343–8 (1955).
C. A., **50**, 3527f (1956).

Rats are given a certain amt. of DOCA by injection, and the urine is collected for 3 hrs. The Na and K of the urine are detd. by the flame photometer, and the results are expressed as a function of the Na/K ratio. There is a linear relation between the Na/K ratio and the logarithm of the amt. of DOCA injected. The method can be used with all substances capable of acting on the Na and K metabolism.

5056. GEGECHKORI, N. M.
Determination of Some Impurities in Tungsten by the Spectrographic Method.
Zavodskaya Lab., **21**, 1075–9 (1955).
C. A., **50**, 9221h (1956).

The effect of several factors on the precision of spectrographic analysis of Si, Al, Ca, Fe, and Mg in W (metallic and H_2WO_4) was investigated. The powd. material was completely oxidized at 700–800°, mixed with C contg. 1% CuO (internal standards of AgCl (Cf. Lounamaa, *C. A.*, **46**, 2960h) and oxides and salts of Co, Mn, Sn, and Ba were less satisfactory), and compressed in cylinders 4–5 mm. diam. These were placed in a carefully machined hollow (3.4 mm. diam., 7 mm. deep, and a wall thickness of about 1 mm.); the upper electrode was finished as a truncated cone with a 2-mm. flat surface. A d.-c. arc of 5–7 amp. was sufficient; 10 amp. gave an unstable arc. All of the elements evapd. completely during the first 2–30 sec. before the W lines appeared in the spectrum. With 0.001% of the impurities the results were reproducible within ±6–8% during the first 15–20 sec.; the error increased up to 20% during the last 10 min.

5057. GEHRKE, C. W., AFFSPRUNG, H. E., AND WOOD, E. L.
Flame Photometric Determination of Potassium With Ion-Exchange Separation of Interfering Anions.
J. Agr Food Chem., **3**, 48–50 (1955).
C. A., **49**, 3724e (1955).

A simple, rapid, and accurate method is described in which PO_4^{---} and SO_4^{--} are exchanged by an anion exchanger, and Ca and Mg are pptd. as carbonates. This method for detg. K is as accurate as the AOAC gravimetric method now in use.

5058. GEILMANN, W.
Investigations on Ancient Glasses. III. Chemical Composition of Some Ancient Glasses, Especially of German Glasses of the 10th to the 18th Centuries.
Glastech. Ber., 146–56 (1955).
C. A., **49**, 10591i (1955).
Cf. *C. A.*, **49**, 3494a.

Fifty complete analyses are given of ancient glasses of Oriental, Roman, and German origin. The Oriental-glass compns. are rather const. over about 3000 years and are similar to those of the Roman products which were manufd. in the Rhinelands and in the Main valley. The early-medieval German glasses are basically different; these distinctions in the compn. are particularly evident in a graph with the mole % of RO and R_2O as coordinates. This fundamental change at a distinct time period is caused by the changing character of the raw materials used for glass batches. Soda (imported) became scarce so beechwood ash was used in its place; therefore more K_2O and P_2O_5 was introduced with it. Expts. of the author have demonstrated that it is easy to reproduce entirely the compn. of the medieval glasses with beech ashes and sand batches. The rather wide variability of the glass compns. only mirrors the unavoidable changes in the compn. of the ashes influenced by soil conditions, etc. French church window glasses are the same type as the German glasses. Analyses of the natural soda (e. g., from Wadi Natrun near Kairo and Fessan) and spectrochem. data on the trace elements of wood ashes (Ag, Cu, Pb, Ni, Sn, V, Be, Zn) and the corresponding concns. in the glasses are given. The great skillfulness of the ancient glassmakers is evident by their ability to overcome the variations necessarily occurring from the natural raw materials to produce remarkably uniform technological results.

5059. GEĬRO, S. S.
Transactions of the IXth All-Union Conference on Spectroscopy. Emission Spectral Analysis of the Cut Through the Devonian and Carbonaceous Age Sediments of the Troitsk-Pechorsk Region of Komi Auton. S.S.R.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 200–1 (1955).
C. A., **50**, 3891c (1956).

5060. GENT, L. L., MILLER, C. P., AND POMATTI, R. C.
Spectrographic Analysis of Petroleum Products and Related Materials.
Anal. Chem., **27**, 15–17 (1955).
C. A., **49**, 6582f (1955).

For the spectrographic detn. of P and various metals in lubricating oils, additive concentrates, greases, used oil sludges and engine deposits, a small amt. of sample is burned on a large bed of graphite powder contg. CuO which later serves as spectroscopic buffer and internal standard. The powder is mixed, and portions are tamped into a shallow-cratered graphite electrode for spectrographic exam.

5061. GERASIMOVA, N. G., IVANOVA, T. F., SVENTITSKIĬ, N. S., STARTSEV, G. P., TAGANOV, K. I., AND TRENTOVIUS, M. E.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Determination of Hydrogen in Metals.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 147–8 (1955).
C. A., **50**, 3889f (1956).

A single impulse discharge of high or low voltage was used. Standards were steels contg. H.

5062. GERGELY, G. AND VÁRADI, P. F.
A Simple Flame Photometer of High Sensitivity.
Acta Phys. Acad. Sci. Hung., **5**, 51–64 (in English) (1955).
C. A., **50**, 7510h (1956).

The flame photometer consists of a H-O flame, a glass-prism monochromator, and a multiplier tube. The required wave lengths are selected by turning a calibrated drum. An atomizer burner similar to the Beckman atomizer is used. It contains a Ni capillary inlet tube which can be adjusted by means of a screw. The light beam entering the monochromator is chopped by means of a rotating sector. Thus, the fluctuating current of the multiplier produces a low-frequency voltage on the load resistance. This output voltage is measured by means of a low-frequency electronic voltmeter. Sensitivity is controlled by adjusting the high-voltage supply of the multiplier. The Ba, Sr, and Ca content of oxide-coated cathodes and the K content in fluorescent screens are detd. with this instrument. An RCA 931A type multiplier tube is used for Ca, Sr, and Ba measurements and an RCA IP22 type for K. Working curves are prepd. by using standard solns. of $Sr(NO_3)_2$, $Ba(NO_3)_2$, and $Ca(NO_3)_2$. The logarithmic emission intensity is plotted against the logarithm of concn. Because of the interference effects, each of the standard solns. of Ca, Sr, and Ba is measured at the wavelengths 4226, 4607, and 4934 Å. Each soln. tested must be measured at these 3 wavelengths. A background emission of the flame is also read and subtracted. The interference effects are calcd. by means of the working curves. In the case of low and moderate concns., approx. results can be obtained by neglecting the interferences. Sensitivities were 0.6 p.p.m. for Ba, 0.2 p.p.m. for Sr, 0.09 p.p.m. for Ca, and 0.005 p.p.m. for K.

5063. GINZBURG, V. L., GRAMENITSKIĬ, I. N., KASHLINSKAYA, S. E., AND LIYSHITS, D. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectrographic Determination of Small Additions in Certain Basic Products, Semifabricates, and Metals of the Copper-Nickel Industry.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 211–16 (1955).
C. A., **50**, 3891g (1956).

To analyze the products for Pt, Pd, and Au, the probes are concd. 30–50 times. The sensitivity of the method is 0.001–0.003%. An analysis for Ag in Cu-Ni sulfide ore is described; the analysis of Cu for Ni, Fe, Sb, Bi, Pb, Zn, Sn, and As and of Co for Ni, Fe, Si, Mn, Pb, Sb, As, and Al is discussed.

5064. GLENDENING, B. L., PARRISH, D. B., AND SCHRENK, W. G.
Spectrographic Determination of Rubidium in Plant and Animal Tissue.
Anal. Chem., **27**, 1554–6 (1955).
C. A., **50**, 4278f (1956).

Rb was detd. spectrographically after dry ashing at 550° and soln. in HCl. A Bausch and Lomb large Littrow quartz prism spectrograph with a Beckman Model 10300 flame photometer excitation unit was employed. Since Na and K enhanced the intensity of the Rb lines (7800.2 and 7947.6 Å.), they were added to the standard soln. The Li line at 6707.8 Å. served as an internal standard. When concn. of K was greater than that of Rb, a matching procedure was employed which blocked out the K lines (7664.9 and 7699.0 Å.). Rb content of 41 human *foods* and animal *feeds* are presented.

5065. GLICK, D., SWIGART, R. H., NAYYAR, S. N., AND STECKLEIN, H. R.
Histochemistry. XXXII. Flame Photometric Determination of Potassium in Microgram Quantities of Tissue and the Distribution of Potassium and Lipides in the Adrenal of the Monkey and Guinea Pig.
J. Histochem. Cytochem., **3**, 6–15 (1955).
C. A., **49**, 5619g (1955).
Cf. *C. A.*, **48**, 13785h.

The adrenal glands of rhesus and cynomolgus monkeys and guinea pigs show histochemically the lipides to be 55–70% of total dry wt. and located primarily in the fascicular zone. K was primarily located between the fascicular and glomerular zones.

5066. GOLDSMITH, J. R., GRAF, D. L., AND JOENSUU, O. I.
The Occurrence of Magnesian Calcites in Nature.
Geochim. et Cosmochim. Acta, **7**, 212–30 (1955).
C. A., **49**, 15645h (1955).

The variation of 112, 521, 663, 112, and 444 spacings of natural calcites (detd. by X-ray powder diffraction with a 114.59-mm. Norelco camera with Fe-filtered radiation or a Nonius quadruple-focus camera with monochromatized Co radiation) was linear with increase in Mg content (detd. by a Jaco-Wadsworth grating spectrograph with Specpure $CaCO_3$ standards and Co internal standards). Spectroanalyses were compared with wet analyses. Fe and Mn displacements of Ca may affect the detn. of Mg via X-ray spacing. The Mg content of natural calcites was correlated with conditions of formation.

5067. GOLLING, E.
Harvey's Semiquantitative Method of Analysis and Its Use with a Spectrograph of Medium Dispersion.
Mikrochim Acta, **1955**, 305–13 (1955).
C. A., **49**, 11486d (1955).

Most of the sensitivity factors contained in the Harvey tables can be transcribed for a medium spectrograph, since the corresponding calibration curves conform to the proportionality of intensity and concn. A significant wave-length dependence has been found for the correction factors obtained. This permits nonexptl. k values to be obtained from the Harvey k-values within about 50% of the truth. For lines which terminate in the ground state of an atom, the proportionality does not hold strictly, but it is still possible to arrive at a satisfactory result provided a concn. range of k:10 k is analyzed. A generalization of this requirement to all detection lines produces better accuracy and reliability in the use of this procedure. As a rule, the effect of anions can be disregarded provided the calibration curve is used only up to concns. of 10 k.

5068. GOLOB, H. R. AND HODGE, E. S.
Extraneous Element Effects as Shown by Data from Harvey's Semiquantitative Spectrographic Analysis.
Appl. Spectroscopy, **9**, 170 (1955).
C. A., **50**, 3145h (1956).

Data on spectral sensitivities for 35 elements in a graphite base are tabulated. It is concluded that elements with high boiling points and complex spectra, such as Nb, W, etc., should be avoided as matrix elements.

5069. GOLOB, H. R. AND HODGE, E. S.
Spectrographic Standard Samples of Tool Steels.
Appl. Spectroscopy, **9**, 172 (1955).
C. A., **50**, 3145i (1956).

Six new standards for spark spectrographic analysis of tool steels are announced. They contain certified amts. of Mn, Si, Cu, Cr, V, Mo, W, and Co and can be obtained from the National Bureau of Standards.

5070. GOLOVCHENKO, V. P.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Electrolytic Baths.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 204–5 (1955).
C. A., **50**, 3891d (1956).

5071. GOLUBEV, N. A. AND NAGIBINA, I. M.
Spectral Determination of Microelements in Fodder.
Leningrad. Inst. Usovershenst. Vet. Vracheĭ, Sbornik Nauch. Tudov, **10**, 173–6 (1955).
C. A., **52**, 4884a (1958).

The elements detd. were Al, Ba, B, K, Co, Mg, Mn, Cu, Si, Ni, Sr, Ti, P, Cr, Zn, and Fe; Pb was absent in all the samples investigated. The spectral analysis of fodder is recommended because it is time-saving and economical. It was found that clover and grains were a good source of Co; grass and other meadow plants contained very little Co. Therefore if the animals are restricted to the latter rations, $CoCl_2$ ought to be added to the fodder. All elements, except Co, were present in amts. of more than 0.001%, the limit of sensitivity of this method.

5072. GORBACH, G.
The Importance of Microchemistry for Spectral Analysis.
Mikrochim. Acta, **1955**, 336–44 (1955).
C. A., **49**, 11486g (1955).

App., reagents, and tests used in microchem. analysis are often very helpful in spectrographic work.

5073. GORBUNOV, N. S., ARYAMOVA, I. I., AND SEL'SKAYA, O. G.
Spectral Method for Determination of Diffusion Coefficient for Chromium in Iron.
Voprosy Poroshkovoĭ Met. (Kiev: Izdatel. Akad. Nauk Ukr. S.S.R.) Sbornik, **1955**, 150–4.
Referat. Zhur. Khim., **1956**, Abstr. No. **35129**.
C. A., **52**, 15175c (1958).

The concn. of a diffusion layer of Cr in Fe after 8 hrs. combustion at 1000° was investigated by the spectral method. The content of Cr changes from 84.5% in the 5-μ layers to 29.4% in the 98-μ layer; the value of the diffusion coeff. of Cr in Fe at 1000° changes correspondingly from 1.31×10^{-10} to 15.13×10^{-10} sq. cm./sec., the av. value is 5.24×10^{-10} sq. cm./sec.

5074. GOTO, K., KIDO, G., AND KIMURA, T.
Rapid Determination of Calcium and Magnesium Oxide in Granulated Blast-Furnace Slag by Means of the Beckman Flame Spectrophotometer.
Semento Gijutsu Nenpô, **9**, 118–21(1955).
C. A., **52**, 7020d (1958).

Dissolve 0.5 g of the sample in concd. HCl and filter. Add 15 cc. of a concd. HCl to the filtrate, and dil. to 100 cc. with distd. H_2O for detg. MgO. Dil. further 5 cc. of this soln. to 100 cc. with Al soln. (100 γ/cc.) for detg. CaO. The values obtained by using the calibration lines detd. by blank test were compared with those obtained by common chem. analysis. Mean value of the range of reproducibility for each sample is 1.2% for CaO and 0.2% for MgO. More accurate results can be expected when the instrument is placed in a room with controlled humidity. The interferences of the concns. of Al and HCl were also discussed.

5075. GRIKIT, I. A.
Transactions of the IXth All-Union Conference on Spectroscopy. The Influence of Thermal Treatment and of the Deformation of Rapid-Cutting Steel P 18 on the Results of Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 171–3 (1955).
C. A., **50**, 3890e (1956).

Differences were observed on annealed and forged samples, when excited by a spark source but not with an arc source.

5076. GRIKIT, I. A.
Transactions of the IXth All-Union Conference on Spectroscopy. The Influence of Cementation and Nitridation on the Results of Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 221–3 (1955).
C. A., **50**, 3891i (1956).

It is shown that cementation and nitridation influence the spectral analysis for alloying elements by introducing errors in excess of 10%.

5077. GRINZAĬD, E. L.
Transactions of the IXth All-Union Conference on Spectroscopy. Errors Produced at Different Stages of Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 132–3 (1955).
C. A., **50**, 3889c (1956).

It is statistically shown that in order to decrease the errors below 1.5–2% it is necessary to further reduce the errors owing to photography and photometry.

5078. GRISHCHENKO, M. P. AND SHAEVICH, A. B.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of the Electrolyte of Galvanic Baths for Zinc and Nickel Plating.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 203–4 (1955).
C.A., **50**, 3891d (1956).

The soln. is introduced into the discharge by means of ash-free filters.

5079. GROVE, E. I. AND NORRIS, J. A.
A Study of Matrix Effects on a Graphite Base Semiquantitative Procedure.

Appl. Spectroscopy, **9**, 63–8 (1955).
C. A., **50**, 101d (1956).

The procedure routinely used for the analsysis of electromagnetically sepd. isotopes and in particular the variations in analytical results due to matrix effects are described. Analytical samples are mixed in a ratio of 1 to 9 parts graphite by wt. and arced at 5-amp. 2400-v. a.c. in a $^3/_{16}$-in. pedestal-type electrode. Inconsistencies in analytical results for certain samples prompted the authors to study some common impurities, namely, Al, Fe, Ca, Ba, and Si in matrixes involving fluorides, chlorides, carbonates, and sulfates of several alk. and alk. earth elements which from experience have shown the greatest variations. Quant. data showing enhancement and suppression effects are given.

5080. GUIMARÃES, D.
Volcanic Tuffs of Mata da Corda.
Estado Minas Gerais, Inst. tecnol. ind., Bol. No. **18**, 1–27 (1955).
C. A., **50**, 3970c (1956).

Petrographic descriptions are given with chem. analyses of 9 rocks, and spectrographic detns. of CuO (0.029–0.069%) and CoO (0.0117–0.0238%). These, with traces of Ni and Cr, indicate that the rocks were formed, in part, from mafic rocks. Hydromica, nontronite, and montmorillonite (1 chem. analysis) were identified in the tuff. The high phosphate content is due to the presence of apatite, partly replaced by davisonite, uniaxial neg., *ns* ϵ 1.590, ω 1.601.

5081. GUIMARÃES, D. AND MORAES, L. J., DE
A Rare Mineral from the Foyaite of Serrote, Cascata, Municipio de Aguas da Prata, São Paulo.
Estado Minas Gerais, Inst. tecnol. ind., Avulso No. **19**, 1–8 (1955).
C. A., **50**, 3165b (1956).

Lamprophyllite was recognized in zeolite-rich foyaite. Spectrochem. analysis gave SiO_2 26.50, ZrO_2 0.15, TiO_2 29.20, Al_2O_3 0.80, FeO 1.80, MgO 0.50, MnO 5.87, CaO 1.90, SrO 19.80, Na_2O 12.10, H_2O 1.53, sum 100.15%; sp. gr. approx. 3.4, optically pos., *ns* α1.739, γ1.764. Assocd. *eudialyte* contained SiO_2 50.0 ZrO_2 10.4, TiO_2 traces, FeO 4.0, Al_2O_3 0.2, MnO 4.0, CaO 10.5, SrO 4.2, Na_2O 15.0, Cl not detd., sum 98.3%. In 8 foyaites, ZrO_2 ranged from 0.04 to 0.21, av. 0.14%; SrO ranged from 0.072 to 0.68, av. 0.27%. It seems likely that giannettite (*C. A.*, **43**, 6127e) contains appreciable Sr.

5082. GUIMET, G. K.
Flame Spectrophotometric Determination of Sodium and Potassium in Pre- and Postoperative Conditions.
Anales fac. farm y bioquím., Univ. nacl. mayor San Marcos (Lima), **6**, 88–93 (1955).
C. A., **52**, 9383i (1958).

The mean serum Na and K content from 30 patients was, pre- and postoperatively, resp. 138.5, 4.61, and 143.33, 4.53 meq./l.

5083. GUSYATSKAYA, E. V. AND LOGINOVA, L. G.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Method of Analysis of Lead in Mineral Water.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz, **19**, 194–6 (1955).
C. A., **50**, 3891a (1956).

Pb (0.001–0.04%) can be detd. with an error of ±12%.

5084. GUSYATSKAYA, E. V. AND RUSANOV, A. K.
Determination of Hafnium and Zirconium by Optical Spectrum Analysis.
Zhur. Anal. Khim., **10**, 75–85 (1955). *J. Anal. Chem. U.S.S.R.*, **10**, 67–75 (English translation). (1955).
C. A., **49**, 15615a (1955).

Detn. of Hf and Zr in a C arc and a spark discharge are described. When Hf and Zr were detd. in the presence of other elements, as is the case in ores and minerals, fractionation of the elements caused changes in the arc temp. which in turn affected the intensity of the Hf and Zr lines. In order of their vaporization, the elements studied were arranged as follows As, Cd, Zn, Bi, Pb, Sb, Na, B, Sn, Mo, W, U, Th, Nb, Ta, Hf, and Zr. Attempts at stabilizing the arc temp. with addns. proved unreliable. When only Hf and Zr were present, the C arc gave satisfactory results. In the presence of other elements detn. of Hf and Zr was difficult. For spark-discharge detn. ZrO_2 and HfO_2 were freed of their admixts. and thoroughly mixed with sponge Ag by using Ag 75 and oxides 25%. The mixt. was pressed into rods of 4-mm. diam. and briefly heated at approx. 800°. To conserve Hf and Zr they were incorporated only in 1–1.5 mm. of the electrode, the rest being pure Ag. This method of detg. Hf in Zr and Zr in Hf over a wide range of concns. gave good results.

5085. HAALAND, J.
Spectrochemical Method for Analysis of Radioactive Solutions.
JENER (Joint Estab. Nuclear Energy Research), Rept. No. **36**, 11 pp. (1955).
C. A., **49**, 15604b (1955).

Evapd. solids from medical solns. contg. 2–5 mc. I^{131} are sparked as graphite pellets in an evacuable plastic chamber with a quartz window. The chamber pressure is 100 mm. Hg. The replaceable chamber liner which was made from Kascka Superpreservat 1211 and the excited electrodes are rejected to active waste after each exposure. The ele-

ments evaluated included: Ag, Al, B, Ba, Be, Ca, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Si, Sn, and Te in concns. between 0.1 and 100 γ/ml. based on Mo as the internal standard.

5086. HAIGH, N.
Spectrochemical Determination of Magnesium and Beryllium in Aluminum Alloys by Using a Rotating Disk Electrode.
Metallurgia, **52**, 154–6 (1955).
C. A., **50**, 728g (1956).

The general procedure is as follows: Dissolve 1 g. of sample in 25 cc. of 6 *N* HCl. Reduce the vol. to 10–15 cc., cool, and make up to 25 cc., returning the sample to the original beaker. Transfer part of the sample to a SiO_2 combustion boat and place on the platform of the soln. app. Raise the platform until the disk is rotating in the soln. at a depth of approx. 1.5 mm. The same disk can be used for all exposures of the same sample, but the counter electrode is changed for each exposure. This is the rotating disk technique with a Hilger Medium Quartz spectrograph and uncontrolled spark source. App. and operation are described. The conditions used for detg. small amts. of Mg and Be in Al alloys are given. 17 references.

5087. HAMAGUCHI, H. AND KURODA, R.
Spectrochemical Analyses of Silicate Rocks by Means of Rotating Logarithmic Sector Method.
Japan Analyst, **4**, 207–10 (1955).
C. A., **50**, 11172c (1956).

Optics were improved by putting a cylindrical lens immediately before the slit with its axis parallel to the slit, so that straight wedge lines could be obtained. Pb, Sn, Ge, Ni, and Co in silicate rocks were detd. by using Bi as an internal standard and NaCl as a spectroscopic buffer material. Ni and Co could be detd. in a range of 0.1–0.0005% with standard deviation of ±15–20%; Pb and Ge 0.1–0.001%; Sn 0.1–0.003%.

5088. HAMAGUCHI, H. AND KURODA, R.
Spectrochemical Determination of Zirconium in Silicate Rocks, Especially with the Spectroscopic Buffer for Zirconium.
J. Chem. Soc. Japan, Pure Chem. Sect., **76**, 524–7 (1955).
C. A., **50**, 11167g (1956).

By the addn. of an equal quantity of $BaCl_2$ to the silicate sample the spectral intensity of Zr lines is greatly enhanced and at the same time the fractional distn. is suppressed. By the use of a d.-c. arc at 170 v. and 7 amp., 0.0001% ZrO_2 can be detd.

5089. HAMAGUCHI, H., KURODA, R., AND GORAI, M.
Geochemical Investigations of the Granitic Rocks. II.
Nippon Kagaku Zasshi, **76**, 919–30 (1955).
C. A., **51**, 9434e (1957).
Cf. *C. A.*, **48**, 2533f.

Contents of B and Be in Japanese granitic rocks of intrusion type (Magmatic) and contamination type (metamorphic) were detd. by spectrographic method for B and fluorometric method for Be. Relations between contents of these elements and types of rocks were discussed.

5090. HANSEN, G.
Comparison of the Efficiency of the Eye, Photographic Layer and Electric Radiation Receivers in Spectrographic Work.
Mikrochim. Acta, **1955**, 708–14.
C. A., **49**, 11487e (1955).

Despite the differing peculiarities of radiation receivers, an exact comparison of their effectiveness is possible if the eye, the photographic layer, and the elec. radiation receiver are referred to the same measuring interval and the same measuring accuracy.

5091. HARANATH, P. B. V. AND RAO, P. T.
The Emission Spectrum of Bromine.
Indian J. Phys., **29**, 205–26 (1955).
Sci. Abstr., **58A**, 1229.
C. A., **51**, 7851a 1957.
Cf. *C. A.*, **49**, 12958d.

The emission spectrum of Br as excited by a high-frequency high-power oscillator is photographed in the visible region, λ6400 to λ4400 and is found to consist of as many as 300 bands as against only 80 bands reported previously by Uchida and Ota (*C. A.*, **23**, 1053) in the region λ6700 to λ5000. Tentative vibrational analysis of the bands on the basis of 2 systems suggested by U. and O. are considerably extended to include all the bands down to λ4400. This has led to a redetn. of the following vibrational consts. for systems I and II, resp., ω_e' 190.0 152.0, $X_e'\omega_e'$ 1.0 0.35, ω_e'', 376.0 376.0, $X_e''\omega_e''$ 1.25 1.25, and v_e 19,290.0 18,782.0. The vibrational assignments are well supported by an extensive study of the Br isotope effect.

5092. HARVEY, C. O.
Notes on Spectrographic Analysis.
Bull. Geol. Survey Gt. Brit., No. **9**, 50–5 (1955).
C. A., **50**, 3145a (1956).

H. describes an improved form of *arc stand clamp* and a simple *powder mixing device* with a rotating silica tube and pestle. Methods are given for spectrographic analysis of alkali earth sulfates; detns. of Ca, Sr and Ba are given for 3 gypsums, 3 anhydrites, 4 barites, and 5 celestites.

5093. HASLER, M. F., DAVIDSON, E., ORR, H., AND BARRY, W. H.
New Universal Emission Quantometer and its Application.
Mikrochim. Acta, **1955**, 596–609.
C. A., **49**, 11422e (1955).

New 1.5-m. and 2.0-m. spectrometers are described and pictured. The difference between the old type model and the new is that

the position of the phototubes is much more flexible and the max. no. of tubes is increased to 50 in the smaller instrument and 68 in the larger. The console has been improved although the principle of the elec. features remains the same but the control system is different. Instead of stepping switches, the new instrument has polarized relays and the max. no. of channels is increased to 240. Recent results obtained in the analysis of P in steel are described briefly.

5094. HAUSEN, J.
Novelties in the Analytical Chemistry Laboratory.
Chim. anal., **37**, 268–72 (1955).
C. A., **49**, 13698f (1955).

New ideas concerning general equipment, balances, materials used as reagents, measure ment of pH, of flow of gases and liquids, and of viscosity, gas analysis, chromatography, biological materials, combustibles, control of materials, diverse tests, spectroscopy, and photometry as well as various techniques of regulation are enumerated.

5095. HAWLEY, J. E.
Spectrographic Study of Some Nova Scotia Coals.
Trans. Can. Inst. Min. Met., **58** (in *Can. Min. Met. Bull.*, **523**, 712–26) (1955).
C. A., **50**, 2950d (1956).
Cf. *C. A.*, **50**, 2145c.

Nine major seams of the Sydney coal field and 2 seams in Cape Breton were studied. The av. compn of all 11 seams indicates the coals are relatively enriched in Mn, As, and Pb, compared with other coals, are slightly above av. in Zn, but are lower in Be, B, V, Cr, Co, Ni, and Mo. They also have a relatively high content of Sr and Ba.

5096. HEADLEE, A. J. W. AND HUNTER, R. G.
Characteristics of Mineable Coals of West Virginia. V. The Inorganic Elements in the Coals.
West Virginia Geol. Survey, **13A**, 36–122; (1955).
C. A., **50**, 551i (1956).
Cf. *C. A.*, **46**, 2264b; **47**, 5094i.

Detns. of ash content and spectrographic detns. of Li, Na, K, Rb, Ca, Sr, Ba, Mg, Al, Si, Fe, Ti, Ag, As, B, Be, Bi, Nb, Co, Cr, Cu, Ga, Ge, Hg, La, Mn, Mo, Ni, P, Pb, Sb, Sn, V, W, Zn, and Zr, in about 600 samples are given.

5097. HEADLEE, A. J. W. AND HUNTER, R. G.
Characteristics of Mineable Coals of West Virginia. VII. Changes in the Concentration of the Inorganic Elements During Coal Utilization.
West Virginia Geol. Survey **13A**, 150–9 (1955).
C. A., **50**, 552a (1956).

Spectrographic analyses are given of the ash of 12 dusts from flues and from gas synthesis expts.

5098. HEGEMANN, F. AND KOSTYRA, H.
Spectrochemical Analysis of Zinc Blende.
Metall, **9**, 849–56 (1955).
C. A., **50**, 1524b (1956).

The spectrograph is described. The C electrode is surrounded with a mantle of filter paper. NH_4Cl is used as a vaporizer, with a small addn. of active C to prevent fusion with higher Fe content. The ignition of ZnS samples is conducted with a cathodically connected electrode on the basis of intensity and voltage-time curves. The combustion of the total sample proceeds uniformly. With the help of the pencil electrode the influence of varying Fe content on the line intensity of the elements to be analyzed was detd. With increasing Fe content of the ZnS an increase in line coincidence and background occurred as well as a fall in arc temp. and a considerable decrease in the sensitivity of detection for most elements, especially Ga, In, Tl as well as Cd, Hg, As, Sb, and Bi. For the detn. of the elements of these 2 groups, 2 special methods were developed, the one by buffering with KCl, the other by use of fractional distn. To attain a high degree of accuracy in the detn. of 21 elements, 3 ignitions per analysis are required. Ignition I is with a pencil electrode connected cathodically for the total combustion of the sample and for detn. of most elements. Beryllium serves as a control element. Ignition II is with porous C and KCl buffering for detn. of Tl, Ga, and In, with Ba as control. Ignition III is with a distn. electrode for Cd, Hg, As, Sb, and Bi, with Be as control. For high Fe (1–30%), this is detd. photometrically after ignition I with Zn as a variable reference element. The sensitivity of the method is 0.001–0.0001%, depending upon the element. Reproducibility varies between ±3% and ±10%, depending on the element. 22 references.

5099. HEGEMANN, F. AND KOSTYRA, H.
Two methods for Visual Evaluation in Quantitative Spectrographic Mineral Analysis.
Z. Erzbergbau u Metallhüttenw., **9**, 319–25 (1955)
C. A., **49**, 13832f (1955).

These methods of visual evaluation are made by comparison with "homologous line pairs" of reference elements. Reproducibility was found to be ±6.8%. Calibration of the scale is made by comparison with lines of known intensity. 14 references.

5100. HEGEMANN, F. AND PFAB, B.
Determination of Sodium and Potassium in Soda-Lime Glass by Flame Photometry.
Glastech. Ber., **28**, 85–9 (1955).
C. A., **49**, 7822i (1955).

The glass samples are rapidly decompd. at 100° by HF + oxalic acid (Cf. Tananaev and Babko, *C. A.*, **24**, 5447); the alkalies are completely dissolved as oxalates, and Ca is pptd. This elimination of Ca removes the disturbing effects of Ca in the flame photometric detn. of Na. If K_2O in the glass is below 1% the solns. can be directly used; the accuracy of the detn. of Na_2O is ±0.4%, and the method requires very simple standard solns. for comparison. Relatively, the results of the Na detn. by flame photometry are in most cases slightly higher than those of the chem. analysis. A complete double detn. of Na and K in soda-lime silicate glasses requires 2 hr., including the decompn. The advantage over the decompn. by HF + $HClO_4$, and the following pptn. of CaO from the solns. is evident. The prepn. of the standard $NaClO_4$ soln. by the evap. of NaCl + $HClO_4$ is much more difficult than that of the simple alk. oxalate solns.

5101. HEGEMANN, F. AND VON SYBEL, C.
Spectrographic Determination of Aluminum, Iron, and Titanium in Quartz Sands.
Glastech. Ber., **28**, 190–4 (1955).
C. A., **49**, 10794b (1955).

The trace elements in glass sands are detd. by spectrochem. analysis in a d.-c. arc burning with an intensity of 6.5 amp. with a graphitized C rod as anode (Cf. Hegemann, *C. A.*, **46**, 11036h; **47**, 1167h). The intensity *vs.* time curves are given for Al, Fe, Ti, Si, Sn, Ni, and photometric calibration is made for Al_2O_3, Fe_2O_3, and TiO_2 from synthetic mixts. with a visual method for the other trace elements. The proposed method is particularly suitable for rapid serial control of glass sands. The lower concn. limit is about Fe_2O_3 0.0005 and Al_2O_3 0.001; TiO 0.001%. Spark spectra even make a higher sensitivity possible.

5102. HEGEMANN, F. AND VON SYBEL, C.
Spectrographic Method for the Determination of Iron, Aluminum, and Titanium in Quartz Sand.
Glastech. Ber., **28**, 307–10 (1955).
C. A., **49**, 14562i (1955).
Cf. *C. A.*, **49**, 10794b.

The sample of sand (200 mg.) is mixed with 0.3 g. of powd. C, and pressed to pellets. The time factor of the spectral emission in the condensed spark is given in intensity *vs.* time curves for Fe, Al, Ti, Si, C, Ni, Sn, and the ratios of the pairs Fe/Ni; Fe/Si; Al/Si; Al/Sn; Ti/C; Ti/Si, as functions of time. Si is the most suitable reference element in the condensed spark emission method. The test curves for the detn. of Fe_2O_3, Al_2O_3, TiO_2 are given from photometric evaluations of standard checking mixts. The lower limit for the detn. of Fe_2O_3 and Al_2O_3 is 0.003%, for TiO_2 it is 0.001%.

5103. HEGEMANN. F. AND VON SYBEL, C.
Determination of Trace Elements in Galena. Spectroanalytical Methods.
Metall, **9**, 91–6 (1955)
C. A., **49**, 6022d (1955).

The app. and procedures are described. The spectrogram obtained can be evaluated visually or photometrically, depending upon the accuracy desired. 17 references.

5104. HEGEMANN, F., VON SYBEL, C., AND WILK. G.
Spectral Analysis of Pyrites and Copper Pyrites.
Metall, **9**, 991–5 (1955).
C. A., **50**, 3144g (1956).

Methods of sample prepn. and spectral analysis of pyrites and Cu pyrites are described, including intensity-time curves, intensity-distribution curves, and calibration curves.

5105. HEINEN, E. J.
(Determination of) Sodium in Plants.
J. Assoc. Offic. Agr. Chemists, **38**, 391–9 (1955).
C. A., **49**, 10120h (1955).
Cf. *C. A.*, **48**, 11240g.

The NH_4OAc procedure of Seay, *et al.* (*C. A.*, **46**, 675c) was selected for sample extn. over hot distd. H_2O, *N* HOAc, 0.25*N* HCl, and 0.9 *N* HNO_3, with later addn. of NH_4 oxalate and neutralization with NH_4OH, because of the simplicity of the method and a somewhat faster rate of filtration. The Na content of the ext. is det. in a flame photometer. Seven collaborators obtained good agreement by this method on corn grain, oat grain, soybean seeds, mixed hay, clover straw, and soybean plants. These values also agreed well with those obtained by the Mg uranyl acetate method by 1 collaborator.

5106. HEINRICH, E. W. AND LEVINSON, A. A.
Studies in the Mica Group Mangan-Muscovite from Mattkärr, Finland.
Am. Mineralogist, **40**, 1132–5 (1955).
C. A., **51**, 961d (1957).

X-Ray powder data and a spectrochem. analysis are given for a deep purplish blue muscovite contg. 1.77% MgO. This is the first muscovite close to normal in compn. that consists of the 1-layer monoclinic polymorph.

5107. HEROS, M. E. AND AMY, L. M.
Simultaneous Use of Spectrography and Paper Chromatography in Detection of Trace Elements.
Bull. soc. chim. France, **1955**, 367–9 (1955).
C. A., **49**, 8028e (1955).

When a metal is quite impure it is difficult to identify an impurity spectrographically because of the closeness of its ultimate bands with those of the main element. "Ultimate bands" are defined as those bands, specific to

the element, which are the last to disappear as the element decreases. However, preliminary paper-chromatographic sepn. permits the identification of trace element by its ultimate bands without difficulty. A detailed procedure is described for the sepn. of Mn from Fe chlorides. After the impure $FeCl_3$ soln. is added to the lower edge of Whatman No. 4 paper, the chromatography is effected by the following soln.; 87 vols. acetone, 5 vols. H_2O, and 8 vols. HCl. The zone contg. the Fe is removed and the zone contg. the Mn can be spotted with Na_2S when the ratio Fe/Mn is no more than 100. After chromatographic sepn., removal of the Fe zone, and concn. of the Mn on the upper part of the paper, Mn can be identified by its ultimate bands 2576.20 and 2593.90 Å. when the Fe/Mn ratio is at most equal to 20,000. A spectrum corresponding to the ratio Fe/Mn = 20,000 shows the presence of the following bands of iron, 2611.09, 2599.50, and 2585.99 Å. The absence of the other Fe bands allows the certain identification of bands 2576.20 and 2595.80 Å. A ratio of 40,000 falls beyond the limits of this method. Results are approx. quantitative.

5108. HERRMANN, R. AND SCHELHORN, H.
An Atomizer-Burner Combination for Flame Photometry.
Z. angew. Phys., **7**, 572–5 (1955).
C. A., **50**, 5334c (1956).

In a H-O burner and atomizer for flame photometry the soln. is introduced into the atomizer capillary by means of a motor-driven syringe. The syringe is sealed to the base of the capillary by means of a gum packing. This arrangement gives better control over the flow of soln. into the atomizer, with an attendant improved reproducibility and accuracy.

5109. HERSHENSON, H. AND SMITH, D. F.
Production Control of Polyelectrolyte Parenterals with a Flame Photometer.
J. Am. Pharm. Assoc., **44**, 731–5 (1955).
C. A., **50**, 3712g (1956).

Production of polyelectrolyte parenteral solns. can be economically and accurately controlled with the flame photometer. Math. factors correcting Ca assays for dextrose enhancement have been established, and methods are described for the quant. detn. of Na, K, Ca, and Mg. General conclusions allowing prediction of radiation interferences are given, and the method used to investigate interferences is outlined.

5110. HETTEL, H. J. AND FASSEL, V. A.
Determination of Traces of Certain Rare Earths in Zirconium.
Anal. Chem., **27**, 1311–14 (1955).
C. A., **49**, 14560g (1955).

Fractional p.p.m. amts. of Gd, Tb, Ho, Sm, and Dy are detd. as impurities in Zr. The method is based on ion-exchange sepn. (Dowex 50) of Zr as the fluozirconate anion, sepn. of the rare earths plus Y^{90} carrier from other nonrare impurities by classical sepns., and spectrographic detn. of the individual rare earths (Gd, Tb, Ho, Sm) with Y^{90} used as the carrier. Quant. recoveries were obtained within ±10%. The method is readily adaptable to the detn. of these rare earths in any metal or oxide which is very sol. in HF, producing a stable anionic complex (Be, B, Si, Ge, Ti, Hf, and V).

5111. HINCKLEY, D. N.
Reconnaissance of the Cameron Area, Coconino County, Arizona.
U. S. Atomic Energy Comm. RME-81 (Rev.), 21 pp. (1955).
C. A., **51**, 15347i (1957).

An airborne radiometric survey of the Cameron area identifies U ores with sandy lens formations, brightness of surface color, carbonaceous material, and Mo deposits. U ores occur in elongated lenses of cross-bedded carbonaceous sandstones to 40-ft. depths in Triassic sediments in the Chinle or upper deposits in the area. The underlying sandy or Shinarump formation yields poorer U ores. The max. Mo content by spectrographic and chem. analysis is 45 p.p.m. Traces of Mo are good criteria for the presence of U. The occurrence of V in both U-bearings and nonbearing ores averages <0.03% in 92% of samplings of the former.

5112. HODGMAN, C. D.
Handbook of Chemistry and Physics, 36th. Ed. (1954–1955).
Chemical Rubber Publishing Co., Cleveland, Ohio. 3173 pp.

Wavelength of the principal lines in the emission spectra of the elements. Section I. Ultraviolet below 2000 Å. pp. 2485–2492. Section II. 2000 to 10,000 Å. pp. 2493–2635. Section III. Infrared above 10,000 Å. pp. 2636–2641. Spark spectrum of air (2287.9 to 8719.2 Å), pp. 2642–3. Standard wavelengths, pp. 2644–2653. Persistent lines of the elements, pp. 2654–2663.

5113. HOFFMAN, M. AND STERNAL, S.
Flame Photometer and Its Application to Metallurgical Analysis.
Przeglad Odlewnictwa, **5**, 134–7 (1955).
C. A., **49**, 12180c (1955).

Li, Na, K, Rb, Cs, Mg, Ca, Sr, and Ba can be conveniently detd. with the flame photometer. Analysis of Polish bearing alloy "L-Ca" by the above method requires only 20 min. and gives a high accuracy. The amt. of Ca in the bearings was 0.58–0.94 and the amt. of Na 0.75–0.85%. The best condition for detn. was when the pressure of C_2H_2 was 25–30 mm. of water.

5114. HOLDT, G.
Lessening of Error in the Quantitative Spectral Analysis in Arcs by Weight Estimations Based on the Logarithms of the Intensity Relations.
Mikrochim. Acta, **1955**, 286–97 (1955).
C. A., **49**, 11486b (1955).

The usual representation of the intensity relations measured photographically of the supplementary and reference lines as the difference of the logs of their intensities gives the smallest scattering of the intensity relations only when the Y error of both lines in the statistical av. is identical in each case. If they are different, a no. which is easily detd. can be given which, applied as a weighting factor to the reference line, reduces the scattering to a min. The "weighted Y difference" obtained in this way is a generalization of the simple Y difference (wt. + 1). It eliminates the systematic error occurring in the intensity ratio and produces a considerable diminution of the errors in the analytical results, provided the residual accidental proportionate errors are slight.

5115. HOLDT, G. AND SCHÄFER, H.
Chemistry of Niobium and Tantalum. XV. Spectral - Analytical Determination of Small Quantities of Tin in Niobium Pentoxide Preparation.
Z. anal. chem., **146**, 4–11 (1955).
C. A., **49**, 13831c (1955).

Mix the sample with an equal quantity of powd. charcoal and heat in a cavity of the C cathode with a current of 5–6 amp. As the sample is vaporized, at first the intensity of the Nb lines weakens sharply, then for a time the Sn and Nb weaken equally and then the Nb lines increase. The intermediate state can alone be used for the detn. of Sn.

5116. HONMA, M.
Flame Photometric Determination of Chloride in Sea Water.
Anal. Chem., **27**, 1656–9 (1955).
C. A., **50**, 4718g (1956).

A modification of the Beilstein chloride test is used to det. Cl^- in sea water. $Cu(NO_3)_2$ is added and the soln. immediately atomized in a Beckman DU spectrophotometer equipped with a model 9290 oxyhydrogen burner attachment and a water manometer placed between the fuel pressure gage and the burner. Absorbance of the $CuCl_2$ band is detd. at 435.4 mμ. The use of the manometer is required for reproducible adjustment of the H_2 pressure for improved sensitivity. The limit of sensitivity of Cl^- as its Na salt is 0.02*M* Cl^-. The method fails to distinguish between Cl^-, Br^-, and F^- ions, but since concn. of Br and F in sea water are below the sensitivity of the method, it is suitable for all practical purposes.

5117. HOURIGAN, H. F. AND ROBINSON, J. W.
Estimation of Sodium in Aluminum with the Flame Photometer.
Anal. Chim. Acta, **13**, 179–82 (in English) (1955).
C. A., **50**, 2360b (1956).

Calibration curves relating Na flame intensity to Na concn. in the presence of const. amts. of Al are prepd., and the sample readings are calcd. from the proper curve. A soln. of HCl is used as a blank and subtracted from the calcd. amt. of Na present.

5118. HOWIE, R. A.
The Geochemistry of the Charnockite Series of Madras, India.
Trans. Roy. Soc. Edinburgh, **62**, 725–68 (1943–55).
C. A., **50**, 9251f (1956).

The geology and mineralogy of charnockite rocks from the Madras area are reviewed. Chem. and spectrographic analyses of the rocks and their minerals for major and trace elements are discussed in the light of possible origins for these rocks. The evidence indicates they represent a plutonic igneous rock series which has undergone recrystn. in the solid state on being subjected to plutonic metamorphism.

5119. HÜGI, T.
Petrographical Observation in the Tunnel of Gadmental-Rotlaui of the Kraftwerke Oberhasli A.-G.
Schweiz. mineralog. petrog. Mitt., **35**, 301–10 (in German) (1955).
C. A., **50**, 9961c (1956).

The most important rock types are described. Spectrographic analyses for Cr, Ni, Co, and V are given for 6 granitic and gneissic rocks.

5120. HULANICKI, A.
Preliminary Separation and Concentration of Components in Emission Spectral Analysis.
Wiadomości Chem. **9**, 249–64 (1955).
C. A., **50**, 9205a (1956).

A review with 41 references.

5121. HULDT, L.
The Interpretation of Spectroscopic Temperature Measurements.
Spectrochim. Acta, **7**, 264–73 (1955).
C. A., **50**, 6195b (1956).

The spectroscopic method of measuring temp. in spark discharges is discussed, bringing out the significance of the cooler zones which lie between the hottest part of the discharge and the surrounding air. A calcn. of the relation between line intensities and temps. with the conventional assumptions leads to the result that most of the spectrum lines measured have their peak emission at between 5000 and 10,000°K. A more precise calcn. for a selected example shows that the

spectroscopically estd. temp. is independent of a doubling of the peak temp., and peak temps. cannot be correlated with experimentally observed temps. Consequently no such measurements can lead to reliable conclusions as to the highest temps. in spark discharges; these can only be estd. by using lines of highly ionized atoms whose transition probabilities are calculable.

5122. HULLINGS, R. S.
Spectrographic Analysis of Plain Carbon, Low-Alloy, and Stainless Steel.
Applied Spectroscopy, **9**, 26–32 (1955).
C. A., **49**, 8041a (1955).

A spectrographic procedure with the a.-c. spark and point-to-plane technique was developed for speed and simplicity while still maintaining high accuracy in the routine analysis of plain carbon, low-alloy, and stainless steels for Cr, Mo, Si, Mn, Ni, V, W, and Cu. Photographic-plate calibration was obtained from a step-sectored Fe spectrum and working curves were prepd. from analyzed standards.

5123. HURWITZ, J. K.
Some Observations on Sparked Craters in Spectrographic Microvolume Analysis.
Spectrochim. Acta, **7**, 1–13 (1955).
C. A., **49**, 8029g (1955).

The effective spark distribution in a point-to-plane discharge was detd. by making depth measurements on sparked craters produced in Mg, Zn, and Cd specimens. Of the several distribution functions considered, it was found that a paraboloid of revolution best described the actual distribution. After extending the observations to sparked craters produced in other metals and alloys, several conclusions were made concerning the crater's width and depth and the bulk volatilization rates (mass of material vaporized from the specimen per unit time). In Mg the bulk volatilization rate was in effect independent of the traverse speed, but the crater's width and depth were functions of the reciprocal of the traverse speed. Measurements of the bulk volatilization rates in a large number of metals and alloys revealed trends in which these rates increased as the m.p. and thermal cond. of the specimens decreased. This result should be applicable to the study of sensitivity limits in the spectrographic examn. of solids.

5124. HYMAN, H. M. AND WEISBERGER, S.
The Spectrographic Characterization of Aluminum Alloys.
Appl. Spectroscopy, **9**, 98–101 (1955).
C. A., **50**, 109h (1956).

A spectrographic method employing 2400 v.a.-c. arc spectra of dry powder samples, on purified C electrodes, has been developed for the detn. of the following elements, in the given concn. ranges, in Al alloys: Mn 0.01–0.8, Fe 0.1–6.0, Mg 0.1–2.0, Cu 0.3–10.0, Zn 0.03–5.0, Si 0.1–6.0, Cr 0.02–0.4, Ni 0.02–0.6, Ti 0.01–0.1, Pb 0.01–1.0, Ca 0.1–2.0%. The standard errors, calcd. for each of the working curves used, range from 11.4 to 14.0%. The method has proved highly satisfactory for the classification of unknown types of Al alloys and to a limited extent, in specification analyses. It is versatile since it can be applied to a sample of any size, shape, or metallurgical history.

5125. IGLESIAS, L.
Third Spectrum of Niobium. (Nb III).
J. Opt. Soc. Amer., **45**, 856–61 (1955).
C. A., **50**, 56i (1956).

The spark spectrum of Nb has been photographed in the region 540–3200 A. Seven hundred lines of Nb III have been measured. It has been possible to establish 58 new levels originating from the $4d^3$, $4d^25s$, $4d^25d$, $4d^26s$, and $4d^25p$ configurations and to classify a total of 319 lines. By assuming $\alpha = 4.8 \times 10^{-6}$ the application of a Ritz formula to the $4d^2(^3F)ns^4$ F series gives 221600 cm.$^{-1}$ for the value of the $4d^{34}F_{1\frac{1}{2}}$ level, with respect to the $4d^2(^3F_2)$ level of the Nb IV; it corresponds to an ionization potential of 27.5 v.

5126. IKEDA, N.
Chemical Studies on the Hot Springs of Nasu. VII, VIII.
J. Chem. Soc. Japan, Pure Chem. Sect., **76**, 711–13; 713–16 (1955).
C. A., **50**, 14152a (1956).
Cf. *C. A.*, **48**, 14051f.

Spectrochem. detn. of rarer element contents of Motoyu Spring. Contents are Li, Rb, and Cs 10^{-5}, S, Ba 10^{-5} -10^{-6}, Be, Ge 10^{-7} -10^{-8}, and Ga 10^{-6} -10^{-7} g./l. Ra 1.6 $\times$ 10^{-12} gl/l. 713–16. The spring water of the Motoyu contained Rn 0.33 Mache, As 0.00185 g./l., In 1 γ/l. and Sb 0.1 γ/l.

5127. IKEDA, N.
Determination of Minute Amounts of Tin in Hot-Spring Waters.
Nippon Kagaku Zasshi, **76**, 1011–13 (1955).
C. A., **51**, 11621e (1957).

Sn dithizonate is extd. by CCl_4 from the spring water to be analyzed, and it is mixed with $NaNO_3$ and analyzed by a d.-c. arc spectrographic method. From 0.1 to 0.5 γ Sn/l. were found in 35 hot springs in Japan.

5128. IKEDA, N.
Chemical Studies on the Hot Springs of Nasu. XI, XII XIII.
Nippon Kagaku Zasshi **76**, 1071–3, 1073–6, 1076–9 (1955).
C. A., 12388d (1957).
Cf. *C. A.*, **51**, 9979i.

The yellow ppt. formed in the Motoyu spring, which is an acidic spring contg. alum, was found to be a new arsenic sulfide AsS_2. The ppt. of Motoyu spring contained the fol-

lowing trace elements: Cu 0.0057, Pb 0.0019, Zn 0.00063, V 0.0010, Cr 0.000032, Mo 0.00029, Sr 0.00086, Ba 0.0065, Ge 0.00001–0.000001, Be 0.0001, Ga 0.0001-0.00001, Li <0.0001, Rb 0.0001, Cs <0.00001, Ra 4.2×10^{-11}%. The ppt. of the Motoyu spring contained the following trace elements: F 0.001, B, 0.01, Ag 0.001–0.0001, Au 0.001–0.0001, Bi 0.00001–0.000001, Sb 0.00001–0.000001, Cd 0.00001, Zr 0.0017%.

5129. IKEDA, S.
Flame Photometric Determination of Calcium and Magnesium in Basic Slag.
Nippon Kagaku Zasshi, **76**, 1258–61 (1955).
C. A., **51**, 12739f (1957).
Cf. *C. A.*, **50**, 12736i.

Detns. were done by O-H flame with a Beckman DU spectrophotometer. Wavelengths used were 554 mμ for Ca and 371 mμ for Mg. HCl is best for dissolving the sample, since HNO_3 and H_2SO_4 diminish the intensities of lines. The presence of Al in amts. larger than 50 γ/ml. is useful as the radiation buffer. The background correction for Mg is calcd. from the intensity at 365 mμ or from the amt. of Ca otherwise detd.

5130. IKEDA, S.
Flame Spectrochemical Analysis. I. Microdetermination of Sodium in Aluminum Metal.
Science Repts. Research Insts. Tôhoku Univ. Ser. A, **7**, 29–34 (in English) (1955).
C. A., **49**, 15617g (1955).

Na in Al was detd. by flame photometry without sepn. The sample was dissolved with 6 *N* HCl and oxidized, if necessary, with a few drops of HNO_3. By using a 0.5 γ/ml. standard soln. of Na, a Beckman DU spectrophotometer was adjusted to 15% transmittancy with 0.2-mm. slit, 25 lb./sq.in. O pressure, and 1.25 lb./sq. in. H pressure. With these conditions the sample was analyzed and compared with previously detd. calibration curves. Variation of Al content from 1.2 to 1.6 g./100 ml. did not change the Na flame intensity. HCl and HNO_3 could be present to about 0.5–0.7 *N* without influence, but H_2SO_4 decreased flame intensity if present over 0.3 *N*. With this method 0.001–0.01% of Na in Al metal was detd.

5131. IKEDA, S.
Flame Spectrochemical Analysis. II. Determination of Microamounts of Calcium and Magnesium.
Science Repts. Research Insts. Tôhoku Univ., Ser., A, **7**, 575–82 (1955).
C. A., **50**, 12736i (1956).
Cf. *C. A.*, **49**, 15617g.

The flame emission of Ca and Mg was intensified by the use of alc. solvents; 50% MeOH produced the greatest increase in intensity. The effect of the presence of various acids and elements on the microdetn. of Ca and Mg by flame spectrophotometry was investigated. If the concn. of alc. is kept const., 0.1 γ/ml. of Ca and 1 γ/ml. of Mg can be detd. with increased sensitivity.

5132. INDICHENKO, L. N.
Semiquantitative Spectral Analysis in Mineralogical and Geochemical Investigations.
Doklady Akad. Nauk S.S.S.R., **100**, 775–8 (1955).
C. A., **49**, 10113f (1955).

The sensitivity of spectrochem. detns., e.g., of Ge is higher in sulfide minerals than in other minerals, especially in standards of feldspar-quartz mixes. Curves for the degree of blackening *vs.* log concn. are distinctly different for sphalerite and the silicate mix. Rapid semiquant. detn. of As. Bi, Pb. Cd, Zn, etc., in sulfides is recommended by studying characteristic d.-c. arc lines appearing in the presence of crit. concns. of these elements. The concns. may vary between 0.005 and 10%, with satisfactory accuracy.

5133. IONOVA, K. I. AND NALIMOV, V. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Statistical Investigation of the Spectrographic Analysis of Unalloyed Steels.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 129–30 (1955).
C. A., **50**, 3889c (1956).

5134. ISAEV, N. G.
Transactions of the IXth All-Union Conference on Spectroscopy. Local Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 151–2. (1955).
C. A., **50**, 3889h (1956).

High localization (~ 20 μ) could be obtained.

5135. ISHIDA, R.
Spectrochemical Analysis by Flame Photometry.
J. Chem. Soc. Japan, Pure Chem. Sect., **76**, 56–60 (1955).
C. A., **49**, 13012c (1955).
Cf. *C. A.*, **46**, 8568f.

Flame photometry of K and Na with the aid of a homemade atomizer and a const. deviation-type spectrograph was studied. Effects of other elements and background blackness are discussed.

5136. ISHIDA, R.
Spectrochemical Analysis by Flame Photometry. III.
J. Chem. Soc. Japan, Pure Chem. Sect. **76**, 60–3 (1955).
C. A., **49**, 13012d (1955).

The band spectrum of La_2O_3 at 790 mμ was used for detg. La in minerals and glasses. The rare earths fractions should be sepd. from

other elements. A Perkin-Elmer-type flame photometer was used.

5137. ISHIDA, R.
Quantitative Spectrographic Analysis of Rare Earth Elements in Lanthanum Oxide.
J. Chem. Soc. Japan, Pure Chem. Sect., **76**, 171–3 (1955).
C. A., **49**, 14560f (1955).

Sm, Pr, Ce, and Nd in La oxide were detd. by the spark method. A quartz spectrograph of large dispersion was used. The briquet electrode was made by mixing C powder with rare earth oxides in the ratio of 1:3 and adding a few drops of molasses. After drying it was pressed under 1000 kg. per sq. cm. and heated to 150°. This briquet with a diam. of 10 cm. and thickness of 4 mm. was used against a pointed C rod of 4 mm. diam. with a spark gap of 2 mm. The following lines were compared: Sm 3609.484/La 3613.077, Pr 3908.-033, 3908.431/La 3925.09, Ce 4012.388/La 4025.882, Nd 4247.367/La 4315.902.

5138. ISHIDA, R.
Quantitative Spectrochemical Analysis by Flame Photometry. I. Determination of Manganese.
Repts. Govt. Chem. Ind. Research Inst. Tokyo, **50**, 35–9 (1955).
C. A., **50**, 8381e (1956).

With a specially devised atomizer and burner which kept C_2H_2 gas and compressed air under const. pressure, Mn in pulp and rocks was detd. by flame photometry. The errors were in the photographic plate with its characteristic curve and drift and other uncontrolled elements because the flame was very stable. The so-called abs. method, in which the intensity of spectral lines cor. by the background of the plate (where the presence of Fe and Ca, but not Rb, markedly affects the spectrum) was more suitable than the internal standard method.

5139. ISHIDATE, M., MASHIKO, Y., AND KANROJI, Y.
Mineral Water. I. Determination of Sodium Ion by Flame Spectrophotometry.
J. Pharm. Soc. Japan, **75**, 1492–6 (1955).
C. A., **50**, 5198c (1956).

Detn. of Na^+ by flame photometry by direct ignition of hot-spring and mineral-spring water, by using the standard calibration curve of a standard NaCl soln., gives a neg. error which cannot be disregarded; the only exception is the common-salt spring. Good analytical results can be obtained when the spring water is adjusted to pH 4 with *N* HCl, boiled for 10 min. to drive off CO_2 and H_2S, passed through Amberlite IRA-410 (R-Cl type), thereby changing all the anions in the sample water to Cl^-, and finally submitted to flame photometry. This method can be applied widely to the majority of neutral-salt springs in Japan, excluding the acid, alum, and acid alum-vitriol springs. It is better than the chem. detn. of Na in that it gives better accuracy and a shorter time is required. The weak-acid components which cannot be substituted by the above resin can be disregarded.

5140. IVANOV, D. N.
Method of Spectrophotoelectrical Determination of the Sodium, Potassium, and Calcium in Solutions.
Gidrokhim. Materialy, **24**, 35–6 (1955).
C. A., **51**, 9406f (1957).

The two photoelec. devices of the Soil Inst., Acad. Sci. U.S.S.R., are reviewed. To det. Na and Ca, selenium photoelements are used and for K the AgS.

5141. IVENSKAYA, N. D.
"Spektral'nyĭanaliz" (Spectrum Analysis). Mashgiz., Moscow (U.R.S.S.). (1955). 48 pp.
C. A., **50**, 7015d (1956).

5142. JACQUINOT, P.
Use of Low Temperatures in Optical Spectroscopy.
J. recherches centre natl. recherche sci., Labs. Bellevue (Paris), **6**, 345–8 (1955).
C. A., **50**, 10514f (1956).

A review.

5143. JAFFE, H. W.
Pre-Cambrian Monazite and Zircon from the Mountain Pass Rare-Earth District, San Bernardino County, Calif.
Bull. Geol. Soc. Amer., **66**, 1247–56 (1955).
C. A., **50**, 1545g (1956).

A detailed study is made of accessory monazite and zircon in pre-Tertiary carbonate-rich rocks and assocd. shonkinite and syenite. Monazite is concd. by sieving, heavy-liquid, and magnetic sepns. to +99% purity. Chem. and spectrographic analyses and optical properties of monazite, and an isotopic analysis of Pb extd. from it, are given, together with an isotopic analysis of Pb from galena believed to be of the same geol. age and used to correct the monazite for original Pb. The Pb content was detd. spectrographically and the age, calcd. from the Pb^{208}/Th^{232} ratios, is 925 million yrs., age detns. made by the Larsen α-counting and total-Pb method (Larsen, *et al.*, *C. A.*, **47**, 77i) average 950 million yrs. Zircon is similarly concd. and age detns. made by the method of L., with total Pb detd. spectrographically, give an av. age of 840 million yrs.

5144. JAMES, C. G. AND SUGDEN, T. M.
New Identification of the Flame Spectra of the Alkaline Earth Metals.
Nature, **175**, 333–4 (1955).
C. A., **49**, 10055c (1955).

Bands in the flame spectra are observed at 5560–5470 and 6400–6000 Å. for Ca, in 6100–6000 and 6900–6850 Å. for Sr and near 5000 A for Ba. These bands are similar to the hal ide spectra of these elements and it is suggested that they are due to the radicals CaOH, SrOH, and BaOH. The suggestion was tested by using a burner at const. temp. with varying concns. of O_2 and H_2. A plot of intensity of the Ca bands *vs.* OH/O concn. gave a straight line indicating the validity of the assignment to the hydroxide mols.

5145. JAMES, C. G. AND SUGDEN, T. M.
Photometric Investigations of Alkali Metals in Hydrogen Flame Gases. I. A General Survey of the Use of Resonance Radiation in the Measurement of Atomic Concentrations.
Proc. Roy. Soc. (*London*), **A227**, 312–29 (1955).
C. A., **49**, 7375g (1955).

Expts. on the intensity of emitted resonance radiation in various of the first and second doublets of alkali metals have been made in the hot gases a few cm. above the primary zone of combustion of H-O flames dild. with N, by using a photoelec. technique. The emission is thermal in origin. Very low intensities are always obtained with Li on account of removal of the metal by hydroxyl radicals to form the very stable gaseous hydroxide. This effect is decreasingly important with Cs and K, and is negligible with Na. In Cs, ionization of the metal accounts for a substantial fraction of the total metal present. For Na it is possible to est. the relative concn. of unexcited atoms by a 2-flame technique. The study of resonance radiation from metals in flame gases provides a powerful method of elucidating chem. reactions and equil. at high temps. One of the advantages of the use of a H/air flame at atm. pressure as the 'reaction vessel and solvent' for the reactions studied is that it appears to provide a basis of thermal equil. at the Na-*D*-line reversal temp. for all substances present, even though full thermodynamic equil. of all the possible chem. reactions may not occur.

5146. JAYCOX, E. K.
A Spectrochemical Procedure of General Applicability.
Anal. Chem., **27**, 347–50 (1955).
C. A., **49**, 8727e (1955).

A spectrochem. procedure is described which is applicable for most powd. samples. The matrix effect is minimized by adding the sample to a buffer system consisting of GeO_2 as the diluent, CuO as the primary buffer and internal standard, and graphite as the secondary buffer. One part by weight of sample plus GeO_2, 19 parts of CuO, and 20 parts of graphite were found to be the most effective. The amts. of CuO and graphite are invariable. Best results are obtained with a 1 to 1 ratio of sample to GeO_2. Al, Cr, Fe, Mn, Ni, Pb, Si, and Sn were detd. in a variety of materials including refractories, steels, brasses, bronzes, glass, Al, Pb, and Zn-base alloys.

5147. JEDWAB, J.
Spectrochemical Characterization of Granites. I. Two-mica Granites of Guehenno and of La Villeder (Morbihan, France).
Bull. soc. belge géol., paléontol. et hydrol., **64**, 526–34 (1955).
C. A., **50**, 11186d (1956).

The La Villeder massif, with numerous quartz veins contg. cassiterite-arseno-pyrite-apatite, and the Guehenno massif with practically no quartz veins but with numerous pegmatites contg. black tourmaline, are chosen as an ideal example to illustrate the conclusions that can be drawn from spectrochem. analyses. Muscovite, biotite, and feldspars were sepd. from a no. of samples from each massif and analyzed spectrographically for Li and Sn; the results, plotted on schematic geol. maps, show that these 2 very similar granites are fundamentally different in their economic nature.

5148. JENTZSCH, D. AND JACOB, G.
The Application of the Flame Photometer for the Determination of Lithium, Sodium, and Potassium in Alkali Salts and Highly Concentrated Alkali Salt Solutions.
Chem. Tech. (*Berlin*), **7**, 93–5 (1955).
C. A., **49**, 10795g (1955).

An attempt was made to analyze by flame photometry mixts. with widely varying ratios of Li, Na, and K in the presence of impurities such as Ca and Fe. The method used has already been described (Cf. *C. A.*, **48**, 7481d). Reference curves made from pure alkali salts could not be used because traces of Fe and Ca interfered. Also the temp. of the sample had to be kept within narrow limits. Better results were obtained when the comparison soln. method was applied (Cf. *C. A.*, **48**, 6903b). Procedure: Dil. the solns. with water so that the Li and K concns. are less than 10 mg./100 ml. and the Na content not more than 20 mg./100 ml. Det. the approx. alkali content of these solns. with the aid of the reference curves obtained from pure substances. The exact alkali content is then ascertained by interpolation with comparison solns. which contain the impurities of the sample and have a similar acidity.

5149. JOHNSON, R. F. AND MANRIQUE, P. A.
The Lead-Zinc Deposits of the Rio Pallanga Region.
Inst. Nacl. Invest. y Formento Mineros (*Peru*), No. **13**, 5–20 (1955).
C. A., **51**, 4889*b* (1957).

At the Rio Pallanga and Alpamarca Mines, sphalerite of low Fe content occurs with pyrite, galena, tetrahedrite, and minor orpi-

ment, realgar, and stibnite. Semiquant. spectrographic analyses are given of 3 sphale rites. At the Chungar and Santander Mines, ferroan sphalerite (marmatite) occurs with pyrite, pyrrhotite, and appreciable chalcopyrite in a skarn zone.

5150. JONCKERS, M. D. E.
Photoelectronic Spectral Analysis in Siderurgy.
Ing. chim., **37**, No. 200, 47–71 (1955).
C. A., **49**, 15604e (1955).

A review of the advantages of spectroscopy and problems in its application to metallurgy. J. describes the components of a spectrograph, principles of their operation, and types of spectrographs available both prism and grating. The spectrographic analysis of P in steel is described.

5151. JONES, E. S. AND COLLINGE, B.
Construction of Flame Photometer with Internal Standard.
J. Med. Lab. Technol., **13**, 68–73 (1955).
Anal. Abstr., **2**, Abstr. No. **2912**,
C. A., **52**, 12037*f* (1958).

An app. is described for the estn. of Na and K. The flame uses coal gas and compressed air. The burner is surrounded by a pyrex-glass water jacket, through which cold water is circulated. The internal standard is Li_2SO_4. A nullpoint system is used in the measuring circuit. Plasma is dild. 1 in 100 for detg. Na and 1 in 25 for K.

5152. JULLIEN, A., ACOLAT, L., RIPPLINGER, J., JOLY, M., AND VIEILLE-CESSAY, C.
Sodium, Potassium, and Calcium Ion Contents of the Hemolymph as Determined by the Flame Photometer, and Their Relation to the Composition of Artificial Media Apt to Insure Prolonged Activity of the Isolated Hearts of Helix Species.
Compt. rend. soc. biol., **149**, 723–5 (1955).
C. A., **50**, 2880h (1956).
Cf. *C. A.*, **49**, 8509a.

The values obtained for the hemolymph of *Helix pomatia*, *H. aspera*, *H. nemoralis*, and *H. hortensis* varied somewhat with the species. The data furnish information for making up artificial saline solns. capable of assuring a long duration of spontaneous automatism of isolated snail hearts.

5153. JUNKES, J. AND SALPETER, E. W.
Rapid Registration Photometer for the Interpretation of Spectral Photographs.
Mikrochim Acta, **1955**, 534–41 (1955).
C. A., **49**, 11329f (1955).

A modern oscillograph writing in ink with 2 pens was used as recorder. The pens operate reliably at right-angled coördinates and with amplitudes as great as 40 mm. at 60 Hertz units. The app. is suitable for prepg. enlargements quickly, for measurements of wave lengths and intensities if the demands are not too rigid. In astronomy spectral types can be detd. from objective prism photographs and in absorption spectroscopy for the direct plotting of absorption spectra.

5154. JUNKES, J. AND SALPETER, E. W.
Effective Line Widths in Spectral Photometry.
Spectrochim. Acta, **7**, 60–3 (1955).
C. A., **49**, 8030a (1955).

The photographic widths of spectral lines are as good for photometric work as their ds., sometimes even better, since they allow one to cover a much wider range of intensities. They are, however, only rarely used in spectrochem. photometry, principally because of lack of an appropriate measuring instrument. Efficient photometers for measuring effective diams. of photographic star images have been developed recently. It is proposed, therefore, to devise an analogous "variable slit photometer" for measuring effective widths of spectral lines, and investigate the possibilities and limits of spectral photometry with effective line widths as applied to quant. spectrochem. analysis.

5155. KAISER, H. AND ROSENDAHL, F.
New Systematic Observations on Sparking-off Reactions.
Mikrochim. Acta, **1955**, 265–77 (1955).
C. A., **49**, 11398*h* (1955).

The known facts concerning sparking-off reactions are reviewed, and special attention is called to the area law of the sparking-off curves and to the significance of the statistical distribution of the spark impacts. New observations are obtained with the aid of an automatically registering spectrometer. These show that the sparking-off reactions are well reproducible if a suitable technique is followed. The effects of the electrode shape and temp. are shown. Observations of periodic variations in the intensity ratio of the lines obtained with Be bronzes are given.

5156. KALININ, P. V.
Garnets from Pegmatite Veins of Southern Transbaikalia.
Trudy Moskov. Geol.-Razvedochnogo Inst. im. S. Ordzhonikidze, **28**, 39–46 (1955).
C. A., **50**, 3164d (1956).

The spectral-analytical examn. shows the presence of Ga, Ge, V, Ti, Na, Zr, Sc, Cu, Cr, Ba, Pb, Zn, Ni, and rare earth elements in almandite; that of Sn, Ge, Zr, Ga, V, Sr, and rare earth elements in andradite; that of Be, Sn, Ga, Ge, V, Cu, Zn, and rare earth elements in spessartite. Specific is the occurrence of Sc, Ba, Pb, Cr, in almandite; of Sn and Sr in andradite; of Be, Sn in spessartite Jaffe (*C. A.*, **47**, 6828a) is in error if he concludes that in andradite the elements of the rare earths are absent, but are specific for spessartite. He examd. only andradites from skarns. not those in pegmatites.

5157. KALININ, S. K.
Transactions of the IXth All-Union Conference on Spectroscopy. Atlas of Spectral Lines for a Glass Spectrograph.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 42–4 (1955).
C. A., **50**, 3886f (1956).

5158. KALININ, S. K. AND MARZUVANOV, V. L.
New Atlas of the Arc and Spark Spectra of Iron.
Vestnik Akad. Nauk Kazakh S.S.R., **11**, No. 1, 59–61 (1955).
C. A., **49**, 8699b (1955).

The compilation of an atlas of the lines of the iron spectrum between 2000 and 10,000 Å. is described.

5159. KANDLER, D. AND JENTZSCH, D.
A High-Frequency Monitoring Apparatus for Use in Spectral Analyses.
Chem. Tech. (Berlin). **7**, 91–2 (1955).
C. A., **49**, 15295g (1955).
Cf. *C. A.*, **47**, 9847*h*.

In spectral analyses for trace elements in cathode materials and metal alloys, inaccuracies occur which are caused by variations in spark intensity owing to irregularities in the spark gap and uneven burning of the electrode material. However, when the spark occurs a high-frequency field is formed in the vicinity of the discharge which is proportional to the voltage across the spark gap, and hence to the spark intensity. A circuit is described for monitoring this high-frequency field. The app. consists essentially of a high-frequency transformer, a Ge demodulator, and a microammeter, the reading of which is a measure of the spark intensity. The variations in spark intensity observed in a series of spectral analyses are then used to provide correction factors for better evaluation of the respective photographic plates.

5160. KANEHANN, J. A.
Quantitative Spectrographic Determination of Vanadium in Petroleum Products by Logarithmic Sector Method.
Anal. Chem., **27**, 1873–4 (1955).
C. A., **50**, 9000i (1956).

A modification of the Anderson and Hughes method (*C. A.*, **46**, 1241b) is described in which a log. sector disk is substituted for a densitometer. The samples are ashed, ashing is completed in a muffle furnace, the ash is dild. with a buffer of graphite and silica to which 1% Ti has been added as an internal standard, then packed into a cratered graphite electrode and excited with a d.-c. arc. The length of the Ti 2956.1-Å. line is subtracted from the length of the V 2977.1-Å. line, and the concn. is read from calibration curves prepd. by plotting this difference against known concns. of V. Good agreement was found between the log sector and the densitometric method.

5161. KAR, B. C. AND GUPTA, M. K.
Determination of Magnesium in Nodular Cast Iron by Spectrographic Analysis.
J. Sci. Ind. Research (India), **14B**, 570–2 (1955).
C. A., **50**, 7660b (1956).

A spectrographic method for detg. Mg in ferrous materials was developed to aid in the control of the inoculation process for nodular cast iron. Standard sample rods 3–4 cm. long and 8 mm. in diam. were used. A microphotometer was used to compare the relative d. of the Mg 2802.7 line and the Fe 2783.69 line with a standard calibration curve. Analysis of a number of nodular cast irons showed a standard deviation generally less than 10%. Comparison of the spectrographic method with the wet chem. analysis showed agreement to within 24%.

5162. KASHIMA, J. AND MUTAGUCHI, M.
Determination of Aluminum by Flame Photometry.
Japan Analyst, **4**, 420–3 (1955).
C. A., **50**, 16539d (1956).

The sample soln. was mixed with a known amt. of Ca, and line intensities of Ca were measured with the Beckman flame photometer, where intensity of Ca decreased with increasing Al concn. The result of Al detn. for Zn alloys was found to be about the same as that obtained by chem. analysis.

5163. KASHIMA, J. AND YASUDA, K.
Spectrochemical Analysis with the Universal Source Unit. I. Determination of a Minute Amount of Silicon in Iron and Steel.
Japan Analyst, **4**, 427–30 (1955).
C. A., **50**, 16534d (1956).

A universal light-source unit was devised in which mode of discharge could be changed from sparklike to arclike by varying capacitance, self-inductance, and resistance of the circuit. Detn. of Si in Fe and steel was investigated by using this unit adjusted for arclike discharge. Sensitivity of this method was comparable with that of the arc method and accuracy was comparable with that of the spark method. The calibration curve was linear up to 1% Si.

5164. KASHIMA, J. AND YASUDA, K.
Spectrochemical Analysis with the Universal Source Unit. II. Determination of Carbon in Iron and Steel.
Japan Analyst, **4**, 482–6 (1955).
C. A., **50**, 16534e (1956).

In the spectrochem. detn. of C in steel, interference of the Fe line (2478.569 Å.) could be minimized against the C line (2478.573 Å.) by selecting the proper condition of discharge of the source unit. The main circuit consts.

suitable for analyzing cast iron and steel, resp., were capacitance 10 and 40 microfarads, inductance 400 microhenries, resistance 6.5 and 5.5 ohms, and charge voltage for the condenser 990 and 850 v., resp. C of more than 1.7% in cast iron and 0.2% in steel could be detd. with a mean deviation of 8.6% and 4.4%, resp.

5165. KASHIMA, J. AND YASUDA, K.
Spectrochemical Analysis with the Universal Source Unit. III. Determination of Large and Small Amounts of Various Elements in Copper Alloys.
Japan Analyst, **4**, 491–6 (1955).
C. A., **50**, 16534f (1956).

Detn. of Zn in brass and of P, Pb, and Fe in bronze were investigated with the universal source unit. Zn in brass was best detd. by sparklike discharge. P, Pb, and Fe in bronze were best detd. by arclike discharge. Linear relations between concn. and line intensity were observed over a wide range of the concn. The error of detn. was within 2% except for Fe.

5166. KATCHENKOV, S. M.
Drawing Geochemical Maps According to Spectrum Analysis Data.
Novosti Neft. Tekh., Nefteprom. Delo **1955**, No. **4**, 13–18.
Referat. Zhur., Khim. **1956**, Abstr. No. **6639**.
C. A., **52**, 185h (1958).

For drawing geochem. maps, the use of quant. (compn. of chem. elements in %) as well as qual. (intensity of spectrum lines) data obtained from spectrum analysis is recommended. Quant. spectrum analysis quickly dets. concns. from 0.001 to 10%. Drawing geochem. maps for rocks, water, oil, coal, etc. from pertinent data is possible either by the ordinary elements (Si, Al, Fe, K, Na, Mg, Ca) or by the rarer (Li, Sr, Ba, Mn, V, Ni, Co, Cr, Cu, Be, Ga). If a transition to quant. data is necessary, the analysis of 2–3 samples taken from the isolines is sufficient. This is important for the detn. of high concns. by the chem. method and for verification of spectrum detd. at low concns.

5167. KATCHENKOV, S. M. AND FLEGONTOVA, E. I.
Accessory Elements in Dovonian Rocks of the Volga-Ural Area.
Doklady Akad. Nauk S.S.S.R., **100**, 749–52 (1955).
C. A., **49**, 10141b (1955).

The investigated rocks were chiefly sandstones, aleuritic schists, clays, marls, dolomites, and limestones. The spectral-analytical detn. of the accessory elements of the Fe and Cu group has brought about important results. (*See C. A.* for complete abstract.)

5168. KATCHENOV, S. M. AND FLEGONTOVA, E. I.
Trace Elements in the Devonian (Petroleum) Deposits of the Volga-Ural Region, as Found by Spectral Analysis.
Trudy Vsesoyuz. Neft. Nauch.-Issledovatel. Geologorazvedoch. Inst. Geol. Sbornik, **83**, No. 1, 466–505 (1955).
C. A., **52**, 7970h (1958).

The elements sought are Na, Mg, Ca, Sr, Ba, Si, Al, Fe, Mn, U, Ni, Cu, Cr, Ti, B, V, S, Co, Ag, Zr, Sn, and Zn. In extensive graphs and tables are presented the comparisons between the results of spectral and gravimetric analyses, where possible (e. g., for V and Ni), the amts. of each of the elements in samples from various wells, the distribution of these elements in the rock bed, in the sands, in the siltstones, in the clays and limestones, and also such distribution over the various parts of this region (in these latter analyses marl deposits are also considered, where present). The distribution of these elements over the stratigraphic horizons is presented, and analyses of the waters for these elements are given.

5169. KEL'TSEVA, Z. A.
Transactions of the IXth All-Union Conference on Spectroscopy. Quantitative Spectrographic Analysis of Raw-Material Mixes and the Production of Cement Factories.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 100–1 (1955).
C. A., **50**, 3888b (1956).

5170. KEMULA, W., HULANICKI, A., AND RUBEL, S.
Determination of Admixtures of Lead. Cadmium, Tin, and Iron in Zinc.
Przemysl Chem., **11**, 102–6 (1955).
C. A., **52**, 10804a (1958).

The analysis of impurities in metallic Zn by applying colorimetric, polarographic, and spectrographic methods is described. Pb, Cd, and Sn were detd. by polarographic and spectrographic methods and Fe by colorimetric and polarographic methods. The accuracy and precision of the methods are discussed.

5171. KENNEDY, W. R.
Direct Spectrographic Analysis of Cerium in Cast Iron.
Appl. Spectroscopy, **9**, 22–6 (1955).
C. A., **49**, 8040e (1955).

Chill-cast ingots were collected from exptl. heats and analyzed chemically for Ce by a colorimetric procedure. These analyzed ingots were used as spectrographic standards. Flat samples of cast iron contg. small amts. of Ce were excited in a Multisource unit, and spectra were photographed in the blue-violet region. Detn. of Ce resulted from measured intensity ratios of Ce and Fe lines when compared with the relation of Ce concn. to inten-

sity ratios shown by the standards. The accuracy is within 10% of the amt. present at the level of 0.05% Ce, and 20% at the level of 0.005% Ce.

5172. KESSLER, K. G., AND MEGGERS, W. F.
Arc and Spark Spectra of Ruthenium.
J. Research Natl. Bur. Standards, **55**, 97–126 (1955) (RP 2609).
C. A., **50**, 6185a (1956).

The d.-c. arc and high-voltage spark spectra of Ru have been investigated for the purpose of compiling a comprehensive line-list for forthcoming term analyses of these spectra. These spectra were observed photographically with 30,000, 15,000, and 7500 lines-per-in. concave gratings in a Wadsworth mounting. Wavelengths and estd. relative intensities are presented for 6000 lines in the spectra, Ru I, Ru II, and Ru III, in the wavelength range 2005.69 to 11,483.91 Å. This list is compared with line lists reported by other investigators.

5173. KHOKHLOW, V. V., PROTOPOPOV, V. N., DENISENKO, L. I., SMIRNOVA, E. Y., AND TIMONINA, Z. G.
Transactions of the IXth All-Union Conference on Spectroscopy. Semiquantitative Method of Spectral Analysis for 40–50 Elements in Rocks.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 115–16 (1955).
C. A., **50**, 3888e (1956).

By using a method developed by Kler (*Izvest. Akad. Nauk S.S.S.R., Ser. Fiz.*, **18**, 291 (1954)), a max. discrepancy of 60% between spectrographic and chem. analysis is obtained.

5174. KIBISOV, G. I., STERIN, K. E., AND KOBETSKAYA-VREDEN, T. O.
Spektral'nyi Analiz (Spectral Analysis).
Izdatel. Akad. Nauk S.S.S.R., Moscow (U.R.S.S.) (1955).
C. A., **51**, 4883a (1957).
183 pp. r. 6, k. 40.

5175. KIRSANOV, N. V.
Composition and Characteristics of the Argillites of the Fransk Basin in Tartary.
Doklady Akad. Nauk S.S.R., **102**, 605–8 (1955).
C. A., **50**, 1543d (1956).

The spectral analyses show (besides the common elements) the presence of B, F, Mg, P, S, Ti, V, Cr, Mn, Cu, Sr, Pb, Zn. (*See C. A.* for complete abstract.)

5176. KISIELOW, W. AND GREGOROWICZ, Z.
Mineral Substances in Polish crude oils.
Nafta (Poland), **11**, 258–9 (1955).
C. A., **52**, 1596g (1958).

The ash from 14 Polish crude oils was spectroscopically investigated and the presence of the following elements was proven: Fe, Ni, Ca, Mg, Al, Si, Mn, V, Cu, Na, Zn, Ti, Pb, Ba, Co, Sr, Ag, Cr, Mo, Au, Sn, and Cd. Trace amts. of Ag, Mo, Au, Sn, and V were detected in several ash samples.

5177. KITAEVA, V. F.
Transactions of the IXth All-Union Conference on Spectroscopy. Investigation of the Form and Width of Spectral Lines in a Direct-Current Arc.
Izvest. Akad. Nauk S. S. S. R., *Ser. Fiz.*, **19**, 27–8 (1955).
C. A., **50**, 3886c (1956).

Arc lines have largely varying widths, the narrowest being the resonance lines. The shape of the large lines is detd. by the interaction of the excited atoms with charged plasma particles.

5178. KLER, M. M.
Transactions of the IXth All-Union Conference on Spectroscopy. A Method of Approximate Quantitative Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 116–17 (1955).
C. A., **50**, 3888f (1956).

The position of analytical graphs, their slope, and their displacement were studied. A study of 16 elements in SiO_2, CaO, Al_2O_3, ZnO, and C powder base showed that the angle of slope was 34.3° with an av. deviation of 1.6°. From 140 analytical graphs of 27 elements in ZnO base an av. slope of 32.8° was obtained for resonance lines and of 32° for lower lines.

5179. KLIMECKI, W.
Spectral Analysis.
Prace Inst. Ministerstwa Hutnic., **7**, 183–202 (English summary) (1955).
C. A., **50**, 12727h (1956).

A review of steeloscopic, spectrographic, and direct spectrometric methods of analysis which were developed by the Polish Inst. of Metallurgy (Inst. Metalurgii) within the last few years. The methods include spectrographic detn. of Si, Mn, Cr, Ni, Mo, and V in steel; Al and P in steels; Si in high-Si steel; Si, Mn, Cr, Ni, W, Mo, V, and Ti in highly alloyed steel; Si and Mn in cast iron; Si, Mn, Cr, Ni, and Mo in alloyed cast iron; Si, Mn, Fe, Mg, and Cu in silumin; and Li in carnalite. Z. presents a special design of voltage transformer and spark generator of simple construction giving highly reproducible excitation conditions. Phenomena accompanying the spark discharge are discussed. It is noted that for certain alloys and in certain excitation conditions the sparking spots may change from bright to dark. It is found that heat-treatment of cast iron does not affect the results of Si detn., whereas surface decarburization considerably influences the results. 27 references.

5180. KNISELEY, R. N. AND FASSEL, V. A.
Rotating Step-Sector for Use with Alternating-Current or Other Intermittent Spectrographic Light Sources.
J. Opt. Soc. Am., **45**, 1032–4 (1955).
C. A., **50**, 2298h (1956).

The calibration of the response of photographic emulsions with rotating step sectors can lead to erroneous results when intermittent spectrographic light sources are used. These errors arise through partial synchronization between the periodicity of the light pulses and the passage of sector apertures in front of the spectrograph slit. A design for a rotating step-sector which should overcome synchronization possibilities has been conceived and some actual sectors have been tested. This sector consists of a series of stepped apertures randomly spaced about the periphery of a rotating disk. Data are presented to show that the random spacing of the sector apertures eliminates the possibilities of introducing errors through synchronization effects when conventional intermittent discharges are used.

5181. KOEHLER, M.
The Determination of Sulfur in Metals with a Low-Voltage Spark.
Congr. groupement avance. méthodes anal. spectrog. prod. mét., **18**, 215–23 (1955).
C. A., **52**, 2648e (1958)

By means of a low-voltage, high-current spark between Ag electrodes in a partial vacuum, weak S lines at 5433, 5454, and 5640 Å. can be used to det. S in Pd alloys and steels. The detection limit is 0.03%. The method can also be used for Cl and C.

5182. KOKA, P. A. AND SALOMATINA, G. A.
Spectrographic Determination of Impurities in Dolomite and Silica Refractories.
Zavodskaya Lab., **21**, 1061–6 (1955).
C. A., **50**, 9230e (1956).

Powd. dolomite cong. known quantities of SiO_2, Al_2O_3, TiO_2, Fe, and Mn was mixed with CuO (1:1); the latter acted as a buffer and as an internal standard. The samples to be analyzed were similarly prepd. The powders were burnt in the crater (5 mm. deep, 3 mm. in diam., and 0.7 mm. wall thickness) of the C anode opposite a rounded C cathode with an arc of 9.5–10 amp. and 3-mm. gap. Three stages of burning were observed during the first 12–15 sec. globules appeared and coalesced: during the 2nd period, 15–120 sec., spattering stopped, the arc was steady. and all elements appeared in the spectrum, Ca and Ti partially; after 2 min. spattering started and the entire charged evapd. at the end of 4 min. The partial evap. of Ca and Ti was ascribed to the formation of CaC_2 and TiC (Cf. Steinberg, et al. *C.A.*, **43**, 7656d) rather than to a difference of the mineralogical form (Cf. Kvalheim, *C. A.*, **41**, 5917f). All points of Fe, Si, and Al fell on the linear calibration curve during the entire 3 min. of exposure, whereas those of Ti became reproducible only after complete evapn. of the sample. The following line pairs were used: Ti I 3186.5–Cu I 3146.82, Ti II 3078.64–Cu I 3108.60, Ti II 3168.52–Cu I 3146.82. The standards for the analysis of SiO_2 refractories were heated at 1400° for 2 hr. to obtain the same physiochem. and mineralogical properties as those of the sample. The mean error for Fe_2O_3, Al_2O_3, TiO_2, CaO, and MgO were ±5.7, 4.4, 6.0, 4.0, and 8.3%, resp.

5183. KOMAROVSKIĬ, A. G.
Transactions of the IXth All-Union Conference on Spectroscopy. Local Analysis of Welded Seams in Highly Alloyed Steels and Refractory Alloys.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 152–3 (1955).
C. A., **50**, 3889h (1956).

The design of a universal generator is discussed. Good pictures are obtained with a strong spark pulse discharge. The distribution of Nb, Mo, Si, and Mn in the cracks and in the metal of the seam is discussed.

5184. KOMAROVSKIĬ, A. G.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Highly Alloyed Steels and Alloys.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 167–9 (1955).
C. A., **50**, 3890c (1956).

All alloys are classified in 3 groups, corresponding to 3 graduation graphs having a parallel displacement. Analysis is made for Si, Mn, Cr, Ni, Mo, W, Ti, V, Co, Al, B, and Nb.

5185. KONDRASHEVA, L. D., PODMOSHENSKIĬ I. V., AND PROKOF'EV, V. K.
Photoelectric Methods of Emission Spectrum Analysis.
Zavodskaya Lab., **21**, 1446–55 (1955).
C. A., **50**, 8371b (1956).

A review with 22 references.

5186. KONOPICKY, K. AND KAMPA, P.
The Flame-Photometric Determination of Calcium.
Tonind.-Zt. u. keram. Rundschau, **79**, No. 5/6, 61–4 (1955).
C. A., **49**, 8033a (1955).

By using the Riehm-Lange photometer and an acetylene flame the curves either have to be calibrated for Al and Ti interference or the sesquioxides have to be removed. Either way the accuracy is ±2% for up to 5% CaO.

5187. KOROLEV, F. A.
Transactions of the IXth All-Union Conference on Spectroscopy. New Methods of Application of a Multiplex Standard to High-Resolution Spectroscopy.

Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 78–9 (1955).
C. A., **50**, 3887f (1956).

5188. KOSHELEVA, M. M. AND CHERNETSOVA, V. I.
The Determination of Silicon in Fluoride by the Spectral Method.
Zavodskaya Lab., **21**, 460–1 (1955).
C. A., **50**, 2362f (1956).

A rapid method is described for the spectral detn. of Si in NaF and CaF_2. Calibration curves were established on the basis of 3 samples of known compn. The error was ~2% for samples contg. 21–4% SiO_2 in NaF and 18% SiO_2 in CaF_2; the time of analysis was much less than that for the chem. method.

5189. KOTSIS, T. AND HUBER, A.
Spectrographic Determination of Gallium in Bauxites.
Kohászati Lapok, **10**, 184–6 (1955).
Hung. Tech. Abstr., **8**, No. 1, Abstr. No. 65 (1956).
C. A., **52**, 8833i (1958).

Fuse 2.5 g. of bauxite with 5 times as much KOH in a Ag crucible. Ext. the melt with water, wash into a beaker while hot, boil, and filter hot. Wash the ppt. with a 1% soln. of KOH, transfer the filtrate to a 50-ml. volumetric flask, and dil. to mark with water. Mix 2 ml. of this stock soln. with 1 ml. of a 0.5% Mo standard soln. in a test tube. Use this bauxite-Mo stock soln. mixed in a ratio of 2 to 1 directly for arcing. Carry out spectrographic examn. by employing an a.-c. arc of 3 amp. and the following reference lines: Ga 4172.06/Mo 4232.61 Å. and Ga 2874.2/Mo 2871.5 Å. The mean values of the analyses are given.

5190. KOVALEV, M. M.
Qualitative Spectral Analysis of Drinking Water and Urinary Calculi.
Klin. Med., **33**, No. 11, 54–6 (1955).
C. A., **50**, 7290i (1956).

Spectral analysis of urinary calculi obtained from the parenchyma of the kidneys revealed the presence of most of the trace elements found in drinking water. The calculi contained Al, Ti, V, Ni, Pb, Li, Cr, Mn, Cu, Mo, Sr, Si, Ag, Fe, Bi, Zn, and Ba. This suggests the possibility of drinking water being the causative factor in formation of calculi.

5191. KOZLOVA, A. V. AND KORZH, P. D.
Transactions of the IXth All-Union Conference on Spectroscopy. The Influence of Graphite on the Spectral Analysis of Alloys.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 119–20 (1955).
C. A., **50**, 3888g (1956).

Graphite powder is added to the probe to prevent melting. By using this method a single graduation graph for Cr or Mn can be constructed for Cr or Mn in stainless steels, Cr-Al alloys, and Nichrome.

5192. KROPIK, H.
Flame-Photometric Determination of Calcium in Soil Extracts.
Z. Pflanzenernähr. Düng. Bodenk., **70**, 138–40 (1955).
C. A., **49**, 16294e (1955).

In the flame-photometric detn. of Ca in CO_2-H_2O exts. of soil, interference by anions and cations was eliminated by pptn. of Ca with oxalate and centrifuging the ppt.

5193. KRYUGER, G., SHVANGIRADZE, R. R. AND MOZGOVAYA, T. A.
Quantitative Spectrum Determination of Hafnium in Zirconium.
J. Anal. Chem. U.S.S.R., **10**, 15–20 (1955).
Zhur. Anal. Khim., **10**, 20–7 (1955).
C. A., **49**, 8034d (1955).

Hf (0.01–15%) in Zr was detd. with an accuracy of ±1.5% in a spectrograph of medium resolution power under the following conditions. For 0.01–1.0% Hf the lines used were Hf II 2393.83 and Zr II 2392.68 Å., and for 0.3–10% Hf Hf II 2417.69 and Zr II 2416.88 Å. The sample used contained ZrO_2 4, graphite 4, and $Na_4P_2O_7$ 1 part. The d.-c. arc was generated by 16 amp. at 220 v., the distance between the electrodes was 3 mm. and the spectrograph slit 0.005 mm. The electrodes were fired for 30 sec. without charge, then for 20 sec. with charge, and finally 30-sec. exposure.

5194. KUDELYA, E. S.
Transactions of the IXth All-Union Conference on Spectroscopy. The Nature of the Influence of Sparking in the Spectral Analysis of Metallic Alloys.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 136–8 (1955).
C. A., **50**, 3889e (1956)

The phenomena in sparking have the character of diffusion. Sparking effects can be decreased if conditions are made favorable for diffusion.

5195. KUDELYA, E. S. AND DEM'YANCHUK, A. S.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectrochemical Determination of Carbon in Iron Alloys.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 150–1 (1955).
C. A., **50**, 3889g (1956).

C in minimum amts. of 0.01–0.02% can be detd. from the variation in intensity of line C III 2296.8 if Mg electrodes are used because such electrodes prevent the oxidation of C.

5196. KUDELYA, E. S. AND DEM'YANCHUK, A. S.
Spectral Analysis of Welds of Certain Copper and Aluminum Alloys.

Avtomat. Svarka, **8**, No. 2, 55–62 (1955).
C. A., **50**, 728f (1956).

A method is developed for the detn. of Al, Si, Mn, Pb, Sn, and Zn in Cu alloys and welds by means of spectroanalysis. Similarly, a method is given for detg. Fe, Si, Ca, Mn, Cu, and Ti in welds of Al alloys. Adjustments in calibration were required when it was found that a Zn content of 10–12% in Cu alloys had a definite weakening effect on the lines for other elements.

5197. KUROYANAGI, S.
Spectrochemical Studies of Woods and Trees. VI. Degree of Accuracy of the Quantitative Spectrographical Analysis of Wood.
Trans., 64th Meeting Japan. Forest. Soc., J. Japan Forest Soc., **1955**, Spec. Issue, 312–14
C. A., **50**, 12728a (1956).
Cf. *C. A.*, **48**, 14190g.

A known amt. of Ca and Mg was detd. by the spectroscopic method, with $Cd(NO_3)_2$ as the internal standard. Av. error of this analysis was: 14.8% for Ca and 20.6% for Mg. The causes of low accuracy were discussed.

5198. LACOMBLE, M. AND D'OR, L.
Comparison of the Analytical and Spectral Methods for the Determination of the Total Aluminum in Steels.
Rev. universelle mines, 11, 86–97 (1955).
Rev. mét., **52**, 150–200 (English Summary) (1955).
C. A., **49**, 7444i (1955).

A comparison of chem., colorimetric, and spectrographic detn. of Al in steels shows the last to be the most exact and fastest. The importance of the Al detn. is discussed and the different methods are described in details.

5199. LAGERQVIST, A. AND HULDT, L.
Carriers of Flame Spectra of Alkaline Earth Metals.
Naturwissenschaften, **42**, 365–6 (1955).
C. A., **50**, 11109b (1956).

The Sr bands were studied in a C_2H_2-air flame with injection of an aq. soln. of Sr $(NO_3)_2$. Parallel expts. were run with solns. in heavy water (D:H ratio 1:5 in flame). The spectrum had a no. of bands shaded to the violet, edges at 6114.2, 6111.9, 6109.8, 6107.9, 6107.5, and 6105.2 Å.; with heavy water weaker edges at 6117.8, 6115.4, 6113.7, 6113.3, 6111.3 and 6109.0 also appeared. The carrier of the spectrum evidently contained H and was SrOH or SrOD. The same probably holds for the Ca spectrum and for the Ba bands between 8000 and 10,000 Å.

5200. LANDERGREN, S.
Spectrochemical Analysis of Sediments and Crystalline Rocks.
Geol. Fören i Stockholm Förh., **77**, 64–5 (1955).
C. A., **50**, 4702g (1956).

A brief description is given of the detn. of major and minor constituents in sediments and igneous rocks by means of combined chem. and spectrochem. analysis.

5201. LANDERGREN, S.
Reports of the Swedish Deep-Sea Expedition, 1947–1948. The Geochemistry of the North Atlantic Sediment Core No. 238.
Göteborgs Kungl. Vetenskaps-och Vitterhets Samhälle, **7**, 125–48 (in English) (undated).
C. A., **49**, 10142c (1955).

The core, 14.12 m. long, was collected at a depth of 7315 m. at lat. S 00°07′, long. W 18° 12′. Samples of each dm. were analyzed spectrochemically for Al, Ti, Ca, Mg, Mn, Fe, Co, Ni, V, and Cr. Correlations between Mg and the ferrides indicate that the parent material was mafic igneous rocks, but the Mn content shows little correlation with those of the other elements. Detns. of the ratio C^{12}/C^{13} for 7 samples gave ratios 88.67 to 88.80 with no consistent variation with depth.

5202. LANDERGREN, S. AND MULD, W.
Spectrochemical Analyses of Igneous Rocks, Sediments, and Ores.
Mikrochim. Acta, **1955**, 245–50.
C. A., **49**, 11488h (1955).

Pulverized samples to be analyzed are divided into 3 parts for major constituents, minor constituents, and special tests, resp. The major constituents, are detd. by a combination of careful chem. examn. with a high-tension arc, used mostly, but with the air-C_2H_2-flame method for alkalies. The minor constituents are usually detd. by the carbon-arc cathode layer method, either in its original form or by a somewhat modified procedure. In some cases, as for detg. Au, as soln. of the sample is evapd. on a heated C rod serving as anode and the spectrum obtained by a d.-c. interrupted arc.

5203. LANDIS, F. P. AND PEPKOWITZ, L. P.
Sparking Thin Sheet Samples for Spectrographic Analysis—Application to Manganese and Niobium Determinations in Stainless Steel.
Anal. Chem., **27**, 141–2 (1955).
C. A., **49**, 6027g (1955).

When thin sheets of steel are sparked in the spectrographic detn. of Mn and Nb, the heat produced causes very erratic and unusually high Mn and Nb values. A flow of cooled He over the unsparked side of the steel sample reduces the Mn and Nb results to reproducible values, although not to the true values. The spectrographic results must therefore be cor-

rected by chem. analysis of samples of correct thickness from each heat of steel.

5204. LANG, K.
Measurable Light Fading With the Rotating Sector in Photographic Spectral Photometry.
Mikrochim. Acta., **1955**, 278–85.
C. A., **49**, 11485i (1955).

The use of rotating sectors in photographic spectrophotometry is of doubtful expediency because of the Schwarzschild and intermittancy effects. Expts. show that the difference between the blackening obtained with intermittent light and continuous light of the same av. intensity, changes with the frequency of the intermittance and disappears almost entirely if a certain critical frequency is exceeded. This critical frequency is dependent on the intensity and the kind of photographic plate used. There is no objection to the use of intermittant light (rotating sectors or a.-c. light) in photographic photometry provided the limiting frequency is exceeded.

5205. LAURENT, A.
A Method of Spectrochemical Analysis of Solutions for the Determination of Trace Elements in Steels.
Congr. groupe. avance. méthods anal. spectrog. prod. mét., **18**, 77–95 (1955).
C. A., **52**, 2649c (1958).

Amts. of Ni less than 500 p.p.m. are detd. in steel with an error of ±8% against Fe as internal standard. The sample is dissolved in HNO_3 and evapd. in a graphite electrode before arcing; the crit. factors are the placing and drying of the soln. The same technique can be used for Al, Mn, Cr, Mo, V, Ti, Cu, and Pb.

5206. LAUSEN, H. H.
Determination of Sodium in Dried Umbilical Cord Tissue.
Scand. J. Clin. & Lab. Invest., **7**, 320–3 (1955).
C. A., **50**, 11408e (1956).

The Na content of dried umbilical cord tissue was detd. after digesting 10–20 mg. of material overnight in 1 ml. concd. HNO_3 and 0.2 ml. 30% H_2O_2. The Na was detd. by flame photometry and the amt. calcd. from a calibration curve by plotting emission values against square root of Na concn. This type of plot gave a linear slope.

5207. LAZARENKO, E. K.
Sphalerites from the Pyrite Deposits of the Central Ural.
Uchenye Zapiski L'vov. Gosudarst. Univ. im. Ivana Franko, Ser. Geol., **35**, No. 8, 72–119 (1955).
C. A., **51**, 4218h (1957).

The sphalerites studied contained, typically (%) Zn 45.5–66.7, S 27.8–34.0, Fe 0.7–5.1, Mn 0.0–1.6, Cd 0.0–0.6, Cu 0.0–6.3, Pb 0.0–1.5, MgO 0.0–0.2, CaO 0.2–0.8, Al_2O_3 0.3–11.1, insol. residue 0.1–20.5. Spectrographic analysis showed the presence of Ge 0.001–0.05, In 0.001–0.005, Sn up to 0.005, As 0.01–0.05, some Ti, and traces of many other elements. (*See C. A.* for complete abstract.)

5208. LEACH, S.
The Emission Spectra of Water and Heavy Water.
J. chim. phys., **52**, 492–7 (1955).
C. A., **50**, 4637e (1956).
Cf. *C. A.*, **49**, 4404c.

The spectra were excited in a Schüler discharge tube operated at 4400 v. and 5 ma. at a pressure of 1–5 mm. Hg. In the ultraviolet a Féry spectrograph was used at F/25 where the dispersion was 16.2 Å./mm. at 3300 Å. In the visible a two prism Bouty-Cojan-type Huet spectrograph was used at F/5 where the dispersion was 193 Å/mm. at 4500 Å. The precision of the measurements was ±1 cm.$^{-1}$. The spectrum of heavy water lay between 4242 and 5513 Å. and consisted of 8 bands degraded towards the red. The rotational structure of these bands was very simple. The HDO spectrum consisted only of bands already found for H_2O and D_2O. Bands were found in the ultraviolet for the $^2\Sigma^2$ II transition of the OH or OD radicals. The results for H_2O agreed well with those of Schüler and Woeldike (*C. A.*, **38**, 1426^5). Previous hypotheses as to the emitter responsible for the observed visible spectra of H_2O and its isotopic mols. are reviewed. It was concluded that the most convincing explanation involves the transition OH^{-*} ($'\Sigma$)-OH($'\Sigma$). Unfortunately this predicts an electron affinity for O of 0.65–0.95 e. v. which contradicts the accepted value of 2.33 e. v. from many other expts.

5209. LEE, T.
The Spectrochemical Determination of Argon in Air.
Appl. Spectroscopy, **9**, 5–13 (1955).
C. A., **49**, 8042c (1955).

A spectrochem. procedure to det. the ratio of the concn. of a A in a sample slightly different from air to the concn. of A in air was developed by using an electrodeless discharge tube and a 22-ft. direct reading optical spectrometer. A method of relative precisions to obtain optimum adjustments of the equipment is described. This method was used to det. the optimum discharge tube pressure and the optimum entrance-slit width.

5210. LESNIKOVA, E. M.
Transactions of the IXth All-Union Conference on Spectroscopy Spectral Analysis of Slags with the Help of Fluxing.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 97–8 (1955).
C. A., **50**, 3888b (1956).

The slags are mixed with dehydrated $Na_2B_4O_7$ in a proportion of 1:4 and the mixt. is molten at 800–50°.

5211. LEWIS, C. L., OTT, W. L., AND HAWLEY, J. E.
Spectrochemical Analysis of Refined Rhodium.
Trans. Can. Inst. Mining Met., **58** (in *Can. Mining Met. Bull.*, **516**, 208–12) (1955).
C. A., **49**, 9436e (1955).

Spectrographic methods for detg. minor contaminants in Rh sponge are far superior to wet chem. methods. Of the methods tried, the sponge technique is most suitable for detg. Ir, Pd, Fe, Ni, and Cu. The modified sponge technique is used for SiO_2. Other elements are detd. by the black technique. The available sample forms are soln., sponge, and black. Solns. can be analyzed by coated-electrode or porous-cup techniques. Sponge (metal powder) and black (very finely divided metal powder) are most easily handled as briquets or pellets. To prep. Rh sponge, dissolve Rh in a pyrex reaction tube. Wash the soln. carefully out of the tube, evap. to dryness twice with concd. HCl to remove all HNO_3, and make up a standard vol. as a chloride soln. with redistd. H_2O. If the Rh is a sample for analysis, an aliquot of soln. is reduced to sponge. If spectrographic standards are to be made, addns. of standard solns. of contaminant elements are made to aliquots of the Rh soln. to give desired wt. percentages. Evap. the solns. to small vols., transfer to 30-ml. Vycor crucibles, and evap. to dryness under infrared lamps. Crush the salts to powder, reduce slightly under H, and place in a furnace at 900° for full reduction under H. Add one part of briquetting powder by wt. (National Carbon Co., *S. U.*, No. 1) to 2 parts of Rh sponge in a small mullite mortar. Add MeOH as a lubricant and treat the mixt. with a combination mixing and grinding action for 1 hr. Dry under infrared lamps. Briquet 40-mg. portions of the sponge-graphite mixt. by Wark's method. Five or 10 pellets, depending on reproducibility, are normally used for analysis of a sample or establishment of a spectrographic standard. A high-voltage spark discharge from a High Precision Source unit is used for excitation.

5212. LIPPI, B. AND MALERBA, G.
Sodium and Potassium of Blood Serum in Aged People.
Arch. "E. Maragliano" patol. e clin., **11**, 839–45 (1955).
C. A., **50**, 10227d (1956).

By the flame spectrophotometric method av. values (mg./100 cc.) of 19.7, 17.4, 18.6, and 19.0 were found for blood K of 65–70, 71–75, 76–80, and 81–85 year old men (20.10, 21.40, 21.20, 21.00, 18.40, and 21.10 for similarly aged and 86–90 and 91–95 year old women, resp.). For Na the above values were 322, 333, 313, and 322 (303, 324, 324, 318, 304, and 294), resp. For 25–50 year old people 19.00 and 329 for K and Na, resp.

5213. LIZUNOV, N. V. AND LISITSYN, A. P.
Spectrum-Analysis Data on the Composition of the Suspension in the Bering Sea.
Doklady Akad. Nauk S.S.S.R., **104**, 593–6 (1955).
C. A., **50**, 9799g (1956).

Be, Mg, Al, Si, P, Ca, Se, Ti, V, Cr, Mn, Fe, Ni, Cu, Zr, Ga, Sr, Ag, Sn, Ba, and Pb were found spectroscopically. The av. concns. of solids in the spring and fall seasons were detd., and the relative amts. of the different elements in the different seasons are given.

5214. LJUNGGREN, P.
Geochemistry and Radioactivity of Some Manganese and Iron Bog Ores.
Geol. Fören. i Stockholm Förh., **77**, 33–44 (in English) (1955).
C. A., **50**, 4732e (1956).

The formation of bog and lake Fe and Mn ores is discussed, and chem. (for MnO_2 and Fe_2O_3) and spectrochem. (for K, Rb, Cs, Sr, Ba, Ni, Co, Pb, B, Be, V, Cr, and Mo) analyses of lake, river, and moraine bog ores of western Sweden are presented. Discussion of the results indicates that most of the trace elements are enriched in the Mn bog ores, as compared with the Fe bog ores. The Mn bog ores were also found to be more strongly radioactive than the Fe bog ores. The sorption of various cations by MnO_2 is discussed. 31 references.

5215. LOKHOV, P. T.
Magnetically Stabilized Alternating-Current Arc for Spectrum Analysis.
Zhur. Anal. Khim., **10**, 331–3 (1955).
C. A., **50**, 1378c (1956).

Details of circuit and set-up are given.

5216. LOMONOSOVA, L. S.
Spectrographic Determination of Some Impurities in Tantalum.
Zavodsakaya Lab., **21**, 1080–1 (1955).
C. A., **50**, 9220c (1956).

Nb, Ti, Si, Fe, Sn, and Ni in Ta were detd. spectrographically with a precision of ±6, 6, 6, 8, 10, and 8–10%. The presence of Ti intensified the line of Fe and Si and depending on the concn. of Ti present the error increased up to ±40% and a correction for Ti was applied. The samples of Ta were oxidized at 700–800° for 10–20 min., compressed into cylinders 1.5 mm. in diam. and 2.4 mm. high, and placed in a hollow of the anode 1 mm. deep and 2.5 mm. in diam.; d.-c. arc 9 amp., exposure 25 sec.

5217. LONGI, Y.
Planning the Scale of Spectrographic Determination.

Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 103–55 (1955).
C. A., **52**, 2641g (1958).

About 150 standard curves for the spectrographic detn. of metals are given. The slopes of these are unity for many elements in varied kinds of samples, and make possible the construction of a calibration curve with a single standard. Correlations of peripheral electron arrangements of the elements with the presence or absence of unit slope are discussed. Details of the author's lab. procedures are given.

5218. LOUNAMAA, K.
Enrichment of Arsenic from Silicate Minerals for a Colorimetric or Spectrographic Determination. Decomposition by Hydrofluoric Acid Under Pressure.
Z. anal. Chem., **146**, 422–9 (1955).
C. A., **49**, 13828 a (1955).

Attack the mineral with HF at 150° for an hr. in a small steel bomb lined with Teflon. Carry out an extn. with diethylammonium diethylthio-carbamic acid from the strong HF soln. in polyethylene app. Samples of granite and serpentine were found to contain 18–79 γ of As/g.

5219. LOUNAMAA, N.
Determination of Trace Elements in Tungsten Oxide by Spectrographic Cathode Layer and Colorimetric Methods.
Ann. Acad. Sci. Fennicae, Ser. A, II, No. **63**, 93 pp. (in English) (1955).
C. A., **50**, 14443g (1956).

A spectrographic method for detg. trace impurities in WO_3 is based on converting WO_3 to W by means of acetylene C in the spectrographic C arc. The nonvolatile W does not contribute an interfering spectrum and the volatile impurities distil into the arc. The cathode layer is used to increase sensitivity. The purity and purification of C electrodes, C. powder, and WO_3 are discussed in detail. The conditions are given for a semiquant. method for Ag, Al, As, B, Be, Ca. Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, Pb, Si, Sn, Ti, and Zn. A table of detectabilities is given in which the results obtained by L. are compared with those of other workers. The quant. method, essentially the same conditions as for the semiquant. method, is given for detg. Al, Ca, Fe, Mg, Mn, Na, and Si. The order of volatility of elements and oxides was studied to det. choice of internal standards. Volatility curves (log I/time) are given for each of 25 elements from 5 sec. to 45 sec. The cathode layer effect *vs.* arc excitation is discussed at length, and an exptl. study of the entire arc was made. Intensity curves (log I/distance from anode) are given for 23 elements from 0 mm. (surface of anode) to 5.5 mm. Distance between anode and cathode was 4.5 mm. More than one internal standard element is necessary and repeatability (reproducibility) tests were carried out to det. choice of standard line or lines. In the quant. method 50 mg. WO_3 is mixed with acetylene C in the ratio of 6:1. The internal standards are Li (540 p.p.m.), Cr (270 p.p.m.), Ga (31 p.p.m.), and Be (9 p.p.m.). Voltage is 240 v; pre-arcing 10 sec. at 7 amp.; exposure, 30 sec. at 10 amp. A reducing sector gave a 20% transmission. An aperture 3.2 mm. wide in the external optics selected $^1/_3$ of the arc from the cathode. Since standard samples of WO_3 are not available, independent chem. methods were considered for detg. Fe, Al, and Ca. (*See C. A.* for complete abstract.)

5220. LUNDEGÅRDH, P. H.
Petrology of the Uppsala Region, Eastern Sweden.
Sveriges Geol. Undersökn., Årsbok, **49**, No. 4 (1955).
Ser. C. Avhandl. och Uppsat., No. **544**, 74 pp. (in English) (1956).
C. A., **52**, 4429h (1958).

The petrology and geol. evolution of the Precambrian Archean rocks of the Uppsala quadrangle are reviewed. Granites predominate in the quadrangle area, but rocks of supracrustal origin (volcanic rocks, gneisses, quartzites, slates, graywackes) are frequent, and subsilicic plutonic rocks occur in addn. The intrusion of the Uppsala granite magma caused widespread granitization of the supracrustal rocks. The chemistry of the rocks is discussed with special reference to Cr, Co, Ni, and Zn detd. spectrochemically. Thirteen chem. rock analyses (3 new) are tabulated. 59 references.

5221. LÜSCHER, E.
A New Direct-Reading Spectrograph for the Schumann Region.
Congr. groupement avance. méthodes anal. spectrog. prod. mét., **18**, 305–9 (1955).
C. A., **52**, 2470a (1958).

An evacuated grating instrument with photomultiplier tubes is used to det. C, S, and P by using the lines at 1390.93, 1826.25, and 1858.92 Å., resp.

5222. LÜSCHER, E.
A New Grating Spectrograph with Photoelectric Recording for the Schumann Region.
Helv. Phys. Acta, **28**, 492–4 (1955).
C. A., **50**, 6915h (1956).

The grating, in a Paschen-Runge mount, has a radius of curvature of 150 cm., 960 lines per mm. ruled over a length of 50 mm., and a max. in the first order at an incident angle of 12.5°. Fluorescent K tungstate was applied to the surface of the photomultiplier in order to convert the short wave lengths of the spectrum to longer ones. The spectrograph is used for analysis, especially for C, S, and P

lines at 1930.93, 1826.25, 1858.92 Å., resp., or 6.39, 6.78, 6.64 e. v.

5223. LUTHER, H. AND BERGMANN, G.
Spectrochemical Study of the Engine Behavior of Lubricating Oils. I. Emission Spectroscopic Analysis of Inorganic Constituents in Petroleum Oils.
Erdöl u. Kohle, **8**, 298–304 (1955).
C. A., **50**, 6025a (1956).

A direct method of analyzing used and new motor oil by means of emission spectroscopy is described. Data are given for the concn. of Cd, Cu, Zn, Ca, Al, Pb, Cr, and P in various new oils and used oils of varying degrees of contamination.

5224. MACINTYRE, I.
The Determination of Calcium in Biological Fluid by Flame Spectrophotometry.
Rec. trav. chim., **74**, 498–501 (in English) (1955).
C. A., **49**, 16034c (1955).

The flame spectrophotometric method for the detn of Ca in serum gave results 0.28 meq. /l. higher than did the oxalate pptn. method. Studies of the latter with Ca^{45} showed that the mean pos. error due to Mg co-pptn. was 3.3% and the mean neg. error due to Ca loss was 6.5%; the mean net error of minus 3.2% suggested that the discrepancy between the 2 methods was due to error in the pptn. technique.

5225. MACQ, C.
New Technique Applied to Spectrograph Slits Using Quartz Plates.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 287–91 (1955).
C. A., **52**, 2530b (1958).

By a photographic process very narrow exit slits can be marked on a quartz support. Slits of differing sizes can be readily interchanged.

5226. MACQ, C.
Recent Developments In The Realization of Apparatus for Direct Analysis.
Rev. universelle mines, **11**, 76–81 (1955).
C. A., **49**, 7299a (1955).

A high-voltage generator for spark discharges, a spectrograph, and the measuring setup for spectrographic analysis are described.

5227. MALINOVSKIĬ, V. G. AND TULEVSKIĬ, Y. N.
Averaging the Results of Spectrographic Analyses.
Zavodskaya Lab., **21**, 1087–9 (1955).
C. A., **50**, 9226i (1956).

Si and Mn in cast iron were detd. spectrographically by means of an arc between 2 electrodes (6.5 mm. in diam.) cast from 2 different samples; 1 electrode was ground to a flat surface and the other to a truncated cone with a surface of 1.5 mm. in diam. The results of 50 detns. gave reproducible av. within 2.5% Si and 3% Mn. The area of the truncated cone of the electrode had no effect on the results; however, when finished to a pointed cone the results deviated ±5–10%.

5228. MALKOVA, O. P. AND RUDNEVSKIĬ, N. K.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Powder Used for Synthetic Corundum for Silicon and Lead.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 224 (1955).
C. A., **50**, 3892a (1956).

5229. MALM, I. L. AND HERBERT, F. J.
A Rapid Method for the Determination of Calcium and Barium in New Lubricating Oils by the Flame Photometer.
Am. Chem. Soc., Div. Petroleum Chem., General Paper, No. **33**, 315–20 (1955).
C. A., **50**, 10385e (1956).

Oil samples are dissolved in pure benzene, and the soln. is directly aspirated into the burner of the Beckman flame photometer. The 617-mμ line is used to det. Ca and the 455-mμ line to det. Ba. The av. of standard deviations is 0.004% for Ca and 0.014% for Ba.

5230. MALMSTADT, H. V. AND SCHOLZ, R. G.
Emission Spectrochemical Analysis of Vanadium and Iron in Titanium Tetrachloride. Spark - in - Spray Excitation Method.
Anal. Chem., **27**, 881–3 (1955).
C. A., **49**, 11493g (1955).

The direct emission spectrochem. detn. of V and Fe in $TiCl_4$ solns. was achieved by spraying the soln. between two horizontal graphite electrodes across which a spark discharge was applied. A Beckman Model 4030 atomizer placed 1.4 cm. below the electrodes sprayed the soln. into a 6.0-mm. electrode gap. Spark excitation obtained from an Applied Research Laboratory Multisource unit with 10-microfarad capacitance, and 2-ohm resistance proved most sensitive for detg. V. The intensity ratios of V 2687.96/Ti 2695.8 and of Fe 2382.04/Ti 2474.19 were used to plot working curves for concn. ranges of 0.003 to 0.2% and of 0.005 to 0.1%, resp.

5231. MAL'TSEV, M. G. AND TAGANOV, K. I.
Transactions of the IXth All Union Conference on Spectroscopy. Spectral Analysis of Metals and Alloys with a Contact Spark Selection of the Sample.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 205–6 (1955).
C. A., **50**, 3891e (1956).

5232. MANDEL'SHTAM, S. L. AND SUKHODREV, N. K.
Transactions of the IXth All-Union Conference on Spectroscopy. Application of the Kirchoff Law to Plasma Radiations in a Gas Discharge.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 11–14 (1955)
C. A., **50**, 3885d (1956).

It is shown theoretically that the absorption: emission ratio of a plasma which is not in thermodynamic equil. is equal to the intensity of radiation of a black body at $T = T_{electrons}$ for a given frequency if (*a*) there is, in case of line spectra, a Boltzmann distribution of atoms in excited levels; (*b*) there is, for continuous spectra, a Maxwellian distribution of electron velocities; (*c*) for a continuous spectrum the Saha formula for $T = T_{electrons}$ is valid. Such conditions are met in arc, spark, and low-pressure discharge spectra.

5233. MANDEL'SHTAM, S. L. AND TINDO, I. P.
Transactions of the IXth All-Union Conference on Spectroscopy. A Photoelectric Investigation of the Spectrum of a Spark Channel.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 60–1 (1955).
C. A., **50**, 3886i (1956).

It is shown on the basis of the change in spectral lines during the spark discharge, that the spark is preceded by a glow discharge. The temp. dependence in the channel greatly depends on the pressure. At atm. pressure it is 40×10^3 °K. for A and 45×10^{3}° K. for H.

5234. MANITIUS, A.
Potassium Content in the Blood Serum in Healthy Man.
Bull. acad. polon. sci., Classe II, **3**, 159–61 (in English) (1955).
C. A., **50**, 5124g (1956).

K concn. of human blood serum was 16.6 ± 1.0 mg. % or 4.25 ± 0.25 meq./l. as detd. with a flame photometer.

5235. MARTI, W.
Measuring the Intensity Trend of the Reference Lines Used in the Analysis of Alloys With Iron, Nickel or Cobalt Base.
Mikrochim. Acta, **1955**, 657–61.
C. A., **49**, 11496i (1955).

Intensity curves were obtained from 2 series of alloys with varying quantities of Fe, Ni, and Co. These curves were used in the quantitative spectral analysis of highly alloyed steels and for Ni and Co alloys in correcting the content found of the base metal.

5236. MARTI, W.
Electronic Regulation of the Charging Potential of Condensers in Spark Generators.
Spectrochim. Acta, **7**, 246–9 (1955).
C. A., **50**, 621g (1956).

In order to improve the accuracy of spectrochem. analysis a circuit for controlling the charging potential of the main condenser of a spark source unit is described, in which the charging is interrupted at the required value by an inertia-free electronic switching device.

5237. MASSIL'ON, T. K.
Transactions of the IXth All-Union Conference on Spectroscopy. Quantitative Spectral Analysis of Cement Raw Materials and Clinkers.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 98–100 (1955).
C. A., **50**, 3888b (1956).

Details of procedure and av. errors are given.

5238. MATHIS, W. T.
The Flame Photometric Determination of Potassium in Plant Tissues.
J. Assoc. Office. Agr. Chemists, **38**, 387–91 (1955).
C. A., **49**, 10446c (1955).

Finely ground plant tissue is extd. with H_2O (LiCl soln. if internal standard method is used) by shaking at intervals for at least 15 min. After filtering through a fast filter paper, K is detd. with the flame photometer. The ratio of sample wt. in g. to vol. extractant in ml. should not exceed 1:500 or slightly incomplete extn. may result. Six collaborators obtained the following av. values for % K, as received basis, by the flame photometer method as compared with the value by a chem. method by one collaborator: corn grain 0.40, 0.40; oat grain 0.38, 0.40; soybean grain 1.63, 1.73; mixed hay 1.46, 1.43; Ladino straw 1.69, 1.62; and soybean plants 0.65, 0.63.

5239. MATSUMOTO, C. AND OTO, Y.
II. Spectrographic Determination of Lead, Iron, Cadmium, and Tin in Zinc Metal.
Repts. Ind. Research Inst., Osaka Pref., **7**, No. 1, 18–21 (1955).
C. A., **49**, 11497c (1955).

An interrupted a.-c. arc source unit ignited by high-frequency spark and quartz spectrograph was used for this study. The elements in the range of 0.1–0.06% were detd. with ±3–15% errors.

5240. MATSUMOTO, C., OTO, Y. AND HAMAGUCHI, T.
Quantitative Emission Spectrum Analysis by Solution Excitation. I. Spectrographic Determination of Sodium in the Silumin Alloys.
Repts. Ind. Research Inst., Osaka Pref., **7**, No. 1, 15–17 (1955).
C. A., **49**, 11497a (1955).

An a.-c. intermittent arc source was ap-

plied so as to secure the steady and reproducible sensitivity; the soln. method was adopted with a porous cup electrode and Cu was selected as an internal standard. A series of standard sample solns. having known contents of Na and Al, and several metal specimens were prepd. with these solns., the spectral lines were photographed on the same plate, and the Na in the standard metal electrode was detd. by the concn. ratio method. The limit of detn. of Na in Al-Si (Na is added for its modification) was 0.005% with ±8.1% error.

5241. MAUVERNAY, R. Y. AND PERIN, G.
Biologic Use of Spectrographic Determination of Mineral Elements; Its Value in Artificial Feeding.
J. méd. Bordeaux, **132**, 413–16 (1955).
C. A., **50**, 2775d (1956).

Human and cow milks contained (av. of 5000 detns.) K 0.041, 0.155, Na 0.011, 0.050, Ca 0.032, 0.118, Mg 0.004, 0.012, Fe 0.0001, 0.00005, Cu 0.00006, 0.00002, Mn 0.0005, 0.0002, and Zn 0.0002, 0.0001 g. %. In cow-milk powders Na and K varied between 0.188–0.60 and 0.78–1.56 mg.%.

5242. MAYER, A. AND PRICE, W. J.
Chemical and Spectrographic Analysis of Magnesium and its Alloys.
Mg Elektron, London (England). (1955).
C. A., **50**, 3162d (1956).

5243. MAYER, F. X.
Fifth International Colloquium for Spectroscopy in Gmunden on August 30 to September 3, 1954 and its Scientific Results.
Mikrochim. Acta, **1955**, 217–25 (1955).
C. A., **49**, 11485e (1955).

5244. MCEVOY, J. E., MILLIKEN, T. H., AND JULIARD, A. L.
Spectrographic Determination of Nickel and Vanadium in Petroleum Products by Catalytic Ashing.
Anal. Chem., **27**, 1869–72 (1955).
C. A., **50**, 9000b (1956).

Ashing can be accelerated by heating the sample with a cracking catalyst of the silica-alumina type which has good adsorptive power for Ni and V. A spectrographic method of analysis is described in which such a catalyst acts as an ash collector and as a spectrographic buffer. The spectrographic detns. are made by mixing the ignited support with a mixt. of Cr_2O_3 and graphite, pelleting the blend, and sparking under controlled conditions. Methods for prepg. standard solns., working curves, and analytical samples, and details of the spectrographic technique, including excitation, exposure, photography, calibration, and densitometry, are described. Two methods are used to mix the sample with the silica-alumina catalyst. Samples with Ni or V content >1 p.p.m. or nonvolatile samples with a metal content <1 p.p.m. are directly mixed with the ground catalyst and a small amt. of concd. HNO_3. Volatile samples with a Ni or V content <1 p.p.m. are added dropwise to the hot catalyst. Data presented in tables show that the 2 procedures give essentially the same results and that good agreement is obtained in a comparison with photometric methods. The repeatability of duplicated results is generally better than ±5%, and the av. deviation between catalytic and photometric results detd. on 8 different kinds of oils is within ±15%. Only 2–5 g. of sample are sufficient for productions contg. about 10 p.p.m. of metals.

5245. MCKENZIE, R. M.
Sampling Variations in the Concentrations of Elements in Soils.
Australian J. Agr. Research, **6**, 699–706 (1955).
C. A., **50**, 2103g (1956).

Cu, Mg, V, Mo, and Mn were detd. spectrographically in 68 samples taken from the surface horizon of an apparently uniform virgin soil, at sites uniformly distributed over an area 8 × 3½ ft. Coeffs. of variation were about 10%, and the highest concn. of each element was about twice the lowest. The concns. of the elements showed a pronounced tendency to rise and fall together. Sampling variations were the source of the greater part of the total error in a detn., except for Mn.

5246. MCKENZIE, R. M. AND PALM, A. W.
Mechanical Calculator for Background Correction in Spectrographic Analysis.
Australian J. Appl. Sci., **6**, 38–40 (1955).
C. A., **49**, 6664i (1955).

The calculator consists of 2 concentric disks with log intensity scales engraved so that the peripheral distances from the zero are proportional to natural nos. By rotating the inner disk until the log intensity of the background on the inner scale coincides with the log intensity of the line plus background on the outer scale, the zero of the inner scale is brought opposite the corrected log line intensity.

5247. MEHTA, S C. AND DAKSHINAMURTI, C.
Spectrographic Analysis of Soils in the Copper Arc.
Current Sci. (India), **24**, 409–10 (1955).
C. A., **50**, 7368f (1956).

B was estd. down to 5 p.p.m., Mn to 30 p.p.m., while Zn could not be estd. below 100 p.p.m. However, detection limits were much lower, namely, 1–2, 20, and 50 p.p.m., resp. Mn content by chem. and spectrographic methods agreed within 10% variation. The Cu arc method in Zn detection compared favorably with the anode excitation method.

5248. MEINE, W.
Flame-Photometric Determination of Tetraethyl Lead in Fuels.

Erdöl u. Kohle, **8**, 711–12 (1955).
C. A., **50**, 8186e (1956).

For detns. the 4060-Å. emission line of Pb is used. A H-O mixt. is used for best results. The method is well suited for rapid detns. with a repeatability of ±0.0005 vol. % $PbEt_4$.

5249. MEINKE, W. W.
Trace Element Sensitivity: Comparison of Activation Analysis with Other Methods.
Science, **121**, 177–84 (1955).
C. A., **49**, 7437i (1955).

Sensitivities of activation analyses with the Oak Ridge nuclear reactors are compared to those obtained with Cu spark and graphite d.-c. arc, flame spectrophotometer, colorimetry, and amperometric titration. Neutron activation analyses are particularly recommended for detg. Eu, Dy, Sm, Ho, Lu. but may be used to advantage for detg. Mn, In, Re, Ir, V, Au, As, and Sb.

5250. MELAMED, S. G.
Spectrographic Analysis of Impurities in Titanium.
Zavodskaya Lab., **21**, 1066–70 (1955).
C. A., **50**, 9221e (1956).

P, Pb, Sb, As, and Bi exhibit selectivity in evapn. in a d.-c. arc (200 v., 6 amp.); the P 2553.28 Å. line stops at the end of 90 sec., whereas those of Ti and Si, appearing simultaneously, continue after 4 min. The analysis was carried out by 2 methods of excitation: TiO_2 contg. small amts. of impurities was analyzed in a d.-c. and arc samples contg. higher proportions of the less volatile elements were analyzed with a spark. In the first method, mix 10 mg. TiO_2 to be analyzed with 10 mg. of a mixt. contg. 5 parts (wt.) of C and 1 part NiO and place in the hollow of a C anode for the detn. of Fe and Al against Ni as an internal standard. Ca, Mg, V, and Ne (?) were detd. by their blackening lines against those of Ti. Ni, Cr, Co, Cu, Zr, Mo, Ta, and Mn were detd. semiquantitatively without an internal standard. In the 2nd method mixts. of 100 mg. TiO_2 and 500 mg. CuO were compressed and sparked against a conical C electrode. For the best sensibility a suitable spark should be found since compressed TiO_2 obtained from Ti metal and from $TiCl_4$ gave different spark spectra. Reproducible results were obtained with a spark of 220 v., 0.8 amp., 0.5 millihenries, and 0.065 millifarads. The relative intensities of the blackening curves of pairs Mg-Ti and Ca-Ti in mixts. contg. 0.1% Ca and 0.1% Mg did not change.

5251. MELAMED, S. G., NOTKINA, M. A., AND SOLODOVNIK, S. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Impurities in Titanium.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 179–80 (1955).
C. A., **50**, 3890f (1956).

Ti is transformed into TiO_2. Analysis is made for P, Si, and Mg with a d.-c. arc discharge and for Si, Mg, and Ca with a spark generator.

5252. MEL'CHENKO, V. S.
Determination of Absolute Concentration of Atoms in a Multicomponent Arc Discharge in Gas.
Zhur. Eksptl. i Teoret. Fiz., **28**, 628–9 (1955).
C. A., **49**, 15449i (1955).

It is shown theoretically that the concns. can be obtained by means of Saha's equation from relative spectroscopic intensity measurements of line pairs. Measurements were made on a 3-component arc, contg. Mg and Zn in air. The temp. of the arc was detd. as 6300°K. from the relative intensity of Zn lines 3072 and 3076 Å. The degree of ionization was 0.43 by comparing lines Mg I (λ = 2779 Å.) and Mg II (λ = 2795 Å.). The corresponding calcd. ionization of Zn is 3.6×10^{-2} and the calcd. concns. are $N_{Mg} = 7.2 \times 10^{-5}$ cm.$^{-3}$ and $N_{Zn} = 4.3 \times 10^{-16}$ cm.$^{-3}$

5253. MEL'CHENKO, V. S.
Transactions of the IXth All-Union Conference on Spectroscopy. Influence of Self-Absorption on the Intensity of Spectral Lines in a Direct-Current Arc.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 30–1 (1955).
C. A., **50**, 3886c (1956).

The dependence of the intensity of Na lines on the concn. of radiating particles was measured. It is shown that the dependence of intensity on concn. ceases to be linear at a value $\log (Nfl\ \pi\ \Delta\nu_D)\sqrt{\log 2} = 1.2$, where N is the concn. of atoms at the lower level for the line, f the oscillator strength, $\Delta\nu D$ the Doppler width of the line, and l the diam. of the arc column.

5254. MENZIES, A. C. AND SKINNER, J.
Recent Advances in Direct Reading Spectroscopic Analysis.
Mikrochim. Acta, **1955**, 614–29.
C. A., **49**, 11329h (1955).

Two instruments are described. One is a 3-m. grating instrument with electronics suitable for use with 30 photomultiplier tubes of the E.M.I. type. Spectral lines down to 1940 Å. in wavelength can be used. Automatic temp. compensation is provided. The charges are integrated on condensers and a counting technique is used to measure the potentials acquired. The nos. are shown on a 4-stage dekatron counter and they are at the same time printed on a paper strip. The second instrument is an attachment for a medium quartz spectrograph and carries 11 photomultiplier tubes. The currents from these charge condensers, and the potentials are measured with a balanced valve voltmeter.

Display is made on a microammeter and a pen recorder can be used in parallel if desired. An indication of performance is given for each instrument.

5255. MEW, W. E., SMITH, F. H., AND WOOD, J.
Segregation in Cast Aluminum Alloy Spectrographic Electrodes.
Metallurgia, **51**, 45–51 (1955).
C. A., **49**, 4343i (1955).

Marked segregation may occur in Al alloys when cast in the plate-type electrodes, the greatest variation in compn. being found through the thickness of the casting. This is not reduced by decreasing the thickness of the casting within the limits of practical castability. In spite of this, the flat type of electrode is satisfactory for practical purposes, provided it is machined and sparked at a definite depth below the cast surface, and that it is sparked in areas at fixed distances from the outer edge of the sample. Segregation also exists across the section of chill-cast pencils, and as in the plate casting, cannot be prevented by a reduction in the thickness of the casting. The pencil electrode is satisfactory for normal routine analysis when sparked at a fixed distance from the end joining the feeder. Comparison with wrought electrodes shows that the reproducibility of analytical results under routine conditions is slightly better with wrought electrodes than with cast. The difference is thought to indicate that segregation is not the most important contributory factor in the error or routine spectrographic analysis when the above precautions are taken. The investigators have measured, by means of composite electrodes, the area covered by the spark in point-to-plane and pencil electrodes, and have demonstrated that contribution is not uniform. In point-to-plane electrodes, the center of the sparked area contributes more than the periphery. In flat-tipped pencil electrodes, the center again predominates, but there is also an abnormally high contribution from the edge of the electrode tip.

5256. MILLS, E. C. AND HERMON, S. E.
Effect of Some Sample Forms on the Reproducibility of Spectrographic Analysis of Certain Mg Alloys with Pin Electrodes and a Simple Source Unit.
Metallurgia, **52**, 210–12 (1955).
C. A., **50**, 1377h (1956).

It is concluded that the use of cast pencils for accurate control spectrographic analysis of Al in Mg alloys is impractical. Reasonable results for Zn and other elements can be obtained. Small diam. extruded rod does not appear to be a suitable alternative to cast pencils. With cast disks, particularly the horizontally cast type, variation through the thickness is less pronounced than along the length of a pencil and machining is much simpler. The horizontally cast disk probably offers the simplest alternative sample form to the cast pencil.

5257. MITCHELL, R. L.
Trace Elements.
Chemistry of the Soil.
Reinhold Publishing Corp., New York, N. Y. pp. 253–85.
C. A., **49**, 7163d (1955).

5258. MÖHL, K., SCHAEL, E., AND BRUCH, J.
Installation with Controlling Mechanism for the Production of Electric Potential for Spectroanalysis.
Arch. Eisenhüttenw., **26**, 669–73 (1955).
C. A., **50**, 4561e (1956).

Const. potential is maintained by means of a motor-generator set synchronous with the elec. main, and two switches that control the exciting current through the electrodes.

5259. MONNOT, G. A.
Spectral Analysis of Nonconducting Powders.
Mikrochim. Acta, **1955**, 446–66 (1955).
C. A, **49**, 11487c (1955)

The work of the lab. at Verneuil is reviewed. Some ultraviolet emission analyses permit the control of the purity of powders used in animal tests, the compn. of coal ashes, schists, etc. The systematic tableting of fine powders with KBr is useful for studies in the infrared from 2 to 15 μ, and in the examm. of quartz, calcite, etc. 38 references.

5260. MORÁVEK, P.
The Occurrence of Native Bismuth in Veins Near Jilové.
Věstník Ústřed. Ústavu Geol., **30**, 42–4 (English summary) (1955).
C. A., **50**, 3957i (1956).

Bi was found in Au-bearing quartz veins. X-ray powder data and a spectrographic analysis are given.

5261. MORELLO, B.
Possibility of Orienting the Blackening Curve.
Mikrochim. Acta, **1955**, 390–409 (1955).
C. A., **49**, 11486i (1955).

Complete knowledge of the plate diagram describing the relation $D = f(\log I)$ is a preliminary requisite in any precise spectrographic method and can be obtained by many systems among which are the FeII homogeneous lines. Below the threshold point D_f of the diagram, there is difficulty both in the drawing and in the use of the curved portion of the plot. A transformed d. scale is proposed, which is based on the math. equation of the curve. The method is applied to the detn. of B in steel and in Cu.

5262. MORITZ, H.
Present Status of Development in the Field of Spectrochemistry, in Particular

for the Nondestructive Testing of Materials.
Die Technik, **10**, 547–52 (1955).
C. A., **50**, 6245e (1956).

The various methods of applying spectrum analysis for detg. chem. compn. without destroying or breaking up the materials to be analyzed and equipment used are described.

5263. MORRIS, D. F. C. AND BREWER, F. M.
The Spectrochemical Determination of Gallium in Blends.
Spectrochim. Acta, **7**, 88–90 (1955).
C. A., **49**, 10795d (1955).

To help confirm the reliability of the detn. of Ga in blend by radioactivation analysis, a spectrochemical method was employed, in which zinc as internal standard and the cathode-layer carbon arc was used. The precision of the spectrochemical procedure is such that over a range of 0.005–0.02% Ga, the standard deviation is approx. 5%.

5264. MUELLER, R. T.
Modified Beckman-Type Atomizer in the Perkin-Elmer Flame Photometer.
Anal. Chem., **27**, 1848 (1955).
C. A., **50**, 1378i (1956)

A Beckman-type glass atomizer is adapted for use in the Perkin-Elmer flame photometer. The modified atomizer permits the use of small samples (5 ml. or less) and minimizes clogging of the orifice. Samples can be changed immediately after a reading is made.

5265. MUNTZ, J. H. AND MELSTED, S. W.
Spectrographic Analysis of Briquetted Unashed Plant Material.
Anal. Chem., **27**, 751–3 (1955).
C. A., **49**, 11484g (1955).

To eliminate the time required for preliminary ashing of plant samples prior to routine spectrographic assays, a method of briquetting the samples is proposed. Finely ground-plant sample (150 mg.) and 75 mg. Li_2CO_3 are ground in an agate mortar; 450 mg. of SP-1 graphite (National Carbon Co.) is added and mixed. The resulting mixt. is briquetted in a 0.5-in. briquetting press at a pressure of 100,000 lb./sq. in. The Li_2CO_3 serves as a buffer and as an internal standard; the graphite is employed to render the briquet electrically conductive. The high pressure is necessary because of the variation in compressibility of the samples and unless it is used, the briquets will not have uniform sparking surfaces. A high-voltage spark was the source of excitation. Pb, Mg, Ca, K, B, Mn, Cu, and Zn were detd. An over-all accuracy of ±20% is claimed for all elements except Zn.

5266. MATAGUCHI, M.
Flame Spectrophotometry with Town Gas.
Japan Analyst, **4**, 445–7 (1955).
C. A., **50**, 16196c (1956).

A burner was devised which could use town gas. The detn. was carried out by using a Beckman DU model with flame attachment, and the same result was obtained as in the C_2-H_2 flame method in Ca detn.

5267. MUTH, H. W.
Flame-Photometric Determination of Magnesium in Serum.
Deut. Med. J. (Berlin), **6**, 599–600 (1955).
Excerpta Med., Sect. II, **9**, 601–2 (1956).
C. A., **51**, 8857d (1957).

The flame-photometric detn. of Mg in serum involves many difficulties, as almost all other ions present interfere, e.g. K, Na, Ca, Cl, sulfate, and phosphates. Mg is pptd. as $Mg(NH_4)PO_4$ after removal of Ca oxalate. The $Mg(NH_4)PO_4$ is dissolved in 2.5*N* HCl plus 2-propanol, after which the flame-photometric detn. is performed.

5268. MUTO, S.
Contents of Inorganic Elements in Different Parts of Bamboo Shoot.
Nippon Kagaku Zasshi, **76**, 984–6 (1955).
C. A., **51**, 11499h (1957).

An analysis was made of the ash of the bamboo shoot for inorg. constituents by chem. and spectrographic methods. B is concd. in the internal lowest part of the shoot.

5269. NAGIBINA, I. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Graduation Graphs and the Width of Spectral Lines in an Alternating-Current Arc Discharge.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 25–7 (1955).
C. A., **50**, 3886b (1956).

If salts of the elements dissolved in H_2O are evapd. from the C electrodes there is at small concns. a linear dependence between the log of relative intensity and the log of concn. In the linear region the width of the line does not change and it is not influenced by the addn. of foreign atoms.

5270. NAGY, Z.
(Spectrographic) Determination of Boron Traces in Carbon Black by the Successive Addition Method.
Magyar Kém. Folyóirat, **61**, 351–3 (1955).
C. A., **52**, 11649h (1958).

Electrolytic Cu electrodes were drilled to provide holes capable of holding 8–10 mg. C-black ash each. To the electrodes so prepd., solns. contg. 1, 2, 4, and 9 γ B were added and measured on a Zeiss Q-24 Spectrograph by using "Agfaspektral blau extrahart" plates and a 15–20 μ aperture. To produce the arc 110 v. and 5 amp. a.-c. current were used. The B line 2496.8 Å. and the Cu line 2492.12 Å. were used to evaluate the results. The concn. of B was detd. from the increasing intensity of the B line as affected by the varying quantities of B, by extrapolation (Cf.

Addink, *C. A.*, **45**, 5217c), or by the approximation method (Cf. Gazzi, *Angew. Chemie*, **66**, 205 (1954).

5271. NAGY, Z.
Procedures of Evaluation for the Successive Addition Method of Spectrographic Analysis.
Magyar Kém. Folyóirat., **61**, 400–3 (1955).
Hung. Tech. Abstr., **8**, No. 3, Abstr. No. 38 (1956)
C. A., **52**, 7928d (1958).

Extrapolation or graphical approximation was used to est. the initial concns. in the procedure of successive addn. Based on these methods a new procedure of evaluation was developed and an equation is presented for the estn. of the initial concns., $1 + \alpha_2 x = (1 + \alpha_1 x)\beta$, where α_1 and α_2 are the added quantities and x is the reciprocal value of the concn. to be detd. The power β was calcd. from the line intensity data and the concns. as detd. finally by means of graphical methods or from nomographs.

5272. NEDLER, V. V.
Transactions of the IXth All-Union Conference on Spectroscopy. The Influence of Sample Composition on the Reliability of the Spectral Analysis of Ores.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 113–14 (1955).
C. A., **50**, 3888d (1956).

The change of intensity of Pb, W, Cu, Sn, and Bi lines upon addn. of NaCl to the sample is tabulated; it is shown that errors can be introduced which are due to variations in the evapn. of different components.

5273. NEDLER, V. V.
Sources of Error in the Spectral Analysis of Ores.
Zavodskaya Lab., **21**, 307–10 (1955).
C. A., **50**, 16538h (1956).

If an ore sample is ground to a grain size <0.01 mm., heterogeneity will not cause significant errors in the detn. of any component present in amts. >0.1%. Quartz samples contg. 0.1% Bi_2O_3 (added as standard) and varying amts. of Pb were placed in an a.-c. C arc and log I_{Pb} (2833 Å.)/I_{Bi} (2898 Å.) was detd. as a function of Pb concn. Addn. of 10% Fe_2O_3 or 10% Na_2CO_3 to the sample increased log I_{Pb}/I_{Bi} by 0.1 or 0.4 unit, resp. The temp. of the arc was detd. from the intensity ratio of the lines Bi 3068 and Bi 2898, or of Cd 3404 and Cd 3261; the effect of the admixtures is partly but not entirely accounted for by a lowering of the arc temp. Differences in degree of ionization cannot be significant, and the remainder of the effect is apparently the result of changes in evapn. rate of the components of the melt.

5274. NEDLER, V. V.
Spectrographic Analysis of Mine and Metallometric Samples by the Method of Pouring.
Zavodskaya Lab., **21**, 1056–9 (1955).
C. A., **50**, 9206b (1956).
Cf. *C. A.*, **31**, 335[5].

Powd. granite, limestone, and pyrite mixed with quartz (1:1) were poured into the gap of an interrupted spark (16–18 amp., exposure 25 sec.) between horizontal C electrodes. An aspirator below the gap prevented the vapors from burning during the interval of sparking. The vibrator affecting the pouring and the spark was triggered by a timing switch. The values of W, Mo, Pb, and Cu (2896, 3170, 2833, and 2825 Å., resp.) were not affected by the compn. of the minerals and in some cases the abs. sensitivity was higher than with the method of complete evapn. in an a.-c. arc of 14–16 amp. and the deviations from the values obtained by the wet chem. analysis lower.

5275. NEWFIELD, O. E. AND TILSON, F. A.
Determination of Sodium and Potassium in the Beckman Model DU Flame Spectrophotometer.
Med. J. Australia, **1955**, 1, 751–2 (1955).
C. A., **49**, 16028d (1955).

Dil. 0.2 ml. of blood serum with Li soln. (26.617 mg. Li_2CO_3 dissolved in water with the aid of HCl and made to 250 ml.) to a vol. of 10 ml. and compare with standard K solns. dild. with the same Li soln. at 767 mμ and a slit width of 0.2 mm. in the Beckman DU flame spectrophotometer. A H-O burner is used. Na can be detd. on the same serum solns.

5276. NIAUSSAT-ANSAULT, R.
Direct Determination of Serum Calcium by Flame Photometry.
Ann. biol. clin. (Paris), **13**, 129–35 (1955).
C. A., **49**, 11056g (1955).

A method is described for detn. of serum Ca with a French photometer. The chief features include preheating of the aerosol, a combination of filters to isolate the 616–624 mμ band, and inclusion of Na and K in unknowns and standards. Acidification of the sample to pH 5.8–6.4, by buffers increases accuracy by eliminating CO_2. The serums are dild. to contain about 0.5% protein.

5277. NIELSEN, S. O.
Simple Recording Attachment for a Beckman DU Spectrophotometer.
Rev. Sci. Instr., **26**, 516–17 (1955).
C. A., **49**, 12133f (1955).

A simple resistor circuit makes it possible to record the output of the Beckman instrument on a Brown recorder.

5278. NIKITINA, O. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectrochem-

ical Methods of Slag Analysis for All Basic Components.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 94–6 (1955).
C. A., **50**, 3888a (1956).

Methods to make the analysis independent of 3rd elements and of mineralogical compn. are discussed, especially the analysis of compressed powder samples and of samples dissolved in HCl.

5279. NIKITINA, O. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Application of the Spectral Method to Determine the Character of Distribution of Arsenic in Steel.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 188–90 (1955).
C. A., **50**, 3890h (1956).

5280. NIKITINA, O. N.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Several Materials with High-Silicate Content.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 199–200 (1955).
C. A., **50**, 3891c (1956).

Methods of analysis of Fe, Co, Mn, V, Ti and Cr in sand, quartz, etc., are described.

5281. NIKIFOROVA, E. F.
Transactions of the IXth All-Union Conference on Spectroscopy. A Method of Spectrographic Determination of Arsenic in Steel and Its Application.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 190–1 (1955).
C. A., **50**, 3890i (1956).

A relation between the distribution of As and of S has been observed.

5282. NIZHIN, A. M. AND PEDOS, F. Z.
Transactions of the IXth All-Union Conference on Spectroscopy. Copies (replicas) of Diffraction Gratings.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 35–6 (1955).
C. A., **50**, 3886e (1956).

5283. NOAR, J.
Some Notes on the Uses of Emission Spectrography in the Petroleum Industry. I. The Emission Spectrographic Method.
Inst. Petroleum Rev., **9**, 187–91 (1955).
C. A., **49**, 13629e (1955).

An evaluation is given of emission spectrography as a quant. analytical method. 48 references.

5284. NOAR, J.
Some Notes on the Uses of Emission Spectrography in the Petroleum Industry. II. Applications to Petroleum Analyses.
Inst. Petroleum Rev., **9**, 209–12 (1955).
C. A., **49**, 15216f (1955).
Cf. *C. A.*, **49**, 13629e.

A review with 49 references.

5285. NOAR, J. AND TOFT, R. W.
Quantitative Spectrographic Analysis of Powdered Substances with the Continuous Current Direct-Current Arc.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 97–101 (1955).
C. A., **52**, 2641e (1958).

An excitation source with a constant feed of a compressed sample prepn. gives high reproducibility and linear proportionality of intensity with concn. with less than a mg. sample. The powd. sample is mixed with Li_2CO_3 and cellulose in the proportions 1:3:16, resp. Errors in V detn. by this technique require modification of the sample matrix.

5286. NOBBS, J. MCK. AND BEALE, P. T.
The Use of Intensity Scales in the Microphotometry of Spectra.
Spectrochim. Acta, **7**, 165–74 (1955).
C. A., **49**, 15491b (1955).

Investigations have been undertaken into the use of intensity scales for microphotometry, whereby relative intensities are very simply recorded on the microphotometer scale, without continuous reference to a calibration curve, resulting in an appreciable saving of time. Intensity scales are drawn empirically from plate calibration curves of relative intensity *vs.* linear galvanometer deflection, and subsequent use of a particular intensity scale is restricted to plates having the same calibration curves. Therefore a no. of scales are required when plates of varying contrast factors are used, and a family of intensity scales has been constructed to cover the range of contrast expected from the type of plates and developing conditions employed. The construction of the scales involved photographic reduction of the original drawing and slight modification of the Hilger valvoscale projector in which they are inserted. A graph-paper incorporating a modified logarithmic scale (partial Seidel transformation) was developed to facilitate the drawing of plate calibration curves, and the family of intensity scales was derived directly from it. This graph paper extends the d. range that can be covered by a straight-line calibration curve and greatly assists in the detn. of the correct curve and hence the intensity scale to be used for a particular plate. The appropriate scale can be selected directly from linear microphotometer readings by means of a slide-rule calculator constructed for the purpose. Several tests on the accuracy of the scales have been conducted, and no difference has been found between the results obtained with intensity scales and those from the usual methods of plate evaluation. It has been concluded, therefore, that, provided a sufficient no. is available, the use of intensity

scales introduces no further photometric error and that a simple method has been found for the more rapid microphotometry of plates without loss of accuracy, the method being particularly useful when background corrections are required.

5287. NORDMEYER, M.
Concerning the Illumination of Spectrographs.
Spectrochimica Acta, Vol. **7**, 128 (1955).

In order to match the optical efficiency of a spectrograph the external light-collecting system should have a light-gathering power not less than that of the spectrograph itself. The geometrical conditions for this are fulfilled by the arrangement of lenses recommended by Zeiss. Improvements are possible by reducing the light-losses in the external system through reflections and through chromatic aberration by substituting a two-mirror system or even a single-mirror system for the lenses. In either case another concave mirror behind the source has advantages for quantitative spectral analysis. Finally the proposal of E. Preuss to use an array of lenses to eliminate the effect of the movements of the light-source on the illumination of the spectrograph is described.

5288. NOSHCHENKO, A. E.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Magnesite in Basic Martensite Ovens.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 104–6 (1955).
C. A., **50**, 3888c (1956).

5289. NUNES DE OLIVEIRA, J.
Trace Elements in Corn and Fish Meal.
Anais fac. farm. Porto, **15**, 5–31 (1955).
Biol. Abstr., **30**, Abstr. No. 33910 (1956).
C. A., **52**, 11309i (1958).

Trace elements in Portuguese cornmeal and sardine meal were identified spectrographically, with F being detd. chemically in the amt. of 7–9 mg.%. The presence of B and Co was not detd. The elements identified in the 2 meals were Al, Ca, Cu, Fe, K, Mg, Mn. Mo, Na, Ni, Pb, Si, and Ti, with Sr in the cornmeal and V in the fishmeal.

5290. OBOLENSKAYA, L. I.
Spectrographic Method for Boron Determination in Plant Ash.
Issledovaniya Priklad. Khim., Akad. Nauk S.S.S.R., Otdel, Khim. Nauk, Sbornik Rabot, **1955**, 337–40.
C. A., **50**, 8376h (1956).

A quartz spectrograph was used with Cu electrodes which were B-free and conical with a diam. of 8 mm. The spectrograph was set up to operate at 7–8 amp., 130 v., a spark gap of 3–4 mm., a slit width of 0.02 mm., and an exposure time of 3 min. on a photographic plate of sensitivity 3 (H.&D.). The temp. of the photographic developer was 17–18° and the developing time was 3 min. The height of the slit was kept at 1 mm. so that as many as 60 spectra could be taken on one plate. The B line at 2497.7 Å. was compared to that of Sn at 2495.7 Å. which was used as the internal standard. Both the standard and the unknown were analyzed as powders. The standards were prepd. by mixing chemically pure salts of Na, Ca, K, P, Mg, Si, Fe, and Al in amts. approximating those found in plant ash. The resultant mixt. was ground carefully in an agate mortar for 30 min. To 5 g. of this material 1 ml. of a 0.5% $Na_2B_4O_7$ soln. was added and the resultant powder contained 0.1% B. By further diln. with the above standard salt mixture, mixts. were obtained contg. 0.1–0.002% B. A 4% standard tin mixt. was made from SnO_2 and the mixt. of salts found in plant ash. For every 1 g. of standard salt mixt. 0.25 g. of the 4% Sn mixt. was ground in an agate mortar for 10–15 min. Three 40-mg. samples of each of the two standards were placed uinformly on strips of filter paper 1 × 20 cm. which were treated with a satd. $(NH_4)_2SO_4$ soln. A filter strip was folded carefully and the end turned up. The strip with the sample was placed inside. Two g. of the powd., dry plant material was ashed in a Pt (or porcelain) crucible at 500–600°. One hundred mg. was weighed out and mixed with 25 mg. of the 4% Sn mixt. in an agate mortar for 10 min. From this mixt. 3 samples of 40 mg. were taken and prepd. for analysis in the same manner as above. The papers trips were placed in the flame by hand. The standard and the unknown were photographed on the same plate. A photometer detd. the difference in darkness of the B and Sn lines. Statistical treatment of the results showed the probable error to be ±5.8%. This method was applicable to soils as well as to plant ash.

5291. OCKERSE, T. AND WASSERSTEIN, B.
Stain in Mottled Enamel.
J. Am. Dental Assoc., **50**, 536–8 (1955).
C. A., **49**, 9793b (1955).

Spectrographic examn. revealed the presence of Mn in mottled enamel, to a greater extent in the severely mottled than in the moderately mottled. The Fe content was practically the same in normal enamel and in both types of mottled enamel; hence Fe compds. do not produce mottling.

5292. OERTEL, A. C.
Internal Standards in Arc Excitation of Soil and Plant Ash.
Australian J. Appl. Sci., **6**, 467–75 (1955).
C. A., **50**, 3957g (1956).

The use of an internal standard in the spectrochem. analysis of soil and plant ash, with an excitation, does not necessarily lead to an increased precision. The goodness of a line

pair depends mainly on the similarity of the volatilization curves of the 2 elements.

5293. OERTEL, A. C. AND MCKENZIE, R. M.
Relationship of Intensity with Concentration and Current for Manganese in Anode Excitation of Mineral Powders.
Australian J. Appl. Sci., **6**, 458–66 (1955).
C. A., **50**, 4707a (1956).

The intensity of a Mn arc line, corrected for self-absorption, varies approx. as the 0.4 power of the concn. of Mn in plant ash; that of a spark varies as the 0.8 power. K increases the intensity of a Mn spark line but has a negligible effect on the intensity of a Mn arc line.

5294. OGAWA, S.
Food Analysis in Relation to the Study of Electrolyte Balance in the Body.
Igaku to Seibutsugaku, **36**, 5–9 (1955)
C. A., **52**, 2289i (1958).

A weighed sample was dried in a desiccator and digested by heating in a crucible on a sand bath with dropwise addns. of 5–10 ml., resp., of fuming HNO_3 and concd. HCl, followed by heating below 650°. The ash thus obtained was dissolved in H_2O, and Na and K were detd. with the flame photometer. The results from 31 foods showed lower Na and K contents as compared with those given in existing tables of food analysis. Some examples were given of the leakage of these cations from the samples during the course of boiling in water. In some cases it was as high as 80%. The balance studies of these electrolytes in normal human beings indicated losses of 27 meq. of Na (13.5% of ingested amt.) and 25 meq. of K (48.3%) per day during cooking and (or) by way of some routes other than the kidney.

5295. OHASHI, K., YASUI, E., AND SUZUKI, H.
Spectrochemical Determination of Copper in Fused Iron Catalysts for Ammonia Synthesis.
J. Chem. Soc. Japan, Ind. Chem. Sect., **58**, 168–70 (1955).
C. A., **49**, 13822h (1955).

Gillis - Eeckhout's extrapolation method (Cf. *C. A.*, **47**, 12100c), for detg. the amt. of an element by measuring the spectroscopic intensity of samples, to which 2 different amts. of the same element had been added, was applied to det. Cu of $1 \times 10^{-2} - 5 \times 10^{-5}$% contained in Fe catalysts. Alc. soln. of $Cu(NO_3)_2$ (approx. 0.45–14.56 mg. Cu/100 cc.) and the spectroscopic line at Cu 3273.96/Fe 3280.26 Å., the accuracy of ±10% at the concn. range 10^{-2}–10^{-3}% Cu, ±20% at 10^{-4}%, and ±40% at 10^{-5}% has been claimed.

5296. OHTA, N.
Sodium and Potassium Contents of Human Stones.
Nippon Kagaku Zasshi, **76**, 1235–7 (1955).
C. A., **51**, 13185h (1957).

Na and K contents of 22 gallstones, 14 urinary stones, bile, and urine were detd. by flame photometry. Mean values obtained were, resp., Na 0.78, K 0.17 mg./g.; Na 4.32, K 2.03 mg./g.; Na 4.4, K 1.6 mg./ml. (normal bile); and Na 3.78, K 0.91 mg./ml. (normal urine). No enrichment of Na and K in stones was found.

5297. OHTA, N. AND UENO, T.
Contents of Sodium and Potassium in Human Organs.
Nippon Kagaku Zasshi, **76**, 1237–41 (1955).
C. A., **51**, 13150g (1957).

Na and K contents of 302 samples of human organs were detd. by flame photometry. Na/K values are 2.73 for bone, 1.56 for blood, 1.48 for fat. Among other organs kidney has Na/K value 0.56 and thyroid gland 0.75. All other organs show approx. 0.4.

5298. OHYAGI, Y.
Present Aspect of Flame Spectrochemical Analysis
Japan Analyst, **4**, 179–87 (1955).
C. A., **50**, 10594f (1956).

A review with 112 references.

5299. OKADA, S.
Chemical Composition of Japanese Granitic Rocks in Regard to Petrographic Provinces. III. Trace Elements.
Sci. Repts. Tokyo Kyoiku Daigaku, Sec. C, **4**, 163–84 (in English) (1955).
C. A., **49**, 15671c (1955).
Cf. *C. A.*, **49**, 8755d.

Spectrographic analyses of 86 rocks were made for Ba, Sr, B, Ga, V, Pb, Sn, Cr, Ni, and Co. The av. content of B was 6–8 p.p.m., except for the Kitakami region, in which the av. B content was 34 p.p.m. No correlation of B content with age of the granites was noted. The av. regional content of V ranged from 43 to 173 p.p.m. and of Cr from 11 to 85 p.p.m.; both varied inversely with the content of Si. The Sr content ranged from 0 to 2700, that of Ba from 0 to 4200 p.p.m., and granites from the same region showed great variability. The Ga content ranged from 20 to 210 p.p.m.; the Pb content was 12–18 p.p.m.

5300. OKADA, T., NAKAI, S., AND KOHZUMA, T.
Spectrographic Determination of Trace Elements in Lubricating Oils by the "Tangential Method."
J. Chem. Soc. Japan, Ind. Chem. Sect., **58**, 661–4 (1955).
C. A., **50**, 8189h (1956).

The procedure for detg. Ba or P in concns. of 0.02–0.10% in lubricating oil is based on the use of the tangent of the curve obtained on plotting the spectrum intensity against the

log of exposure time. Various examples are given. The method can be used for routine work.

5301. ORSAG, J.
Spectrographic Analysis in the Aluminum Industry of France.
Congr. groupement avancement méthodes anal. spectrog. prod.mét., **18**, 271–82 (1955).
C. A., **52**, 2643c (1958).

Direct-reading spectrographs offer great advantages of time and accuracy for Fe, Si, Mg, Mn, Ti, Cu, Ni, and Zn detns. in Al alloys. Locations and statistics of such installations in France are given.

5302. OSBORN, K. R. AND GUNNING, H. E.
Determination of Mercury-202 and Other Mercury Isotopes in Samples of Mercury Vapor by Mercury Resonance Radiation Absorptiometry.
J. Opt. Soc. Amer., **45**, 552–5 (1955).
C. A., **49**, 10796a (1955).

A method is described for detg. the percentage of Hg^{202} present in small samples of Hg. An electrodeless discharge tube contg. Hg^{202} is used as a source of the Hg^{202} hyperfine component of the 2537-A. resonance line of Hg. By detg. the absorbance of this component by Hg vapor, the quantity of the isotope present in the vapor can be estd. The analyses of samples of Hg contg. various quantities of Hg^{202} agree with values obtained by mass spectrometric methods to within 2%. The method has the advantage over the mass spectrometer of requiring very much smaller samples. Furthermore, contamination from "hangup" of previous samples is avoided. Through the use of isotopic sources it is shown that the method could be extended to the analysis of other isotopes of Hg.

5303. OTO, Y., HAMAGUCHI, T., MATSUMOTO, C., YOSHINAKA, T., AND NAKAO, N.
Quantometer Analysis. I. Apparatus. Low-Alloy Steels.
Nippon Kinzoku Gakkaishi, **19**, 696–700 (1955).
C. A., **51**, 14482h (1957).

The industrial research quantometer was applied to the analysis of Fe and steel. In quant. analysis of Cu, Si, Mn, Cr, Ni, Mo, and V in low-alloy steels, its accuracy and reproducibility were studied from various aspects and found to be satisfactory. The fully standardized app. showed a deviation of 1–3% in analyzing various elements in Fe and steel simultaneously.

5304. OTO, Y., HAMAGUCHI, T., MATSUMOTO, C., YOSHINAKA, T., AND NAKAO, N.
Quantometer Analysis. II. Pig Irons and High-Alloy Steels.
Nippon Kinzoku Gakkaishi, **19**, 700–3 (1955).
C. A., **51**, 14482 i(1957).

In the quant. analysis of Cu, Si, Mn, Cr, and Ni in cast iron, of Cu, Si, Mn, Cr, Ni, and Mo in stainless steel, and of Cu, Si, Mn, Cr, Ni, Mo, W, V, and Co in high-speed steel, quantometer analysis is satisfactory from various points of view. By the conventional spectrographic method, it is difficult to accurately det. Cr, Ni, W, Co, etc., but with the photoelec. photometry system of the quantometer these can be analyzed with comparatively high accuracy. The samples are standardized cast iron and unstandardized high-alloy steels. The conditions of analysis such as spark, are almost the same as in the case of low-alloy steels. It is ncessary and easy to calibrate the readings in high-alloy steel owing to different contents of Fe in the internal standard line. In the case of cast iron and stainless steel, the analysis was achieved within a deviation of 1–3%. Unfavorable results were found in high-speed steel. Through *Japan Sci. Rev. Mining Met.*, 1, 66–7 (1957).

5305. OTOZAI, K. AND FUKUSHIMA, S.
Errors in Quantitative Flame Photometry.
Japan Analyst, **4**, 188–93 (1955).
C. A., **50**, 10594g (1956).

A review and discussion with 16 references.

5306. PAGLIASSOTTI, J. P.
Spectrochemical Analysis with the Rotating Electrode.
Appl. Spectroscopy, **9**, No. 4, 153–8 (1955).
C. A., **50**, 2214a (1956).

Spectrochem. analysis of solns. has conventionally required drying or ashing the sample to convert them to a solid form. New procedures that continuously feed fresh soln. directly into the excitation zone are free of many variables assocd. with the analysis of dried salts and ashes. Solid materials can usually be put into soln. and analyzed with comparative ease. The often difficult problem of prepn. and verifying standards is particularly simplified. Most convenient of these procedures is the use of the rotating electrode. Sensitivity and precision with the rotating electrode are usually excellent. In oil soln. 2 p.p.m. of P, 0.2 p.p.m. of V, and 0.05 p.p.m. of Ag can be detected. In routine analysis of additives in lubricating oils, precision is 2 to 3% of the amt. present of each element being detd. Comparable precision applies to the analysis of catalysts, steels, and other solids in soln.

5307. PAGLIASSOTTI, J. P.
Emission Spectroscopy in the Petroleum Industry.
Am. Chem. Soc., Div. Petroleum Chem., Symposium No. **32**, 55–60 (1955).

C. A., **50**, 8999h (1956).
47 references.

5308. PALATNIK, L. S., LYUBARSKIĬ, I. M., LYUBCHENKO, A. P., AND TANANKO, I. A.
Phase Composition of Carburized Layers of Steel.
Fiz. Metal. i Metalloved., Akad. Nauk S.S.S.R., Ural. Filial, **1**, 500–5 (1955).
C. A., **51**, 1800b (1957).

Specimens of steel contg. C 0.18, Cr 1.5, Ni 4.45, and W 1.02% were carburized at 910° for 15–17 hr. producing a carburized zone 1.8 mm. thick. Carbides were removed from the carburized zone by electrolysis in 20% HCl soln. X-ray examn. of the carburized layer and chem. and spectrographic analysis of the carbides indicated the formation of carbides of the Fe_3C and $(Fe, Cr, W)_{23}C_6$ types. The latter contained Fe 50–70, Cr 7–10%, and W and C balance. No $(Fe, Cr, W)_{23}C_6$ was formed on the surface; at a depth of 0.2–0.3 mm. it reached a max. of 4–5% and then decreased at 2–3% at increased depth. Residual austenite reached a max. of 80% at a depth of 0.3–0.5 mm. The formation of max. amts. of residual austenite and $(Fe, Cr, W)_{23}C_6$ was due to intermediate transformations in the metastable system.

5309. PASHEVKIN, B. P.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Determination of Cadmium, Lead, Copper, and Iron in Zincs (Z-V, Z-0, and Z-1) by the Method of Photometric Interpolation with Displaced Spectra.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 185–6 (1955).
C. A., **50**, 3890g (1956).

5310. PATTERSON, E. M., MITCHELL, W. A., AND SWAINE, D. J.
Tertiary Volcanic Succession in the Western Part of the Antrim Plateau.
Proc. Roy. Irish Acad., **57B**, 155–78 (1955).
C. A., **50**, 8408h (1956).

Minor picrite-basalts in 2 bore-holes are compared as to Ga, Ba, Li, and Cr content. X-ray diffraction and spectrographic analyses for Ni, Co, Cu, Sc, Zn, Y, and Sr are given for many of the basalts (some of which are actually dolerites). (*See C. A.* for complete abstract.)

5311. PATTERSON, G. D., JR.
Automatic Operations in Analytical Chemistry.
Anal. Chem., **27**, 574–89 (1955).

A short review of photoelectric spectrometry is included on pp. 580–581.

5312. PEDAN, G. A.
Transactions of the IXth All-Union Conference on Spectroscopy. Quantitative Spectral Analysis of Magnesite and Magnesia Refractories.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 102–3 (1955).
C. A., **50**, 3888c (1956).

Details of the detn. of SiO_2, Al_2O_3, CaO, and Fe_2O_3 in magnesia refractories are given.

5313. PERRY, P. R., LEWIS, R. W., AND SULLIVAN, T. A.
Methods for Analyzing Titanium Sponge and Intermediate Products.
U. S. Bur. Mines, Rept. Invest., **5168**, 45 pp. (1955).
C. A., **50**, 2361e (1956).

This report gives tested methods for the analyses of $TiCl_4$, Ti sponge, and various intermediate materials and products. The methods are not claimed to be preferred or standard. For the analysis of Ti sponge, chem. procedures are given for the detn. of Cl, N, Fe, C, Mg and Ca, Mn, Si, V, Mo, Cr, S, P, O and H, Ti, and Na (by flame photometry). Spectrochem. procedures are described for Fe, Mg, Mn, Si, Cr, V, and Al in Ti sponge. In the analysis of $TiCl_4$, chem. procedures are given for the detn. of "free Cl," V, Fe, Si, S, P, H_2S, and nonvolatile residue. Spectrochem. procedures for V and Si in $TiCl_4$ are given, and also the methods for detg. N and C in Mg.

5314. PETHO, A.
The Practical Application of a Hungarian-Built Spectroscope for the Testing of Materials.
Gép, **7**, 128–33 (1955).
Hung. Tech. Abstr., **8**, No. 1, Abstr. No. 4 (1956).
C. A., **52**, 8638a (1958).

A system of lenses has been designed to revert the path of the light rays for observing the image near the entrance slit. The refracting prism is rotatable so that any part of the spectrum can be observed. A low-voltage a.-c. arc generator with Tesla coil is used. With sufficient quantity of alloying constituents qual. analysis is made possible by the appearance of their characteristic lines next to those of the basic material. Approx. quant. analysis is effected by the homologous pairs of lines method, through comparing the intensity of the chosen lines of the alloying constituents with those of the basic material. The spectroscope is primarily used for the analysis of alloyed steels in which Mn, Cr, Mo, Ni, V, W, Co, and Ti can be detd. It also can be employed for Pb, Sn, Ni, Fe, Mn, Cd, and Si in nonferrous metals and Mg, Mn, Cu, Fe, Si, Ni, and Zn in light metals. The spectroscope can be utilized for spark analysis after converting the light source into a spark exciter.

5315. PETRUN, V. F.
The Origin of Rose Quartz in Hydrothermal Veins.

Zapiski Vsesoyuz. Mineralog. Obshchestva, **84**, 191–7 (1955).
C. A., **49**, 15650i (1955).

Spectral analysis of 3 samples of the rose quartz from the sulfide-cassiterite veins showed about Al 0.1; Na 0.1; Ti 0.01; Mg 0.01–0.03; Mn 0.001–0.01; Sn 0.001; Fe 0.1–1% (the high Fe content is perhaps from ore contaminations); Ca 0.003–0.01; Cu 0.001%; traces of Zn. (*See C. A.* for complete abstract.)

5316. PFEILSTICKER, K.
Progress in the Spectrochemical Analysis of Nonmetals with Powerful Low-Tension Sparks.
Mikrochim. Acta, **1955**, 358–75.
C. A., **49**, 11493i (1955).

It was found possible to raise the detection sensitivity by lowering the self induction. Details are given of an improved app. S and halogens except F can be detected down to less than 1 γ, and F lines become visible at 10 γ. It is easy to detect A in air. S is easily detected in metals injured by its presence and in steel down to 0.02%. The detn. of H in metals is possible. The opposing demands of excitation and volatilization are discussed. Several theoretical remarks about low-tension sparks conclude the paper.

5317. PIENAAR, W. J.
Quantitative Spectrographic Analysis of Plant Material by the Direct-Current Arc.
Union S. Africa, Dept. Agr., Sci. Bull., No. **355**, 16 pp. (1955).
C. A., **50**, 7104h (1956).
Cf. *C. A.*, **45**, 2368b.

A spectrographic method for the detn. of K, Ca, Mg, Na, Mn, Fe, and Cu in plant material without chem. prepn. of the plant ash is described. Li_2CO_3 is used as a spectrographic buffer. Small concns. of Rb, Sn, and Cr incorporated in a graphite diluent serve as internal standards.

5318. PIENAAR, W. J., LOTZ, E. v. d. S., AND PIAGET, J. E. H.
The Flame Photometric Determination of Potassium, Calcium, and Sodium in Plant Material with the Aid of the Beckman Flame Spectrophotometer.
Union S. Africa, Dept. Agr., Sci. Bull., No. **362**, 23 pp. (1955).
C. A., **50**, 12742g (1956).

A method for the detn. of K, Ca, and Na in plant material by means of a Beckman flame spectrophotometer is described. Mg, SO_4^{--}, and P have a suppressive effect on the detn. of Ca, whereas Na and K have no effect in the concn. range studied. High Ca and Na (K) concns. increase the excitation of K (Na); Mg, SO_4^{--}, and P have little or no effect. Diln. of the solns. reduces these disturbing effects. For reliable detns. the chem. compn. of the standard solns. should be approx. the same as that of the plant exts. The method is more rapid than the usual chem. method and about as accurate. Some aspects of the electronic appl. used are discussed.

5319. PISAREV, V. D., KORNILOV, A. V., AND KOSTROVA, Z. P.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Tin.
Izvest. Akad. Nauk S.S.S.R., Ser Fiz., **19**, 210–11 (1955).
C. A., **50**, 3891f (1956).

Pb, Cu, Sb, Fe, and As are detd. in concns. of 0.01–2%.

5320. PITT, G. J. AND FLETCHER, M. F.
The Spectrographic Determination of Germanium in Coal and Flue Dust.
Spectrochim. Acta, **7**, 214–18 (1955).
C. A., **50**, 1518e (1956).

A method was developed for the detn. of Ge in coal and flue dust. The sample is ashed and mixed with Li_2CO_3 buffer and a small known amt. of SnO_2 as internal standard. The lower limit for detection of Ge is 6 p.p.m. on the ashed sample, but for estn. the useful range is from 24 p.p.m. upwards, where the coeff. of variation is 5 per cent between exposures on one plate.

5321. PLATONOVA, P. I.
Spectroscopic Determination of Sodium and Calcium Impurities in Magnesium by the Solution Method.
Dom Nauchno-Tekh. Propagandy (1955).
C. A., **51**, 10314g (1957).
8 pp.

5322. PODMOSHENSKIĬ, I. V. AND KONDRASHEVA, L. D.
Transactions of the IXth All-Union Conference on Spectroscopy. Photoelectric Installation for Quantitative Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 36–8 (1955).
C. A., **50**, 3886e (1956).

Sb.-Cs photomultipliers are used in connection with a tube electrometer.

5323. PODOLSKY, T.
Geology of the Horseshoe Rapids Area, Lower Hamilton River, Labrador.
Newfoundland Dept. Mines and Resources Geol. Survey Rept. No. **8**, 1–26 (1955).
C. A., **50**, 5481c (1956).

The rocks of the area are mainly gneisses and granitic to dioritic intrusives. Quant. spectrochem. analyses for major constituents and for Pb, Cu, Ni, Cr, Zn, and Ag are given for 4 rocks.

5324. POLUEKTOV, N. S.
Flame Photometry.

Zavodskaya Lab., **21**, 1045–56 (1955).
C. A., **50**, 9205a (1956).

A review with 112 references.

5325. POLYAKOV, P. M. AND RUSANOV, A. K.
Spectrographic Determination of Impurities in Vanadium.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. **19**, 180–2 (1955).
Zavodskaya Lab., **21**, 1070–5 (1955).
C. A., **50**, 9937g (1956).
Cf. *C. A.*, **50**, 3890f.

The analysis of V_2O_5 was carried out with 3 types of C electrodes. (*a*) Al was detd. by placing 20 mg. V_2O_5 in a hollow 3 mm. in diam., 6 mm. deep, and 1.5-mm. wall thickness and arced against a pointed cathode. The intensification and weakening of Al and V lines (Al 3961.53 and V 3951.96 Å.) occurred simultaneously over a considerable interval of arcing. The curve ΔS *vs.* log *C* covered a concn. range of 0.001-0.3% Al with a probable error of ±12%. (*b*) Powd. V_2O_5 mixed with graphite contg. 4% NaO was placed in hollows of both electrodes identical with the anode of *a*. The blackening curves of Ni II 2437.89 and Ni I 2457.47 Å. in an a.-c. arc and in a spark indicated an initial rise followed by a drop in temp. The ΔS log *C* curves were satisfactory for the detn. of 0.001% Mn, Mg, and Cu and 0.01% Si and Fe with a probable error of ±9–12%. (*c*) V_2O_4 (40 mg) mixed with graphite (1:1) contg. 0.5% SnO_2 was placed into half of a large hollow in the anode and arced against a pointed cathode. The evapn. of Sb and Bi was complete in 80 sec. The ΔS-log *C* curve enabled the detn. of 0.001% Sb and Cd, 0.004% Pb and As, and 0.01% Bi and Zn with a probable error of ±11–12%. P was similarly detd. but without an internal standard. It completely evapd. in 30–45 sec. P (0.02%) was detd. with a probable error of ±11% by the relative blackness of its line 2535.65 A. The presence of 0.05% Fe interfered with the P detn.

5326. POLYAKOVA, V. V.
Transactions of the IXth All-Union Conference on Spectroscopy. The Spectra of Standards for Spectral Analysis Prepared from Pressed Metal Powders.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 165–6 (1955).
C. A., **50**, 3890b (1956).

Cu, Ni, Pb, Sn, Bi, Zn, Cd, and Al pressed standards contg. 10^{-3}–10^{-2}% impurities As, Cd, Zn, Bi, Sb, Pb, Mn, Ag, Sn, Cu, and Ni were compared to fused standards. The spectra are different but the resemblance is closer if the d. of the pressed pills is increased.

5327. POPOVA, T. N. AND PRILEZHAEVA, N. A.
Transactions of the IXth All-Union Conference on Spectroscopy. The Distribution of Molecules Over Vibrational Levels in a Glow Discharge.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 20–1 (1955).
C. A., **50**, 3885i (1956).

The electron temp. of mols. of N, CN, and CO in the upper vibrational levels is higher in a glow discharge than the gas temp., but lower than the electron temp.

5328. PORTER, G.
High-Speed Photographic Spectroscopy. Science and Applications of Photography.
Proc. R.P.S. Centenary Conf., London, **1953**, 462–5 (Pub. 1955).
C. A., **49**, 12998i (1955).

Examples are given of the application of flash spectroscopy to chem. reactions of very short duration.

5329. PORTER, P. AND WYLD, G.
Elimination of Interferences in Flame Photometry.
Anal. Chem., **27**, 733–6 (1955).
C. A., **49**, 11485d (1955).

Interferences in the flame photometric detn. of Na and K with a Perkin-Elmer Model 52A instrument and a Beckman Model B flame photometer are discussed as overlapping of spectra, radiation interference, and anion interference. Reduction of the overlapping interference is attained by decreasing the slit width and correcting for the background radiation. Radiation interference is reduced by the addn. of a buffer such as LiCl. LiCl is also effective in reducing the interference by anions in instruments which have a spray chamber.

5330. POSSIDONI DE ALBINATI, J. F.
Determination of Lanthanum, Iron, and Magnesium in Uranium by Flame Spectrophotometry.
Anales asoc. quím. argentina, **43**, 106–20 (1955).
C. A., **50**, 4706g (1956).

Impurities in U, such as La, Fe, and Mg can be sepd. from an aq. HNO_3 soln. of $UO_2(NO_3)_2$ by Et_2O extn., and then detd. by flame spectrophotometry. A 10-g. sample of U is converted to the nitrate and the aq. soln. evapd. almost to dryness. The residue is placed in a separatory funnel and dissolved in 4 *M* HNO_3. The soln. is extd. with 20–5-ml. portions of peroxide-free Et_2O, and after each extn. 2 ml. of HNO_3 is added to the soln. to maintain the acidity. The extns. are continued until the Et_2O phase is colorless. The aq. phase, which contains the La, Fe, and Mg impurities, is heated gently to remove dissolved Et_2O and then evapd. almost to dryness. If Fe is present it must be sepd. Therefore, the residue is treated with 0.5 ml. of distd. HCl and again evapd. The residue is dissolved in 5–7 ml. of 6 *N* HCl, and the $FeCl_3$ is removed by Et_2O extn. in a separatory

funnel. The aq. phase contg. La and Mg is evapd. almost to dryness, the residue dissolved in distd. H_2O and made up to 25.0 ml. in a volumetric flask. The Et_2O phase, contg. the Fe is evapd., the residue dissolved in distd. H_2O, and the vol. made up to 10.0 ml. in a volumetric flask. A Beckman DU spectrophotometer, equipped with a flame attachment with either a H_2-O_2 burner or an O_2-C_2H_2 burner, is used to det. the quantities of La, Fe, and Mg. La is detd. at 440 mμ, Mg at 371 mμ, and Fe at 372 mμ. Calibration curves were prepd. for each element and the effect of interfering ions was detd.

5331. PRICE, W. J.
Determination of Trace Elements in Magnesium and Its Alloys by Spectrographic Procedures.
Spectrochim. Acta, **7**, 118–27 (1955).
C. A., **49**, 10795i (1955).

A survey on the detection and detn. of elements at trace concns. in Mg and its alloys is reported. General techniques for various sample forms are detailed, and line pairs and sensitivities are given. Al, Be, Cd, Ca, Ce, Cu, Fe, La, Pb, Mn, Ni, Si, Ag, Sn, Ti, Zn, and Zr can all be detd. in a simple routine procedure. Special analytical or standardization procedures are given for B, Be, Ba, Ca, and Li, and several working graphs are shown.

5332. PUNGOR, E. AND HEGEDUS, A.
Flame Photometric Microdetermination of Calcium, Strontium, and Barium in the Presence of Each Other.
Magyar Kém. Folyóirat, **61**, 308–12 (1955).
C. A., **52**, 8842e (1958).

The procedure described previously (Cf. Ibid., **59**, 304 (1953)) was modified to enable the detn. of small quantities of Ba in the presence of excess Sr and Ca. If the aperture is reduced from 0.5 mm. to 0.2 mm., the disturbing effects of Sr and Ca at a wave length of 870 mμ will disappear. The spectra of the elements involved were studied in an attempt to explain the reasons for this condition.

5333. PUNGOR, E. AND ZAPP, E. E.
Investigation of Alkali Metals by Flame Photometry.
Acta Chim. Acad., Sci. Hung., **7**, 185–98 (in German) (1955).
Magyar Kem. Folyóirat, **61**, 117–22 (1955).
C. A., **50**, 671f (1956).

Expts. showed that H_2SO_4 and H_3PO_4 reduce the emission of Li, whereas with Na and K this interfering effect is negligible in H_2SO_4. In addn. to thermal dissocn., heat energy may induce 2 effects; the excitation of the atom and the ionization of the atom. From the correlation of ionization const. and temp. and ionization energy it follows that the higher the temp. and the lower the ionization energy, the higher will be the ionization const. Accordingly, K, Rb, and Cs will show similar phenomena in flame photometry, in contrast to the other group of alkali metals, Na and Li, where the role of thermal dissocn. is dominant. The emission of the last members of the group is appreciably affected by one another. Certain anions strongly influence the emission.

5334. RATHJE, A. O.
Flame Photometric Determination of Silver in Cadmium and Zinc Sulfide Phosphors.
Anal. Chem., **27**, 1583–5 (1955).
C. A., **50**, 4709e (1956).

Ag in amts. of the order of 0.01% in ZnS and ZnS and Zn CdS phosphors is detd. flame photometrically by means of a Beckman DU spectrophotometer equipped with flame photometer attachment, H-O burner, and photomultiplier attachment employing the 338.3-mμ line. A 5-g. sample contg. 50–500 γ Ag is dissolved by heating with concd. HCl in a borosilicate glass beaker. The soln. is transferred to a volumetric flask contg. 30 ml. of acetone, and made to vol. with H_2O. Luminosity is measured at 338 mμ. 0% transmittance is detd. on a soln. contg. approx. the same amt. of Zn and (or) Cd sulfide, HCl, and acetone. Luminosity of a standard of the same compn. contg. 500 γ is also detd. Luminosities of Na and Mg affect that of Ag and since these are normally found in phosphors of this type a correction is made. Luminosities of both sample and standard at 335 and 341 mμ are interpolated to obtain luminosity at 338 mμ. This is subtracted from that obtained for the sample. In the range employed, the Ag luminosity is directly proportional to Ag concn. A typical calcn. is shown.

5335. REICH, H. F. AND GRABBE, F.
Flame Photometric Determination of Alkalies and Calcium in Refractory Materials with Propane Gas.
Tonind. Ztg. u. Keram. Rundschau, **79**, 127–30 (1955).
C. A., **49**, 10795a.

C_2H_2 has impurities that falsify results of flame photometric detns. C_3H_8 gives satisfactory results.

5336. RICARD, R.
Utilization of the Electric Arc From a Continuous Current for the Analysis of Silicates.
Mikrochim. Acta, **1955**, 226–35.
C. A., **49**, 11497f (1955).

The usual continuous arc between graphite electrodes is a simple source, sufficiently stable and reproducible. The emission spectrum is registered during the first 15 sec. of the combustion. A study of the distn. phenomena by the moving plate method justifies this procedure. It is necessary to dil. the material being analyzed and to add powdered graphite to this mixt. Ni powder was chosen as diluent. Results are given as obtained in

the analysis for the SiO_2 contents of argillaceous materials contg. 10–100% SiO_2.

5337. RICARD, R. AND RICARD, J
Influence of the Physical State of the Sample on Its Spectrum in Continuous Arc.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 225–8 (1955).
C. A., **52**, 4387a (1958).

Pure TiO_2 ignited at high temp. gives a less intense spectrum than does TiO_2 which has been simply oven-dried or ignited at a lower temp., but there is negligible variation in the relative intensities of Ti lines. In clays the Ti lines are intensified (relative to Ni) by high-temp. ignition. These effects are attributed to the slow transformations of the crystal forms of TiO_2, and high-temp. ignition is recommended to eliminate these variations in the spectroanalysis of samples of different origins.

5338. RIVKINA, M. A., PISAREV, V. D., KORNILOV, A. V., KOSTROVA, Z. P., KOTEL'NIKOVA, L. A., AND LEVCHENKO, M. P.
Spectrographic Analysis of Tin.
Zavodskaya Lab., **21**, 1081–3 (1955).
C. A., **50**, 9936e (1956).

Sn fused with 10% Bi, Pb, Sb, and Cu was added to pure Sn at 350°. Alloys contg. Fe and As were prepd. from "black" tin to which the Sn-Fe and Sn-As alloys were added at 500–50°. After stirring and removing the scum of oxides, the alloys were poured into a nest of 6 molds 6 mm. in diam. and 70 mm. deep. These rods served as electrodes of a spark with an analytical gap of 2 mm., exposure 45 sec. Arsenic was detd., semiquantitatively, visually. In the presence of more than 0.2% Fe, Bi could not be detd. The mean arithmetic error for tin was ±7–9%. The analysis was completed in 50–50 min.

5339. RODRÍGUEZ, A.
New Precision Method of Quantitative Spectrochemical Analysis Without Using Internal Standards.
Inst. hierro y acero, **8**, 729–37 (1955).
C. A., **50**, 6247a (1956).

After many checks and plotting graphically the intensities of lines 3175.04 and 2850.61 of Sn as function of the actual amt. of electrode consumed, the conclusion was reached that the difference of each point in a graph with its homolog in another has an abs. value which depends on the abs. amt. of electrode consumed, and this is proportional to its log. The reproducibility is much better than with the internal standard method, and elements can be analyzed up to 100%, independently of other elements present in the sample. A method is given to take advantage of all the spectrographic sensitivity in case one of the lines used loses the d. required by the Hurter and Driffield curve. The application of the method to iron and steel is considered.

5340. ROMAND, J. AND BALLOFFET, G.
Determination of Carbon, Sulfur, and Phosphorus in Steels by Far-Ultraviolet Spectrography.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 191–213 (1955).
C. A., **52**, 2649d (1958).

With a vacuum spectrograph and a spark source (Cf. *C. A.*, **48**, 2475c) steels were analyzed for S, P, and C by using lines in the 850–1300 Å. region with Fe as internal standard. Limiting concns. were 0.005 for S and P and 0.01% for C. At concns. of 0.05% errors were less than 20%.

5341. ROSSIKHIN, V. S. AND TSYKORA, I. L.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectroscopic Study of High-Frequency Discharges in Gases and Flames at Atmospheric Pressure.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz, **19**, 18 (1955).
C. A., **50**, 3885 g (1956).

Discharges of 1.6 Mc. and 28.5 Mc. were produced in air, CO_2, C_2H_2, and in a C_2H_2-air flame. Formation of C_2 and CN was observed, which was due to complete dissocn. of CO_2 and CO. In up to 12% C_2H_2 in air, the formation of free radicals (C_2, CH, OH) is predominant; above this, C_2 particles are formed. CH is produced by the reaction $C_2 + OH = CH + CO$.

5342. ROST, F.
Silicate Analysis in Alternating-Current Arcs.
Mikrochim. Acta, **1955**, 236–44.
C. A., **49**, 11497h (1955).

An attempt is made to explain with respect to its physical conditions, the "double electrode-alternating arc" between 2 electrodes filled with material. This concept is developed from a comparison of the various kinds of glow in C permanent arcs and applied to the detn. of accessory elements in Mg silicates. The chief constituents in Mg silicates and boiler scales contg. no alkalies are detd. with the use of $Ba(OAc)_2$ as dilg. reference basis.

5343. ROTHE, C. F.
Reduction of Rapid Random Fluctuations of the Beckman Flame Spectrophotometer.
Anal. Chem., **27**, 1507 (1955).
C. A., **49**, 15492e (1955).

In order to reduce the random, rapid fluctuations present when a Beckman DU spectrophotometer with direct-atomizing flame attachment and photomultiplier is used at near max. sensitivity, capacitors have been installed across the null-meter. The capacitors are 500- and 3000-microfarad. Mallory type WP dry electrolytics mounted in a metal box

and connected to the null-meter through a 2-gang, 3-position switch. A circuit diagram of the fluctuation suppressor is presented.

5344. ROTHE, C. F.
Renal Glomerulotubular Relations as Revealed by the Effects of Ureteral Pressure on the Excretion of Magnesium, Calcium, and Other Electrolytes, with Appendices on the Flame Spectrophotometric Determination of Magnesium and Calcium.
Univ. Microfilms (Ann Arbor, Mich.), Publ. No. **14,490**, 238 pp. (microfilm, paper enlargement)
Dissertation Abstr., **15**, 2270 (1955).
C. A., **50**, 2810f (1956).

5345. ROTHE, C. F. AND SAPIRSTEIN, L. A.
A Self-Standardization Method for Flame-Spectrophotometric Determination of Calcium in Biologic Materials.
Tech. Bull. Registry Med. Technologist, **25**, 184–97 (1955).
Am. J. Clin. Pathol., **25**, 1076–89 (1955).
C. A., **49**, 14871g (1955).

The method of addn., whereby an aliquot of the unknown itself is used in compounding the standard, is used for the flame-spectrophotometric detn. of Ca. The method is applied to a variety of solns. contg. known amts. of Ca and preponderant amts. of various materials likely to have large effects on the Ca luminosity, and to human plasma. The method is easy, sensitive, and relatively rapid. Because of its self-standardizing characteristics, it is well adapted to biol. materials of widely varying compn.

5346. ROUIR, E. V.
Spectrographic Analysis of Slags.
Compt. rend. 27e congr. intern. chim. ind., Brussels, **1954**, 2.
Industrie chim. belge, **20**, Spec. No., 431–5 (in French). (1955).
C. A., **50**, 11170c (1956).
Cf. *C. A.*, **48**, 5730g.

The problem of spectrographic analysis of slags has never been solved in a satisfactory manner because of the difficulty of exact calibration either with chemically analyzed samples or by attempts to produce standards by fusion, vitrification, or by mixing powders. The various methods, previously proposed, are reviewed, and a method of calibration and analysis by prepg. solns. is described; it gives the best precision.

5347. ROUIR, E. V. AND MERKEMAN, M. J.
Direct Spectrographic Analysis of Metallic Elements in Plastics.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 229–55 (1955).
C. A., **52**, 3393c (1958).

Plastic samples dissolved in ethyl phthalate with Co naphthenate added as standard are detd. spectrographically with the aid of a rotating-disk electrode suitable for both solns. and suspensions. Pb, Ca, and Ti are detd.

5348. RUBINA, N. P.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis Methods in the Moscow Plant of Secondary Aluminum in 1952–1954.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 158–9 (1955).
C. A., **50**, 3890a (1956).

5349. RUBINSHTEĬN, R. N. AND KARPEL, N. G.
Adaptation of Nomographic Procedure of Calculations to Spectrographic Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 128–9 (1955).
Zavodskaya Lab., **21**, 1094–1103 (1955).
C. A., **50**, 9205h (1956).
Cf. Pasveer, *C. A.*, **47**, 922a.

Nomographic calcns. are analyzed and their application to spectrographic analysis demonstrated.

5350. RUDNEVSKIĬ, N. K. AND GOLITSYN, G. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Dependence of the Intensities of Copper and Nickel Lines on Their Concentration in a Copper-Nickel Alloy.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 123–5 (1955).
C. A., **50**, 3889a (1956).

The intensity of Cu arc lines has a max. at 80–85% Cu; the intensity of Cu spark lines increases rapidly in the interval 80–100% Cu. The rise in intensity of Ni lines shows some peculiarities.

5351. RUDNEVSKIĬ, N. K., MATYUNIN, A. I., AND OBUKHOVA, E. S.
Transactions of the IXth all-Union Conference on Spectroscopy. The Transfer of the Material of a Copper-Nickel Alloy Into the Gas Cloud of an Arc.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 125–6 (1955).
C. A., **50**, 3889b (1956).

The amt. of Cu in the gas cloud has a max. at 80% Cu in the alloy. The total amt. of material in the cloud also has a max. at 80% Cu. The concn. of Ni in the gas cloud is smaller than the concn. of Ni in the alloy.

5352. RUNGE, E. F., BROOKS, L. S., AND BRYAN F. R.
Spectrographic Determination of Traces of Boron in Steel.
Anal. Chem., **27**, 1543–6 (1955).
C. A., **50**, 4710h (1956).

B in the range of 0.0001–0.0006% is detd. with a precision of 10% at the 0.0003% level by measuring the 249.77 mμ B line with a Littrow quartz spectrograph crossed with an echelle grating attachment. Only the initial portions

of the arcing period are recorded in order to improve the line-to-background ratio. Four exposures on separate pieces of sample are super-imposed on the plate to obtain adequate over-all spectral intensity.

5353. RUSANOV, A. K.
Transactions of the IXth All-Union Conference on Spectroscopy. Change in Temperature Conditions of Excitation During the Spectral Analysis of Ores and Minerals in an Arc.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 106–13 (1955).
C. A., **50**, 3888c (1956).

Variation of arc temp. during operation are measured by means of a special vaporizer which injects standard solns. into the arc. The volatilities of different compds. are shown and the temp. ranges of the corresponding arc discharges are tabulated.

5354. RUSANOV, A. K., Gusyatskaya, E. AND IL'YASOVA, N. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Atlas of Spark and Arc Spectra of the Elements (region 2100–6600 Å.).
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 44–5 (1955).
C. A., **50**, 3886f (1956).

5355. RUSANOV, A. K. AND TARASOVA, T. I.
Spectroscopic Analysis of Powdered Substances by Feeding the Powder Into the Discharge Zone by Means of Air.
Zhur. Anal. Khim., **10**, 267–75 (1955).
C. A., **50**, 1378a (1956).

An app. is described by means of which a powd. sample is down-fed into the discharge zone between 2 electrodes. The advantage of this procedure is better reproducibility of results. Where the sample is placed inside a depression of an electrode the rate of vaporization of the constituents varies which also causes the temp. of the arc to fluctuate, both factors affecting the intensity of spectrum lines. Feeding the sample directly into the discharge obviates these difficulties. The rate at which the sample flows into the discharge is of importance and this phase is discussed at length.

5356. RUSSMANN, H. H.
Charcoal and Graphite in Analysis of Emission Spectroscopy.
Congr. groupement avancement méthodes anal. spectrog. prod. mét., **18**, 159–81 (1955).
C. A., **52**, 2641h (1958).

Although "amorphous" C has the same crystal lattice as graphite, the structure consists of relatively small crystallites having more lattices imperfections than graphite with a resulting difference in phys. properties of graphite and "amorphous" C electrodes. The thermal cond. of graphite is greater and the porosity lower making it a less suitable electrode material for elements of low ionization potential and for solns. Similar differences exist in powd. carbons.

5357. RYSKIN, A. I.
Transactions of the IXth All-Union Conference on Spectroscopy. A Spectrograph with Large Dispersion and Resolution.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 81–2 (1955).
C. A., **50**, 3887h (1956).

A description is given of spectrograph ISP-67 claimed to have the highest resolution of all Russian spectrographs.

5358. SARTESCHI, P. AND ARDITO, R.
Simultaneous Determination of Potassium in Blood and Cerebrospinal Fluid (CSF) of Neuropsychic Patients, by Flame Spectrophotometry.
Riv. neurobiol., **1**, 319–48 (1955).
C. A., **50**, 13260h (1956).

By spectrophotometer, av. values of 21.4 and 11.6, 20.4, and 11.2, 22.1 and 12.8, 25.2 and 11.5, 21.4 and 11.3, 23.4 and 12.3, 20.0 and 12.3, and 20.7 and 10.9 mg.%, resp., were found in the blood serum and CSF of 18, 10, 6, 5, 22, 9, 9 and 25 patients with epilepsy, multiple sclerosis and other marrow diseases, diseases of the peripheral nervous system, brain apoplexy, other neurol. diseases, neurosyphilis, psychoneurosis, and mental diseases, resp. Blood values varied within a wider range than CSF values.

5359. SATPAEVA, R. A.
Spectrographic Analysis in Studies of Silicosis.
Vestnik Akad. Nauk Kazakh. S.S.R., **11**, No. 1. (Whole No. 118), 62–7 (in Russian)
C. A., **49**, 7704i (1955).

Spectrographic analysis shows a sharp rise in SiO_2 content in lymphatic nodes, lungs, liver, aorta, spleen, stomach, pancreas, heart, liver, and brain in cases of silicosis. The following amts. of SiO_2 are regarded as normal (controls): brain 0.04–9, heart 0.03–0.67; aorta 0.46–0.8, spleen 0.05–0.2; lymphatic nodes 0.3–26.4; lungs 0.1–13.7; stomach 0.01–0.37; liver 0.07–0.65; pancreas 0.09–0.47; kidneys 0.06–0.11 mg.%. The specimens were fixed in 10% formalin, dried at 110°, calcined at 600–650° and placed in the channel of the a.-c. arc electrode; at low concns. the detns. were made with the 2881.578 Å. line.

5360. SCACCIATI, G. AND D'ESTE, A.
Spectrographic Monitoring in the Manufacture of Electrolytic Zinc and By-Products.
Metallurgia ital., **47**, 259–65 (1955).
C. A., **49**, 14568c (1955).

Two emission spectrographs are used in monitoring the electrolytic Zn production in the Porto Marghera plant of the Montevec-

chio Co. Directions for the analysis of by-products consisting of Ag, Bi, In, Tl, Ge, Sn, Sb, Mo, As, and Ga and analytical procedures for detg. Pb, Co, Tl, Ag, and Zn in Cd are given.

5361. SCHMIDT, E. R. AND VERMAAS, F.H.S.
Differential Thermal Analysis and Cell Dimensions of Some Natural Magnetites.
Am. Mineralogist, **40**, 422–31 (1955).
C. A., **50**, 8401h (1956).

Spectrographic and chem. detns. showed MgO 0.095–2.55%, Al_2O_3 0.07–0.75%; 1 sample contained 1.76% NiO. (*See C. A.* for complete abstract.)

5362. SCHÖNTAG, A.
Spectrographic Consequences from Varying the Discharge Gases With Carbon Electrodes and High Tension Sparks.
Mikrochim. Acta, **1955**, 376–89.
C. A., **49**, 11499b (1955).

The quartz cell described in this paper is useful for work in a foreign gas with a normal support without significant delays. This avoids all cyanogen bands in work with discharge gases contg. no. N. The strength of the spectral lines of various elements depends greatly upon the nature of the discharge gas, particularly with H additives. The effect of moisture in the atm. must be taken into consideration. The material disintegration in the C arc depends entirely on the chem. activity of the discharge gas or of the elements of this discharge gas and not on the elec. energy transformed into heat. An a.-c. arc can be burned in A contg. 10% 0 if the current strength exceeds 4 amp.

5363. SCHRENK, W. G. AND GLENDENING, B. L.
Performance of Interference Filters in Simple Flame Photometer.
Anal. Chem., **27**, 1031–3 (1955).
C. A., **49**, 11484i (1955).

A simple flame photometer was constructed with the Beckman Model 10,300 as the excitation source. Two interference filters, with peak transmittance at 589 and 768 mμ, resp., were used for Na and K detns. A General Electric barrier layer photocell, Type 88 × 565, converted the radiant energy into elec. energy. The energy from the photocell activated a sensitive galvanometer. The principal inorg. constituents of plant tissue which were studied for mutual effects included Ca, Mg, Na, and K. Mg depressed the intensity of emission of both Na and K. Na and Ca had only a slight effect on K. Ca enhanced the Na emission, whereas the effect of K on Na was negligible. Na and K can be accurately detd. in plant tissue, if standards contg. Ca and Mg in quantities approximating that present in plant tissue are prepd. The av. value for 29 different samples of plant tissue analyzed for Na by the filter method was 0.53%. The same samples analyzed for Na by a spectrographic procedure was 0.56%. Thirty-two samples of plant tissue were analyzed for K by both techniques. The filter instrument produced an av. value of 1.04%, while the spectrographic procedure gave an av. value of 1.16%.

5364. SCHROLL, E.
The Occurrence of Trace Metals in Lead-Zinc Ores of the East Alpine Mining District.
Tschermaks mineralog. u. petrog. Mitt. [3], **5**, 183–208 (1955).
C. A., **50**, 4704a (1956).
Cf. *C. A.*, **48**, 13535h.

The semiquant. analysis of the galena and sphalerite ores for Bi, Te, Sn, In, Hg, Ga, Ge, and Tl by spectrochem. methods affords regional distinctions independent of mineralogical factors, and the leading ore bodies of the district are characterized geologically by means of the distribution of these trace elements.

5365. SEN, S. AND TOOLEY, F. V.
Effect of Na_2O/K_2O Ratio on Chemical Durability of Alkali-Lime-Silica Glasses.
J. Am. Ceram. Soc., **38**, 175–7 (1955).
C A., **49**, 10594d (1955).

The mechanism of the attack of alkali-lime-silica glasses by H_2O and the effect of the Na_2O/K_2O ratio have been studied. Seven glasses contg. 72% SiO, 10% CaO, and 18% of mixed alkali oxide having a varying Na_2O/K_2O ratio were digested in distd. H_2O for 4 hr. at 90°, and the Na and K in the exts. estd. by the Perkin Elmer flame photometer. Ca and Si were detd. by standard methods. The major factor controlling the relative amts. of Na^+ and K^+ removed was their relative concns. in the original glass. Ion exchange was the dominant process in the removal of alkali ions by H_2O, but Ca^{++} was extd. by a network breakdown mechanism. Extn. values for Ca were comparatively lower and were not affected by the Na_2O/K_2O ratio.

5366. SENO, S.
Application of Flame Spectrophotometry to Pharmaceutical Analysis. I. Determination of Sodium in San-*p*-Amino-Salicylic Acid and Calcium in San-*p*-Aminosalicylic Acid Calcium.
Ann. Rept. Takamine Lab., **7**, 110–17 (1955).
C. A., **50**, 16040c (1956).

Detn. of Na and Ca in this *p*-aminosalicylate was carried out with the Beckman Model DU spectrophotometer with 9200 flame attachment and O-H flame in order to develop a simple and rapid method of detn. Na could be detd. at wave length Na 589 mμ, slit width 0.05 mm., sensitivity at the middle point, O pressure of 15 lb./sq in., H pressure of 3.5 lb./sq. in., and by testing the material in aq. soln. Ca could be detd. at wave length Ca 554

mμ, slit width 0.2 mm., sensitivity at the middle point, O pressure of 14 lb./sq. in., H pressure 3.5 lb./sq. in., and by testing the material in 20% AcOH soln. The presence of a high concn. of metallic ions and org. solvents affect the flame intensity. The effect of Cl^- is small, HCl up to 1 *N* concn. is without any effect, and the effect increases in the order of $HClO_4$, HNO_3, H_2SO_4, and H_3PO_4. The same was found in Ca detn., whereby the effect of H_3PO_4 was especially great.

5367. SHAEVICH, A. B.
Methodology of Studying Spectral Standards. II.
Zavodskaya Lab., **21**, 332–6 (1955).
C. A., **50**, 12727g (1956).
Cf. Ibid., **19**, No. 10 (1953).

A statistical analysis showed that the systematic errors involved in the chem. analysis of spectral standards comprise most of the total error involved. This complete elimination by present methods of chem. analysis is difficult, costly, and time consuming. Therefore, a spectroanalytical method based on the primary synthetic standard was developed for rechecking spectral standards. The analysis of the method showed that it was more reliable and faster, when the individual concn. of the metals in the standard did not exceed 2%.

5368. SHAEVICH, A. B.
The Effect of the Form of the Compound of Elements on the Spectrographic Analysis of Their Solutions by Means of an Excited Spark.
Zavodskaya Lab., **21**, 1089–94 (1955).
C. A., **50**, 9205f (1956).

The abs. blackening intensity, *S*, of nitrates, chlorides, and sulfates of Cr, Mn, Ni, and of the internal standard Fe, detd. by a modified Dmitriev method (Cf. *C. A.*, **43**, 5325h), was different; the values of *S* for the salts of Fe were 1.083, 0.840, 0.865 for the line 2577.9 Å.; 1.159, 1.064, 0.982 for the line 2684.1 Å.; and 0.616, 0.534, 0.570 for the line 3413.1 Å. The calibration curve ΔS *vs.* log *C* deviated most for the sulfates and was greater than the exptl. error. Detns. were made with solns. of the salts contg. 5 and 15% of the other free acids; nitrates contg. HCl and H_2SO_4, etc. The shift in the calibration curves occurred primarily in the presence of free H_2SO_4 (up to 35% error). Substitution of satd. C for satd. filter paper gave the same results. To det. the effect of the spark temp., 3 groups of solns. of Mn salts were carried out comparing the Mn line 2949.2 with the Fe lines 2936.9, 2926.6, and 2944.4 Å. Even with such pairs as Mn 2949.2-Fe 2926.6 Å. with similar ionization potentials, 5.37 and 5.22, complete merging of the curves for the detn. of Mn nitrate and sulfate was not observed, whereas the curves of the nitrates and the chlorides did not coincide for any of the pairs. This was ascribed to the greater volatility of the chlorides.

5369. SHAININ, V. E. AND DELLWIG, L. F.
Pegmatites and Associated Rocks in the Newry Hill Area, Oxford County, Maine.
Maine Geol. Survey Bull., No. **6**, 1–58 (1955)
C. A., **50**, 733d (1956).

The area contains 35 pegmatites, 6 of which are described in detail. They occur in an area of quartz-muscovite and actinolite-schists. Minerals identified total 45; quartz, perthite, albite, and muscovite are the most common. Pollucite, gem tourmaline, and feldspar have been mined; beryl and spodumene are of possible com. interest. Quant. spectrographic analyses are given of 2 albites and 4 colored tourmalines; all contained Be, Ga, Mn, Sr, and Ti; Zr was also present in the albites, and Sn in the tourmalines.

5370. SHAMANNA, T. G. AND GANDHI, P. N.
Spectrographic Analysis of Low-Alloy Steel. I. Plate Calibration Technique Based on Relative Intensities of Standard Iron Lines.
Trans. Indian Inst. Metals., **8**, 309–17 (1954–55).
C. A., **51**, 16331i (1957).

The suitability of the B.I.S.R.A. method of plate calibration (based on the use of standard Fe lines) for the spectrographic analysis of low-alloy steels was tested. The method was thoroughly reliable and gave a high degree of reproducibility even under unfavorable conditions.

5371. SHAMANNA, T. G. AND GANDHI, P. N.
Spectrographic Analysis of High-Alloy Steels.
Trans. Indian Inst. Metals, **8**, 319–32 (1954–55).
C. A., **51**, 16202g (1957).

Tests were made to det. the applicability of the Gentry and Mitchell concn. ratio method (*C. A.*, **42**, 57i) to the detn. of the alloying elements in high-alloy (tool, stainless, etc.) steels on a routine basis. By using a Ag counter electrode with an 80° cone angle, satisfactory (within ±5%) analyses were made of steels with 2–25% Cr, 5–20% Ni, 0.3–6% Mo, 0.3–2% V, and 9–24% W. In these steels the Fe content was 54–95%. Spectrographic analyses for Mn and Si were not reliable with the technique used. The technique was equally applicable to low-alloy steels.

5372. SHAPOCHKIN, B. A.
Transactions of the IXth All-Union Conference on Spectroscopy. A Two-Prism Dispersion System with an Intermediate Mirror.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 82–4 (1955).
C. A., **50**, 3887h (1956).

5373. SHAVRIN, A. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Powders with a Single Standard.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 122–4 (1955).
C. A., **50**, 3888h (1956).

Standards contg. 0.025–0.20% V and 0.5% Mo in SiO_2 were used. The slope of the line log I_V/I_M *vs.* log C has a 45° angle. Thus a single standard would be sufficient.

5374. SHAY, D. E., HADDOX, J. H., AND RICHMOND, J. L.
Inorganic Qualitative and Quantitative Analysis of Green Stain.
J. Am. Dental Assoc., **50**, 156–60 (1955).
C. A., **49**, 4835d (1955).

Green stain of teeth, dried at 100°, contained more than 10% Ca; 1–10% K, Na, Si, Mg, P; less than 1% Al, Fe, Pb, Mn, B, Cu, Ag, Ti, Ni, Ba, Sr, as detd. by examn. of the arc spectrogram in a projection comparator densitometer. Both green stain and brown stain contained Ca, Fe, Si, Mg, Pb, Mn, P, Ag, Na. The chem. elements found only in green stain were Al, Ba, Ni, B, Cu, Ti, Sr, K, and Sn and Cl only in brown stain.

5375. SHENSTONE, A. G.
Standard Wavelengths In Copper (Cu II).
J. Opt. Soc. Amer., **45**, 868 (1955).
C. A., **50**, 56f (1956).

New grating measurements of 32 Cu spark lines, useful as ultraviolet standards, are given. They should be measured interferometrically because of their importance in the calcn. of standards for the vacuum ultraviolet.

5376. SHERSTKOV, Y. A.
Transactions of the IXth All-Union Conference on Spectroscopy. Quantitative Spectral Analysis in Geology.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 117–19 (1955).
C. A., **50**, 3888g (1956).

The dependence of the spectrum on the mineralogical compn. of the samples can be overcome by transforming the samples into solns. and by introducing these into the arc by means of a special fulgurator. Data are given relating to an analysis of refractory clays for Fe, Ti, Ca, and Mg.

5377. SHERSTKOV, Y. A.
Quantitative Spectral Determination of Iron, Titanium, Magnesium, and Calcium Oxides in Solutions of Refractory Clays.
Zavodskaya Lab., **21**, 320–4 (1955).
C. A., **50**, 12739f (1956).

After the detn of Al_2O_3 and SiO_2 by the usual chem. methods, the soln. of refractory clay (general compn. SiO_2 58, Al_2O_3 32, Fe_2O_3 2, TiO_2 1.5, CaO .05, and MgO 0.7 wt. %) was transferred into a glass cup through the center of which was passed a C electrode (with a tip 3 mm. in diam.). A 1.2-mm. shaft in the center and through the walls of the electrode allowed an even flow of soln. into the spark interstice. The geometry of the fulgurator (diagram shown) prevented splashing of liquid and deposition of salts on the electrodes. With the aid of calibration graphs obtained with standard solns., spark spectrographs made possible the simultaneous detn. of Fe_2O_3, TiO_2, MgO, and CaO in 15–20 different samples of clay during 8 hr.

5378. SHERSTKOV, Y. A. AND FEDINA, E. P.
Application of the Spectrographic Method to Phase Analysis of Nickel Ores.
Zavodskaya Lab., **21**, 1060–1 (1955).
C. A., **50**, 9217a (1956).

The ore was treated with aqua regia and the residue together with the filter paper ignited at 600°. The sintered residue (300 mg.) was ground with 300 mg. of quarzt and 100 mg. CuO and placed in an annular cavity in the C anode; the C cathode was finished as a truncated cone. The values obtained with Ni 3059.8–Cu 3063.4 Å. agreed with those of the wet chem. analysis within ±4% for ores contg. less than 0.1% Ni silicate. With ores of higher silicate content the error was as high as 20–30%. This was ascribed to the variable degree of soln. by the acid during the 1st phase of the analysis.

5379. SHILLIBEER, H. A. AND WATSON, K.
Some Potassium-Argon Ages for Ontario.
Science, **121**, 33–4 (1955).
C. A., **49**, 4476h (1955).

K-A age detns. were carried out on assocd. minerals from the same pegmatite to det. whether consistent results could be obtained for minerals of different lattice structures. The results agree within exptl. error. For the K-A method it was necessary to det. the branching ratio of the decay const for orbital electron capture and decay const. for β emission. It was detd. to 0.809, from the mean value obtained by two labs. on a K feldspar of known age. It is given as 0.503×10^{-9}/yr. and is the mean value of 11 of the most recent counting expts. K detns. were carried out by a flame photometer; A was extd. from the mineral by a McLeod gage. The results demonstrate the validity of the method for age detns. and give further support to the assumption that the age limit of the Greenville orogeny is 800 to 1100 million yrs.

5380. SHILLING, M. L.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Determination of Tin in Minerals.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 216 (1955)
C. A., **50**, 3891h (1956).

The sample is mixed with K Sb tartrate and Sn is detd. by comparison with Sb in an arc

stabilized by K. For standardization purposes Sn is introduced as $SnCl_2.2H_2O$ in EtOH.

5381. SHIPITSYN, S. A.
Transactions of the IXth All-Union Conference on Spectroscopy. Correction for Background in Spectral Line Intensity Measurements by the Photographic Method.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 138–9 (1955).
C. A., **50**, 3889e (1956).

5382. SHMULYAKOVSKIĬ, Y. E.
Spectrographic Magnesium Determination in Aluminum Silicates.
Neftyanoe Khoz., **33**, No. 3, 78–9 (1955).
C. A., **49**, 8732h (1955).

The method is based on the detn. of the intensity relation between the Mg and Fe spectrum lines. Mg silicate standards were prepd. with a Mg content of 0.2, 0.3, 0.4, 0.5, 0.6, 0.8, 1.4, and 10% Mg, and used with pure Fe and C electrodes, tested for freedom from traces of Mg, and heated in a strong arc if any Mg was found present. The precision of the results shown was satisfactory.

5383. SHORT, H. G.
Determination of Boron in Steel.
Arch. Eisenhüttenw., **26**, 209–12 (1955).
C. A., **49**, 8737g (1955).

The difficulty of sepn. of B in qual. analysis is discussed. Several known methods of detn. are described. Spectrum analysis is best. The most sensitive spectral line, 2497.73 Å., is excited by 4.9 e. v.

5384. SHVARTS, D. M. AND NILOVA, I. S.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectral Analysis of Nickel Production Slags in a Large Interval of Concentrations of the Components.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 96–7 (1955).
C. A., **50**, 3888a (1956).

5385. SHYNE, J. C. AND MORGAN, E.R.
Preparation of Spectrographic Standards of Low Boron Content for Determination of Boron in Iron.
Anal. Chem., **27**, 1542–3 (1955).
C. A., **50**, 3946d (1956).
Cf. *C. A.*, **48**, 8716e.

Spectrographic detn. of B in steel has been hindered by the lack of a reliable standard in the B range below 6 p.p.m. Standards contg. as little as 1 p.p.m. were prepd. by the use of vacuum melting and careful ingot processing. The Bur. of Standards spectrographic standard No. 830 contg. 0.019% B was used for the addn. Ingots prepd. were hot-rolled into 0.25 in. diam. rods below 865°. After rolling, the surface of the standards were cleaned by centerless grinding to $^7/_{32}$ in. diam.

5386. SILVESTRI, U.
Chemical Composition of Hair.
Bull. sci. med., **127**, 66–72 (1955).
C. A., **50**, 15829f (1956).

In hair of newborns and sucklings, 2-year old children, 7–15 year old girls (I), av. age subjects (II), and 81–90-year-old people, the following elements were identified by a spectrographic method: Ca, Mg, Na, P, Si, Al, in higher, Mn, K, Fe in lower amts., Cu, Zn, Pb, Ag, B, Ti in traces, and Sr, Ba, Cr, and Cd in minute traces. Cd was absent in I and II.

5387. SIMONS, F. S.
The Lead-Zinc Veins of the Chilete Mining District in Northern Peru.
Econ. Geol., **50**, 399–419 (1955).
C. A., **50**, 1536e (1956).

The ores are quartz veins contg. mainly sphalerite, galena, and pyrite, with minor chalcopyrite, in andesitic rocks that are highly altered. The total of Pb + Zn is nearly const. in different veins and at various depths, but the ratio Zn/Pb increases markedly with depth. Chem. analyses and spectrographic detns. of Cd, Ga, Ge, and In are given for 7 sphalerite samples.

5388. SKORNYAKOV, G. P.
Transactions of the IXth All-Union Conference on Spectroscopy. Evaporation of Metallic Electrodes in a Direct-Current Arc.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 57–8 (1955).
C. A., **50**, 3886h (1956).

Cu electrodes were opposed by electrodes made out of (*1*) Al, Cu, Mg, Zn, Si, Sn, Pb, C, Mo, or W; (*2*) Fe, Co, Ni, Mn, or Cr. The type 1 electrodes evapd. more as anodes; the type 2 electrodes evapd. equally as anodes or cathodes; this is attributed to a difference in the movement of vapor in the elec. field. The formation of neg. ions of Fe, Co, and Ni is surmised.

5389. SLATTER, A. V. AND STITCH, S. R.
A Modified Lathe for Turning Spectrographic Carbon Electrodes Used in the Cathode Layer Arc Method.
Atomic Energy Research Estab. (Gt. Brit.), Rept. No. **C/R 1641**, 2 pp. (1955).
C. A., **49**, 11325h (1955).

5390. SMALER, A. A.
A Comparison of Some Methods for the Determination of Trace Impurities in Semiconductors.
J. Electronics, **1**, 327–32 (1955).
C. A., **50**, 10520i (1956).

Different analytical methods of detg. impurities in concns. below 1 p.p.m., such as emission and mass spectroscopy, polarography, vacuum fusion (for O_2, N_2, H_2), colorimetry, fluorimetry, radiotracers and radioactivation are discussed.

5391. SMITH, I. L., YEAGER, E., KAUFMAN, N., HOVORKA, F., AND KINNEY, T. D.
Spectrographic Analysis of Biological Samples. I. The Preparation of Samples for Analysis.
Appl. Spectroscopy, **9**, No. 4, 167–70 (1955).
C. A., **50**, 3529e (1956).

Biol. samples are generally characterized by contg. very small amts. of mineral elements in the presence of large amts. of water and org. matter. Various methods for prepg. such samples for spectrographic analyses are available. The techniques of direct analysis, drying, and ashing have been discussed along with the advantages and disadvantages of each, and the spectrographic methods with which each may be suitably combined.

5392. SMITH, P. V., JR.
The Origin and Accumulation of Oil.
Proc. 4th. World Petrol. Congr., Rome, **1955**, Sect. I, 359–76.
C. A., **51**, 13668f (1957).
Cf. *C. A.*, **49**, 15667g.

Spectrographic analysis of 5 exts. showed more trace elements in the nonmarine sediments. Fe and Mg were the most abundant trace elements; V and Ni were more prevalent in the nonmarine exts., and Fe, Mg, Si, Cu, Pb, B, Zn, Ca, and Mn were present in all. (*See C. A.* for complete abstract.)

5393. SMITH, W. L., STONE, J., RISKA, D. D., AND LEVINE, H.
Doverite, a New Yttrium Mineral.
Science, **122**, 31 (1955).
C. A., **49**, 13029b (1955).

Spectrographic analysis shows Y to be a major component. Rare earth components include Ca, La, Gd, Dy, Er, Yb, Nd, Pr, Lu, Ho, Tm, and Eu.

5394. SMOLYAK, I. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Rapid Spectral Analysis for Fluorine.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 217 (1955).
C. A., **50**. 3891h (1956).

$CaCO_3$ (calcite) is introduced into the upper C electrode and F is analyzed by measuring visually the intensity of the mol. bands of CaF—5291, 5830, 6064, and 6256.6 A.

5395. SOLODOVNIK, S. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Determination of Antimony in Antimony Ores and of Impurities in Antimony Oxide and in Metallic Antimony.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 182–4(1955).
C. A., **50**, 3890g (1956).

Sb_2O_3 is used for optical and fluorescent materials and the max. admissible impurities are Pb 0.01%, Cu 0.001%, Fe 0.008%, and Ni 0.001%.

5396. SOLOMON, A. K., AND CATON, D. C.
Modified Flame Photometer for Microdetermination of Sodium and Potassium.
Anal. Chem., **27**, 1849–50 (1955).
C. A., **50**, 1378f (1956).

Microquantities of Na and K are detd. by using a Beckman Model DU flame photometer with the phototubes and amplifier replaced by an RCA Type 6217 photomultiplier tube. The photomultiplier tube is connected to an Applied Physics Corp. Model 30 vibrating reed electrometer which in turn feeds a Brown recording potentiometer thus providing a permanent record of the measurement.

5397. SPECKER, H.
Optical Methods for the Determination of Traces of Elements by Concentration.
Arch. Eisenhüttenw., **26**, 267–70 (1955).
C. A., **49**, 10791e (1955).

Traces of elements can best be detd. by spectrochem. analysis, but for very small amts., 0.1% and less, they should first be more concd. This can be accomplished (*1*) by extracting the principal constituents with a selective org. solvent, either as a pure inorg. compd., e. g., $FeCl_3$, $Fe_2(CNS)_6$, or as org. chelate complexes. The trace constituents remain thereby in the aq. phase, (*2*) making the principal constituents in the aq. layer of the soln. (in an org. solvent) as stable complex compds., and extracting the trace elements as chelate complexes with org. solvents. There is no need to sep. the principal constituents entirely from the trace constituents for the spectrochem. analysis, a removal of 95–99% is usually sufficient. This selectivity for certain elements is increased by addn. reactions. Several examples are given showing the possibility of detg. 0.01–0.00001% of Mg, Ca, Cu, Cd, Zn, Ti, Pb, Cr. Fe, Co, and Ni and 0.001% of Mn photometrically.

5398. SPECTOR, J.
Mutual Interferences and Elimination of Calcium Interference in Flame Photometry.
Anal. Chem., **27**, 1452–5 (1955).
C. A., **49**, 15604i (1955).

A discussion of the effects of mutual cationic interference with respect to K, Na, and Ca in the Lange flame photometer. Ca interference is eliminated in an aliquot sample by adding an equal vol. of 0.2 *M* $AlCl_3$. This has little effect on K or Na readings but suppresses the Ca emission considerably, thus avoiding the need for chem. sepn.

5399. SPEKTOROV, L. A., KLAVDIENKO, I. K., AND POGULYAEVA, A. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Influence of

Some Substances Present in the Sample on the Intensity of the Lines of Molybdenum, Indium, and Thallium.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 122–3 (1955).
C. A., **50**, 3888i (1956).

Easily ionizing substances (K, Na, etc.). intensify the Mo lines 3902, 3194, 3174, 3158, 3132 Å.; Sr, Ba, Li decrease the intensity of Mo lines; K, Na, Li intensify the lines of In and Tl.

5400. SPITZY, K. H.
New Spectroscopic Apparatus
Mikrochim. Acta, **1955**, 734–9 (1955).
C. A., **49**, 11330b (1955).

Pictures are shown and the instruments are discussed of a self-registering spectrophotometer, a spectroscope with photometer, the Spektrolux, for emission analysis by the Fuess method, an industrial quantometer and the spectral double projector of Steinheil.

5401. STAATZ, M. H., MURATA, K. J., AND GLASS, J. J.
Variation of Composition and Physical Properties of Tourmaline with its Position in the Pegmatite.
Am. Mineralogist, **40**, 789–804 (1955).
C. A., **49**, 145f (1957).

Quant. spectrographic analyses and optical data are given for 10 tourmalines, 5 from each of 2 zoned pegmatites in Gunnison County, Colorado. From wall zone to core, Li, Ca, Pb, K, Be, Rb, and Cs increase; Fe, Mg, and Ti decrease; Na is nearly const. except in the core sample, in which it is lower. Mn, Y, and La first increase, then decrease. The observed changes are best explained on the basis of gradual changes in compn. of a single pegmatite fluid crystg. in a closed system.

5402. STRASHEIM, A. AND CAMERER, L.
Spectrographic Analysis of Trace Elements in Plant Materials—Comparison Between the Anode Arc and Cathode Layer Arc Methods of Excitation.
J. S. African Inst., **8**, 28–38 (1955).
C. A., **49**, 15605a (1955).
Cf. *C. A.*, **42**, 2203 g; **47**, 7936a.

The relative merits of the cathode and anode methods of sample excitation as they apply to the analysis of trace metallic constituents in plant materials are discussed. The data indicate that (*1*) the accuracies obtainable by the 2 methods are about the same, (*2*) the cathode method appears to be the more suitable for the detn. of Co and Mo, (*3*) the alignment of the anode arc is less crit. than that of the cathode. The method of sample prepn. follows that described by Mitchell (*C. A.*, **43**, 1136i). Results obtained in 2 collaborating labs. are included.

5403. STRAUBEL, H.
A New Atomizer for the Flame Photometer.
Mikrochim. Acta, **1955**, 329–35.
C. A., **49**, 11329a (1955).

The new atomizer which operates on an electrostatic principle requires no compressed air. It is nearly 100% effective because the dispersed particles can be guided into the flame by appropriate electrostatic fields.

5404. SUKHENKO, K. A., MLADENTSEVA, I. O., GOROZHANKINA, N. P., PLATONOVA, Z. S., AKSENOVA, A. V., AND IL'INA, S. M.
Transactions of the IXth All-Union Conference on Spectroscopy. Preparation and Investigation of Different Alloy Standards for Spectral Analysis.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 161–4 (1955).
C. A., **50**, 3890b (1956).

5405. SUKHOVALOVA, V. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Spectrographic Method of Arsenic Analysis in Simple Carbon-Containing Steels.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 191–2 (1955).
C. A., **50**, 3890i (1956).

5406. SUSANO, C. D.
Graphite- and Aluminum-Block Solution Evaporators.
Anal. Chem., **27**, 1038 (1955).
C. A., **49**. 11325h (1955).
Cf. Maroney, *The Laboratory*, **6**. No. 4, 62 (1933).

Solid blocks of graphite or Al with suitable apertures are used for holding dishes over a hot plate during evapns. The bottom of each container is $^1/_8$ to $^1/_4$ in. above the heating surface and the liquid level is below the periphery of contact between the evaporator and the container. Graphite evaporators are more satisfactory than Al evaporators. Evapns. are fast and bumping is eliminated.

5407. SUSSMAN, G.
Spectrographic and Colorimetric Analysis of Carbides Separated from a Chrome Steel.
Congr. groupement avancement méthodes. anal. spectrog. prod. mét., **18**. 41–75 (1955).
C. A., **52**, 2649b (1958).

Semimicrospectrographic detn. of Cr, Mn, and Fe in carbides with a precision of 2% is obtained by using spark excitation. $CoSO_4$ is added to the samples as an internal standard, and the mixt. is ignited and shaped, after mixing with graphite, into a briquet electrode. Results are compared with Fe detd. by $TiCl_3$ titration and with simultaneous spectrophotometric detns. of Cr and Mn as dichromate and permanganate.

5408. SVEJDA, H.
Note on Solution Spectral Analysis.
Mikrochim. Acta, **1955**, 251–6.
C. A., **49**, 11485h (1955).

In order to spark off solns. from the Petri holder, use is made of a cup-disk electrode made of metal. An app. which meets the demands for greater speed and better sensitivity is shown and described.

5409. SVENTITSKIĬ, N. S. AND TAGANOV, K. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Excitation of Spectra by an Electric Discharge in a Liquid Medium.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 77 (1955).
C. A., **50**, 3887f (1956).

A change of parameters in a low-voltage impulse operation can suppress the continuous spectrum and provide line spectra. Discharges between Zn, Cu, and brass electrodes in CCl_4 were investigated; it is reported that the intensity relations between lines are markedly different than in air.

5410. SZÁDECZKY-KARDOSS, E. AND VOGL, M.
Geochemical Investigations on the Ashes of Hungarian Coals.
Földtani Közlöny, **85**, 7–43 (1955).
Hung. Tech. Abstr., **7**, No. 4, 10.
C. A., **51**, 15349g (1957).

The practical and scientific importance of the trace elements found in hard and brown coals is considerable. The ashes of 265 Hungarian and foreign coals were examined by the quartz-spectrographic method and their approx. trace-element contents were established in 5 groups of line intensity. By comparing coals of different ages it could be ascertained that the enrichment in trace elements takes place during the formation as well as during carbonization. At a higher degree of carbonization the enrichment is insignificant; in fact, in anthracite the trace-element content decreases. The large quantity of trace elements found in coals is a consequence of the loss of water, C, H, and O. In the spatial distribution of the trace elements an important role is played by the eruptive rocks deposited in the vicinity of the occurrence. Thus, for instance, the granitic territory of Pécs-Fazekasboda-Mórágy provides most of the Ga, Sn, Pb, Mo, and Ba found in the nearby hard and brown coals. The young basalts of Hungary may influence the peaty formations. Certain trace elements found in the ashes of coals from Nagybátony and Kisterenye can be connected with the andesites of the Matra Mountains, whereas the considerable quantity of Ni, Cr, V, and Mn found in the coals of Bánfalva and other occurrences in the Borsod Basin can be attributed to the substances supplied by the basic mass of the Bükk Mountains. Karstic coals show a min. of trace elements; this can be explained by the smaller quantities in which they are found in limestone.

5411. SZÁDECZKY-KARDOSS, G. AND BENKO, I.
Spectrographic Determination of Germanium in Coal.
Acta Chim. Acad. Sci. Hung., **8**, 241–62 (in English) (1955).
C. A., **50**, 9714b (1956).

The known gravimetric and titrimetric detns. for Ge are cumbersome and often unreliable. Photometric methods are very sensitive, but the results do not always represent the whole amt. of Ge present in a coal sample. A spectrographic method was developed suitable to det. Ge contents from 0.01 to 0.001% in coal ashes without using concn. methods. The quartz spectrograph used and all accessories, like plates, developer, and samples for standardization, are described. The coal sample (1 g.) was placed in a porcelain dish and ashed in an elec. furnace at 400°. If the temp. was raised during ashing to 900° a small loss of Ge was observed. For the spectrographic detn. of Ge in the approx. amt. of 0.001% only the most intensive lines can be used. Sn was selected as internal standard. The Ge line 3039 Å. was chosen for measurements owing to its intensity and proximity to the Sn line 3032 Å. The reference element, Sn, added in the form of SnO_2 (0.5%), proved very suitable as the rate of vaporization of Ge and SnO_2 are similar. Other internal standards like Ga, Bi, and In were tested but none could replace Sn. The following working conditions were employed: d.-c. arc excitation at 15 amp., diam. of C electrode 5 mm., diam. of bore 4 mm., depth of bore 3 mm., sample wt. about 30 mg., exposure time 9 sec. Detns. on mixts. contg. known amts. of Ge added as GeO_2, GeS_2, or Mg_2GeO_4 showed consistency and an av. error not exceeding 6%. Evaluations were carried out on the basis of the ratio of intensity values Ge 3039/Sn 3032 A. Working curves for concns. up to 0.0025, 0.0015, and 0.0004% Ge are illustrated. Results compared with those obtained by photometric procedure with phenylfluoron were found in good agreement. 18 references.

5412. TAJIMA, M. AND OUYE, S.
Automatic Recording Photographic Densitometers.
Bull. Soc. Sci. Phot. Japan, No. **4/5**, 35–41 (1955).
C. A., **50**, 7512e (1956).

5413. TAKENAKA, S.
Minor Components in Pyrrhotite. II.
J. Japan. Assoc. Mineral, Petrol. Econ. Geol., **39**, 261–6 (1955).
C. A., **51**, 140i (1957).
Cf. *C. A.*, **48**, 5747f.

Minor elements in pyrrhotite from the Chichibu Mine, Saitama Prefecture, Kawayama Mine, Yamaguchi Prefecture, and Yanahara Mine, Okayama Perfecture were detd. by spectrographic methods. Results of quant. analysis are discussed. Some elements are distributed only in some parts of the deposits, and this mode of occurrence should be ascribed to the difference in the genetic conditions.

5414. TATEKAWA, M.
The Pegmatites of the Oku-Tango District of Kyoto Prefecture, Researched Chiefly from the Viewpoint of Trace Elements.
Mem. Coll. Sci. Univ. Kyoto, Ser. B, **22**, 199–212 (1955).
C. A., **51**, 5653e (1957).
Cf. *C. A.*, **49**, 13030c.

Chem. analyses are given of 2 granites and of 3 feldspars, and semiquant. spectrographic detns. are given of Sr, Mn, Mg, Sn, Pb, Ba, and Sr in feldspars, and of Ba and V in biotites. The essential minerals of the granite were higher in nearly all minor elements than the same minerals from pegmatites. The Ba and the V contents of biotites vary concordantly.

5415. TAYLOR, A. E. AND PAIGE, H. H.
Determination of Microgram Quantities of Strontium in Solution. Evaluation of Flame Spectrophotometric Method.
Anal. Chem., **27**, 282–4 (1955).
C. A., **49**, 8037d (1955).

A study of flame photometric methods, including 2 different fuels (C_2H_2 and H_2) and different light-measuring devices, has been conducted. Statistical evaluation of the results shows the general superiority of a photomultiplier detection unit, C_2H_2 as a fuel, and a wavelength of 681 mμ.

5416. TAYLOR, R., BANYARD, W. H., GARNER, A. V., COFFIN, A. N., LESSING, W., MILBOURN, M., NORTH, J. C., PRICE, R. H., SMITH, D. M., BEALE, P. T., AND NOBBS, J. M.
Spectrographic Analysis of Nominally Pure Lead.
Spectrochim. Acta, **7**, 205–13 (1955).
C. A., **50**, 725 g (1956).

Coöperative investigations have been carried out by a no. of labs. interested in the spectrographic detn. of trace impurities in lead. Methods have been developed for detg. Ni, Bi, Tl, Cd, Sb, Ag, As, Sn, Cu, Zn, and Te in the range 0.0005–0.005 per cent. The greater sensitivity of the triggered-arc type sources has been demonstrated, although acceptable results can be obtained with simple condensed-spark circuits by using prolonged exposures.

5417. THORNE, R. P. AND CHILDS, B. M.
Determination of Niobium in Some African Low Grade Minerals and Mineral Dressing Products., Pt. 2. Spectrographic.
Atomic Energy Research Estab. (Gt. Brit.), Rept. No. **C/R 1232/2.** 3 pp. (1955); H.M. Stationery Office, London (England)
C. A., **50**, 7016b (1956).

5418. THÜMMLER, F. AND MORGENSTERN, I.
Spectrochemical Trace Determination of Metals.
Chem. Tech. (Berlin), **7**, 10–16 (1955).
C. A., **50**, 102h (1956).

The application of the briquetting technique (Cf. Dietert, *C. A.*, **36**, 721[5]) to the spectrographic analysis of the residues from solns. of metals and alloys was studied by using graphite, Ag, or Cu powders as base materials. Results are given for the detn. of traces of Cd and of Pb in Zn metal, Pb and Cd in Ni, and Ni and Cu in Fe which indicate the feasibility of this technique.

5419. THÜMMLER, F. AND MORGENSTERN, I.
Spectrochemical Determination of Magnesium in Nodular Iron by the Pellet Method.
Chem. Tech. (Berlin), **7**, 35 (1955).
C. A., **49**, 13824c (1955).

T.'s pellet method has been applied to the detn. of Mg in nodular iron as follows: dissolve 0.2 g. of sample in HNO_3 and evap. to dryness. Pellet with Ag powder and compare with standards made from $Mg(NO_3)_2.6H_2O$ and pure Fe_2O_3 by using the line pair Mg 2802.7 Å.–Fe 2779.8 Å.

5420. TISCHENDORF, G.
Paragentic and Tectonic Investigations Upon Veins of the Fluorite-Barite-Bearing Lead Formation of Freiberg Especially of the Halsbrücken Spar.
Freiberg Forsch., **C18**, 129 pp. (1955).
C. A., **49**, 11515a (1955).

Spectrochem. analyses were made on 149 barite, 29 fluorspar, and 14 galena samples. The geochem. paths of Ba, Sr, Pb, Zn, Cu, Sb, As, and Zn are followed throughout the paragentic sequence.

5421. TOMIYAMA, T.
Spectrochemical Analysis of Trace Elements in Biological Materials.
Science and Crime Detection, **8**, No. 1, 74–6 (1955).
C. A., **49**, 11760c (1955).

Trace elements in biol. materials, such as bone, liver, stomach, and kidney, were detd. spectrochemically. Pptn. of these elements as sulfides and addn. of an equal wt. of NaCl make it possible to detect $<10^{-5}\%$ Pb and As. Data obtained by the method of Mitchell and Scott (*C. A.*, **43**, 2541e) are tabulated.

5422. TOPALOV, L. N.
Spectral Method of Analysis of Chromium and Silicon in Ferrochrome.
Sovremennye Metody Analiza v Met. Gosudarst. Nauch.-Tekh. Izdatel. Lit. Chernoĭ i Tsvetnoĭ Met. Moscow (U.R.S.S.). *Sbornik*, **1955**, 64–71.

Referat. Zhur., Khim., **1956**, Abstr. No. 36161.
C. A., **52**, 15324a (1958).

The spectra are produced in the a.-c. arc and photographed on the Spectrograph ISP-22 by using a 0.02-mm. slit width and graphite as the other electrode. The investigated sample is filed and polished on an abrasive wheel. The discharge current is 2.5 amp.; arc distance is 2 mm.; and burning time is 20 sec.; exposure is 20 sec. The analytical line (Å.) and concn. limits (in %) are Cr 2513.62–Fe 2512.36 (60–75), Si 2516.12-Cr 2530.45 (0.1–0.6), Si 2435.16–Cr 2408.75 (0.5–2.5), Si 2532.38-Cr 2530.45 (2.0–5.0). Calibration graphs are plotted by using $\Delta S_{Fe/Cr}$ *vs.* log ($C_{Fe/Cr}$) as coördinates, the concns. of Cr are calcd. from the formula % Cr = (100 − α)/(1 + % Fe/% Cr) where α is % Si and the sum of other impurities in the alloy. The av. value of these impurities is 0.6%. The graph for Si has $\Delta S_{Si/Cr}$ − log C as coördinates. In order to obtain reproducible results, very careful polishing of the sample surface is necessary. The relative error for Si detn. in triplicate exposure is ±3.1%, Cr ±0.6%. The high accuracy of the detn. of Cr, as the main component of the alloy, is explained by the fact that the selected lines are very homologous and by the very steep calibration graphs. The deviation of ΔS values from the av. value does not exceed 0.012.

5423. TÖRÖK, T. AND SZIKORA, G.
The Spectrographic Determination of Carbon in Steels.
Acta Tech. Acad. Sci. Hung., **13**, 165–85 (in German)(English summary)(1955).
C. A., **50**, 5458c (1956).

Excite the spark according to the Feussner principle, use 35 kv. as peak voltage, and a capacitance of 14,000 microfarads, do not use a self-induction, but 100 main discharges/sec. The sample must have a plane surface of at least 20 × 20 mm.; if the sample weighs less than 500 g. one must provide for H_2O cooling. The counterelectrode is Cu-H_2 (i. e., H_2 is the protective gas used), the Cu has 5 mm. diam. with an equipotential front facet, is contained in a quartz cylinder of 20 mm. diam., with a 5 × 7 mm. opening. The H_2 flows with 10 ml./sec. The distance between the electrodes is 2.5 mm., one presparks 2 min., then exposes for 2 min., if the spectrograph is a Hilger E 478 of the Littrow type. The image of the light source is picked up in the collimator lens by a lens of f = 160 mm., in front of the slit, distance between light source and image-forming lens 180 mm. The slit width is 40 μ, the Kodak UV plate is used, which is developed after the fluorescent layer has been rinsed off with gasoline, in a Kodak-D-19 developer, at 18° for 4 min. One uses the line pairs, for calibration depending upon the anticipated % C: 0.30% C 2296.86 with Fe 2279.92; 0.15% C 2296.86–Fe 2308.77; 0.12% C 2296.86–Fe 2304.75. This method can be used for a C range of 0.01–1.5%, with an accuracy of ±3.5% at a C assay of 0.5%.

5424. TÖTTERMAN, H., JOHANSSON, M., AND SALO, S.
Flame Photometric Determination of Alkali in Lime Sludge.
Paperi ja Puu, **37**, 445–50 (in English) (1955).
C. A., **50**, 10607e (1956).

The flame photometric method was more rapid and as accurate as titrimetric and gravimetric methods in detg. the total and sol. alkali in lime sludge.

5425. TRICHÉ, H. AND ROCQUES, G.
Spectrographic Determination of Traces of Silver Entrained by Ferrous Hydroxide.
Bull. soc. chim. France, **1955**, 1507–9.
C. A., **50**, 3151a (1956).

The $Fe(OH)_2$ formed in an ammoniacal soln. of Ag carries along all the Ag of the soln. This Ag has been detd. by means of a high-dispersion Hilger quartz spectrograph with an intermittent arc with a.-c. and by means of a microphotometer. The Ag has been detd. to a concn. of 10^{-8} N with a precision of 3–5%. In addn. the method has been applied to the detn. of traces of Ag in brass.

5426. TVERYANKINA, R. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Grating Spectrographs DFS 2 and DFS 3.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 28–9 (1955).
C. A., **50**, 3886c (1956).

5427. VAĬNSHTEĬN, E. E., BOROVIK-ROMANOVA, T. F., AND KOROLEV, V. V.
Spectrum Analysis of Clays for Basic Components.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 194 (1955).
Zhur. Anal. Khim., **10**, 158–63.
J. Anal. Chem. U.S.S.R., **10**, 147–51 (Eng. trans.) (1955).
C. A., **49**, 15626g (1955).

As basic components of clays, Si, Al, Fe, Mg, and Ca are considered. The effect of extraneous elements was reduced to a min. by dilg. the samples with CuO and powd. C. Favorable results were obtained by using a mixt. of sample: Cu:powd. C 1:39:60. Under conditions of this study (d.-c. C arc, 10 amp., 250 v.) good results were obtained with an exposure of 60 sec. The spectrum lines used in this method were: Si 2514.3, Al 3082.2, Ca 4226.7 and 3179.3, Mg 2779.8 and 2802.7, and Fe 2599.6 Å. For comparison the lines Cu 4275.1, 3073.8, and 2441.6 Å. were used. The basic components were detd. in wide range of concns. No interference of one element with another was ob-

served. The reproducibility of results for Al_2O_3 was 1.4, for Fe_2O_3 2.5, for CaO 4.3, for SiO_2 4.5 and for MgO 5.8%. The av. deviation of the results from those of chem. analysis was 4–6%.

5428. VAN KOLMESCHATE, G. J.
Determination of Trace Metals in Organic Materials.
Compt. rend. 27e congr. intern. chim. ind. (Brussels), **1954**, 1
Industrie chim. belge, **20**, Spec. No., 222–4 (in French)(1955).
C. A., **50**, 9932b (1956).

A discussion of various methods of digesting material, concg., and detg. traces of metals in org. substances.

5429. VAN SOMEREN, E. H. S.
Contribution of Photography to Spectroscopy.
Science and Applications of Photography, Proc. R.P.S. Centenary Conf., London, **1953**, 457–62 (Pub. 1955).
C. A., **49**, 12997g (1955).

5430. VAN SOMEREN, E. H. S. AND LACHMAN, F.
Spectrochemical Abstracts, **1946–1951**. Hilger & Watts, London (1955). 179 pp.
C. A., **50**. 4651c (1956).

5431. VEĬTS, I. V., GURVICH, L. V., AND KOROBOV, V. V.
Transactions of the IXth All-Union Conference on Spectroscopy. Determination of the Dissociation Energy of Metal Oxides (SrO, CaO, and MgO) by Measuring the Intensity of Resonance Lines of Metal Atoms in Flame Spectra.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 21–2 (1955).
C. A., **50**, 3886a (1956).

The obtained energies, D_0, were $D_0(MgO) = 100.0 \pm 3.0$; $D_0(CaO) = 114.3 \pm 3.0$; $D_0(SrO) = 110.8 \pm 3.0$ cal./mol. The ground level in mols. of alk. earth oxides is $^1\Sigma$.

5432. VELICHKO, O. C.
Transactions of the IXth All-Union Conference on Spectroscopy. Methods of Spectral Analysis Used in the Combine "Severonickel."
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 156–8 (1955).
C. A., **50**, 3890a (1956).

Steeloscopic, steelometric, and spectrographic analyses of small quantities of Fe, Ni, S, Cr, and Zn are discussed.

5433. VENEMARK, E.
Flame Photometric Control Methods for Bleaching Processes.
Svensk Papperstidn., **58**, 78–85 (1955.)
C. A., **50**, 8205b (1956).

The uniformity after mixing of stock and chemicals, the manner in which the stock passes through a tower, and the performance of wash filters in detail can be studied by detn. of Na and Ca by flame photometry in micro samples, contg. about 0.02 mg. metal, added as bleaching agent or trace compd. Some examples are presented, and a few results discussed.

5434. VICTORIA DE LA PEÑA, M. AND CAMUÑAS, A.
Spectrochemical Determination of Boron at Minimum Concentrations.
Anales real soc. españ. fís. y quím. (Madrid), **51B**, 169–72 (1955).
C. A., **49**, 10116g (1955).

Aq. solns. of $Na_2B_4O_7$ contg. 11.3–0.11 γ/cc. of B can be detd. spectrographically with graphite electrode and a low-voltage arc. Solns. contg. 1.13–0.05 γ/cc. of B can be detd. by using Pt electrodes and a high-voltage spark. Since only two drops of soln. are required for a detn., as little as 0.003 γ of B can be measured. The amts. of B present as impurities in the electrodes det. the lower limit of sensitivity. The detn. is based in the ratio of intensities of the 2497.73 and 2496.78 Å. lines and is affected only slightly by the presence of large amts. (30 to 200 mg./cc.) of NaCl, KNO_3, K_2SO_4, $Ba(NO_3)_2$, HCl, H_2SO_4, or NH_4OH. The presence of these impurities has a large effect on the abs. intensities of the B lines.

5435. VODAR, B. AND ROMAND, J.
Recent Progress in the Study of the Far Ultraviolet.
Mikrochim. Acta, **1955**, 429–45.
C. A., **49**, 11487b (1955).

Considerable progress has been made in recent years in this field. Recent methods are described and their possible development discussed. These can find application in emission analysis and in the detn. of metalloids.

5436. VOĬNAR, O. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Applications of Emission Spectral Analysis in Biology and Medicine.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 153–4 (1955).
C. A., **50**, 3889h (1956).

The content in microelements depends on the age, the condition of the nervous system, etc. Introduction of Cu in eggs increases the growth of chicks; Li salts retard the growth. In anesthetized nervous cells Ti, Cu, and Ag decrease; Mn, Pb, Ni, Al, and Cr increase.

5437. VOROB'EV, A. L. AND BADALOV, S. T.
Some Data on the Zinc Silicates of the Montmorillonite Group.
Trudy Sredneaziat. Gosudarst. Univ. im. V. I. Lenina, Geol.-Nauki, **63**, No. 6, 23–6 (1955).
C. A., **51**, 6445e (1957).

It has recently been found that sauconite is present in large or small amts. in most polymetallic deposits in a complex of other zinc minerals of the oxidation zone. A chem. analysis of sauconite from Central Asia is given. A spectral analysis showed much (about 1%) Mg; several tenths of a per cent Ca and Fe; hundredths of a per cent Mn, and thousandths of per cents Ti, Ba, and Cu. A large Ag content was observed in some sauconites. (*See C. A.* for complete abstract.)

5438. VORSATZ, B.
Emission Spectroscopic Analysis of Impurities in Highly Purified Copper.
Magyar Tudományos Akad. Központi Fiz. Kutató Intézetének Közlemenyei, **3**, 12–21 (1955).
C. A., **52**, 16117a (1958).

The globule arc method was used to analyze the impurities in Cu samples. The emission spectra were compared with samples of known amts. of impurities in known amts. of Cu.

5439. VORSATZ, B. AND HALTENBERGER, S.
Determination of Tungsten in Titanium Metals with Emission Spectroscopy.
Magyar Tudományos Akad. Központi Fiz. Kutató Intézetének Közlemenyei, **3**, 5–11 (1955).
C. A., **52**, 16123h (1958).

The small impurities of W in Ti metals were detd. by emission spectroscopy by using standards of known Ti-W compn. A Qu-24 type Zeiss quartz spectrograph and "extra-hard blue" Agfa plates were used.

5440. VORSIN, A. N.
Transactions of the IXth All-Union Conference on Spectroscopy. Determination of Some Difficulty Excited Elements with the Help of a Square Pulse Generator.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 150 (1955).
C. A., **50**, 3889g (1956).

Quant. analysis was developed for Br, I, and S in concns. 0.1–1.0%.

5441. WAHR, J. C., MCCORMICK, W. W., AND SAWYER, R. A.
Emission Characteristics of Vacuum Spark Discharges. III. Aluminum and Carbon Spectra in the Visible Region.
J. Opt. Soc. Amer., **45**, 665–9 (1955).
C. A., **49**, 15468c (1955).
Cf. *C. A.*, **47**, 5244i.

The intensity of a no. of lines of Al I, Al II, Al III, C II, and C III, in the visible region, has been measured as a function of the peak current in a vacuum spark discharge at values of self-inductance ranging from 2.4 to 45 microhenrys. The spark was energized from a bank of condensers, with a total capacitance of 21.6 microfarads, charged to 5 different voltages from 5.3–20.5 kv. The line spectrum is accompanied by a continuum, which is most intense during the first oscillation of the spark current and then decays rapidly. At large currents most of the apparent line intensity during the first current cycle comes from the continuous background. At values of inductance above 2.4 microhenrys the intensity of the lines of Al I and C II increases about linearly with the peak current. However, at 2.4 microhenrys the intensity of the Al III lines is enhanced in the neighborhood of 32 kamp. At a particular current, the intensity is always larger at the larger inductances, but at const. voltage, the addn. of inductance does not in all cases reduce the intensity. The behavior of the C III lines is very irregular, particularly at the lower inductances, and the enhancement of the intensity at about 32 kamp., and at min. inductance, is very pronounced. Indeed, the C spectrum appears to be considerably more sensitive to the magnitude of the peak current than is the Al spectrum. The results for all the lines show a remarkable sensitivity to the direction of the current flow in the spark.

5442. WALSH, A.
The Application of Atomic Absorption Spectra to Chemical Analysis.
Spectrochim. Acta, **7**, 108–17 (1955).
C. A. **49**, 10792b (1955).

The theoretical factors governing the relation between atomic absorption and atomic concn. are examd. and the exptl. problems involved in recording atomic absorption spectra are discussed. It is shown that such spectra provide a promising method of chem. analysis with vital advantages over emission methods. It is also suggested that the absorption method offers the possibility of providing a simple means of isotopic analysis.

5443. WALSH, A.
Apparatus for Spectrochemical Analysis.
Australian, Patent, No. 163, 586, June 24, 1955; to Commonwealth Scientific and Industrial Research Organization.
C. A., **52**, 9686g (1958).

Two forms of app. are described in which an independent beam of radiation contg. a spectral line characteristic of the element whose concn. is to be detd. is passed through an at. radiation-emitting vapor of the material to be analyzed. The absorption effect is measured by eliminating or compensating for the radiation from the vapor.

5444. WARD, W. AND INNES, D. D.
Spectrographic Estimation of Iron, Titanium, and Antimony in Glass.
J. Soc. Glass Technol., **39**, 156–61T (1955).
C. A., **50**, 3721i (1956).

A method is described for the detn. of Fe_2O_3, TiO_2, and Sb_2O_3 in a semioptical glass. The ground sample is mixed with suitable internal standards and the cathode layer technique employed in the analysis. Results are given of 40 analyses carried out on the same

sample of glass. The method provides an accurate and rapid means of compn. control for the elements Fe, Ti, and Sb.

5445. WEBER, K. AND BROZ, I.
Spectral Analysis. III. Determination of the Spectral Sensitivity of Photographic Emulsions.
Kemija u Industriji (Zagreb), **4**, 165–74 (1955).
C. A., **50**, 5409i (1956).
Cf. *C. A.*, **42**, 7818g.

5446. WEDEPOHL, K. H.
Geochemistry of Lead.
Fortschr. Mineral., **33**, 145–6 (1955).
C. A., **49**, 14605g (1955).

Preliminary results from spectrographic analyses of more than 300 samples gave av. contents of Pb in p.p.m. basic eruptive rocks 9, acid eruptive rocks 25, clays and shales 20, sandstones 6, limestones 9. Pb mainly replaces K in feldspars, micas, and feldspathoids. Adularia had av. content of 300 p.p.m. Pb, orthoclase from pegmatites even more. Some indications point to the possible presence of quadrivalent Pb.

5447. WEISBERGER, S., PRISTERA, F., AND REESE, E. F.
Universal Spectrographic Method for the Analysis of Iron and Steel.
Appl. Spectroscopy, **9**, 19–22 (1955).
C. A., **49**, 8040g (1955).

A spectrographic method has been developed for the detn. of Si, Mn, Ni, Cr, Co, Mo, Ti, Nb, V, Al, Cu, Ag, Pb, and Sn in iron and steel. It can be applied to any sample of 0.01 g. or larger, irrespective of size, shape, or previous history. A sample, in the form of chips, drillings, or cuttings, is converted to oxide, then mixed with twice as much graphite, and excited in an a.-c. arc between specially purified graphite rods. The spectra are photographed through a step sector with a stigmatic grating, and the ds. of the analysis lines are measured relative to Fe lines serving as internal standards. Working curves were prepd. with certified standards or synthetic samples. The method is satisfactory for classifying or characterizing miscellaneous samples of iron and steel.

5448. WERNER, G. K., SMITH, D. D., OVENSHINE, S. J., RUDOLPH, O. B., AND MCNALLY, J. R., JR.
Further Investigations in the Spectroisotopic Assay Technique for Lithium.
J. Opt. Soc. Amer., **45**, 202–5 (1955).
C. A., **49**, 6025b (1955).

Preliminary studies utilizing photographic procedures for the spectrographic detn. of Li isotopes (*C. A.*, **46**, 7426b) were characterized by low precision and time consuming steps in the photographic and densitometric processes. Photoelec. direct measurement of the intensity ratio at 6707 A. for Li^6 and Li^7 is made by exciting a sample in a hollow cathode, dispersing the spectra with a concave grating ruled 30,000 lines per inch, and detecting the isotopic lines with 2 selected photomultiplier tubes. Improvements in the hollow cathode permit sample changing at rates comparable with changing electrodes in conventional spectrochem. arc stands. The photoelec. method reduces the time for analysis and improves the precision.

5449. WESTERHOFF, H.
The Flame-Photometric Determination of Lime in Foodstuff and Soils.
Landwirtsch. Forsch., **7**, 128–30 (1955).
C. A., **49**, 8514h (1955).

Ash 2.5 g. substance and wash into a 100-ml. flask, add 10 ml. 25% HCl, and heat. Cool, fill up to the mark, and pipet 10 ml. of the soln. into a 100-ml flask, dil. with H_2O to about 70 ml., add 2 ml. $(NH_4)_2HPO_4$ soln., and heat. To the hot soln. add 4 ml. NH_4 acetate soln., boil, and filter through a fluted filter, and spray in the flame photometer. Of 41 foodstuff samples 54% showed an error below 5% compared with the CaO detn. by $(NH_4)_2C_2O_4$.

5450. WHISMAN, M. AND ECCLESTON, B. H.
Flame Spectra of Twenty Metals with a Recording Flame Spectrophotometer.
Anal. Chem., **27**, 1861–9 (1955).
C. A., **50**, 9210e (1956).

Twenty-seven metals are qualitatively identified and quantitatively detd. in Diesel fuels with a recording flame spectrophotometer. A Beckman Model DU instrument with flame attachment and photomultiplier tube and with a modification of the King and Priestley (Cf. *C. A.* **47**, 7264e) electronic circuit for automatic recording was used. Modifications of the previously described circuit are given in detail with block diagram and electronic circuit. The Diesel fuel sample is dry ashed and dissolved in a few ml. of aq. soln. Only 10 ml. of soln. are required for a complete scan. Aq. solns. contg. 100 p.p.m. of the 28 metals (20 as chlorides, the others as nitrates, sulfates, and acetates) were scanned over the range from 700 to 275 mμ, with a slit width 0.05 mm. Spectra of the persistent peaks of 20 of these elements, with the heights recorded in mv., are given. All lines and bands found for the 27 elements in order of increasing wavelength are tabulated. Solns. contg. 10 p.p.m. of metal with a 0.10 mm. slit were also tested but found unsatisfactory because of higher and more irregular background. The intensities of the principal lines for each element were measured with both the rapid scanning and a manual technique, and a base-line correction. Wavelengths of these lines, the observed peak heights, and detection limits in p.p.m. are given in addnl. tables. Explicit instructions for making background corrections are given.

A relation between concn. and intensity for the principal lines of 20 of the metals is given in a figure which shows, that for several elements, such a relation is linear, for others there is a decrease in intensity as the concn. is increased up to 100 p.p.m., while still others show an opposite tendency of increase sensitivity with increased concn. Attempts to incorporate Li or Sr as an internal standard were abandoned as unsatisfactory and the method was standardized by burning an aq. standard soln. of Sr 2 or 3 times each day. The peak at 460.7 mμ was maintained const. by cleaning the burner or varying the high-voltage adjustment in the electronic circuit. With this control analyses of the standard solns. were duplicated over a period of several weeks with an av. deviation from the known value of ±2%. Spectrograms of a crude oil, a thermally cracked distillate fuel and the same fuel with added Co, Mn, Zn, and Pb 2-ethylhexanates are also given. Several samples of 2-ethylhexanoates and naphthenates in hydrocarbon solvents were also analyzed after an acid digestion with H_2SO_4 and HNO_3 an soln. of the residue from this digestion with distd. H_2O. A similar procedure was used for semiquant. analysis of metals in some distillate fuels and crude oils. For these analyses equal weights of sample and H_2SO_4 were charred in a Vycor beaker and ashing was completed in a muffle furnace. The final ash was dissolved in distd. H_2O.

5451. WHITE, C. S., LOCKYEAR, W. H., AND SMITH, L. L.
Quantitative Emission Spectroscopy as a Means of Analyzing Respiratory Gases.
J. Aviation Med., **26**, 104–16 (1955).
C. A., **49**, 13833f (1955).

The emission spectra of dry N, O, and CO_2 were detd. at 2000–5000 Å. at a tube pressure of 1000 μ and at 2000–5000 Å. at 200 μ with a Beckman DI spectrophotometer with slit widths of 0.01 and 0.05 mm., resp. The light source was a quartz, gas-discharge tube sealed between 2 Al electrodes. At a discharge tube pressure of 1000 μ, CO_2 gave very low emission, and O none. At 200 μ, 0 gave a no. of weak peaks, and the emission of CO_2 was greatly increased. In 8 spectral regions, 5640, 5580, 5180, 4820, 2880, 2820, 2658, and 2000–2200 Å., the emission phenomena were such that detn. of CO_2 might be possible. The 4810–4840 Å. region was explored, and emission at 4815 Å. had the best potential for the CO_2 analysis. The results indicated that the N-O ratio must be kept fairly const. if the results are to be reliable. It is suggested that an instrument with better resolution is needed to increase the value of the method.

5452. WILKINSON, P. G.
Provisional Wave Length Standards in the Vacuum Ultra-violet.
J. Opt. Soc. Amer., **45**, 862–7 (1955).
C. A., **50**, 56d (1956).

The wavelengths of 245 at. emission lines, mainly C, N, and O, and commonly occurring as impurities in conventional light sources, have been measured from 875 Å. to 1940 Å. in the first order of a 21-ft. vacuum grating spectrograph with a dispersion of 1.3 Å./mm. Cu II, Fe I, and Fe II lines, whose wave lengths can be calcd. accurately by the combination principle, were used as standards. The present work expands the no. of previously known vacuum ultraviolet provisonal standards and places them on a consistent wavelength scale with an av. internal error of ±0.003 Å. and an abs. error of less than ±0.005 Å.

5453. WILKINSON, P. G. AND TANAKA, Y.
New Xenon-Light Source for the Vacuum Ultraviolet.
J. Opt. Soc. Amer., **45**, 344–9 (1955).
C. A., **49**, 7984h (1955).

A new vacuum ultra-violet-light source is described which emits a strong continuous emission spectrum from 1500 Å. to 2250 Å. This source is constructed of Pyrex, is charged with Xe, and carries a fluorite window which allows the tube to be completely sealed off from the vacuum system. Microwave energy at a frequency of 2450 Mc./sec. is used to excite the emission. Mol. Xe is presumably responsible for the continuum, and the main transition is probably $^3\Sigma_u^+ \rightarrow {}^1\Sigma_g^+$ with some contribution from $^1\Sigma_u^+ \rightarrow {}^1\Sigma_g^+$. The source has been used to photograph the Schumann-Runge absorption bands of O in the 1st order of a 21-ft. vacuum grating spectrograph.

5454. WILL, E. G. AND SCHWARZKOPF, B.
Flame-Spectrophotometric Determination of Calcium in Potable Water Supplies.
J. Am. Water Works Assoc., **47**, 253–6 (1955).
C. A., **49**, 7782e (1955).

A flame-spectrophotometric method is described, which makes possible the easy detn. of small quantities of Ca. Only the addition of H_2SO_4 is required.

5455. WINKLER, G.
Quantometric Analysis of Light Metals.
Mikrochim. Acta, **1955**, 610–13.
C. A., **49**, 11488i (1955).

Sparking conditions, av. deviation of the results, quantometer calibration, and prepn. of calibration samples are described as used in the daily operation of a large Al plant.

5456. WORK, P. L. AND JULIARD, A. L.
Rapid Spectrographic Analysis of Organic Compounds for Metallic Elements by Catalytic Ashing.
Am. Chem. Soc., Div. Petroleum Chem.,

General Papers, No. **33**, 307–14 (1955).
C. A., **50**, 10385a (1956).

In order to det. trace elements in petroleum products, ashing is carried out by adding the sample to an alumina catalyst, heating the mixt. until the sample is destroyed, and heating 2 hr. at 600°. After addn. of Co oxide in graphite powder as internal standard, the residue is analyzed with an Applied Research Laboratory 1.5-mm. spectrograph. Results are given for the analysis of Ba, Ca, Fe, and Pb.

5457. WURZIGER, J.
Flame Photometric Determination and the Potassium and Sodium Content in Wine.
Deut. Lebensm.-Rundschau, **51**, 124–30 (1955).
C. A., **49**, 11235f (1955).

K and Na in wine were detd. with a flame-photometer with propane gas for heating. The wine was dild. with distd. H_2O in a ratio of 1:10. The figures obtained for K and Na agreed satisfactorily with those obtained by gravimetric detns. The K and Na content of 155 wines is listed. The data, given as percentage of the ash, average 41% for K and 2.86% for Na. Based on these tests, a max. of 8% Na and a min. of 25% K can be expected.

5458. YAKOVLEVA, A. V., GROMOVA, I. I., AND PROTAS, I. R.
Transactions of the IXth All-Union Conference on Spectroscopy. A Fluorite Vacuum Spectrograph, Photographic Material for It, and Some Investigations.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 84–6 (1955).
C. A., **50**, 3887h (1956).

A new list of 11 lines is given for a discharge spectrum of Mo in A in the interval 1735.10–69.60 Å. A new photographic emulsion of high sensitivity was developed contg. large amts. of AgCl and little gelatin.

5459. YAMAZAKI, K., IIDA, C., AND YOKOI, H.
A Spectrographic Determination of the Distribution of Trace Elements in a Granodiorite and Its Weathering Products.
J. Earth Sci. Nagoya Univ., **3**, 58–64 (in English) (1955).
C. A., **49**, 12231c (1955).

Chem. analyses and spectrographic detns. of Ba, Ce, Co, Cr, La, Ni, Pr, Sr, V, and Zr are given for a 2-mica granodiorite and its weathering products at depths 150–200, 120–150, 60–120, 30–60, 10–30, and 0–10 cm. During the weathering SiO_2, CaO, alkalies, Ba, Sr, and rare earths decrease; Al_2O_3, H_2O, Cr, and V increase; Fe_2O_3, Ni, and Zr showed a max. and FeO a min. concn. in the 30–120-cm. zone. The Co content remained const.

5460. YANAGI, M. AND KAWAKUBO, S.
Chemical Durability of Glass Studied by Flame Photometry.
J. Ceram. Assoc. Japan, **63**, 6–10 (1955).
C. A., **49**, 9241f (1955).

Comparative studies of the chem. durabilities of bottle, borosilicate, and window glasses as well as the optical glasses such as flint, borosilicate, and fluorocrown glasses were carried out. The amt. of alkali leached out by water was detd. by 2 methods, titration with acid and flame photometry. For some glasses contg. appreciable amts. of F or Pb the above 2 methods led to the different values. The durability of fluorocrown glass detd. by the first method gave lower value than the second one. The difference between two values was found to be equal to the amt. of F ion found in the soln., if all values were expressed in gram equivs.

5461. YANAGI, M. AND KAWAKUBO, S.
Studies on the Durabilities of Glasses Containing Lithium, Sodium, Potassium, Calcium, and Barium by Means of Flame Photometry.
Yogyo Kyokaishi, **63**, 722–7 (1955).
C. A., **51**, 9112a (1957).

Amts. of alkali and alk. earth metals leached out of the soda-lime-silica type glass specimens by boiling water were detd. by flame photometry, and the sum of their values was compared with the data obtained by usual acid treatment method. Values obtained by both methods agreed well for glass contg. only silica as acidic component. Introduction of alumina into the glass of above mentioned suppressed markedly the migration of alk. earth ions into water, while this suppressing effect is less remarkable for alkali metals.

5462. YASUI, E. AND SUZUKI, H.
Spectrochemical Determination of Trace Impurities in Salt, Brine, and Caustic Soda.
J. Chem. Soc. Japan, Ind. Chem. Sect., **58**, 170–4 (1955).
C. A., **49**, 13822i (1955).

The spectroscopic analysis of Si, Fe, Al, Ca, Mn, and Cu contained in $0.1-10^{-5}$ wt. % in com. NaCl, salt brine, and com. NaOH was detd. by comparing the intensity of lines of each element with the standard lines of Cr or Mo; the sample soln. was dild. to 0.5 *M* NaOH and 3.5 *M* NaCl, added with the addn. compds. to increase the concn. by known amts., and the content of each element was obtained by the use of calibration curves expressing the relation of spectroscopic intensity with the content. A reproducibility of ±10% is claimed. Similarly, Ca and Mg were analyzed with better accuracy (±2–6%).

5463. YOKOSUKA, S., TANAKA, M., AND MORIKAWA, H.
Simultaneous Determination of Calcium and Magnesium by Flame Spectrophotometry.
Japan Analyst, **4**, 437–40 (1955).
C. A., **50**, 16542a (1956).

Simultaneous detn. of Ca and Mg in siliceous material was investigated with a Beckman Model DU flame spectrophotometer. Emission line and slit width were chosen for Ca 554 mμ and 0.15 mm., and for Mg 371 mμ and 0.5 mm., under the const. pressure of H_2 at 3 lb./sq. in., and of O_2 at 15 lb./sq. in. Although the emission of Ca was not interfered with by Mg, Mg was interfered with by the presence of Ca, and as degree of interference was proportional to the concn. of Ca, the amt. of Ca which was previously detd. by using the 554-mμ line was taken into account to correct the emission of Mg at 371 mμ. Other elements interfere seriously. Max. limit of estn. of CaO and MgO was 500 and 1000 p.p.m., resp.

5464. YOSHINAGA, H., MINAMI, S., AND FUJITA, S.
Inhomogeneity of Samples in Spectrochemical Analysis.
Technol. Repts. Osaka Univ., **5**, 251–60 (1955).
C. A., **51**, 10296f (1957).

Quant. analyses are performed with the quantometer to det. the inhomogeneity of Fe and Si in Al, Mg in nodular cast iron, Ti in cast steel, and Mn, Si, Ni, and C in steel bars. Spectrochem. values which indicate the concns. at local positions in the sample are not necessarily in complete agreement with ordinary chem. analysis which shows av. values. Metals and alloys which appear homogeneous under the optical microscope often contain inhomogeneous spots which are detected with quantometric analysis. The percentage of Fe in cast Al samples near microscopic blow holes varies considerably from one spot to another. The deviation of Si in such areas is much smaller. Ti in cast-steel samples is not uniformly distributed. Though the analysis of Mg in nodular cast iron is difficult, in spectrochem. analysis accurate results are easily obtained with the soln. method. The method with pin samples is also used, and the range of inhomogeneity of Mg in a typical cast-iron sample is estd. at 0.081% ± 0.002%, a result in agreement with metallographic aspects of the material. In a steel bar the Mn concn. ranged from 0.7 to 1.2% (chem. analysis 0.78); forging greatly reduced the inhomogeneity. Si in steel ranged 0.13–0.18% (chem. analysis 0.20); forging also improved the homogeneity of Si. There was little inhomogeneity of Ni and C in the steel.

5465. ZAĬDEL, A. N., PROKOF'EV, V. K., AND RAISKIĬ, S. M.
Tables of Spectrum Lines.
VEB Verlag Technik, Berlin (1955).

The tables, designed especially for use in analytical spectroscopy are in three parts, I. Table of spectrum lines arranged in order of wavelength, II. Tables of spectrum lines arranged in order of elements, and III. Auxiliary tables. In part II excitation potentials are given for many of the lines, in addition to intensities. The auxiliary tables in Part III include ionization potentials; molecular weights, melting and boiling points of the elements and their oxides; sensitive lines of the elements in order of wavelengths and by elements; lines in the ultraviolet range 1800–2000 Å.; spectrum lines of iron, molecular hydrogen, and deuterium. In this international edition, introductions and other text sections are in German, English, and French (*see also Ref.* **4224**).

5466. ZAĬDMAN, N. AND ORECHKIN, D.
Flame Photometric Determination of Sodium and Other Alkali Elements in Wash Waters and in Contact Catalysts.
Novosti Neftyanoĭ Tekh., Neftepererabotka, **1955**, No. 5, 25–30.
C. A., **51**, 5625d (1957).

Na and K, if present together, are detd. in the form of sulfates in a photometer contg. a Ag_2S photoelec. cell. Calibration curves are needed. Na is detd. in concns. of 0.005–5% Na_2O to within 0.0001% by using the lines at 5890 and 5896 Å.; $FeCl_3$, $CrCl_3$, and $CuCl_2$ interfere, giving slightly high results. Na detn. results on Al_2O_3 by this method are more accurate (higher) than by wet analysis. K in concns. as low as 0.001% with the lines at 7664 and 7699 Å., Li, Ca, etc., can be detd. similarly.

5467. ZHIGALOVSKAYA, T. N.
Transactions of the IXth All-Union Conference on Spectroscopy. The Absolute Sensitivity of Determination of Rare Earth Elements.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 115 (1955).
C. A., **50**, 3888e (1956).

The limit for Ce, Pr, and Nd was found to be 10^{-3}% if NH_4NO_3 (50%) and AgCl (5%) were added to the sample.

5468. ZIL'BERSHTEĬN, K. I.
Transactions of the IXth All-Union Conference on Spectroscopy. Some Problems of the Spectral Analysis of Solutions.
Izvest Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 197–9 (1955).
C. A., **50**, 3891b (1956).

The intensities of the spectra of Zn, Be, Si, Bi, Mn, and La were investigated as functions of the location of the dry powder in the C electrode of an a.-c. arc. Introduction of

Na in the discharge increases the intensity by decrease of the temp. of the arc. The following sensitivities were obtained Be 8×10^{-11} g.; Zn 4×10^{-8} g.; Sb 5×10^{-8} g.; Cr, La, and Co 5×10^{-9} g.; Ag 4×10^{-10} g.; Zn and Pd 1×10^{-8} g. material on the electrode.

5469. ZIL'BERSHTEĬN, K. I.
Methods for the Spectral Analysis of Solutions.
Zhur. Tekh. Fiz., **25**, 1491–1507 (1955).
C. A., **50**, 721i (1956).

Methods for the spectral analysis of solns. are discussed from the standpoint of the prepn. of the sample for analysis and the effect of the temp. of the arc upon the sensitivity of the analysis. The best form for the sample was found to be a layer of the solid residue (after evapn.) on a C electrode. The method described is not significantly affected by small amts. of impurities as shown by a comparison of literature data with exptl. data.

5470. ZIL'BERSHTEĬN, K. I. AND MAKAROV, L. P.
Prevention of Porosity Effects in Carbon Electrodes Used in Spectral Analysis of Solutions.
Zavodskaya Lab., **21**, 342–4 (1955).
C. A., **50**, 12695f (1956).

Carbon electrodes were satd. with kerosine, paraffin (at 100°), collodion soln., and soln. of polystyrene in benzene. On top of each electrode was then placed 0.08 ml. of a Cs soln. (1.4×10^{-3}) g. Cs/ml.). Three types of solns. were used: neutral, contg. 10 vol. % HNO_3, and 5 vol. % H_2SO_4 (the working concns. used for analytical testing by the spark method). After drying, X-ray photographs of each electrode revealed that neutral solns. in unprotected electrodes had deep and uneven penetration; in the instance of protected electrodes the penetration was completely absent. HNO_3 solns. did not pass through pores of collodion and polystyrene-treated electrodes; other protective agents had only a partial effect. H_2SO_4 solns. slightly penetrated into every electrode, with polystyrenes-satd. C giving the best results. In practical applications polystyrene satd. electrodes gave good wettability with aq. solns., provided even burning, and thus improved analytical precision.

5471. ZOLOTUKHIN, G. E.
Transactions of the IXth All-Union Conference on Spectroscopy. The Influence of the Chemical Composition of the Electrodes and the Conditions of the Discharge on the Relative Speed of Evaporation of Particles.
Izvest. Akad. Nauk S.S.S.R., Ser. Fiz., **19**, 67–70 (1955).
C. A., **50**, 3887c (1956).

Evapn. of electrodes of Pt and Pt-Ag contg. 0.1% Pd, Au, Rh, or Ru and electrodes of Cu and Cu-Au contg. Pt, Pd, Rh, Ir, or Ru was investigated as a function of discharge parameters. The heat-exchange conditions are calcd. and it is shown that the fractionated evapn. is small in an a.-c. arc with cooled electrodes.

5472. ZOTOV, G. AND FOWLER, C. A.
Spectrochemical Analysis of Plutonium.
Atomic Energy Can. Ltd., Chalk River Project, No. **298**, 30 pp. (1955).
C. A., **51**, 9406a (1957).

Impurities in Pu, that are produced by the bombardment of U, are measured spectrochemically. The sample material is dried on graphite electrodes in a dry box to prevent Pu contamination. Co is used as the internal standard element because it is absent in the Pu spectra. The substitute element is U since the most persistent U line in the spectra is very weak. The electrodes are sparked in a chamber filled with O at a pressure reduced to about 10 cm. of Hg below atm. This reduced pressure prevents contamination outside of the chamber if a leak should develop. The O atm. reduces the background owing to C and cyanogen. Techniques of prepn. of standards and samples, loading of electrodes, plate calibration, and internal standardization are described. The limits of detection are 0.03% by wt. for Al, B, Cr, Cu, Fe, Mg, Pb, Si; 0.02% for Ba, Be, Ca, Mg, Sr, Ti, and Zr; and 0.01% for Ni and Zn. The av. duplicate detns. are reproduced within 10% of their mean. The accuracy of the method for Fe falls within 30% of the accepted value. Illustrations are given of the equipment used and spectra obtained.