

# Sixty-sixth Annual Meeting Papers

*Symposium on*

## X-RAY AND ELECTRON PROBE ANALYSIS



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# SYMPOSIUM ON X-RAY AND ELECTRON PROBE ANALYSIS

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Presented at the  
Sixty-sixth Annual Meeting  
AMERICAN SOCIETY FOR TESTING AND MATERIALS  
Atlantic City, N. J., June 27, 1963



Reg. U. S. Pat. Off.

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## FOREWORD

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Under the general chairmanship of R. W. Smith, AC Spark Plug Division, General Motors Corp., and Vice-chairman of ASTM Committee E-2 on Emission Spectroscopy, a Symposium on X-ray and Electron Probe Analysis was held during the Sixty-sixth Annual Meeting of ASTM in Atlantic City, N. J., on June 27 and 28, 1963. The Symposium, sponsored jointly by Committees E-2 on Emission Spectroscopy and E-4 on Metallography, was planned to be of a tutorial and review nature, with invited papers selected from outstanding workers in the field to cover specific topics.

In a technology where new concepts and new applications are developed with astonishing regularity, the field of X-ray spectrography is one of the most prolific. Great strides have been made in the quantitative applications of X-ray fluorescence and a new technique—electron microprobe analysis—has been brought to a high degree of development. Ten years ago, in 1953, ASTM sponsored a symposium on the status of X-ray spectrographic analysis, subsequently published as *ASTM Special Technical Publication STP 157*, now out of print. Recognition of the great advances of the past ten years, particularly the advent of the electron microprobe as an analytical tool, prompted Committees E-2 and E-4 to join forces and arrange another comprehensive symposium on X-ray spectrographic analysis for the 1963 Annual Meeting.

The Symposium papers were selected and arranged so as to develop the subject in a logical sequence of topics. The introductory papers stress the fundamentals of the generation of X-ray spectra and compare the basic concepts and practices of the two techniques. Subsequent papers discuss X-ray optics and spectrometers, detectors, and associated electronic circuitry together with the statistics of X-ray measurement. This part of the program is concluded with a survey of a wide variety of current and future applications. The succeeding papers are devoted entirely to electron probe analysis. A paper on the special instrumentation required is followed by a discussion of the problems and practices involved in quantitative analysis and a comparison of electron probe and X-ray data. The Symposium concludes with papers stressing the value of the electron probe in such diverse fields as metallurgical, ceramic, and biological research and control.

The Symposium has been published as an ASTM Special Technical Publication to provide for maximum dissemination of the information presented. Whether the reader is a worker in this particular field or whether his interest is general, he should find useful information and insights on the variety of subjects covered under X-ray and electron probe analysis. Moreover, most of the papers provide adequate references so that further study on each topic is encouraged.

R. E. Michaelis and L. L. Wyman, both from the National Bureau of Standards, each presided over two of the four sessions.

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**NOTE.—**The Society is not responsible, as a body, for the statements  
and opinions advanced in this publication.

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## RELATED ASTM PUBLICATIONS

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Index to the Literature on Spectrochemical Analysis, STP 41 and supplements  
Standard Samples for Spectrographic Analysis, STP 58 and supplements  
Spectroscopic Light Sources, STP 76 (1947)  
Chemical Analysis of Inorganic Solids by Means of the Mass Spectrometer, STP 149 (1951)  
Fluorescent X-ray Spectrographic Analysis, STP 157 (1953)  
Spectrochemical Analysis for Trace Elements, STP 221 (1957)  
Spectroscopic Excitation, STP 259 (1959)  
Spectroscopy, STP 269 (1959)  
Index to the Literature on X-ray Spectrographic Analysis, Part 1, 1913–1957 (January, 1961)  
Extension of Sensitivity for Determining Various Constituents in Metals, STP 308 (1962)  
Advances in Electron Metallography and Electron Probe Microanalysis, STP 317 (1962)

THIS PUBLICATION is one of many issued by the American Society for Testing and Materials in connection with its work of promoting knowledge of the properties of materials and developing standard specifications and tests for materials. Much of the data result from the voluntary contributions of many of the country's leading technical authorities from industry, scientific agencies, and government.

Over the years the Society has published many technical symposiums, reports, and special books. These may consist of a series of technical papers, reports by the ASTM technical committees, or compilations of data developed in special Society groups with many organizations cooperating. A list of ASTM publications and information on the work of the Society will be furnished on request.



