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# MATERIALS AND ELECTRON DEVICE PROCESSING



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# MATERIALS AND ELECTRON DEVICE PROCESSING

A Symposium  
Presented at a  
NATIONAL TECHNICAL MEETING  
of the  
AMERICAN SOCIETY FOR TESTING AND MATERIALS  
Philadelphia, Pa.  
April 5-7, 1961



Reg. U.S. Pat Off.

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## FOREWORD

BY S. A. STANDING<sup>1</sup>

Committee F-1 is a group within the American Society for Testing Materials dealing with materials for electron tubes and semiconductor devices. Its 9 active subcommittees meet three times a year. The attendance at each of these meetings has averaged 250 members and guests.

The history of this committee actually goes back to the late 1930's, when in the infancy of the radio tube business it was a subcommittee of ASTM Committee B-4, then titled Electrical Heating and Resistance Alloys. With the rapid growth of the electron tube industry and the more extensive activities of the committee, it became apparent that the group should not remain a part of Committee B-4. Accordingly, in 1955 the Society established Committee F-1 with essentially its present organization. Since that time it has had approximately a three-fold growth in membership and guest attendance, and has been a most active group on the "electronic frontier." The subcommittee activities include active working groups on cathode materials, wire, strip, sealing materials, semiconductor materials, materials analysis, contaminants, and an active editorial group to handle the complexities of its methods of test and specification output.

About two years ago we became aware that the cleaning and chemical processing of materials, particularly within this industry, were becoming increasingly important. The conventional specifications and terminology, such as "degrease until clean" or "hydrogen fire until bright" were far too broad and outmoded for the industry's current and future needs. We are particularly grateful as a committee to Messrs. F. J. Biondi and D. E. Koontz for their orienting thoughts and activities which resulted in the formation of Subcommittee X on Control of Contaminants, of which Mr. Koontz, who is your program chairman for this symposium, is the leader.

Following the formal organization of the subcommittee, a very marked interest in all its task areas was obvious and gratifying, and it is substantially the outgrowth of this activity that brings forth this present symposium.

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<sup>1</sup> Raytheon Corp., Newton, Mass.; Chairman, Committee F-1 on Materials for Electron Tubes and Semiconductor Devices.

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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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## P R E F A C E

BY D. E. KOONTZ<sup>1</sup>

On October 13 and 14, 1958, a symposium on Cleaning Electron Device Components and Materials was held at the Franklin Institute in Philadelphia, Pa. The participation at that meeting, the demand for the publication (STP 246) which contained the symposium papers, and the growth and accelerated activities of Subcommittee X on Control of Contaminants of ASTM Committee F-1 prompted the committee to sponsor this second symposium on Materials and Electron Device Processing.

Many of the problems in the area of contamination control, materials evaluation, and selection which were first seen in the electronics industry are in reality quite common to a large segment of industry. It is generally recognized that the reliability, uniformity, and reproducibility of electron devices, electronic apparatus, optical and magnetic devices, and precision machinery are controlled in a large measure by minute traces of extraneous materials.

Therefore, the examination of materials and processing techniques for constructing devices in the virtual absence of trace contaminants is highly desirable and in many cases an economic necessity. In addition, it is becoming increasingly evident that the reliability and reproducibility of devices is often closely related to subtle variations in the composition of materials or processing history of component parts. Successful solution of many of these problems will require the development of new diagnostic tools and approaches to material controls that are not now commonly employed. Almost certainly, many of the techniques and procedures which are currently confined to the research laboratory will become more common for production and monitoring purposes.

Many of these newer research tools and concepts have originated outside the electronics industry. Therefore, it is mutually beneficial for representatives of various industries to cooperate as they have done in the regular activities of Subcommittee X, in the adaptation of techniques and principles to the solution of their individual problems. In this connection, it is anticipated that a third symposium on Cleaning and Materials Processing for Electronics and Space Apparatus will be held in conjunction with the Fourth Pacific Area National Meeting in Los Angeles, Calif., Sept. 30 to Oct. 5, 1962.

A large part of the activity of Subcommittee X on Control of Contaminants has been conducted on a cooperative basis and cannot properly be reported as original work or by a single author. Therefore, appended to these proceedings is a statement on the scope and organization of Committee F-1,

<sup>1</sup> Bell Telephone Laboratories, Inc., Murray Hill, N. J.; Chairman of Subcommittee X on Control of Contaminants, ASTM Committee F-1 on Materials for Electron Tubes and Semiconductor Devices; Chairman of Symposium Committee.

together with a brief résumé of the past activities of the four major sections of Subcommittee X, with the names of the principal participants (see p. 279).

Members of the Symposium Committee presided at the six sessions as follows:

- Session 1. Air-Borne Contaminants, N. L. Hobbs, Wyeth Laboratories,
- Session 2. Analytical Methods and Instrumentation, F. Van Luik, General Electric Co.,
- Session 3. Processing Apparatus and Techniques, H. A. Stern, Radio Corp. of America,
- Session 4. Materials and Processing Techniques, J. Lineweaver, Corning Glass Co.,
- Session 5. Gaseous Contaminants, V. C. Smith, Barnstead Still and Sterilizer Co., and
- Session 6. Influence of Cleaning on Device Performance, D. E. Koontz, Bell Telephone Laboratories.

On behalf of Committee F-1 and the Symposium Committee, I wish to thank the authors, the Session Chairmen, the ASTM Headquarters Staff, and the Officers of the ASTM Philadelphia District for the fine job which they did in making this meeting a success and for preparing these proceedings.

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