from numerous investigations on the phenomenon of LME are presented, and possible mechanisms and prerequisites for its occurrence are discussed. The influence of metallurgical, physical, and mechanical parameters on LME are reviewed in terms of the various mechanisms. An extensive summary and bibliography on LME of metals and alloys during soldering or industrial processing are also presented.

Chapter 10 by Hawthorne provides an in-depth review of irradiation embrittlement of common structural steels for service temperatures below 400°C. Irradiation embrittlement of ferritic steels, and the environmental and metallurgical variables which influence the irradiation response of alloys are described. Mechanical-property data and correlations for estimating radiation effects during reactor service are presented. Recent efforts to develop radiation-resistant structural steels and methods for restoring mechanical properties of irradiated materials are detailed.

The last chapter by Solomon describes metallurgical processes that result in weld defects or cracks: hot cracking of weld metal, reheat or stress-relief cracking of heat-affected zones (HAZ), weld sensitization, and cold or hydrogen cracking. A detailed discussion of solute distribution during solidification and its effect on weld structure identifies the factors that influence hot cracking. The influence of alloy composition, trace impurities, and welding conditions on susceptibility to weld defects is described in great detail.

This volume offers comprehensive coverage of topics involved in materials degradation. The scope and relevance of these subjects will provide impetus and guidance to materials scientists, engineers, and designers. The well-illustrated volume with its extensive background information, bibliography, and detailed discussions could serve as a source book for students and researchers in materials science. It should be a valuable addition to reference libraries.

Reviewer: Omesh K. Chopra is a metallurgist in the Materials Science and Technology Division of Argonne National Laboratory.

Materials for Microlithography
Edited by L.F. Thompson, C.G. Willson, and J.M.J. Frechet

(*Volume 266 of ACS Symposium Series, American Chemical Society, 1984*)

This volume is a collection of papers given in a symposium at the American Chemical Society's Annual Meeting in St. Louis, MO in April 1984.

Conference proceedings often convey a rather fragmented picture of their field. This volume achieves unusual consistency due partly to three excellent introductory chapters by Everhart (Limits of Lithography), by Broers (Fundamentals), and by Bowden (Resist Materials). The other papers fall into two groups: the first concerns the fundamental radiation chemistry of electron beam, x-ray, or deep UV materials; the second deals directly with resist materials and their applications.

A brief perusal of the papers will show that coverage of the field of microlithographic materials is fairly comprehensive and that the volume title is justified.

Reviewer: Arnost Reiser is chairman of the Department of Imaging Sciences of the Polytechnic Institute of New York, Brooklyn, NY.

New Frontiers in Rare Earth Science and Applications, Volume I
Edited by G. Xu and J. Xiao

(*Science Press, Beijing and Academic Press, New York, 1985*)

New Frontiers in Rare Earth Science and Application contains the proceedings of the International Conference on Rare Earth Development and Applications held in Beijing, China, September 10-14, 1985. The editors, Drs. Xu and Xiao, are professors at Peking University and Beijing University of Iron and Steel Technology, respectively. Volume I includes approximately 170 extended abstracts of invited and contributed papers by several internationally recognized authorities on the rare earths and by numerous workers from the People's Republic of China.

In addition to plenary lectures, the volume includes a mixture of reports on theoretical, experimental, and applied topics. The People's Republic reportedly has the world's largest reserves of rare earths, and the rapid expansion of interest in rare earth technology suggests that the development of this resource is being actively pursued. Surprisingly large sections are devoted to geochemistry, extraction, and analytical chemistry. Approximately one fourth of the papers are related to bio-inorganic and organometallic chemistry, but only ten papers were presented on the chemistry and physics of solids. Sections on quantum chemistry and spectroscopy, catalysis, and environmental chemistry are also included.

Volume II was not available for review, but abstracts on important topics such as luminescence, hydrogen storage, and magnetism are included in the table of contents. Lengthy sections on applications in steels, alloys, and ceramics also appear in the second volume along with a series of reports on the effects of rare earths in crop production, nitrogen fixation, and other agricultural applications. The abstracts generally provide enough information to be of technical value, but they are probably most useful as a guide to current directions of rare earth research, particularly in the People's Republic of China.

Reviewer: J.M. Haschke, a member of the research staff at Rockwell International, has been interested in the solid-state chemistry of rare earth and actinide compounds throughout his career.

Glass IV
Edited by M. Tomozawa and R.H. Doremus

(*Volume 26 of Treatise on Materials Science and Technology, Academic Press, 1985*)

Glass IV is the most recent volume in a series that began with the publication of *Glass I* in 1977. This volume contains five chapters in different areas in glass, science, and technology.

In the first chapter, J.M. Aitken (IBM Corporation) and E.A. Irene (University of North Carolina) review the use of SiO_2 films in semiconductor devices. The aim of the review, according to the authors, is to give materials scientists working outside the electronics industry some insight into the role of glass films in modern microelectronic devices. They describe the preparation method of the films, physicochemical characterization of the films, and electrical properties of the films.

In the second chapter, G.G. Wicks summarizes the progress in the program on the solidification of nuclear waste in glass. He starts his description with waste disposal strategy and then explains the vitrification process and waste-glass performance.

The third chapter, written by R.E. Loehman, covers almost every field of the science of oxynitride glasses, which attracts much interest because of their mechanical properties. This chapter consists of seven sections: introduction, glass synthesis, compositional system, properties, crystallization, structure, and applications.

Heavy-metal fluoride glasses, good candidates for an optical material that accesses the mid-IR region, are described in the fourth chapter by M.G. Drexhage (Rome Air Development Center). Beginning with the history of fluoride glasses, he covers almost all areas in the science of these glasses.

The final chapter on viscoelastic analysis of stresses in composites was written by G.W. Scherer (Corning Glass Works) and S.M. Rekhson (General Electric Company). This chapter explains and quantifies the influence of relaxation phenomena on the stresses in composites such as seals. The description includes numerical formulae for the analysis and then the comparison with measured results and calculated stress followed for different geometric shapes of the composites.

continued

This series on glass successfully summarizes research over the past decade and serves as an introduction to the glass science and technology over this period. These volumes can be recommended to all levels of glass scientists from graduate students to industrial laboratory scientists.

Reviewer: Itaru Yasui is an associate professor at the Center for Advanced Materials, Institute of Industrial Science, University of Tokyo. He received his Dr. Eng. degree from the University of Tokyo in 1973.

Advanced Ceramic Materials: Technological and Economic Assessment

(Noyes Publications, 1985)

This book is based on findings of previous reports prepared by the Charles River Associates (*Technological Assessment of Advanced Ceramic Materials*, August 1984), the Office of Industry Assessment (*A Competitive Assessment of the U.S. Advanced Ceramics Industry*, March 1984), and the Committee on the Status of High Technology Ceramics in Japan (*High Technology Ceramics in Japan*, 1984).

The first cited report uses, as case studies, the topics of heat engine applications, capacitors, integrated optic devices, toxic and combustible gas sensors, and cutting tools. For each of these case studies, the book completely covers the technological status of its application, including current technological barriers or future areas of research with anticipated technological and economic benefits. The section on high technology ceramics in Japan gives an insight into the management of research and development programs through a system which includes the participation of business, government, universities, and national laboratories. This section also lists mutually beneficial areas of cooperation between Japan and the United States.

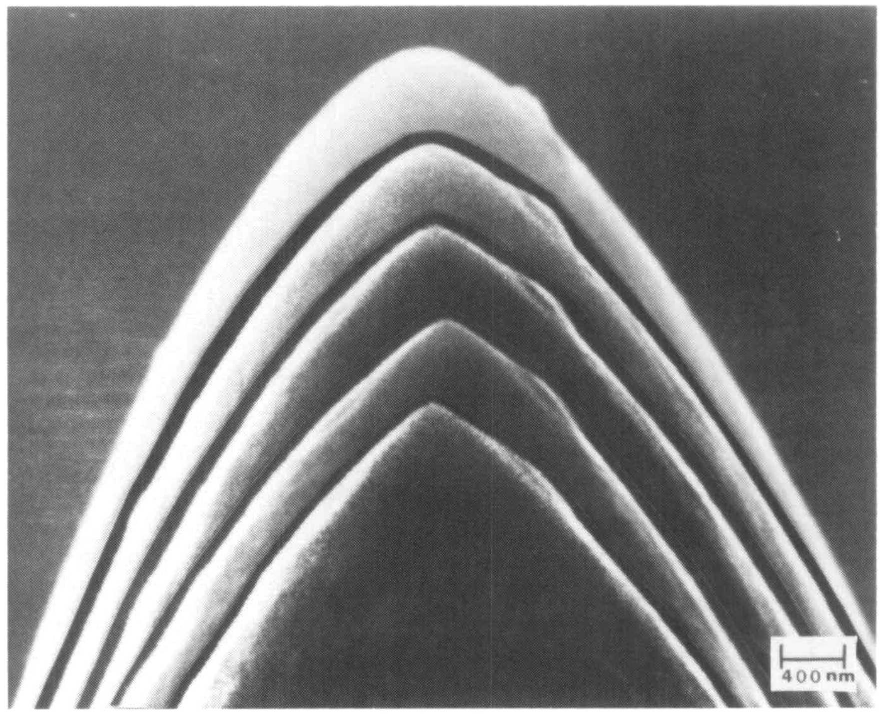
The technical considerations in this book are discussed at an elementary level and, presumably, were not intended for specialists in the given area. However, the general approach adopted by this book provides a broad and valuable overview of the current status of and future trends in advanced ceramic materials. The information is of interest to scientists, engineers, policymakers, and entrepreneurs.

Reviewer: Z.A. Munir is a professor in the Division of Materials Science and Engineering and associate dean for graduate studies, College of Engineering, University of California-Davis.

MRS

EDITOR'S CHOICE

Figures appearing in the EDITOR'S CHOICE are those arising from materials research which strike the editor's fancy as being aesthetically appealing and eye-catching. No further criteria are applied and none should be assumed. Submissions of candidate figures are welcome and should include a complete source citation, a photocopy of the report in which it appears (or will appear), and a reproduction-quality original drawing or photograph of the figure in question.



The EDITOR'S CHOICE for this issue of the BULLETIN comes from the work of J. A. Kubby and B. M. Siegel who studied the evolution of sputter-eroded surfaces for application to the formation of field-ion emitting tips. This figure is from their paper in *Journal of Vacuum Science and Technology* (B4(1) Jan/Feb 1986, p. 120-125). It shows the successive stages of erosion of a tungsten single crystal wire subjected to ion milling at room temperature by 4 keV argon ions collimated along the axis of the wire which is also its <100> crystallographic axis. The original parabolic profile at the top first loses its radius of curvature at the apex and then the apex angle continues to decrease. The incremental argon fluence between SEM examinations was 5.6×10^{18} Ar/cm^2 delivered in 15 minutes. For the sake of exposition and comparison with a model for the erosion process, the authors chose to overlay five separate SEM micrographs, giving the impression of nested arches reminiscent of those seen in the architecture of cathedrals or in the harbor view of the Sydney Opera House.

ERRATA

In "Damage Mechanisms in Optical Materials for High-Power, Short-Wavelength Laser Systems" (May/June issue, page 46) "104 photons per surface site" should read "10^4 photons per surface site."