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Characterization of the Structure and Chemistry of Defects in Materials

Editors: Bennett C. Larson, Manfred Rühle and David N. Seidman

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MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS VOLUME 138

Characterization of the Structure and Chemistry of Defects in Materials

Symposium held November 28-December 3, 1988, Boston, Massachusetts, U.S.A.

EDITORS:

Bennett C. Larson

Oak Ridge National Laboratory, Oak Ridge, Tennessee, U.S.A.

Manfred Rühle

University of California, Santa Barbara, California, U.S.A.

David N. Seidman

Northwestern University, Evanston, Illinois, U.S.A.



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Preface

The third MRS Symposium focussing on defects in materials provided a lively forum for the discussion of investigative techniques and the physical phenomena associated with electronic and structural defects in condensed matter. The symposium featured both contributed and invited papers presented in oral and poster sessions, including an atomic level imaging session held jointly with a related symposium on High Resolution Electron Microscopy. This book contains 89 of the 101 papers presented in this symposium, representing contributions from 12 countries in addition to Canada and the United States.

Substantial progress is being made in understanding the structure of displacement cascades in irradiated materials and in quantifying their influence on phase transformations and phase stability in materials subjected to radiation fields. Diffraction as well as field-ion and conventional microscope measurements are providing direct information on the internal structure and thermal evolution of displacement cascades; thus making it possible to carry out direct comparisons of cascade observations and phase stability of alloys under particle irradiation conditions with numerical cascade simulations and theoretical formulations.

Impressive progress continues to be made in the investigation of natural and synthesized interfaces and grain boundaries in materials. Chemically sensitive scanning transmission electron microscopy (STEM) with atomic resolution was demonstrated in semiconductors and high T_c superconductors, as was chemical sensitive scanning tunneling microscopy (STM) of metallic overlayers on semiconductors. Combined with continued progress on conventional high resolution electron microscopy (HREM) and x-ray diffraction investigations, the structure and physical phenomena associated with grain boundaries, interfaces, and thin films are being probed with ever increasing detail and precision in semiconductors, metals, insulators, superconductors, heterostructures, and other synthetic layered materials.

The thrust of symposia such as these is to highlight the development of new investigative techniques as well as to promote discussion of underlying physical phenomena. This association serves to stimulate the application of new techniques in characterizing and more fully analyzing the structure and microstructure of materials. In turn, this information and understanding provides an opportunity for application and controlled use of specific microstructural effects to achieve desired results for technological applications.

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