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Diffusion Mechanisms in Crystalline Materials

Editors: Yuri Mishin, Gero Vogl, Nicholas Cowern, Richard Catlow and Diana Farkas

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Diffusion Mechanisms in Crystalline Materials

Symposium held April 13–16, 1998, San Francisco, California, U.S.A.

EDITORS:

Yuri Mishin

*Virginia Polytechnic Institute
Blacksburg, Virginia, U.S.A.*

Gero Vogl

*University of Vienna
Vienna, Austria*

Nicholas Cowern

*Philips Research Laboratories
Eindhoven, The Netherlands*

Richard Catlow

*Royal Institution of Great Britain
London, United Kingdom*

Diana Farkas

*Virginia Polytechnic Institute
Blacksburg, Virginia, U.S.A.*



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PREFACE

This volume contains the proceedings of the symposium, "Diffusion Mechanisms in Crystalline Materials," held April 13-16, as part of the 1998 MRS Spring Meeting in San Francisco. The symposium consisted of 10 sessions, including two poster sessions and a joint oral session with the symposium on "Silicon Front-End Technology: Materials Processing and Modeling." The program included 18 invited talks, 43 contributed oral presentations and 45 posters. The symposium was well attended and had a strong international participation.

Solid-state diffusion often controls the evolution of the structure and properties of engineering materials, during both processing and the working lifetime of the engineered product. Diffusion characteristics are critical for the manufacturing and operation of an enormous range of advanced products, from microelectronic devices to gas turbine blades. Although a large volume of diffusion data has been accumulated over the years, many fundamental issues remain unresolved.

The symposium focused on experimental and simulation techniques that provide access to *atomic-scale mechanisms* of diffusion in different classes of crystalline materials. Recent achievements in the understanding of *microscopic* mechanisms of diffusion were reviewed and future research directions were discussed. More importantly, the symposium promoted an exchange of ideas between the communities of diffusion scientists working with metals and metallic alloys, intermetallic compounds, semiconductors, ceramics and ionic materials. This symposium was the first diffusion forum of its type, and we hope that it has had a substantial impact on the current understanding of microscopic aspects of diffusion in materials.

The choice of the Materials Research Society (MRS) as the host of this symposium was based on two considerations. First, MRS meetings provide the most appropriate multidisciplinary forum for discussing common fundamental ideas (diffusion mechanisms, in our case) across a broad spectrum of different classes of materials. Second, this symposium was deliberately organized to attract the attention of scientists and funding agencies in the United States to this vitally important area of materials research. MRS meetings, attended by the core of the materials community, seemed to provide the best opportunity to reach this goal. We are particularly grateful to the international community, including many leading diffusion scientists from overseas (Germany, France, Great Britain and Japan), for their contributions to the symposium. Their talks and discussions served to demonstrate the most recent advances in diffusion science and its impact on modern materials technology.

We are pleased to acknowledge the financial support of Avant! Corporation (TCAD business unit) and Virginia Polytechnic Institute. We are grateful to the officers and staff of the Materials Research Society for their guidance, help and support in organizing this symposium and preparing these proceedings.

Yuri Mishin
Gero Vogl
Nicholas Cowern
Richard Catlow
Diana Farkas

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