

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:

Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

**Phase Transformations
and Systems Driven
Far From Equilibrium**

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:

Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

**MATERIALS RESEARCH SOCIETY
SYMPOSIUM PROCEEDINGS VOLUME 481**

Phase Transformations and Systems Driven Far From Equilibrium

Symposium held December 1–5, 1997, Boston, Massachusetts, U.S.A.

EDITORS:

En (Evan) Ma

*Louisiana State University
Baton Rouge, Louisiana, U.S.A.*

Now at:

*The Johns Hopkins University
Baltimore, Maryland, U.S.A.*

Michael Atzmon

*University of Michigan
Ann Arbor, Michigan, U.S.A.*

Pascal Bellon

*University of Illinois at Urbana-Champaign
Urbana, Illinois, U.S.A.*

Rohit Trivedi

*Ames Laboratory, U.S. Department of Energy
and
Iowa State University
Ames, Iowa, U.S.A.*



Materials Research Society

Warrendale, Pennsylvania

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town,
Singapore, São Paulo, Delhi, Mexico City

Cambridge University Press

32 Avenue of the Americas, New York NY 10013-2473, USA

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9781107413399

Materials Research Society

506 Keystone Drive, Warrendale, PA 15086

<http://www.mrs.org>

© Materials Research Society 1998

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

This publication has been registered with Copyright Clearance Center, Inc.
For further information please contact the Copyright Clearance Center,
Salem, Massachusetts.

First published 1998

First paperback edition 2013

Single article reprints from this publication are available through
University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, MI 48106

CODEN: MRSPDH

ISBN 978-1-107-41339-9 Paperback

Cambridge University Press has no responsibility for the persistence or
accuracy of URLs for external or third-party internet websites referred to in
this publication, and does not guarantee that any content on such websites is,
or will remain, accurate or appropriate.

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

CONTENTS

Preface xv

Materials Research Society Symposium Proceedings xvi

PART I: SOLIDIFICATION THEORY AND EXPERIMENTS

***A Calorimetric Evaluation of the Role of Impurities in the
Nucleation of Secondary Phases in 1xxx Al Alloys 3**
C.M. Allen, K.A.Q. O'Reilly, P.V. Evans, and B. Cantor

Grain Refinement in Undercooled Metals 15
J.Z. Xiao, H. Yang, and H.W. Kui

**Subcritical Bifurcation From Planar to Cellular Interface in
Al-0.5 wt.% Cu Directionally Solidified 21**
O. Fornaro, H. Palacio, and H. Biloni

**Transitory Metastable Phases in Refractory Metals-Based
Systems Solidified by Drop-Tube Processing: A
First-Principles Approach 27**
A. Pasturel and B. Vinet

Melting vs. Solidification of a Pure Metal Analysed by DSC 33
*N. Clavaguera, M.T. Clavaguera-Mora, J. Fontán, J. L. Tournon,
and C. Comas*

**Mechanisms of Layer Structure Formation in Peritectic
Alloys 39**
P. Mazumder, R. Trivedi, and A. Karma

Microstructure of Ni₂B Laser-Induced Surface-Alloyed α -Fe 45
G. Dehm, C. Scheu, and M. Bamberger

**Interface Morphological Stability of Unidirectionally
Solidified RE123 Superconductor 51**
M. Sumida, Y. Shiohara, and T. Umeda

**Effects of Finite Rate Phase Transformation Kinetics on the
Steady-State Solidification Front Propagation Speed in
Undercooled Pure Liquids 59**
J.A. Norris and D.R. Kassoy

**Superdendrites in Directional Solidification of
Polymer-Solvent Mixtures 65**
Rolf Ragnarsson, Brian Utter, and Eberhard Bodenschatz

*Invited Paper

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

Eutectic Growth in Unidirectionally Solidified Fe-Cr-Ni Alloy 71
Toshimitsu Okane and Takateru Umeda

The Solidification Microstructure of Al-Cu-Si Alloys Metal-Matrix Composites 77
O. Garbellini, H. Palacio, and H. Biloni

Growth of Single-Crystal YIG Fibers by the Laser Heated Pedestal Growth Method 83
HanJin Lim, R.C. DeMattei, and R.S. Feigelson

Formation of a Metastable bcc Solid Solution and Decomposition to a C15 Laves Phase in Melt-Spun CrNb₁₀Ti₁₀ 89
Katherine C. Chen, Paul G. Kotula, Fuming Chu, and Dan J. Thoma

PART II: NUCLEATION

Derivation of the Kinetics of Phase Transformations With Nucleation and Growth Mechanism 97
G. Yu, S.T. Lee, and J.K.L. Lai

Time-Dependent Nucleation in Partitioning Systems 107
K.F. Kelton and K. Lakshmi Narayan

Nucleation Modes in Sharp Concentration Gradients 113
F. Hodaj, A.M. Gusak, A.O. Kovalchuk, and P.J. Desre

Particle Nucleation in Dissipative Systems 119
K.C. Russell and J.C.F. Rangel

Phase Separation: From the Initial Nucleation Stage to the Final Ostwald Ripening Regime 125
Celeste Sagui, Dean Stinson O’Gorman, and Martin Grant

Domain-Spatial Correlation Function of Spherulitic Domain Evolution in Polymer Films 131
Tao Huang, Tomohiro Tsuji, M.R. Kamal, and A.D. Rey

Time-Dependent Nucleation in a Bulk Metallic Glass-Forming Alloy 137
T.K. Croat and K.F. Kelton

Correlation Functions for Nanostructures Obtained by Nucleation and Growth Kinetics 143
D. Crespo and V. Garrido

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

**PART III: SOLID-STATE TRANSFORMATIONS
AND MICROSTRUCTURAL EVOLUTION**

Kinetic Lattice Monte Carlo Simulations of Diffusion and Decomposition Kinetics in Fe-Cu Alloys: Embedded-Atom and Nearest-Neighbor Potentials	151
<i>B.D. Wirth and G.R. Odette</i>	
A Possible Mechanism for Atomic Transport in Amorphous Metals	157
<i>Leon D. van Ee, Barend J. Thijsse, and Jilt Sietsma</i>	
Computer Simulations of the Chessboardlike Microstructure Formation in Decomposing Alloys	163
<i>Y. Le Bouar and A.G. Khachaturyan</i>	
Evolution of γ' Precipitation Kinetics and Morphology in a Ni-13.36 at.% Al Alloy Aged Under Compression	169
<i>S.V. Prikhodko, R.T. Nielsen, and A.J. Ardell</i>	
Approximations for Vibrational Thermodynamics of Disordered Alloys: Effective Supercells and the Quasiharmonic Method	175
<i>Didier de Fontaine, Jeffrey Althoff, Dane Morgan, Mark Asta, Stephen Foiles, Andrew Quong, Duane Johnson</i>	
Energetics of Stable and Metastable Low-Temperature Iron Oxides and Oxyhydroxides	183
<i>Ch. Laberty and A. Navrotsky</i>	
Vacancy Properties in 5d BCC Transition Metals: <i>Ab Initio</i> Study at Finite Electron Temperature	189
<i>Alessandra Satta, F. Williams, and Stefano de Gironcoli</i>	
Evolution of γ' Precipitate in IN-713C for Long Aging Treatments	195
<i>A. Ges, O. Fornaro, and H. Palacio</i>	
Computer Investigations on Phase Decomposition in Real Alloy Systems Based on a Discrete-Type Phase Field Method	201
<i>Toru Miyazaki, Toshiyuki Koyama, and Takao Kozakai</i>	
Competition Between SRO and LRO in CuAu₃	207
<i>M. Kompatscher, H. Lang, W. Püschl, and W. Pfeiler</i>	
Refinement of Size Distributions for Primary Crystallizations	213
<i>E. Pineda, T. Pradell, D. Crespo, N. Clavaguera, J. Zhu, and M.T. Clavaguera-Mora</i>	
Coarsening of B2 Ordered Domains by Monte Carlo Simulations	219
<i>D. Le Floc'h, M. Athènes, and P. Bellon</i>	

The L1₂ to DO₁₉ Phase Transformation in the Intermetallic Compound Fe₃Ge 225
Q.Z. Chen, A.H.W. Ngan, and B.J. Duggan

AC Field-Induced Polarization Disordering in the Ferroelectric Phase of Modified PZT Ceramics 231
Q. Tan and D. Viehland

Effects of Hafnium, Heat Treatment, and Cycling Under Applied Stress on the Transformations of Cold Worked NiTi-Based Shape-Memory Alloys 237
Chen Zhang, Ralph H. Zee, Paul E. Thoma, and John J. Boehm

Shape Evolution and Splitting of a Single Coherent Particle 243
J.D. Zhang, D.Y. Li, and L.Q. Chen

Effect of Phase Transformations on Hardness of Semiconductors 249
B.A. Galanov, O.N. Grigor'ev and Y.G. Gogotsi

Three-Dimensional Simulations of Phase Separation in Model Binary Alloy Systems with Elasticity 255
D. Orlikowski, C. Sagui, A.S. Somoza, and C. Roland

Stress-Driven Collective Nucleation of Dislocation Loops 261
Y.Q. Sun, P.M. Hazzledine, and D.M. Dimiduk

Reentrance and Multistriped Phases in the Blume-Emery-Griffiths Model With Biased Diffusion 267
Geetha Seshaiyar and Susan R. McKay

Production and Study of Ca/Sn(II) Metastable Fluoride Ion Conductors 273
Michael F. Bell, Georges Dénès, and Zhimeng Zhu

Mobility of Ag Atoms in the Binary System Ag₂Se-Ag₂S: A Molecular-Dynamics Study 279
A. Smith, R. Ravelo, and N. Pingitore

Orientational Order Phase Transition in Solid C₆₀ 285
J.R. Soto, R.M. Valladares, and A. Calles

Diffusion Via Native Defects, and the Appropriate Choice of Independent Thermodynamic Variables in Both Quasi-Equilibrium and Nonequilibrium Experimental Designs 291
R.M. Cohen

Kinetics of Ordering in Cu₃Au 297
H. Lang and W. Pfeiler

Electric-Field Effects on Reactions Between Oxides 303
Matthew T. Johnson, Shelley R. Gilliss, and C. Barry Carter

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

Nucleation and Growth of Precipitates in Transformations Driven by Diffusion	309
<i>N. Clavaguera and M.T. Clavaguera-Mora</i>	
Crystallography of Hydride Formation in Zr-Nb Alloys	315
<i>D. Srivastava, G.K. Dey, S. Banerjee, and S. Ranganathan</i>	
Ordered Omega Derivatives in (Zr₃Al)-Nb Alloys	321
<i>R. Tewari, G.K. Dey, P. Mukhopadhyay, S. Banerjee, and L.A. Bendersky</i>	
Precipitation Kinetics in an Air-Cooled Aluminum Alloy: A Comparison of Scanning and Isothermal Calorimetry Measurement Methods	327
<i>George W. Smith</i>	
Effects of Aging and Thermal Cycling Treatments on the Damping Capacity of Cu-Mn Alloys	333
<i>T.S. Chung, J.H. Jun, and Y.K. Lee</i>	
Underpotential-Overpotential Phase Transformation Phenomena in Copper Deposition Processes on Glassy Carbon	339
<i>T.A. Arzhanova</i>	
Iron Precipitation and Dissolution in Float-Zone Silicon	345
<i>Deepak A. Ramappa and Worth B. Henley</i>	
Characterization of Composite Ceramic High Level Waste Forms	351
<i>S.M. Frank, K.J. Bateman, T. DiSanto, S.G. Johnson, T.L. Moschetti, M.H. Noy, and T.P. O'Holleran</i>	

PART IV: BEAM-INDUCED TRANSFORMATIONS

*Strained Ion Tracks in Amorphous Solids: Origin of Plastic Deformation	359
<i>H. Trinkaus and H.R. Schober</i>	
Disordering in the Ni-Al System Under Low-Dose Ion Irradiation: A Computer Simulation Study	371
<i>A. Almazouzi, M. Alurralde, M. Spaczer, and M. Victoria</i>	
Phase Formation in Zr/Fe Multilayers During Kr Ion Irradiation	377
<i>A.T. Motta, A. Paesano, Jr., R.C. Birtcher, E.A. Ryan, M.E. Bruckmann, S.R. Teixeira, and L. Amaral</i>	
Role of Interstitial and Interstitial-Impurity Interaction on Irradiation-Induced Segregation in Austenitic Steels	383
<i>M. Nastar, P. Bellon, G. Martin, and J. Ruste</i>	

*Invited Paper

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

Onionlike Nanoscale Structures and Fullerene-Type
Cages Formed by Electron Irradiation of Turbostratic
 B_xC_{1-x} ($x < 0.2$) 389
D. Golberg, Y. Bando, K. Kurashima, and T. Sasaki

From Semiconductor to Metal in a Flash: Observing
Ultrafast Laser-Induced Phase Transformations 395
J.P. Callan, A.M.T. Kim, L. Huang, E.N. Glezer, and E. Mazur

Phase Transitions During Ion-Beam Irradiation of the
Perovskite-Structure Oxides 401
A. Meldrum, L.A. Boatner, and R.C. Ewing

Phase Transformation and Ion-Beam-Induced
Crystallization in SiC Layers Formed by MEVVA
Implantation of Carbon Into Silicon 407
Dihu Chen, S.P. Wong, L.C. Ho, H. Yan, and R.W.M. Kwok

Radiation Damage of a Glass-Bonded Zeolite Waste Form
Using Ion Irradiation 413
B.G. Storey and T.R. Allen

Response of Zircon to Electron and Ne^+ Irradiation 419
R. Devanathan, W.J. Weber, and L.A. Boatner

PART V: AMORPHOUS SOLIDS

Investigation of Phase Formation During Cold Rolling of
Elemental Zr-Al-Ni-Cu Foils With Bulk Glass-Forming
Composition 427
A. Sagel, H. Sieber, H.J. Fecht, and J.H. Perepezko

Amorphization of Zr-Al Under Mechanical Alloying at
Different Temperatures: A Reentrant Melting Phenomenon 433
H.W. Sheng, K. Lu, and E. Ma

Nonequilibrium Formation of Silicon Nitride During Both
Ball Milling and Ion Bombardment 439
*Z.L. Li, J.S. Williams, D.J. Llewellyn, J. Wong-Leung, M. Giersig,
and D.J. Chivers*

Changes in Mass Density and Sound Velocity of
Amorphous $Pd_{80}Si_{20}$ by Low-Temperature Ion Irradiation 445
*G. Schumacher, R.C. Birtcher, D.P. Renush, M. Grimsditch,
and L.E. Rehn*

Diffusion-Governed-Asymmetric Growth of Amorphous
Layer Under Solid-State Reaction in Ni-Zr Multilayers 451
B.X. Liu and W.S. Lai

Crystallization of Amorphous Ribbon in NiTi-Cu Shape-
Memory Alloy 459
F. Yang, J.L. Ma, Z.J. Pu, and K.H. Wu

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

Recrystallization of Si-, As-, and BF₂-Implanted, Bonded SOI 465
M. Tamura and M. Horiuchi

**Amorphous to Crystalline Phase Transformation in
Metglas® Studied by Mössbauer Spectroscopy 471**
*V. Marquina, R. Gómez, S. Aburto, M. Jiménez, R. Ridaura,
M.L. Marquina, and R. Valenzuela*

Surface-Energy-Driven Crystallization of Amorphous Pd₈₁Si₁₉ 477
Gerhard Schumacher and Rajeshwar P. Wahi

**Densification and Crystallization Kinetics of Cordierite
Glass-Ceramic Coatings on Rigid Substrates 483**
Jesus Noel Calata, Sihua Wen, and Guo-Quan Lu

Influence of Mo on the Epitaxial Crystallization of Silicon 489
S. Thoma, J.K.N. Lindner, and B. Stritzker

**Magnetic Softening and Hardening in Metglas® 2605SC at
the Onset of Nanocrystallization 495**
*S. Aburto, M. Jiménez, V. Marquina, R. Gómez, M.L. Marquina,
R. Ridaura, and R. Valenzuela*

**Temperature Dependence and Annealing Effects of
Absorption Edges for Selenium Quantum Dots Formed by
Ion Implantation in Silica Glass 501**
*A. Ueda, M. Wu, R. Mu, Y-S. Tung, D.O. Henderson, A. Meldrum,
R.A. Zuhr, J.D. Budai, C.W. White, J.C. Keay, and L.C. Feldman*

PART VI: INTERFACIAL AND THIN-FILM TRANSFORMATIONS

***Initial Phase Formation During Interdiffusion 509**
*J.H. Perepezko, J.S. Park, K. Landry, H. Sieber, M.H. da Silva Bassani,
and A.S. Edelstein*

**Atomic-Scale Study of Precipitate/Matrix Interfaces in a
Metallic Alloy 521**
I. Rozdilsky, A. Cerezo, G.D.W. Smith, and A. Watson

Interface Diffusion in Polysynthetically-Twinned TiAl 527
*D.E. Luzzi, D. Imamura, H. Inui, E.P. George, L. Heatherly, H. Yasuda,
H. Mori, and M. Yamaguchi*

**Metastable Phase Formation and Microstructural Evolution
During Self-Propagating Reactions in Al/Ni and Al/Monel
Multilayers 533**
D. Van Heerden, A.J. Gavens, S. Jayaraman, and T.P. Weihs

**In Situ TEM Phase Formation in Cold-Rolled
Aluminum-Nickel Multilayers 539**
H. Sieber and J.H. Perepezko

*Invited Paper

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

Structural Stability Diagrams for Thin-Film Multilayers 545
S.A. Dregia, R. Banerjee, and H.L. Fraser

Interfacial Reaction in Aluminum/Carbon Multilayer Thin Films 551
K. Landry, H. Sieber, M. Sui, and J.H. Perepezko

***In Situ* UHV TEM Investigations of the Initial Oxidation Stage of Copper Thin Films** 557
J.C. Yang, M. Yeadon, B. Kolasa, and J.M. Gibson

Modeling Self-Propagating Exothermic Reactions in Multilayer Systems 563
S. Jayaraman, A.B. Mann, O.M. Knio, D. Van Heerden, G. Bao, and T.P. Weihs

The Selective Synthesis of Molybdenum Silicides From Modulated Elemental Reactants 569
Christopher D. Johnson and David C. Johnson

Formation of Metallic Systems Far From Equilibrium by Pulsed Laser Deposition 575
Hans-Ulrich Krebs, Marco Hamp, Sebastian Fähler, Michael Störmer, Kai Sturm, and Martin Weisheit

The Formation of Cu₃Si From Cu/a-Si Multilayers 581
R.R. Chromik, W.K. Neils, and E.J. Cotts

Thermal Drag of the Antiphase Domain-Boundary Motion 587
A. Umantsev

Structure, Morphology, and Kinetics of the C49 to C54 Phase Transformation in TiSi₂ Thin Films 593
S. Bocelli, F. Marabelli, M. Iannuzzi, L. Miglio, M.G. Grimaldi, and F. LaVia

The Cubic to Hexagonal Phase Transition in Spray Deposited Tin-Doped Indium Oxide Films 599
A. Malik, R. Nunes, and R. Martins

Pseudo-C11b Phase Formation of Titanium Disilicide During the C49 to C54 Transition 605
Patrick L. Smith, Bill Brennan, Richard Ortega, and Taner Yildirim

PART VII: NANOPHASES AND MECHANICAL ALLOYING

Phase Transformation as a Function of Particle Size in Nanocrystalline Zirconia 613
Tomas Chraska, Alexander H. King, Christopher C. Berndt, and J. Karthikeyan

Phase Stability in the Nanocrystalline TiO₂ System 619
Hengzhong Zhang and Jillian F. Banfield

Cambridge University Press
978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium
Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi
Frontmatter
[More information](#)

**Oxidation Dynamics of Nanophase Aluminum Clusters:
A Molecular-Dynamics Study 625**
*Shuji Ogata, Timothy J. Campbell, Kenji Tsuruta, Akihiro Nakano,
Rajiv K. Kalia, Priya Vashishta, and Chun-K. Loong*

Point Defects and the B2 to fcc Transformation in Milled FeRh 631
Luke S-J. Peng and Gary S. Collins

**Low-Temperature Mechanical Alloying of Cu-Fe and
Cu-Ta Powders 637**
J.-H. He and E. Ma

**Microstructure Evolution in Al-Ag Alloys Under Severe
Plastic Deformation 643**
F. Haider and H. Voss

**Phase Evolution During Ball Milling of Al in NH₃ and
Subsequent Annealing 649**
J.I. Nikolov, J.S. Williams, D.J. Llewellyn, and A. Calka

**Metastable Phase Formation in Mechanically Alloyed
Sm-Co-Fe 655**
P.A.I. Smith, J. Ding, P.G. McCormick, and R. Street

**Molecular-Dynamics Calculations of Melting and
Fragmentation of Ar and Ag Clusters 661**
A.M. Mazzone

**Phases Driven Far From Equilibrium by Applying
Mechanical Energy: Phase Transformations to γ -PbSnF₄
Upon Ball Milling 667**
Georges Dénès, Delphine Le Roux, and M. Cecilia Madamba

Phase Transitions in Lead(II) Fluoride Upon Milling 673
Georges Dénès and M. Cecilia Madamba

Author Index 679

Subject Index 683

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

Preface

This volume compiles invited and contributed papers that were presented at Symposium B of the 1997 MRS Fall Meeting, 'Phase Transformations and Systems Driven Far From Equilibrium,' which was held December 1-5, in Boston, Massachusetts. While this symposium followed the tradition of previous MRS symposia on the fundamental topic of phase transformations, this year the emphasis was on materials systems driven far from equilibrium. The large number of papers submitted to the symposium and the large audiences attending the sessions are clear indicators of the consistent interest in, and the central importance of, phase transformations in materials science. The central theme of the majority of the work presented is the understanding of the thermodynamics and kinetics of phase transformations, with significant coverage of metastable materials and externally forced transformations driven, for example, by energy beams or mechanical deformation.

The papers in this volume are topically arranged in seven sections: solidification theory and experiments; nucleation; solid state transformations and microstructural evolution; beam-induced transformations; amorphous solids; interfacial and thin film transformations; and nanophases and mechanical alloying. All papers published in this book were peer reviewed.

The organizers/editors wish to thank Energy Conversion Devices Inc. and Philips Electron Optics for financial support, and all participants and authors, invited speakers, session chairs, and referees, who worked with them to make this symposium and these proceedings possible.

En (Evan) Ma
Michael Atzmon
Pascal Bellon
Rohit Trivedi

April 1998

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS

- Volume 467— Amorphous and Microcrystalline Silicon Technology—1997, M. Hack, E.A. Schiff, S. Wagner, R. Schropp, I. Shimizu, 1997, ISBN: 1-55899-371-1
- Volume 468— Gallium Nitride and Related Materials II, C.R. Abernathy, H. Amano, J.C. Zolper, 1997, ISBN: 1-55899-372-X
- Volume 469— Defects and Diffusion in Silicon Processing, T. Diaz de la Rubia, S. Coffa, P.A. Stolk, C.S. Rafferty, 1997, ISBN: 1-55899-373-8
- Volume 470— Rapid Thermal and Integrated Processing VI, T.J. Riley, J.C. Gelpey, F. Roozeboom, S. Saito, 1998, ISBN: 1-55899-374-6
- Volume 471— Flat Panel Display Materials III, R.T. Fulks, G.N. Parsons, D.E. Slobodin, T.H. Yuzuriha, 1997, ISBN: 1-55899-375-4
- Volume 472— Polycrystalline Thin Films—Structure, Texture, Properties and Applications III, S.M. Yalisove, B.L. Adams, J.S. Im, Y. Zhu, F.R. Chen, 1997, ISBN: 1-55899-376-2
- Volume 473— Materials Reliability in Microelectronics VII, J.J. Clement, R.R. Keller, K.S. Krisch, J.E. Sanchez, Jr., Z. Suo, 1997, ISBN: 1-55899-377-0
- Volume 474— Epitaxial Oxide Thin Films III, D.G. Schlom, C.B. Eom, M.E. Hawley, C.M. Foster, J.S. Speck, 1997, ISBN: 1-55899-378-9
- Volume 475— Magnetic Ultrathin Films, Multilayers and Surfaces—1997, J.G. Tobin, D.D. Chambliss, D. Kubinski, K. Barnak, P. Dederichs, W.J.M. de Jonge, T. Katayama, A. Schuhl, 1997, ISBN: 1-55899-379-7
- Volume 476— Low-Dielectric Constant Materials III, C. Case, P. Kohl, T. Kikkawa, W.W. Lee, 1998, ISBN: 1-55899-380-0
- Volume 477— Science and Technology of Semiconductor Surface Preparation, G.S. Higashi, M. Hirose, S. Raghavan, S. Verhaverbeke, 1997, ISBN: 1-55899-381-9
- Volume 478— Thermoelectric Materials—New Directions and Approaches, T.M. Tritt, M.G. Kanatzidis, H.B. Lyon, Jr., G.D. Mahan, 1997, ISBN: 1-55899-382-7
- Volume 479— Materials for Optical Limiting II, R. Sutherland, R. Pachter, P. Hood, D. Hagan, K. Lewis, J. Perry, 1997, ISBN: 1-55899-383-5
- Volume 480— Specimen Preparation for Transmission Electron Microscopy of Materials IV, R.M. Anderson, S.D. Walck, 1997, ISBN: 1-55899-384-3
- Volume 481— Phase Transformation and Systems Driven Far From Equilibrium, E. Ma, P. Bellon, M. Atzmon, R. Trivedi, 1998, ISBN: 1-55899-386-X
- Volume 482— Nitride Semiconductors, F.A. Ponce, S.P. DenBaars, B.K. Meyer, S. Nakamura, S. Strite, 1998, ISBN: 1-55899-387-8
- Volume 483— Power Semiconductor Materials and Devices, S.J. Pearton, R.J. Shul, E. Wolfgang, F. Ren, S. Tenconi, 1998, ISBN: 1-55899-388-6
- Volume 484— Infrared Applications of Semiconductors II, S. Sivananthan, M.O. Manasreh, R.H. Miles, D.L. McDaniel, Jr., 1998, ISBN: 1-55899-389-4
- Volume 485— Thin-Film Structures for Photovoltaics, E.D. Jones, R. Noufi, B.L. Sopori, J. Kalejs, 1998, ISBN: 1-55899-390-8
- Volume 486— Materials and Devices for Silicon-Based Optoelectronics, J.E. Cunningham, S. Coffa, A. Polman, R. Soref, 1998, ISBN: 1-55899-391-6
- Volume 487— Semiconductors for Room-Temperature Radiation Detector Applications II, R.B. James, T.E. Schlesinger, P. Siffert, M. Cuzin, M. Squillante, W. Dusi, 1998, ISBN: 1-55899-392-4

Cambridge University Press

978-1-107-41339-9 - Materials Research Society Symposium Proceedings: Volume 481:
Phase Transformations and Systems Driven Far from Equilibrium

Editors: En (Evan) Ma, Michael Atzmon, Pascal Bellon and Rohit Trivedi

Frontmatter

[More information](#)

MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS

- Volume 488— Electrical, Optical, and Magnetic Properties of Organic Solid-State Materials IV, J.R. Reynolds, A. K-Y. Jen, L.R. Dalton, M.F. Rubner, L.Y. Chiang, 1998, ISBN: 1-55899-393-2
- Volume 489— Materials Science of the Cell, B. Mulder, V. Vogel, C. Schmidt, 1998, ISBN: 1-55899-394-0
- Volume 490— Semiconductor Process and Device Performance Modeling, J.S. Nelson, C.D. Wilson, S.T. Dunham, 1998, ISBN: 1-55899-395-9
- Volume 491— Tight-Binding Approach to Computational Materials Science, P.E.A. Turchi, A. Gonis, L. Colombo, 1998, ISBN: 1-55899-396-7
- Volume 492— Microscopic Simulation of Interfacial Phenomena in Solids and Liquids, S.R. Phillpot, P.D. Bristowe, D.G. Stroud, J.R. Smith, 1998, ISBN: 1-55899-397-5
- Volume 493— Ferroelectric Thin Films VI, R.E. Treece, R.E. Jones, S.B. Desu, C.M. Foster, I.K. Yoo, 1998, ISBN: 1-55899-398-3
- Volume 494— Science and Technology of Magnetic Oxides, M. Hundley, J. Nickel, R. Ramesh, Y. Tokura, 1998, ISBN: 1-55899-399-1
- Volume 495— Chemical Aspects of Electronic Ceramics Processing, P.N. Kumta, A.F. Hepp, D.N. Beach, J.J. Sullivan, B. Arkles, 1998, ISBN: 1-55899-400-9
- Volume 496— Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells, D.S. Ginley, D.H. Doughty, T. Takamura, Z. Zhang, B. Scrosati, 1998, ISBN: 1-55899-401-7
- Volume 497— Recent Advances in Catalytic Materials, N.M. Rodriguez, S.L. Soled, J. Hrbek, 1998, ISBN: 1-55899-402-5
- Volume 498— Covalently Bonded Disordered Thin-Film Materials, M.P. Siegal, J.E. Jaskie, W. Milne, D. McKenzie, 1998, ISBN: 1-55899-403-3
- Volume 499— High-Pressure Materials Research, R.M. Wentzocovitch, R.J. Hemley, W.J. Nellis, P.Y. Yu, 1998, ISBN: 1-55899-404-1
- Volume 500— Electrically Based Microstructural Characterization II, R.A. Gerhardt, M.A. Alim, S.R. Taylor, 1998, ISBN: 1-55899-405-X
- Volume 501— Surface-Controlled Nanoscale Materials for High-Added-Value Applications, K.E. Gonsalves, M-I. Baraton, J.X. Chen, J.A. Akkara, 1998, ISBN: 1-55899-406-8
- Volume 502— *In Situ* Process Diagnostics and Intelligent Materials Processing, P.A. Rosenthal, W.M. Duncan, J.A. Woollam, 1998, ISBN: 1-55899-407-6
- Volume 503— Nondestructive Characterization of Materials in Aging Systems, R.L. Crane, S.P. Shah, R. Gilmore, J.D. Achenbach, P.T. Khuri-Yakub, T.E. Matikas, 1998, ISBN: 1-55899-408-4
- Volume 504— Atomistic Mechanisms in Beam Synthesis and Irradiation of Materials, J.C. Barbour, S. Roorda, D. Ila, 1998, ISBN: 1-55899-409-2
- Volume 505— Thin-Films—Stresses and Mechanical Properties VII, R.C. Cammarata, E.P. Busso, M. Nastasi, W.C. Oliver, 1998, ISBN: 1-55899-410-6

Prior Materials Research Society Symposium Proceedings available by contacting Materials Research Society