

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

Doping Engineering for Front-End Processing

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

**MATERIALS RESEARCH SOCIETY
SYMPOSIUM PROCEEDINGS VOLUME 1070**

Doping Engineering for Front-End Processing

Symposium held March 25–27, 2008, San Francisco, California, U.S.A.

EDITORS:

B.J. Pawlak

NXP Semiconductors
Leuven, Belgium

M.L. Pelaz

University of Valladolid
Valladolid, Spain

M. Law

University of Florida
Gainesville, Florida, U.S.A.

K. Suguro

Toshiba Corporation
Yokohama, Japan



Materials Research Society
Warrendale, Pennsylvania

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

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/9781107408548

Materials Research Society

506 Keystone Drive, Warrendale, PA 15086

<http://www.mrs.org>

© Materials Research Society 2008

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 2008

First paperback edition 2012

Single article reprints from this publication are available through

University Microfilms Inc., 300 North Zeeb Road, Ann Arbor, MI 48106

CODEN: MRSPDH

ISBN 978-1-107-40854-8 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

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

CONTENTS

Preface	xi
Materials Research Society Symposium Proceedings	xii

ULTRA SHALLOW JUNCTIONS I

* Strengths and Limitations of the Vacancy Engineering Approach for the Control of Dopant Diffusion and Activation in Silicon	3
Alain Claverie, Fuccio Cristiano, Mathieu Gavelle, Fabrice Sév�rac, Fr�d�ric Cayrel, Daniel Alquier, Wilfried Lerch, Silke Paul, Leonard Rubin, Vito Raineri, Filippo Giannazzo, Herv� Jaouen, Ardechir Pakfar, Aomar Halimaoui, Claude Armand, Nikolay Cherkashim, and Olivier Marcelot	
* Modeling and Experiments of Dopant Diffusion and Defects for Laser Annealed Junctions and Advanced USJ	15
Taiji Noda, Wilfried Vandervorst, Susan Felch, Vijay Parihar, Christa Vrancken, and Thomas Y. Hoffmann	
* Surfaces and Interfaces for Controlled Defect Engineering	25
Edmund G. Seebauer	
Experimental Investigation of the Impact of Implanted Phosphorus Dose and Anneal on Dopant Diffusion and Activation in Germanium	35
Vincent Mazzocchi, St�phane Koffel, Cyrille Le Royer, Pascal Scheiblin, Jean-Paul Barnes, and Marco Hopstaken	
Micro-Uniformity During Laser Anneal: Metrology and Physics	41
W. Vandervorst, E. Rosseel, R. Lin, D.H. Petersen, T. Clarysse, J. Goossens, P.F. Nielsen, and K. Churton	
Scanning Spreading Resistance Microscopy for 3D-Carrier Profiling in FinFET-Based Structures	49
Jay Mody, Pierre Eyben, Wouter Polspoel, Malgorzata Jurczak, and Wilfried Vandervorst	
*Invited Paper	

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

- USJ Dopant Bleaching and Device Effects in Advanced
Microelectronic Plasma Enhanced Resist Strip Processing57**
Frank Wirbeleit, Volker Grimm, Christian Krüger,
Christoph Streck, Roger Sonnemans, and Ivan Berry

SHALLOW JUNCTION CONTACTING

- * Ion Implantation for Low-Resistive Source/Drain Contacts in
FinFET Devices67**
Mark J.H. van Dal, Ray Duffy, Bartek J. Pawlak, Nadine Collaert,
Malgorzata Jurczak, and Robert J.P. Lander
- Pt Segregation at the NiSi/Si Interface and a Relationship with
the Microstructure of NiSi 79**
Haruko Akutsu, Hiroshi Itokawa, Kazuhiko Nakamura,
Toshihiko Iinuma, Kyoichi Suguro, Hiroshi Uchida, and
Masanori Tada
- Investigation of Platinum Silicide Schottky Barrier Height
Modulation Using a Dopant Segregation Approach85**
Nicolas Breil, Aomar Halimaoui, Emmanuel Dubois,
Evelyne Lampin, Guilhem Larrieu, Ludovic Godet,
George Papasouliotis, and Thomas Skotnicki

POSTER SESSION

- A Comprehensive Atomistic Kinetic Monte Carlo Model for
Amorphization/Recrystallization and its Effects on Dopants93**
Nikolas Zographos and Ignacio Martin-Bragado
- Performance Characteristics of 65 nm PFETs Using
Molecular Implant Species for Source and Drain
Extensions99**
C.F. Tan, L.W. Teo, C-S. Yin, J.G. Lee, J. Liu, A. See,
M.S. Zhou, E. Quek, S. Chu, C. Hatem, N. Variam,
E. Arevalo, A. Gupta, and S. Mehta
- Phosphorus Diffusion and Activation in Silicon: Process
Simulation Based on Ab Initio Calculations 105**
Beat Sahli, Kilian Vollenweider, Nikolas Zographos,
Christoph Zechner, and Kunihiro Suzuki

*Invited Paper

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

Infrared Semiconductor Laser Annealing Used for Formation of Shallow Junction.....	111
Toshiyuki Sameshima, Yuta Mizutani, Naoki Sano, and Masao Naito	
Modeling of Sb Activation in Ultra-Shallow Junction Regions in Bulk and Strained Si.....	117
Yan Lai, Nicolas Cordero, and James C. Greer	
Study on the Effect of RTA Ambient to Shallow N+/P Junction Formation Using PH₃ Plasma Doping.....	123
Seung-woo Do, Byung-Ho Song, Ho Jung, Seong-Ho Kong, Jae-Geun Oh, Jin-Ku Lee, Min-Ae Ju, Seung-Joon Jeon, Ja-Chun Ku, and Yong-Hyun Lee	
Modeling of Effect of Stress on C Diffusion/Clustering in Si.....	129
Hsiu-Wu Guo, Chihak Ahn, and Scott T. Dunham	
Atomistic Simulations of Epitaxial Regrowth of As-Doped Silicon.....	135
Joo Chul Yoon and Scott Dunham	
<i>ULTRA SHALLOW JUNCTIONS II</i>	
* Source-Drain Engineering for Channel-Limited PMOS Device Performance: Advances in Understanding of Amorphization-Based Implant Techniques.....	143
Nick E. Covern	
Efficacy of Damage Annealing in Advanced Ultra-Shallow Junction Processing.....	155
Paul Timans, Yao Zhi Hu, Jeff Gelpy, Steve McCoy, Wilfried Lerch, Silke Paul, Detlef Bolze, and Hamid Kheyrandish	
Optimization of Flash Annealing Parameters to Achieve Ultra-Shallow Junctions for sub-45 nm CMOS.....	163
Pankaj Kalra, Prashant Majhi, Hsing-Huang Tseng, Raj Jammy, and Tsu-Jae King Liu	

*Invited Paper

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

Doping of sub-50 nm SOI Layers	169
Bartek J. Pawlak, Ray Duffy, Mark van Dal, Frans Voogt, Robbert Weemaes, Fred Roozeboom, Peer Zalm, Nick Bennett, and Nick Cowern	
Optimization of Stressor Layers Created by ClusterCarbon™ Implantation.....	177
Karuppanan Sekar, Wade A. Krull, and Thomas N. Horsky	
Optimization of Si:C Source and Drain Formed by Post- Epi Implant and Activation Anneal: Experimental and Theoretical Analysis of Dopant Diffusion and C Evolution in High-C Si:C Epi Layers	185
Yonah Cho, Victor Moroz, Nikolas Zographos, Sunderraj Thirupapuliyur, Lucien Date, and Robert Schreutelkamp	

SOLID PHASE EPITAXIAL REGROWTH

* Indirect Diffusion Mechanism of Boron Atoms in Crystalline and Amorphous Silicon	193
Salvo Mirabella, Davide De Salvador, Enrico Napolitani, Elena Bruno, Giuliana Impellizzeri, Gabriele Bisognin, Emanuele Francesco Pecora, Alberto Carnera, and Francesco Priolo	
Effect of Elevated Implant Temperature on Amorphization and Activation in As-Implanted Silicon-on-Insulator Layers.....	205
Katherine L. Saenger, Stephen W. Bedell, Matthew Copel, Amlan Majumdar, John A. Ott, Joel P. de Souza, Steven J. Koester, Donald R. Wall, and Devendra K. Sadana	
Boron Enhanced H Diffusion in Amorphous Si Formed by Ion Implantation	211
Brett C. Johnson, Armand J. Atanacio, Kathryn E. Prince, and Jeffrey C. McCallum	
Intrinsic and Dopant-Enhanced Solid Phase Epitaxy in Amorphous Germanium	217
Brett C. Johnson, Paul Gortmaker, and Jeffrey C. McCallum	

*Invited Paper

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)**First Principles Study of Boron in Amorphous Silicon223**Iván Santos, Wolfgang Windl, Lourdes Pelaz, and
Luis Alberto Marqués**Atomistic Simulation and Subsequent Optimization of
Boron USJ Using Pre-Amorphization and High Ramp
Rates Annealing229**Julien Singer, François Wacquant, Davy Villanueva,
Frédéric Salvetti, Cyrille Laviron, Olga Cueto,
Pierrette Rivallin, Martín Jaraíz, and Alain Poncet*MODELING AND SIMULATION**** Atomistic Simulation Techniques in Front-End Processing237**Luis A. Marqués, Lourdes Pelaz, Iván Santos, Pedro López,
and María Aboy**Ab Initio Modeling of Arsenic Pile-Up and Deactivation at
the Si/SiO₂ Interface249**

Naveen Gupta and Wolfgang Windl

**Atomistic Modeling of {311} Defects and Dislocation
Ribbons255**

Bart Trzynadlowski, Scott Dunham, and Chihak Ahn

**A Comparison of Intrinsic Point Defect Properties in Si
and Ge261**Jan Vanhellefont, Piotr Spiewak, Koji Sueoka,
Eddy Simoen, and Igor Romandic*** Modeling Evolution of Temperature, Stress, Defects, and
Dopant Diffusion in Silicon During Spike and Millisecond
Annealing267**Victor Moroz, Ignacio Martin-Bragado, Nikolas Zographos,
Dmitri Matveev, Christoph Zechner, and Munkang Choi**F⁺ Implants in Crystalline Si: The Si Interstitial Contribution279**Pedro Lopez, Lourdes Pelaz, Ray Duffy,
P. Meunier-Beillard, F. Roozeboom, K. van der Tak,
P. Breimer, J.G.M. van Berkum, M.A. Verheijen, and
M. Kaiser

*Invited Paper

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

Concentration-Dependence of Self-Interstitial and Boron Diffusion in Silicon.....	285
Wolfgang Windl	
* An Alternative Approach to Analyzing the Interstitial Decay From the End of Range Damage During Millisecond Annealing.....	291
Renata Camillo-Castillo, Mark E. Law, and Kevin S. Jones	
* Dopant Condensation Beyond Solubility Limit in the Vicinity of Silicon/Silicide Interface Based on First-Principles Calculations.....	303
Takashi Yamauchi, Yoshifumi Nishi, Atsuhiko Kinoshita, Yoshinori Tsuchiya, Junji Koga, and Koichi Kato	
Author Index	315
Subject Index.....	319

*Invited Paper

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

PREFACE

This volume contains papers presented at Symposium E, “Doping Engineering for Front-End Processing,” held March 25–27 at the 2008 MRS Spring Meeting in San Francisco, California. The scope of the symposium was to bring together researchers from the field of materials science and technology to review the state-of-the-art in doping engineering and activation methods, metal-semiconductors contacting for integrated circuits, to discuss the current achievements, remaining challenges, and to identify future research directions for fundamental investigation and technology development. These proceedings document the recent developments in the areas of experiments, modeling and metrology related to planar and FIN transistor source and drain regions.

It has been a pleasure and privilege to have the opportunity to organize the symposium and edit this volume. This would not be possible without the support of the speakers and authors, all of whom are gratefully acknowledged.

Many exciting research achievements have been presented at this symposium. We hope that the readers will enjoy reading this proceedings volume, and find its contents both informative and interesting.

B.J. Pawlak
M.L. Pelaz
M. Law
K. Suguro

July 2008

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society
Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)**MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS**

- Volume 1066 — Amorphous and Polycrystalline Thin-Film Silicon Science and Technology—2008, A. Nathan, J. Yang, S. Miyazaki, H. Hou, A. Flewitt, 2008, ISBN 978-1-60511-036-3
- Volume 1067E — Materials and Devices for “Beyond CMOS” Scaling, S. Ramanathan, 2008, ISBN 978-1-60511-037-0
- Volume 1068 — Advances in GaN, GaAs, SiC and Related Alloys on Silicon Substrates, T. Li, J. Redwing, M. Mastro, E.L. Piner, A. Dadgar, 2008, ISBN 978-1-60511-038-7
- Volume 1069 — Silicon Carbide 2008—Materials, Processing and Devices, A. Powell, M. Dudley, C.M. Johnson, S-H. Ryu, 2008, ISBN 978-1-60511-039-4
- Volume 1070 — Doping Engineering for Front-End Processing, B.J. Pawlak, M. Law, K. Suguro, M.L. Pelaz, 2008, ISBN 978-1-60511-040-0
- Volume 1071 — Materials Science and Technology for Nonvolatile Memories, O. Auciello, D. Wouters, S. Soss, S. Hong, 2008, ISBN 978-1-60511-041-7
- Volume 1072E — Phase-Change Materials for Reconfigurable Electronics and Memory Applications, S. Raoux, A.H. Edwards, M. Wuttig, P.J. Fons, P.C. Taylor, 2008, ISBN 978-1-60511-042-4
- Volume 1073E — Materials Science of High-k Dielectric Stacks—From Fundamentals to Technology, L. Pantisano, E. Gusev, M. Green, M. Niwa, 2008, ISBN 978-1-60511-043-1
- Volume 1074E — Synthesis and Metrology of Nanoscale Oxides and Thin Films, V. Craciun, D. Kumar, S.J. Pennycook, K.K. Singh, 2008, ISBN 978-1-60511-044-8
- Volume 1075E — Passive and Electromechanical Materials and Integration, Y.S. Cho, H.A.C. Tilmans, T. Tsurumi, G.K. Fedder, 2008, ISBN 978-1-60511-045-5
- Volume 1076 — Materials and Devices for Laser Remote Sensing and Optical Communication, A. Aksnes, F. Amzajerdian, 2008, ISBN 978-1-60511-046-2
- Volume 1077E — Functional Plasmonics and Nanophotonics, S. Maier, 2008, ISBN 978-1-60511-047-9
- Volume 1078E — Materials and Technology for Flexible, Conformable and Stretchable Sensors and Transistors, 2008, ISBN 978-1-60511-048-6
- Volume 1079E — Materials and Processes for Advanced Interconnects for Microelectronics, J. Gambino, S. Ogawa, C.L. Gan, Z. Tokei, 2008, ISBN 978-1-60511-049-3
- Volume 1080E — Semiconductor Nanowires—Growth, Physics, Devices and Applications, H. Riel, T. Kamins, H. Fan, S. Fischer, C. Thelander, 2008, ISBN 978-1-60511-050-9
- Volume 1081E — Carbon Nanotubes and Related Low-Dimensional Materials, L-C. Chen, J. Robertson, Z.L. Wang, D.B. Geohegan, 2008, ISBN 978-1-60511-051-6
- Volume 1082E — Ionic Liquids in Materials Synthesis and Application, H. Yang, G.A. Baker, J.S. Wilkes, 2008, ISBN 978-1-60511-052-3
- Volume 1083E — Coupled Mechanical, Electrical and Thermal Behaviors of Nanomaterials, L. Shi, M. Zhou, M-F. Yu, V. Tomar, 2008, ISBN 978-1-60511-053-0
- Volume 1084E — Weak Interaction Phenomena—Modeling and Simulation from First Principles, E. Schwegler, 2008, ISBN 978-1-60511-054-7
- Volume 1085E — Nanoscale Tribology—Impact for Materials and Devices, Y. Ando, R.W. Carpick, R. Bennewitz, W.G. Sawyer, 2008, ISBN 978-1-60511-055-4
- Volume 1086E — Mechanics of Nanoscale Materials, C. Friesen, R.C. Cammarata, A. Hodge, O.L. Warren, 2008, ISBN 978-1-60511-056-1

Cambridge University Press

978-1-107-40854-8 - Doping Engineering for Front-End Processing: Materials Research Society Symposium Proceedings: Volume 1070

Editors: B. J. Pawlak, M. L. Pelaz, M. Law and K. Suguro

Frontmatter

[More information](#)**MATERIALS RESEARCH SOCIETY SYMPOSIUM PROCEEDINGS**

- Volume 1087E—Crystal-Shape Control and Shape-Dependent Properties—Methods, Mechanism, Theory and Simulation, K-S. Choi, A.S. Barnard, D.J. Srolovitz, H. Xu, 2008, ISBN 978-1-60511-057-8
- Volume 1088E—Advances and Applications of Surface Electron Microscopy, D.L. Adler, E. Bauer, G.L. Kellogg, A. Scholl, 2008, ISBN 978-1-60511-058-5
- Volume 1089E—Focused Ion Beams for Materials Characterization and Micromachining, L. Holzer, M.D. Uchic, C. Volkert, A. Minor, 2008, ISBN 978-1-60511-059-2
- Volume 1090E—Materials Structures—The Nabarro Legacy, P. Müllner, S. Sant, 2008, ISBN 978-1-60511-060-8
- Volume 1091E—Conjugated Organic Materials—Synthesis, Structure, Device and Applications, Z. Bao, J. Locklin, W. You, J. Li, 2008, ISBN 978-1-60511-061-5
- Volume 1092E—Signal Transduction Across the Biology-Technology Interface, K. Plaxco, T. Tarasow, M. Berggren, A. Dodabalapur, 2008, ISBN 978-1-60511-062-2
- Volume 1093E—Designer Biointerfaces, E. Chaikof, A. Chilkoti, J. Elisseeff, J. Lahann, 2008, ISBN 978-1-60511-063-9
- Volume 1094E—From Biological Materials to Biomimetic Material Synthesis, N. Kröger, R. Qiu, R. Naik, D. Kaplan, 2008, ISBN 978-1-60511-064-6
- Volume 1095E—Responsive Biomaterials for Biomedical Applications, J. Cheng, A. Khademhosseini, H-Q. Mao, M. Stevens, C. Wang, 2008, ISBN 978-1-60511-065-3
- Volume 1096E—Molecular Motors, Nanomachines and Active Nanostructures, H. Hess, A. Flood, H. Linke, A.J. Turberfield, 2008, ISBN 978-1-60511-066-0
- Volume 1097E—Mechanical Behavior of Biological Materials and Biomaterials, J. Zhou, A.G. Checa, O.O. Popoola, E.D. Rekow, 2008, ISBN 978-1-60511-067-7
- Volume 1098E—The Hydrogen Economy, A. Dillon, C. Moen, B. Choudhury, J. Keller, 2008, ISBN 978-1-60511-068-4
- Volume 1099E—Heterostructures, Functionalization and Nanoscale Optimization in Superconductivity, T. Aytug, V. Maroni, B. Holzapfel, T. Kiss, X. Li, 2008, ISBN 978-1-60511-069-1
- Volume 1100E—Materials Research for Electrical Energy Storage, J.B. Goodenough, H.D. Abrufia, M.V. Buchanan, 2008, ISBN 978-1-60511-070-7
- Volume 1101E—Light Management in Photovoltaic Devices—Theory and Practice, C. Ballif, R. Ellingson, M. Topic, M. Zeman, 2008, ISBN 978-1-60511-071-4
- Volume 1102E—Energy Harvesting—From Fundamentals to Devices, H. Radousky, J. Holbery, B. O'Handley, N. Kioussis, 2008, ISBN 978-1-60511-072-1
- Volume 1103E—Health and Environmental Impacts of Nanoscale Materials—Safety by Design, S. Tinkle, 2008, ISBN 978-1-60511-073-8
- Volume 1104—Actinides 2008—Basic Science, Applications and Technology, B. Chung, J. Thompson, D. Shuh, T. Albrecht-Schmitt, T. Gouder, 2008, ISBN 978-1-60511-074-5
- Volume 1105E—The Role of Lifelong Education in Nanoscience and Engineering, D. Palma, L. Bell, R. Chang, R. Tomellini, 2008, ISBN 978-1-60511-075-2
- Volume 1106E—The Business of Nanotechnology, L. Merhari, A. Gandhi, S. Giordani, L. Tsakalakos, C. Tsamis, 2008, ISBN 978-1-60511-076-9
- Volume 1107—Scientific Basis for Nuclear Waste Management XXXI, W.E. Lee, J.W. Roberts, N.C. Hyatt, R.W. Grimes, 2008, ISBN 978-1-60511-079-0

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