High Purity Silicon 11

Editors:

E. Simoen
IMEC
Leuven, Belgium

R. Falster
IMEC
Leuven, Belgium

P. Stallhofer
Siltronic
München, Germany

C. Claeys
IMEC
Leuven, Belgium

C. Mazure
SOITEC
Bernin, France

Sponsoring Division:

Electronics and Photonics

Published by
The Electrochemical Society
65 South Main Street, Building D
Pennington, NJ 08534-2839, USA
tel 609 737 1902
fax 609 737 2743
www.electrochem.org

ecs transactions ™

Vol. 33, No. 11

Copyright 2010 by The Electrochemical Society.
All rights reserved.

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

Published by:

The Electrochemical Society
65 South Main Street
Pennington, New Jersey 08534-2839, USA

Telephone 609.737.1902
Fax 609.737.2743
e-mail: ecs@electrochem.org
Web: www.electrochem.org

ISSN 1938-6737 (online)
ISSN 1938-5862 (print)
ISSN 2151-2051 (cd-rom)

ISBN 978-1-56677-830-5 (PDF)
ISBN 978-1-60768-180-9 (Softcover)

Printed in the United States of America.

ECS Transactions, **Volume 33, Issue 11**
High Purity Silicon 11

Table of Contents

Preface *iii*

Chapter 1
Keynote Papers

(Invited) Nano Characterization of Materials 3
D. K. Schroder

(Invited) Recent Advances in the Smart Cut Technology for CMOS Applications 23
O. Kononchuk, D. Landru, C. Veytizou, and E. Guiot

Chapter 2
Hydrogen Defects and Engineering

(Invited) Germanium on Sapphire Technology 37
H. S. Gamble, P. B. Baine, Y. H. Low, P. V. Rainey, J. H. Montgomery, M. Bain, B. Armstrong, D. W. McNeill, and N. S. Mitchell

The Impact of Helium Co-Implantation on Hydrogen Induced Donor Profiles in Float Zone Silicon 51
J. Laven, R. Job, H. Schulze, F. Niedernostheide, V. Häublein, H. Schulze, W. Schustereder, H. Ryssel, and L. Frey

(Invited) Practical Method and Physics of Evaluation for Vacancy Concentration of Silicon Crystals by Measuring Low-Temperature Elastic Softening 63
H. Yamada-Kaneta, S. Baba, Y. Nagai, M. Akatsu, K. Mitsumoto, T. Yanase, K. Okabe, Y. Ono, Y. Nemoto, and T. Goto

Chapter 3
Crystal Growth

Point Defects in Silicon Melt Growth from the Experimental Results 75
T. Abe and T. Takahashi

Chapter 4
Defect Engineering and Gettering in Silicon

(Invited) Lifetime Degradation in Boron Doped Czochralski Silicon 103
V. V. Voronkov, R. J. Falster, J. Schmidt, K. Bothe, and A. Batunina

Getter Effects in Low Oxygen and High Oxygen Czochralski Silicon Wafers 113
G. Kissinger, D. Kot, and W. Häckl

Minority Carrier Lifetime in Czochralski Silicon Containing Oxide Precipitates 121
J. D. Murphy, K. Bothe, M. Olmo, V. V. Voronkov, and R. J. Falster

Niobium Contamination in Silicon 133
M. Polignano, D. Codegoni, G. Borionetti, F. Bonoli, J. Brivio, S. Greco, A. Marino, P. Monge, I. Patoprsta, V. Privitera, and C. Riva

A DLTS Study of SiO_2 and SiO_2/SiN_x Bi-Layer Surface Passivation of Silicon 145
E. Simoen, C. Gong, N. Posthuma, E. Van Kerschaver, J. Poortmans, and R. Mertens

Chapter 5
Poster Session

Modeling of Hydrogen Diffusion And Segregation in Amorphous Silicon During Solid Phase Epitaxy 157
B. C. Johnson, M. Mastromatteo, D. De Salvador, E. Napolitani, A. Carnera, and J. McCallum

Chapter 6
Implantation, Defects and Annealing

(Invited) Recent Insights in the Diffusion of Boron in Silicon and Germanium 167
S. Mirabella, D. De Salvador, E. Bruno, E. Napolitani, G. Scapellato, M. Mastromatteo, G. Impellizzeri, G. Bisognin, S. Boninelli, A. Terrasi, A. Carnera, and F. Priolo

Single Ion Implantation into Si-Based Devices 179
B. C. Johnson, G. Tettamanzi, C. Yang, A. Alves, J. van Donkelaar, S. Thompson, A. Verduijn, J. A. Mol, R. Wacquez, M. Vinet, A. Dzurak, M. Sanquer, S. Rogge, and D. Jamieson

Combined IV and CV Analysis of Laser Annealed Carbon and Boron Implanted SiGe Epitaxial Layers 191
D. Kobayashi, M. Bargallo-Gonzalez, E. Rosseel, A. Hikavyy, K. Hirose, E. Simoen, and C. Claeys

Chapter 7
Strain Analysis and Modeling

(Invited) Nano-Beam Diffraction: Crystal Structure and Strain Analysis at the Nanoscale 205
P. Favia, M. Popovici, G. Eneman, G. Wang, M. Bargallo-Gonzalez, E. Simoen, N. Menou, and H. Bender

(Invited) Impact of Stress and Defects on Advanced Junction Leakage 221
V. Moroz and M. Choi

Recent Insights In Solid Phase Epitaxy of Silicon and Germanium 237
B. C. Johnson, N. Stavrias, S. Kandasamy, D. Pyke, A. Holland, and J. McCallum

Author Index 249