

Table of Contents

Preface

Smart-Cut Process for Ultrathin SOI Wafers Manufacturing C. Maleville	1
Investigation of Crystal Defects in Epitaxial Layers on Nitrogen-Doped Substrates and a Method for their Suppression K. Nakai, K. Kitahara, Y. Ohta, A. Ikari and M. Tanaka	11
Defect Formation in Heavily As-Doped Cz Si S. Rouvimov, R. Kuytt, J. Kearns, V. Todt, B. Orschel, H. Siriwardane, A. Buczkowski, I. Shul'pina and G.A. Rozgonyi	17
Recrystallization of Silicon on Insulator Layers Implanted with High Doses of Hydrogen Ions I.E. Tyschenko, A.B. Talochkin, A.K. Gutakovskii and V.P. Popov	23
Laser Crystallization of Thin a-Si Films on Plastic Substrates Using Excimer Laser Treatments M.D. Efremov, V.A. Volodin, L.I. Fedina, A.K. Gutakovskii, D.V. Marin, S.A. Kochubei, A.A. Popov, Y.A. Minakov and V.N. Ulasyuk	29
Predicting Material Parameters for Intrinsic Point Defect Diffusion in Silicon Crystal Growth M. Griebel, L. Jager and A. Voigt	35
Dislocation Locking in Silicon by Oxygen and Oxygen Transport at Low Temperatures S. Senkader, A. Giannattasio, R.J. Falster and P.R. Wilshaw	43
Effect of Electron Irradiation on Thermal Donors in Oxygen-Doped High-Resistivity FZ Si K. Takakura, H. Ohyama, T. Yoshida, H. Murakawa, J.M. Rafi, R. Job, A.G. Ulyashin, E. Simoen and C. Claeys	53
Investigations of the Effect of High Pressure on the Annealing Behavior of Oxygen Related Defects in Silicon C.A. Londos, M.S. Potsidi, A. Misiuk, J. Bak-Misiuk, A. Shalimov and V.V. Emtsev	59
Simulation of Oxygen Contaminated Silicon Grain Boundaries in Cluster Approximation A.L. Pushkarchuk, A.K. Fedotov and S.A. Kuten	65
Optimized Parameters for Modeling Oxygen Nucleation in Silicon M. Zschorsch, R. Hölzl, H. Rüfer, H.J. Möller and W. von Ammon	71
Oxygen Ion Bombardment for Local Oxide Formation in Si D. Krüger, R. Kurps, P. Formanek and G. Weidner	77
Nitrogen Diffusion and Interaction with Oxygen in Si V.V. Voronkov and R.J. Falster	83
Structure and Electronic Properties of Nitrogen Defects in Silicon R. Jones, I. Hahn, J.P. Goss, P.R. Briddon and S. Öberg	93
Characterization of Nucleation Sites in Nitrogen Doped Czochralski Silicon by Density Functional Theory and Molecular Mechanics F. Sahtout Karoui, A. Karoui, G.A. Rozgonyi, M. Hourai and K. Sueoka	99
Processing and Characterization of 300 mm Argon-Annealed Wafers T. Müller, E. Daub, H. Yokota, R. Wahlich, P. Krottenthaler and W. von Ammon	105
Thermal Stability of Oxygen Precipitates in Nitrogen-Doped Czochralski Silicon D.R. Yang, H.J. Wang, X. Yu, X.Y. Ma and D.L. Que	111
Nitrogen Out-Diffusion from Czochralski Silicon Monitored by Depth Profiles of Shallow Thermal Donors V.V. Voronkov, A.V. Batunina, G.I. Voronkova and R.J. Falster	117
Vibrational Lifetimes of Hydrogen and Silicon MOSFET Reliability L.C. Feldman, G. Lüpke and N.H. Tolk	123
Influence of Hydrogen on the Formation of Interstitial Agglomerates in Silicon T. Mchedlidze and M. Suezawa	129
High Resolution Deep Level Transient Spectroscopy of Hydrogen Interactions with Ion Implantation-Induced Defects in Silicon J.H. Evans-Freeman and N. Abdulgader	135

Depth Resolved Defect Analysis by Micro-Raman Investigations of Plasma Hydrogenated Czochralski Silicon Wafers	
R. Job, Y. Ma, Y.L. Huang, A.G. Ulyashin, W.R. Fahrner, M.F. Beaufort and J.F. Barbot	141
Casting Technologies for Solar Silicon Wafers: Block Casting and Ribbon-Growth-on-Substrate	
A. Schönecker, L.J. Geerligs and A. Müller	149
Silicon Ribbons for Solar Cells	
J.P. Kalejs	159
Metal Content of Multicrystalline Silicon for Solar Cells and its Impact on Minority Carrier Diffusion Length	
A.A. Istratov, T. Buonassisi, R.J. McDonald, A.R. Smith, R. Schindler, J. Rand, J.P. Kalejs and E.R. Weber	175
Carbon-Induced Twinning in Multicrystalline Silicon	
H.J. Möller	181
Light-Induced Degradation in Crystalline Silicon Solar Cells	
J. Schmidt	187
Estimation of the Upper Limit of the Minority-Carrier Diffusion Length in Multicrystalline Silicon: Limitation of the Action of Gettering and Passivation on Dislocations	
M. Kittler and W. Seifert	197
Minority Carrier Diffusion Lengths in Multi-Crystalline Silicon Wafers and Solar Cells	
D. Cavalcoli, A. Cavallini, M. Rossi and K. Peter	205
Evaluation of Silicon Sheet Film Growth and Wafer Processing via Structural, Chemical and Electrical Diagnostics	
G.A. Rozgonyi, J. Lu, R. Zhang, J. Rand and R. Jonczyk	211
The Effect of Grain Orientations on the Efficiency of Multicrystalline Solar Cells	
P.C. Hjermås, O. Lohne, A. Wandera and H. Singh Tathgar	217
Understanding and Reducing the Boron-Oxygen-Related Performance Degradation in Czochralski Silicon Solar Cells	
K. Bothe, R. Hezel and J. Schmidt	223
Carrier Density Imaging as a Tool for Characterising the Electrical Activity of Defects in Pre-Processed Multicrystalline Silicon	
S. Riepe, G. Stokkan, T. Kieliba and W. Warta	229
Influence of High-Temperature Processes on Multicrystalline Silicon	
O. Schultz, S. Riepe and S.W. Glunz	235
Growth of $\text{Si}_{1-x-y}\text{Ge}_x\text{C}_y$ Alloy Layers on Si by Chemical Vapor Deposition Using Ethylene	
Y.D. Zheng, N. Jiang, P. Han, S.L. Gu, S.M. Zhu, R.L. Jiang, Y. Shi, W.F. Lu, B. Shen and R. Zhang	243
Impact of Defects on the Leakage Currents of Si/SiGe/Si Heterojunction Bipolar Transistors	
D. Wolansky, G.G. Fischer, D. Knoll, D. Bolze, B. Tillack, P. Schley and Y. Yamamoto	249
Long-Wavelength SiGe/Si MQW Resonant-Cavity-Enhanced Photodiodes (RCE-PD)	
J.Z. Yu, C. Li, B.W. Cheng and Q.M. Wang	255
Extended Defects in Silicon: an Old and New Story	
J. Vanhellemont, O. De Gryse and P. Clauws	263
Luminescence of Dislocations and Oxide Precipitates in Si	
S. Pizzini, E. Leoni, S. Binetti, M. Acciarri, A. Le Donne and B. Pichaud	273
Influence of Extended Structural Defects on the Characteristics of Electroluminescence in Efficient Silicon Light-Emitting Diodes	
N.A. Sobolev, A.M. Emel'yanov, E.I. Shek and V.I. Vdovin	283
Luminescence of Silicon Implanted with Phosphorus	
T. Arguirov, M. Kittler, W. Seifert, D. Bolze, K.-. Ehwald, P. Formanek and J. Reif	289
Properties of Cavities Induced by Helium Implantation in Silicon and their Applications to Devices	
F. Cayrel, D. Alquier, L. Ventura, M.L. Vincent, F. Roqueta, C. Dubois and R. Jérision	297
Modification of MeV He Implantation-Induced Cavities in Silicon by Hydrogen Plasma Treatment	
C.L. Liu, E. Ntsoenzok, M.F. Barthe, P. Desgardin, S. Ashok, A. Vengurlekar, D. Alquier and M.O. Ruault	307

Effect of External Stress at Annealing on Microstructure of Silicon Co-Implanted with Hydrogen and Helium A. Misiuk, A. Barcz, J. Ratajczak and J. Bak-Misiuk	313
Defects Created by Multi-Energy He Implantation of Silicon at High Temperatures M. David, M.F. Beaufort and J.F. Barbot	319
Doping Effect of Helium Induced Nanocavities in Silicon F. Cayrel, L. Ventura, D. Alquier, F. Roqueta and R. Jérísian	325
LACBED Investigations of High Energy Helium Implanted into 4H-SiC M.F. Beaufort, F. Pailloux and J.F. Barbot	331
Effects of Self-Ion Implantation on the Thermal Growth of He-Induced Cavities in Silicon C.L. Liu, D. Alquier, F. Cayrel, E. Ntsoenzok and M.O. Ruault	337
Effect of High Pressure - Temperature on Structure of Silicon Crystals Implanted with Nitrogen / Silicon J. Bak-Misiuk, A. Misiuk, A. Shalimov, J. Ratajczak, B. Surma and G. Gawlik	343
Two Dimensional Interstitial Diffusion in Mesoscopic Structures F. Giannazzo, V. Raineri, S. Mirabella, D. De Salvador, E. Napolitani and F. Priolo	351
Kinetic Reaction of the Formation of the Platinum Related Complex at the Origin of the p-Type Doping Effect in Silicon W. Vervisch, L. Ventura, B. Pichaud, G. Ducreux, F. Lanois and A. Lhorté	361
A Deep Level Study of High-Temperature Electron-Irradiated n-Type Cz Silicon E. Simoen, C. Claeys, V.B. Neimash, A. Kraitichinskii, M. Kras'ko, V. Tischenko and V. Voitovych	367
Influence of Cobalt Contamination in the Measurement of Diffusion Length of Silicon Wafers N. Pic, A. Danel, M.L. Polignano, G. Salvà, M. Sardo and S. Rey	373
High Temperature Electron Irradiation Effects in InGaAs Photodiodes H. Ohyama, K. Takakura, K. Hayama, T. Hirao, S. Onoda, E. Simoen and C. Claeys	381
Accurate Identification of Radiation Defect Profiles in Silicon after Irradiation with Protons and Alpha-Particles in the MeV Range P. Hazdra and V.V. Komarnitskyy	387
Interstitial-Related Radiation Defects in Silicon Doped with Tin and Germanium L.I. Khirunenko, O.A. Kobzar, Y.V. Pomozev, M.G. Sosnin, N.A. Tripachko, N.V. Abrosimov and H. Riemann	393
Radiation Hardening of Silicon for Detectors by Preliminary Irradiation P.G. Litovchenko, D. Bisello, A. Candelori, A.P. Litovchenko, A.A. Groza, A.P. Dolgolenko, V.I. Khivrich, L.I. Barabash, V.F. Lastovetsky, L.A. Polivtsev, W. Wahl and J. Wyss	399
Computer Modelling of SiO₂ Precipitation in Cz-Si Doped with Nitrogen A.A. Efremov, V.G. Litovchenko, A.V. Sarikov, H. Richter and V.D. Akhmetov	405
First Principles Simulations of Extended Defects at Cubic SiC Surfaces and Interfaces A. Catellani, G. Cicero, G. Galli and L. Pizzagalli	415
Dislocation-Impurity Interaction in Silicon I. Yonenaga	423
Influence of Magnetic Field on Critical Stress and Mobility of Dislocations in Silicon M. Badylevich, Y.L. Iunin, V.V. Kveder, V.I. Orlov and Y. Osipyan	433
Dislocation Generation in Device Fabrication Process I. Mica, M.L. Polignano, G.P. Carnevale, A. Armigliato, R. Balboni, M. Brambilla, F. Cazzaniga, G. Pavia and V. Soncini	439
Microstructural and Electrical Properties of NiSi₂ Precipitates at Dislocations in Silicon M. Seibt and V.V. Kveder	447
Electrical and Optical Properties of Dislocations Generated under Pure Conditions M. Acciarri, S. Binetti, O.V. Feklisova, E.A. Steinman and E.B. Yakimov	453
Effect of Dynamic Aging of Dislocations on the Deformation Behavior of Extrinsic Semiconductors B.V. Petukhov	459
Influence of Nitrogen on Dislocation Mobility in Czochralski Silicon V.I. Orlov, Y.L. Iunin, M. Badylevich, O. Lysytskiy and H. Richter	465
Precise Measurement of Ge Depth Profiles in SiGe HBT's - a Comparison of Different Methods P. Zaumseil, D. Krüger, R. Kurps, O.V. Fursenko and P. Formanek	473

Capacitance-Transient Detection of X-Ray Absorption Fine Structure: A Possible Tool to Analyze the Structure of Deep-Level Centers?	
J. Weber, J. Bollmann, S. Knack, V. Kotestki, H.E. Mahnke and E. Welter	483
Measurement of Nitrogen Concentration in Cz Silicon Crystals	
N. Inoue, A. Hashimoto, K. Shingu and K. Masumoto	489
Gold Diffusion as a Tool for Defect Characterization in Si	
O.V. Feklisova and E.B. Yakimov	495
Infrared Transmission Investigations of Rod - Like Defects in Multicrystalline Silicon	
A. Lawerenz, M. Ghosh, K. Kremmer, V. Klemm, A. Müller and H.J. Möller	501
Atomic Environment of Positrons Annihilating in Different Parts of Cz-Si Single Crystal	
N.Y. Arutyunov and R. Krause-Rehberg	507
Residual Stress Distribution and Silicon Phase Transformation Induced by Rockwell Indentation at Different Temperatures, Studied by Means of Micro-Raman Spectroscopy	
S. Kouteva-Arguirova, V.I. Orlov, W. Seifert, J. Reif and H. Richter	513
Investigation of Semiconductors by Nanoindentation	
A. Richter, B. Wolf and J. BelBruno	519
Phosphorus Diffusion Gettering of Metallic Impurities in Silicon: Mechanisms beyond Segregation	
W. Schröter, A. Döller, A. Zozime, V.V. Kveder, M. Seibt and E. Spiecker	527
Tuning Oxygen Concentration at Low and High Temperature IG Process and Boron Concentration in Epitaxial Wafer for the Gettering of Metal Impurities	
M.B. Shabani, Y. Shiina and Y. Shimanuki	539
Gettering Strategies for SOI Wafers	
A.A. Istratov, W. Huber and E.R. Weber	547
Interaction of Interstitially Dissolved Cobalt and Oxygen-Related Centres in Silicon	
A. Sattler, M. Seibt, V.V. Kveder and W. Schröter	553
Controlled Gettering of Implanted Platinum in Silicon Produced by Helium Co-Implantation	
P. Hazdra and J. Vobecký	559
Gettering of Impurities in Hydrogen Implanted Nitrogen-Doped Silicon	
I.V. Antonova, A. Misiuk, A. Barcz, D.S. Yang and V.P. Popov	565
Gettering of Oxygen onto Buried Defect Layer in Hydrogen Implanted Silicon Wafers after Low Temperature Surface Saturation by Oxygen and Vacuum Annealing	
A.V. Frantskevich, A.M. Saad, A.V. Mazanik, A.K. Fedotov, E.I. Rau and S.V. Chigir	571
Re-Dissolution of Gettered Iron Impurities in Czochralski-Grown Silicon	
P. Zhang, A.A. Istratov, H. Väinölä and E.R. Weber	577
Simulations of Iron Re-Dissolution from Oxygen Precipitates in Cz-Silicon and its Impact on Gettering Efficiency	
H. Väinölä, P. Zhang, A. Haarahiltunen, A.A. Istratov and E.R. Weber	581
Ion Beam Induced Excess Vacancies in Si and SiGe and Related Cu Gettering	
R. Kögler, A. Peeva, A. Kuznetsov, J.S. Christensen, B.G. Svensson and W. Skorupa	587
Internal Gettering Efficiency in p/p⁺ and p/p⁻ Silicon Epistuctures	
C. Frigeri, G. Borionetti, P. Godio and E. Gombia	593
Dopant Segregation on Cavities Induced by Helium Implantation: Impact of the Doping Level	
F. Cayrel, M.L. Vincent, D. Alquier, F. Cristiano, L. Ventura, C. Dubois and A. Claverie	599
Atomically Controlled Technology for Future Si-Based Devices	
J. Murota, M. Sakuraba and B. Tillack	607
Epitaxial Growth Due to Phase Separation of Disordered Eutectic Au:Si Alloys on Silicon	
Y.L. Huang, M. Seibt and W. Schröter	617
Application-Specific Wafer Reclaim	
H. Dudenhausen, M. Fritzsche, C. Streit and C. Reuss	623
Coulomb Blockade in Silicon Nanocrystals Embedded in SiO₂ Matrix	
M.D. Efremov, G.N. Kamaev, G.A. Kachurin, A.V. Kretinin, V.A. Volodin, D.V. Marin, S.A. Arzhannikova, V.V. Malutina-Bronskaya and S.G. Yanovskaya	629
Self-Assembled Surface Patterning and Structural Modification upon Femtosecond Laser Processing of Crystalline Silicon	
F. Costache, S. Kouteva-Arguirova and J. Reif	635

Local Dielectric Degradation of Cu-Contaminated SiO₂ Thin Films N. Tokuda, S. Nishiguchi, S. Yamasaki, K. Miki and K. Yamabe	641
Process-Induced Changes of the Properties of Silicon Oxide Layers Containing Carbon: A Study of a Low-k Material to be Used in the Interconnection System V.D. Akhmetov, M. Kittler, W. Seifert, S. Marschmeyer, H. Richter, P. Formanek and J. Doerschel	647
Hafnium Oxide on Silicon: A Non-Destructive Characterization of the Interfacial Layer D. Wolfframm, S. Kouteva-Arguirova, T. Arguirov, R.P. Schmid, K. Dittmar, I. Zienert and J. Reif	653
Surface Tension Variation of Silicon Melts with Nitrogen Addition K. Terashima, M. Sakairi, M. Hirai and T. Tsuchiya	659
Prospects for New Wafer Types and Materials in Semiconductor Technology and Factors for their Successful Introduction W. Bergholz, J. Wittmann, R. Winkler, H. Tews and R. Fehlhaber	665