Ion Implantation Technology

MRS Advances Volume 7, Issue 36

Various Locations
2022-2023

ISBN: 978-1-7138-7119-4

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2023) by Springer Nature
All rights reserved.

Printed with permission by Curran Associates, Inc. (2023)

For permission requests, please contact Springer Nature
at the address below.

Springer Nature
The Campus 4 Crinan St.
London N1 9XW
United Kingdom

www.springernature.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Introduction: Ion Implantation Technology Special Issue 1231
Larry Larson, Susan Felch

35 Years of Challenge and Innovation in Ion Implant 1234
Anthony Renau

Where is the Annealing Technology Going for Better Device Performance? 1241
Kyoichi Suguro

Development of Ultra-High-current Implanter for Material Modification Process in Next Era Devices 1248
Hiroaki Kai, Yuya Uchida, Takeshi Matsumoto

Particle Counts and Size Distributions After Implantation with On-Wafer Graphite Sources 1253
Michael I. Current, Hideto Fujibuchi, Greg Lucchesi

High-Temperature Electrostatic Chuck Enabled by BN Dielectrics 1257
Wei Fan, Yuji Morikawa, Brian Kozak

Comparison of Annealing Quality After 3e15/cm^2 50 keV BF_2^+ Implant Between Rapid Thermal Annealing and Furnace Annealing 1260
Leonhard Sturm-Rogon, Alexander Burenkov, Wilfried Lerch

The Examination of Source Life and Beam Parameters of Germanium Implantation Using Hydrogen Carrier Gas 1265
Weng Siong Chan, King Suen Lee, James Huang

Thermal Budget Reduction for Spike Anneals in Conventional RTP 1270
S. Hamm, M. Bauer, A. Wansidler

Parasitic Side Channel Formation Due to Ion Implantation Isolation of GaN HEMT 1274
Hao Yu, Uthayasankaran Peralagu, Nadine Collaert

Angle Control Requirements and Solutions for Enabling High Aspect Ratio Structures 1279
James Deluca, Cheongil Ryu, Edward Eisner

Precise Angle Control for Channeling Using SS-UHE, a Single-wafer Ultrahigh-energy Ion Implanter 1285
Hiroyuki Kariya, Sho Kawatsu, Mitsuaki Kabasawa

New ECR Source Ion Implanter with Advanced Wafer Temperature Control for Material Modification 1289
Sarko Cherekdjian, Preston Barrows, Ross Radel

Introducing the Purion H200™ Single Wafer High Current Implanter 1295
A. Gupta, A. Ray, R. Rzeszut

A Snapshot Review on Flash Lamp Annealing of Semiconductor Materials 1301
Lars Rebohle, S. Prucnal, S. Zhou

Optimization of Solid-Phase Epitaxial Regrowth Performed by UV Nanosecond Laser Annealing 1310
Angela Alvarez Alonso, Pablo Acosta Alba, Alain Claverie

On Continuum Simulations of the Evolution of Faulted and Perfect Dislocation Loops in Silicon During Post-Implantation Annealing 1315
Anna Johnsson

Lateral Mapping of Damage Patterns in Plasma Immersion Ion-Implanted Silicon 1321
O. Kéri, Á. Kerekes, Z. Zolnai

Measuring Activation Depth Profiles in Very Highly Doped Ultra-Thin Semiconductors at Sub-nm Depth Resolution 1326
Abhijeet Joshi, Bulent M. Basol

The Diffusion Analysis of Implanted Heavy Metals in 4H-SiC 1331
Ryota Wada, Nariaki Hamamoto, Takashi Kuroi

Comparative Evaluation of Indirectly Heated Cathode DC Ion Source and Inductively Coupled Plasma RF Ion Source for High Current Ion Implanter 1338
Jongjin Hwang, Myoungsoo Choi, Ho-Jun Lee

Risk of Neutron Generation with Implantation of Light Ions 1343
J. A. Turcaud, C. Heckman, J. Schuur

Ion Implantation and Activation of Aluminum in Bulk 3C-SiC and 3C-SiC on Si 1347
F. Torregrosa, M. Canino, R. Nipoti

Advanced Process Control Method for Inline Isolation Implant Monitoring in III–V GaAs Semiconductor Fabrication 1353
Sasha Kurkcuoglu, Shiban Tiku

Single Implant Damage Accumulation and Interactions Between Multiple Implants 1358
J. Deluca, G. Cai

Defects and Dopant Behavior of a Medium-Dose Range Implant into Heated Silicon Wafers 1364
Tae-Hoon Huh, Akira Mineji, Yoji Kawasaki

A Snapshot Review on Metal–semiconductor Contact Exploration for 7-Nm CMOS Technology and Beyond 1369
Hao Yu, Marc Schaekers, Nadine Collaert

Strain/lattice Characterization of Si + Ge, SiGe + Ge, SiGe + C and Si + GeSn Surface Layers Formed by Implantation with RTA Or Laser Annealing Using SIMS, XPS, TEM-EDX, XRD and Raman Analysis 1380
John Borland, Shota Komago, Temel Buyuklimanli

Nitride Stress Inversion Using Plasma Immersion Ion Implantation Processes 1390
L. Lachal, C. Plantier, F. Mazen

The Performance of the Fourth Generation of Safe Delivery Source® (SDS®4) Package on AIBT iPulsar High Current Implanter 1395
Ying Tang, Vito Nien, Brandon Ni

Performance Improvement on SMIT SHX-III High Current Ion Implanter Through the Use of EnrichedPlus ^{72}germanium Tetrafluoride (EnPlus $^{72}GeF_4$) and Hydrogen (H_2) Mixture Gases 1398
Ying Tang, Vito Nien, Eric Tien

Germanium Ion Implantation Performance Improvement on Applied Materials' VIISta HCS High Current Implanter with Use of Germanium Tetrafluoride (GeF_4) and Hydrogen (H_2) Mixture Gases 1401
Ying Tang, Chee Weng Leong, Eric Tien

Investigation of Source Materials, Co-Gases, and Methods for Aluminum Ion Implantation 1404
Ying Tang, Ed Jones, Joseph Sweeney

Investigation of Various Source Materials and Co-Gases for Fluorine Ion Implantation Performance Improvement 1407
Ying Tang, Joseph Despres, Joseph Sweeney

Performance and Reliability of the Fourth Generation of Safe Delivery Source® (SDS®4) in the Ion Implantation Application 1410
Weihang Guan, Ying Tang, Kavita Murthi

Results and Adoption of Safe Delivery Source® (SDS®4) on VIISta® HCP 1418
Barry Chambers, Douglas Newman, John Flood

Improving Safety in Dopant Gas Delivery Systems 1421
Josep Arnó, Mitchell H. Weston

Dopant Gas Purity and Adsorbent Stability 1426
Josep Arnó, Omar K. Farha, Patrick E. Fuller

Temperature Effect in High-Dose, Medium-energy Implantation with Single-wafer-type Implanter 1431
Takuya Sakaguchi, Kazutaka Tsukahara, Yoji Kawasaki

Enhancement of Al^+ Beam Current in GSD III-180 1435
Hiroki Murooka, Keiji Sakita, Hideo Tsurumi

A Study of Beam Divergence Effects on Medium-Dose Channeling Implants 1438
Tae-Hoon Huh, Akira Mineji, Yoji Kawasaki

Ion Erosion and Elemental Purity of Deposited Si Films on Al 1441
Walt Wriggins, Matthew Wong, Michael I. Current

Angle-Directed Ion Beams for Localized Deposition on High Aspect Ratio Structures 1445
Thomas E. Seidel, Michael I. Current

Ion Erosion and Particle Release in Fine Graphite 1450
Michael I. Current, Hideto Fujibuchi, Max Slaton

Profiles and Defects in Highly Channeled and Random Beam Orientation MeV Dopant Implants in Si(100) 1454
Michael I. Current, Yoji Kawasaki, Viktor Samu

Individual Dopant Profiles in High Energy Multiple Implantation Under Channeling Conditions 1459
Yoji Kawasaki, Takuya Sakaguchi, Haruka Sasaki

Beam Shape Control System by Machine Learning on the NISSIN BeyEX Medium Current Ion Implanter 1463
Shinya Takemura, Shigeki Sakai, Eiichi Murayama

The Scaled FinFET Well Formation Using Heated Implantation 1468
B. N. Guo, N. Pradhan, K. H. Shim

Analysis of Dopant Distribution Profiles of Very High energy Implants 1472
Serguei Kondratenko, Leonard Rubin

Neutron Radiation Due to High Energy Boron Ion Beams 1476
Wilhelm Platow, Leonard Rubin, Steven Roberge

Ion Implanter Beam Optics Design Using Global Optimization Techniques 1482
Bo Vanderberg, Steve Drummond, Joseph Valinski

IMPHEAT-II, a Novel High Temperature Ion Implanter for Mass Production of SiC Power Devices 1486
Yusuke Kuwata, Shiro Shiojiri, Weijiang Zhao

Purion XEmax, Axcelis Ultra-High Energy Implanter with Boost™ Technology 1490
Shu Satoh, Wilhelm Platow, Russ Newman

New Control System of the Multiple Filaments in the Large Ion Source for Ion Doping System iG6 Ver.2... 1495
Yuya Hirai, Kenji Watari, Yutaka Inouchi

Unique Features of FLEXion® Tool for Wide Band Gap and III–V Semiconductor Devices Fabrication.. 1499
F. Torregrosa, G. Mathieu, B. Roux

A Newly Developed ECR Ion Source with Wide Dynamic Range of Beam Current.................................... 1504
Suguru Itoi, Hideki Fujita, Shigeki Sakai

Detection of Particles in the Ion Beam 1509
Hiroshi Matsushita, Sayumi Hirose, Takao Morita

LINAC Simulation with Dataset Generator 1515
Wilhelm Platow, Shu Satoh, Neil Bassom

Sheet Resistance Measurement for Ultra-High Energy Ion Implantation 1520
Haruka Sasaki, Takuya Sakaguchi, Yoji Kawasaki

Low-Temperature Monitoring with Implantation and Alloying 1525
L. Ende, M. Grund, A. Scheit

Optimization of Doped Lanthanated Tungsten Components in Ion Sources by Determining the Temperature Profile for Halogen Processes.. 1530
Florian Schaper, Stefan Schulz, Thomas Leiter

Cryogenic Implantation to Boost PFET Performance and Reduce Variability in 3D NAND Flows.............. 1534
Jeng-Hwa Liao, Jung-Yu Hsieh, Kyuha Shim

Author Index