2022 33rd Annual SEMI Advanced Semiconductor Manufacturing Conference (ASMC 2022)

Saratoga Springs, New York, USA
2 – 5 May 2022

IEEE Catalog Number: CFP22ASC-POD
ISBN: 978-1-6654-9488-5

Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number: CFP22ASC-POD
ISBN (Print-On-Demand): 978-1-6654-9488-5
ISBN (Online): 978-1-6654-9487-8
ISSN: 1078-8743

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
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings.com

TABLE OF CONTENTS

Supply Crisis Parts Commodities Management During Unplanned FAB Shutdown Recovery 1
Hoon Kang, Salvin Macwan, Wes Van Erp, Josephine Quek, Bastiaan Saris, Gary Huffman, Scott Rogers

3D NAND Vertical Channel Defect Inspection and Classification Solution on a DL-Based E-Beam System - DI: Defect Inspection and Reduction 5
Cheng Hung Wu, Yen Chun Chuan Sun, Rishabh Kushwaha, Piyush Bajpai, Shao Chang Cheng

In-Situ Cleaning of Post-Etch Byproducts by Manipulating Dechucking Environment Gas in Silicon Etch Process 9
Ki Dong Yang, Hanbit Park, Joonho H. Lee, Eunji Hwang, Jiwoo Jeong, Sangku Kwon, Kihyun Kim, Jaein Jeong, Eunyoung Han, Young Jeong Kim, Joong Jung Kim

Automatic Wafer Defect Classification Based on Decision Tree of Deep Neural Network 13
Zhixing Li, Zhangyang Wang, Weiping Shi

Enabling Glass Wafers in a Si Fab 19
Jay Zhang, Chee-Hau Ng, Sebastien Kouassi

Stochastics Based Reliability Model for Optimal Scheduled Maintenance of Semiconductor Tools 23
Swajeeth Panchangam, Keerthi Gowdaru

Machine Learning Assists on High Aspect Ratio Slit Trench Etching in 3D NAND 26
Yu-Fan Chang, Hong-Ji Lee, Fu-Hsing Chou, Shih-Chin Lee, Yao-An Chung, Nan-Tzu Lian, Tzung-Ting Han, Tahone Yang, Kuang-Chao Chen, Chih-Yuan Lu

Improvement of Twisting and Line-Edge Roughness of 3D NAND Deep Trench Etching on Yield Enhancement - AEPM: Advanced Equipment Processes and Materials 30
Yao-An Chung, Yuan-Chieh Chiu, Yu-Fan Chang, Hong-Ji Lee, Nan-Tzu Lian, Tahone Yang, Kuang-Chao Chen, Chih-Yuan Lu

An Advanced Bragg Diffraction Imaging Technique to Characterize Defects in SiC and GaN - Topic/Category, E.G. AM: Advanced Metrology 34
Thu Nhi Tran Thi Caliste, Lutz Kirste, Alexis Drouin, Jose Baruchel

ILD CMP Polishing Pad and Disk Characterization 36
Liew Siew Wan, Chong Yew Siew

Continuous Plasma Etch Process with Waferless Chamber Clean Optimization for Defect Reduction by Eliminating Center Injector Shading 39
Jeff J. Ye, John Lee, Michael W. Davis

Predictive Maintenance Practices for Cryogenic Pumps in Semiconductor Manufacturing 43
Erik Collart, Andrew Longley, Dirk Gordon, John Nordquist, Paul Matthews

CMP Process Control with iAPC Segmented Modeling to Achieve Desired With-in-Wafer Uniformity and Geometry Across Consumable Life 49
Logamanya Rukmangathan Duraisamy, Karthik Sankar, Gerry Dizon, Sreejith Ajithkumar, Yew Siew Chong Mentor

Robust Process Development for Dislocation Free DTI Formation 55
Qiong Luo, Huang Jing Yan, Zhou Jianbo, Ong Shiang Yang

Real-Time Vacuum Leak Detection Technology to Calculate Vacuum Leak Parameters for Dry Stripping - EO: Equipment Optimization 59
Jaepyo Jeong, Taekyung Ha, Hyojeong Ji, Sung Jin Yoon

Computational Overlay as Enabler for Enhanced On-Product Overlay Control 63
Leon Van Dijk, Kedir M. Adal, Sepideh Golmakaniyoon, Bertrand Le-Gratiet, Niyam Haque, Reza Sahraeian, Auguste Lam, Richard Van Haren

Integrated Circuit Die Level Yield Prediction Using Deep Learning 69
Petr Lenhard, Alexander Kovalenko, Radomir Lenhard

Hybrid Quantum-Classical Machine Learning for Lithography Hotspot Detection 75
Yuan-Fu Yang, Min Sun

In-Line Raman Spectroscopy: High-Throughput Strain Metrology for 3D Devices 81
Amir Nourbakhsh, Lan Yu, Tyler Sherwood, Xing Chen, Siddarth Krishnan, P. Y. Hung, Aron Cepler, Marjorie Cheng, Yonatan Oren

Surface Modification of Elastomeric Seals to Reduce Stiction Force on Various Surfaces 86
Feyzan Durn, Martina Weingartner, Maike Khosrawi, Renate Brielmann, Murat Gulcur

On-Wafer Organic Defect Review and Classification with Universal Surface Enhanced Raman Spectroscopy 91
Ali Ozhan Altun

Yield Improvement Methodology with Addressing Design Systematics During Production Ramp-Up 95
Jianhua Yin, Ian Chen, Rakesh Chokanathan, Suraj Gyawali, Yuchen Du, Yuansong Wang, Xue Mei Liu, C. T. Lim, Wen Zhi Gao

Optimizing Photoresist Strip to Reduce Fluorine Outgassing Causing Bubble Defect 99
Yujie Xiao, Shuhong Sun, Ghit Guan Goh, Guanyu Zhou, Kim Foong Kong

A Perspective of MIM Defect Density Performance Improvement for Automotive Chip Fabrication 103
Ee Jan Khor, Jian Xun Sun, Zin Tun Thant, Ramasamy Chockalingam, Wei-Hui Hsu, Pannirselvam Somasuntharam, Kwang Sing Yew, Hin Kiong Yap, Juan Boon Tan

A Customizable Simulator for Artificial Intelligence Research to Schedule Semiconductor Fabs 106
Benjamin Kovacs, Pierre Tassel, Ramsha Ali, Mohammed El-Kholany, Martin Gebser, Georg Seidel

Accelerating FinFET MOL Process Development Using Design for Inspection Methodology 112
Fangrui Wu, Linrong Yang, Runling Li, Chiung-Han Ye, Haiqiong Zhang, Ikai Hsu, Tomasz Brozek, Bo Yu

A Simulation-Based Approach for Operational Management of Time Constraint Tunnels in Semiconductor Manufacturing: *Topic: IE: Industrial Engineering 116
Benjamin Anthouard, Valeria Borodin, Quentin Christ, Stephane Dauzere-Peres, Renaud Roussel

Photoluminescence Imaging for Slip Line Detection and Characterization in Silicon Substrates 122
Romain Duru, Isabella Mica, Jacopo Frascaroli, Pierre Bellanger

A Metal Gate Height Variation Control Method by the Metal Gate Etch at the FinFET Technology 128
Wutao Tu, Yan Wang, Jing Qiu, Haiyang Zhang

Optimization of OC-SVM Engine Used for Out-Of-Control Detection in Semiconductor Industry 132
Rabhi Ilham, Roussy Agnes, Pasqualini Francois

Specialty Coatings to Reduce Corrosion in Scrubber Components: Advanced Equipment Process and Materials 138
Cesar M. Garza, Cole Mann, Min Yuan, James Mattzela, Nik Snyder

On Updating a Virtual Metrology Model in Semiconductor Manufacturing Via Transfer Learning 143
Rebecca Clain, Ikram Azzizi, Valeria Borodin, Agnes Roussy

Analysis of Artificial Neural Network Based Algorithms for Real Time Dispatching 149
Shiladitya Chakravorty, Nagendra N. Nagarur

Developing a Digital Twin of a Polymerization Reaction for Process Optimization 155
Balazs Bordas, Kutup Kurt, Andreas Bamberg, Sebastian Engell

Root Cause Identification and Mitigation of Polysilicon CMP Underpolish Increase in DRAM Manufacturing 161
Russell McCabe, Ritesh Ray Chaudhuri, Samantha Spangler, Russ Heller, Ahmed Tahraoui, Emmett Synder, William Simpson, Michael Frachel, Glen Martin

Multiphased Process Optimization for CMP Variation Reduction in High Volume Manufacturing 164
Russell McCabe, Ritesh Ray Chaudhuri, Samantha Spangler, Lauren Kerstetter, Femi Aborisade, Raita Hoech

NOR Yield Enhancement and Downstream Process Variation Reduction by STI CMP Optimization 167
Russell McCabe, Suraj Kaulkevin Ward, Ronilo Acosta, Bhaskar Pant

Wafer Geometry Technique for Blank 300mm Silicon Wafers 173
Juan M. Trujillo-Sevilla, Alex Roque-Velasco, Miguel Jesus Sicilia, Oscar Casanova-Gonzalez, Jose Manuel Ramos-Rodriguez, Jan Gaudestad

Nuisance Rate Improvement of E-Beam Defect Classification 180
Hairong Lei, Qian Dong, Cho Teh, Lingling Pu, Chih-Yu Jen, Steve Lin

Combination of Mass Metrology with Scatterometry to Obtain Bottom Width of Deep Trenches - AM: Advanced Metrology 184
Martin Haberjahn, Sasmita Srichandan, Yulia Polak, Georg Ehrentraut, Franz Heider

Introduction of Equipment Level FDC System for Semiconductor Wet-Cleaning Equipment Optimization and Real-Time Fault Detection 189
Namjin Kim, Hojin Choi, Jaeho Chun, Jongpil Jeong

Visualization of Particle Retention Profiles in Advanced Filtration Media with Confocal Fluorescence Microscopy for Semiconductor Applications 193
Yu Cai

Identification and Control of Surface Charge Defect Induced by Wafer Spin-Cleaning Process 198
Jaein Jeong, Dukmin Ahn, Myungjoon Kim, Eunyoung Han, Youngjeong Kim, Joong Jung Kim

Fabrication of Se-Fe_2O_3-Based Schottky Diode Using Cantilever-Based Ag-Contact Printing Technology: Topic: NS/NC - Non-Silicon and Non-CMOS 203
Joshua Roy Palathinkal, Sumit Majumder, Thomas T Daniel, Vimal Kumar Singh Yadav, Roy Paily Palathinkal

Nano Filtration Using Polysulfone Membrane - CFM: Contamination Free Manufacturing 208
Jian Tan, Rob Shick, Joe Peri, I.-F. Wang, Amarnauth Singh, Rajan Beera

Real-Time Automated Socket Inspection Using Advanced Computer Vision and Machine Learning - DI: Defect Inspection and Reduction 212
Chris Edwards, Aditya Kumar, Alex Vaske, Nathan McDaniel, Dipali Pradhan, Debashis Panda

Observation of Pattern Sensitivity in Laser Anneal: Topic/Category Yield Enhancement 218
Raymond Van Roijen, Mark Hurley, Pial Mirdha, Jeff Brown

Using a Wireless Temperature Measurement Wafer to Analyze the Cause of Critical Dimension Differences Between Tools 222
Seunguk Cha, Matteo Rossi, Bonwang Koo, Kwanghyun Jin, Vivek Jain

On an Application of Denoising to the Uncertainty Quantification of Line Edge Roughness Estimation 227
Inimfon I. Akpabio, Serap A. Savari

Feature Selection for Virtual Metrology Modeling: An Application to Chemical Mechanical Polishing 233
Oussama Djedidi, Rebecca Clain, Valeria Borodin, Agnes Roussy

Electrically Testable Product Macro Multi-Via Measurement for Within Die CD Variation 239
Carol Boye, Dukkyun Moon, Steven McDermott, Norbert Arnold, Nicole Saulnier, Felix Levitov, Sam Choi, Alex Goldenshtein, Uri Smolyan, Noam Amit, Injo Ok, Iqbal Saraf

Evolution of Gas Delivery and Liquid Delivery Systems in Semiconductor Processing Equipment: Modular Architectures Drive Configurability Options and Improve Tool Productivity: EO: Equipment Optimization 243
Gary Xing, Paul Werbaneth, Randy Treur, Phil Barros

Non-Contact, In-Line Thermal Characterization Capability with Time Domain Thermoreflectance 249
Robin Mair, G. Andrew Antonelli, Manjusha Mehendale, Priya Mukundhan, Beth May, Karen Terry, Nathaniel Brandt, Xiaoyue Phillip Huang, Tong Zhao

Yield Methodology and Learning in Phase Change Memory (PCM) Technology for Analog Computing: Topic/Category: YE: Yield Enhancement/Learning, YM: Yield Methodologies 253
Victor Chan, A. Gasasira, R. Pujari, R. Southwick, I. Ok, S. Choi, C. Silvestre, G. W. Burr, N. Saulnier, S. Teehan, I. Ahsan

Implementation of an OES System to Detect Silane Bursting During HDP SiN Film Deposition 257
Isabel Azevedo, Matthew Hurley, David Mosher

Negative Mode E-Beam Inspection of the Contact Layer 262
Oliver D. Patterson, M. Golam Faruk, Datong Zhang, Guanchen He, Brian Sheumaker

Artificial Intelligence for Real Time Cluster Tool Scheduling - EO: Equipment Optimization 267
Doug Suerich, Trevor McIlroy

Novel Micro-Textured Film Offers Promise in Universal Handling of 3D Devices 270
Raj Varma, Jennifer Dossee Nunes

High Temperature Resilience of Deposited Films in Harsh Environment Semiconductor Devices - Topics/Categories: Non-Silicon 274
C.-P. Chen, S. Goswami, R. Gossman

Conductive AFM in SEM for 7 NM and Beyond - AM: Advanced Metrology 280
Greg Johnson, Thomas Rodgers, Heiko Stegmann, Frank Hitzel

Full Wafer Process Control Through Object Detection Using Region-Based Convolutional Neural Networks 288
Thomas Alcaire, Delphine Le Cunff, Jean-Herve Tortai, Sebastien Soulan, Virginie Brouzet, Romain Duru, Christophe Euvrard

Author Index