2016 16th International Workshop on Junction Technology (IWJT 2016)

Shanghai, China
9 – 10 May 2016

IEEE Catalog Number: CFP16796-POD
ISBN: 978-1-4673-9966-1

Copyright © 2016 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 publication is a representation of what appears in the IEEE Digital Libraries. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number: CFP16796-POD
ISBN (Print-On-Demand): 978-1-4673-9966-1
ISBN (Online): 978-1-4673-9965-4

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

May 9 (Mon.)
09:00-09:30

Opening

(Auditorium, 4th floor)

May 9 (Mon.)
09:30-11:30

Plenary Session

(Auditorium, 4th floor)

Co-Chairs: Bing-Zong Li, Fudan University, China
Kazuo Tsutsui, Tokyo Inst. of Technol., Japan

K1-1 **End of the scaling theory and Moore's law** 1
09:30 Hiroshi Iwai[1,2]
(Keynote) [1]Tokyo Institute of Technology, Yokohma, Japan;[2]National Chao Tung University, Hsinchu. Twian

Coffee Break (10:15-10:45)

K1-2 **From Millisecond to Nanosecond Annealing: Challenges and New Approach** 5
10:45 Yun Wang, Shaoyin Chen, Michael Shen, Xiaoru Wang
(Keynote) Ultratech Inc., USA

May 9 (Mon.)
13:30-15:30

Contact Technology

(Meeting Room 1, 4th floor)

Chair: Yu-Long Jiang, Fudan University, China

S1-1 **Ohmic Contacts for AlGaN/GaN HEMTs with Artificially Introduced Uneven Structures at Metal/AlGaN Interfaces** 9
13:30 Kazuo Tsutsui
(Invited) Tokyo Institute of Technology, Japan

S1-2 **Improving Contact Resistance with Advanced Ion Implantation and Rapid Thermal Annealing** N/A
14:00 Er-Xuan Ping, Fareen Adeni Khaja
(Invited) Applied Materials, USA

S1-3 **Metal/Insulator/Semiconductor Contacts for Ultimately Scaled CMOS Nodes: Projected Benefits and Remaining Challenges** 14
14:30 Julien Borrel[1,2,3], Louis Hutin[2], Helen Grampeix[2], Emmanuel Nolot[2], Magali Tessaire[2], Guillaume Rodriguez[2], Yves Morand[1], Fabrice Nemouchi[2], Magali Grégoire[1], Emmanuel Dubois[3], Maud Vinet[2]
(Invited) [1]STMicroelectronics, France; [2]CEA, LETI, Minatec Campus, France; [3]IEMN, UMR 8520 CNRS, France

S1-4 **MIS or MS? Source/Drain Contact Scheme Evaluation for 7nm Si CMOS Technology And Beyond** 19
15:00 Hao Yu[1,2], Marc Schaekers[1], Steven Demuynck[1], Kathy Barla[1], Anda Mocuta[1], Naoto Horiguchi[1], Nadine Collaert[1], Aaron Voon–Yew Thean[1], Kristin De Meyer[1,2]
(Invited) [1]Imec, Belgium; [2]K. U. Leuven, Belgium

Coffee Break (15:30-16:00)

May 9 (Mon.)
16:00-16:45

Device Technology

(Meeting Room 1, 4th floor)

S2-1 **Dual Sources U-shape Gate Tunnel FETs with High On-current and Steep SS** **25**
16:00 Zhi Jiang[1], Yiqi Zhuang, Cong Li, Ping Wang
[1]Xidian University, China

S2-2 **P^+-$Ge_{1-x}Sn_x$ / p^--$Ge_{1-x-y}Si_xSn_y$ / n-$Ge_{1-x-y}Si_xSn_y$ NTFET Analysis and the realization of n-$Ge_{1-x-y}Si_xSn_y$ Ohmic Contact** **28**
16:15 Suyuan Wang, Jun Zheng, Chunlai Xue, Chuanbo Li, Yuhua Zuo, Buwen Cheng, Qiming Wang
Chinese Academy of Sciences, China

S2-3 **A Novel High-voltage LDMOS with Folded Drift Region** **31**
16:30 Ling Du, Yufeng Guo, Jiafei Yao, Jun Zhang, Kemeng Yang
[1]Nanjing University of Posts and Telecommunications, China; [2]Jiangsu Province Engineering Lab of RF integration & Micropackage, China

May 10 (Tues.)
08:00-11:30

Doping Technology

(Meeting Room 1, 4th floor)

Co-Chairs: Shu Qin, Micron Technologies, USA
Masayasu Tanjo, Nissin Ion Equipment Co.,Ltd, Japan

S3-1 **Vacancy-type defects in Mg-implanted GaN probed by a monoenergetic positron beam** **35**
08:00 Akira Uedono[1], Shinya Takashima[2], Masaharu Edo[2], Katsunori Ueno[2], Hideaki Matsuyama[2], Hiroshi Kudo[3], Hiroshi Naramoto[3], Shoji Ishibashi[4]
(Invited) [1]University of Tsukuba, Japan; [2]Advanced Technology Lab. Fuji Electric Co., Ltd., Japan; [3]University of Tsukuba, Japan; [4]National Institute of Advanced Industrial Science and Technology (AIST), Japan

S3-2 **Ultra Shallow Junction (USJ) Formation Using Plasma assisted Doping on 3D Devices Structures** **39**
08:30 YS Kim, YounGi Hong, Ivan Berry
Lam Research Corp., USA

S3-3 **New processes for homojunction silicon solar cells doping: From beam line to plasma immersion ion implantation** **44**
08:45 Marianne Coig[1], Frédéric Milési[1], Jean-François Lerat[2], Thibaut Desrues[2], Jérôme Le Perchec[2], Adeline Lanterne[2], Laurent Lachal[1], Frédéric Mazen[1]
(Invited) [1]CEA, LETI, MINATEC Campus, France; [2]CEA, INES, France

S3-4 **Device Performance Improvement with Implantation Balancing Energy Contamination and Productivity** **51**
09:15 Yonggen He[1,2], Guohui Cai[2], Zuyuan Zhou[2], Youfeng He[2], Jingang Wu[2], David Wei Zhang[1], Ting Cai[3], Junfeng Lu[3], Ganming Zhao[3], Baonian Guo[4]
[1]Fudan University, China; [2]Semiconductor Manufacturing International Corp., China; [3]Applied Materials China, China; [4]Applied Materials, USA

Coffee Break (9:30-10:00)

S3-5 **Ion Implantation Technology in SiC for High-Voltage/High-Temperature Devices** **54**
10:00 T. Kimoto, K. Kawahara, N. Kaji, H. Fujihara, J. Suda
(Invited) Kyoto University, Japan

S3-6 **Ion Implant Technology for State-of-the-art High Efficiency Solar Cell Applications** **59**

10:30

Guangyao Jin[1], Yaojie Sun[3], Yizhe Wang[1], David Wei Zhang[2], Lin Chen[2], Chuan He[1], Jeff Boeker[1], Junhua Hong[1], Shoujun Chen[1], Renjie Liu[1], Yimin Lv[1], Jiong Chen[1]

[1]Kingstone Semiconductor Joint Stock Co., Ltd., China; [2]Fudan University, China; [3]Fudan University, China

S3-7 **Implant Application for Advanced Memory** **N/A**

10:45

(Invited)

Wei (David) Zou, Kyu-Ha Shim, Todd Henry

Applied Materials, USA

S3-8 **FinFET Doping with PSG/BSG Glass Mimic doping by Ultra Low Energy Ion Implantation** **64**

11:15

Chuan He[1], Lin Chen[2], David Wei Zhang[2], Junhua Hong[1], Guangyao Jin[1], Jin Zhang[1], Jeff Boeker[1], Renjie Liu[1], Hao Jin[1], Yimin Lv[1], Jiong Chen[1]

[1]Kingstone Semiconductor Joint Stock Co., Ltd., China; [2]Fudan University, China

May 10 (Tues.)
13:30-15:15

Annealing Technology

(Meeting Room 1, 4th floor)

Chair: Yun Wang, UltraTech Inc., USA

S4-1 **Activation of Impurity Atoms in 4H-SiC Wafer by Atmospheric Pressure Thermal Plasma Jet Irradiation** **68**

13:30

(Invited)

S. Higashi, K. Maruyama, H. Hanafusa

Hiroshima University, Japan

S4-2 **Dopant activation and crystal recovery in arsenic-implanted ultra-thin silicon-on-insulator structures using 308nm nanosecond laser annealing** **72**

14:00

S. Kerdilès[1,2], P.Acosta Alba[1,2], B. Mathieu[1,2], M. Veillerot[1,2], R. Kachtouli[1,2], P. Besson[1,2,3], H.Denis[1,2],F.Mazzamuto[4], I. Toqué-Trésonne[4], K. Huet[4], C. Fenouillet-Béranger[1,2]

[1]Université Grenoble Alpes, France; [2]CEA, LETI, MINATEC Campus, France; [3]STMicroelectronics, France; [4]SCREEN-LASSE, France

S4-3 **Defects and dopant activation in laser annealed Si and Ge** **N/A**

14:15

(Invited)

F. Cristiano[1] and S. Boninelli[2]

[1]LAAS-CNRS, Toulouse, France;[2] IMM-CNR, Catania, Italy

S4-4 **10 nm-Deep n^+/p and p^+/n Ge Junctions with High Activation Formed by Ion Implantation and Flash Lamp Annealing (FLA)** **77**

14:45

H. Tanimura[1], H. Kawarazaki[1], K. Fuse[1], M. Abe[1], T. Yamada[1], Y. Ono[1], M. Furukawa[1], A.Ueda[1], Y. Ito[1], T.Aoyama[1], S. Kato[1], I. Kobayashi[1] H. Onoda[2], Y. Nakashima[2], T. Nagayama[2], N. Hamamoto[2], S. Sakai[2]

[1]SCREENSemiconductor Solutions Co., Japan; [2]Nissin Ion Equipment Co., Japan

Coffee Break (15:15-15:45)

May 10 (Tues.)
15:45-17:15

Characterizations and Metrologies

(Meeting Room 1, 4th floor)

Chair: Hua Fang, PDF Solutions (Shanghai), China

S5-1 Anisotropic Strain Evaluation Induced in Group IV Materials using Liquid-Immersion Raman Spectroscopy 81
15:45 Atsushi Ogura, Kazuma Takeuchi
(Invited) Meiji University, Japan

S5-2 Metrologies for conformal doping on 3D structures like FinFET N/A
16:15 Lei Shi, Jin An, Jianou Shi, Lu Yu
(Invited) KLA-Tencor Semiconductor Equipment Technology (Shanghai) Co., China

S5-3 Challenges of 2-D (3-D) Device Doping Process and Doping Profiling Metrology 91
16:45 Shu Qin
(Invited) Micron Technology Inc., USA

Author Index 99