

THURSDAY

ORAL PRESENTATIONS

* Invited Paper

Reliability and Ruggedness II

Session Chairs: A. Q. Huang and Edward Van Brunt
Thursday Morning, September 21, 2017
Thurgood Marshall Ballroom, North Salon
8:30 am – 10:00 am

8:30 AM TH.D1.1

H3TRB Test on 650 V SiC JBS Diodes

Christian Zorn¹, Felix Hoffmann¹, Michael Hanf¹, Nando Kaminski¹, Andrei Konstantinov², Fredrik Allerstam² and Thomas Neyer³; ¹Universität Bremen, Germany; ²ON Semiconductor, Sweden; ³ON Semiconductor, Germany.

8:45 AM TH.D1.2

Short-Circuit Capability of SiC Cascade

Xueqing Li; United Silicon Carbide, Inc., United States.

9:00 AM TH.D1.3

An Experimental Demonstration of Short Circuit Protection of SiC Devices

Eddy Aeloiza; ABB Inc., United States.

9:15 AM TH.D1.4

Suppression of Short-Circuit Current with Embedded Source Resistance in SiC-MOSFET

Hideyuki Hatta¹, Takaaki Tominaga¹, Shiro Hino¹, Naruhisa Miura², Shingo Tomohisa¹ and Satoshi Yamakawa¹; ¹Mitsubishi Electric Corporation, Japan; ²Mitsubishi Electric Corporation, Japan.

9:30 AM TH.D1.5

Influences of Bias Interruption and Reapplication on High-Temperature Threshold-Voltage Shifts of SiC DMOSFETs

Daniel B. Habersat, Aivars Lelis and Ronald Green; U.S. Army Research Laboratory, United States.

9:45 AM TH.D1.6

(LATE NEWS) Extremely Compact Half-Bridge SiC Power Modules Built into EV In-Wheel Motor

Satoshi Tanimoto^{1,3}, A. Hara¹, M. Yamashita¹, T. Suzuki¹, S. Araki¹, S. Sato² and K. Akatsu³; ¹Nissan ARC Ltd., Japan; ²AIST, Japan; ³Shibaura Institute of Technology, Japan.

10:00 AM BREAK

Diodes and Bipolar Devices II

Session Chairs: Sei-Hyung Ryu and Yoshiyuki Yonezawa
Thursday Morning, September 21, 2017
Thurgood Marshall Ballroom, North Salon
10:30 am – 12:00 pm

10:30 AM TH.D1.6

Performance Evaluation of SiC JBS Diodes Rated for 6.5kV Applications

Andrei Mihaila, Lars Knoll, Lukas Kranz, Enea Bianda, Giovanni Alfieri, Marco Bellini, Charalampos Papadopoulos and Munaf Rahimo; ABB, Switzerland.

10:45 AM TH.D1.7

Breakdown Characteristics of 4H-SiC p-n Junction Diodes with a Wide Range of Doping Concentration

Xilun Chi, Hiroki Niwa and Tsunenobu Kimoto; Kyoto University, Japan.

11:00 AM TH.D1.8

Impact of Cell Layout and Device Structure on On-Voltage Reduction of 6.5-kV n-Channel SiC IGBTs

Naoki Watanabe, Hiroyuki Yoshimoto and Akio Shima; Hitachi, Japan.

11:15 AM TH.D1.9

Low Loss 4H-SiC PiN Diode with Local Low Carrier Lifetime Region

Koji Nakayama¹, Tetsuo Hatakeyama¹, Yoshiyuki Yonezawa¹, Hajime Okumura¹ and Hidekazu Tsuchida²; ¹National Institute of Advanced Industrial Science and Technology, Japan; ²Central Research Institute of Electric Power Industry, Japan.

11:30 AM TH.D1.10

SiC MPS Devices—One Step Closer to the Ideal Diode

Rudolf Elpelt¹, Mihai Draghici², Rolf Gerlach¹, Roland Rupp¹ and Reinhold Schörner¹; ¹Infineon Technologies AG, Germany; ²Infineon Technologies Austria AG, Austria.

11:45 AM TH.D1.11

(LATE NEWS) High Temperature Characterization of a 4H-SiC PiN Rectifier

Benedikt Lechner, S. Schaub, Aldin Striković, Y. Huang and Gerhard Wachutka; Technical University of Munich, Germany.

Quantum Technology

Session Chairs: Adam Gali and Nguyen Son
Thursday Morning, September 21, 2017
Thurgood Marshall Ballroom, West Salon
8:30 am – 10:00 am

8:30 AM *TH.B1.1

Sub-Bandgap Photoluminescence Study on Implantation-Induced Color Centers in 4H-SiC

Maximilian Rühl, Christian Ott, Heiko Weber and Michael Krieger; Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany.

9:00 AM TH.B1.2

Enhanced Single Photon Emission near Stacking Fault in 4H-SiC Epilayer

Yasuto Hijikata¹, Shuhei Akahori¹ and Takeshi Ohshima²; ¹Saitama University, Japan; ²National Institutes for Quantum and Radiological Science and Technology, Japan.

9:15 AM TH.B1.3

Oxidation-Process Dependence of Single Photon Sources Embedded in 4H-SiC MOSFETs

Yuta Abe; University of Tsukuba, Japan.

9:30 AM TH.B1.4

Processing of Cavities in SiC Material for Quantum Technologies

Rachael L. Myers-Ward, Karl D. Hobart, Kevin M. Daniels, Alex Giles, Marko J. Tadjer, Lunet E. Luna, Fritz J. Kub, Shojan Pavunny, Sam Carter, Hunter B. Banks, Evan Glaser, Paul Klein and Kurt Gaskill; U.S. Naval Research Laboratory, United States.

9:45 AM TH.B1.5

(LATE NEWS) Optical Charge State Control of Spin Defects in 4H-SiC

Gary Wolfowicz¹, Christopher P. Anderson¹, Andrew P. Yeats¹, Samuel J. Whiteley¹, Jen Niklas², Oleg G. Poluektov², F. Joseph Heremans³ and David Awschalom¹; ¹University of Chicago, United States; ²Argonne National Laboratory, United States; ³Argonne National Laboratory, United States.

10:00 AM BREAK

Impact of Additives in SiC Materials

Session Chairs: Yuri Khlebnikov and Rajan Rengarajan
Thursday Morning, September 21, 2017
Thurgood Marshall Ballroom, West Salon
10:30 am – 12:00 pm

10:30 AM *TH.A1.1

Effects of Al Co-Doping for Reducing Stacking Faults in High N Doped 4H-SiC Crystal

Kazutoshi Kojima; National Institute of Advanced Industrial Science and Technology, Japan.

11:00 AM TH.A1.2

Achieving Semi-Insulating On-Axis 4H-SiC Epilayers by Vanadium Doping

Robin Karhu¹, Einar Sveinbjörnsson^{1,2}, Ivan G. Ivanov¹, Erik Janzén¹ and Jawad Ul Hassan¹; ¹Linköping University, Sweden; ²Science Institute, Iceland.

11:15 AM TH.A1.3

Optical and Structural Investigation of Heavy B-Doping Effects in Sublimation-Grown 3-SiC

Augustinas Galeckas¹, Patricia Carvalho², Quanbao Ma¹, Alexander Azarov¹, Sigurd Hovden², Annett Thøgersen², Daniel N. Wright³, Spyros Diplas², Ole M. Løvvik², Valdas Jokubavicius⁴, Jianwu Sun⁴, Mikael Syväjärvi⁴ and Bengt Svensson¹; ¹University of Oslo, Norway; ²SINTEF, Norway; ³SINTEF, Norway; ⁴Linköping University, Sweden.

11:30 AM TH.A1.4

High Aluminum-Doping in Fast Growth of 4H-SiC Bulk Crystals Using Gas Source Method

Norihiro Hoshino¹, Isaho Kamata¹, Yuichiro Tokuda², Emi Makino², Takahiro Kanda², Naohiro Sugiyama^{2,3}, Hironari Kuno², Jun Kojima² and Hidekazu Tsuchida¹; ¹Central Research Institute of Electric Power Industry (CRIEPI), Japan; ²Denso Corporation, Japan; ³National Institute of Advanced Industrial Science and Technology (AIST), Japan.

11:45 AM TH.A1.5

Influence of Additives on Surface Smoothness and Polytype Stability in Solution Growth of N-Type 4H-SiC

Naoyoshi Komatsu, Takeshi Mitani, Yuichiro Hayashi, Tomohisa Kato and Hajime Okumura; National Institute of Advanced Industrial Science and Technology (AIST), Japan.

Contacts

Session Chairs: Roberta Nipoti and Ranbir Singh
Thursday Afternoon, September 21, 2017
Thurgood Marshall Ballroom, North Salon
1:30 pm – 3:15 pm

1:30 PM *TH.C2.1

Metal/Semiconductor Contacts to Silicon Carbide—Physics and Technology

Fabrizio Roccaforte¹, Marilena Vivona¹, Giuseppe Greco¹, Raffaella Lo Nigro¹, Filippo Gianazzo¹, Simone Rascunà² and Mario Saggio²; ¹Istituto per la Microelettronica e Microsistemi (CNR-IMM), Italy; ²STMicronics, Italy.

2:00 PM TH.C2.2

Co-Sputtered Pt:Ti as a Diffusion Barrier and Simultaneous Ohmic Contact to N- and P-Type 4H-SiC

Robert Okojie¹ and Dorothy Lukco²; ¹NASA Glenn Research Center, United States; ²Vantage Partners, LLC, United States.

2:15 PM TH.C2.3

Ni-Al-Ti Ohmic Contacts with Preserved Form Factor and Few 10⁻⁴ Ωcm² Specific Resistance on 0.1 - 1 Ωcm P-Type 4H-SiC

Roberta Nipoti¹, Maurizio Puzanghera^{2,1}, Maria Concetta Canino¹, Giovanna Sozzi² and Paolo Fedeli¹; ¹CNR, Italy; ²UniPR, Italy.

2:30 PM TH.C2.4

Silicidation-Less Ohmic Contact Formation on N-Type 4H-SiC with Silicon Cap Annealing

Hiroaki Hanafusa, Taichi Taniguchi and Seiichiro Higashi; Hiroshima, Japan.

2:45 PM TH.C2.5

Formation of Ohmic Contacts to N-Type 4H-SiC at Low Annealing Temperatures

Vinoth Sundaramoorthy, Renato Amaral Minamisawa, Lukas Kranz, Lars Knoll and Giovanni Alfieri; ABB Switzerland Ltd, Switzerland.

3:00 PM TH.C2.6

Extremely Thermal Stable Ni/W/TaSi₂/Pt Simultaneous Ohmic Contacts to N-Type and P-Type 4H-SiC

YanLiang Li, Yimeng Zhang, Xiaoyan Tang, Tao Guo and Yuming Zhang; Xidian University, China.

Extended Defects

Session Chairs: Michael Dudley and Isaho Kamata
Thursday Afternoon, September 21, 2017
Thurgood Marshall Ballroom, West Salon
1:30 pm – 3:15 pm

1:30 PM *TH.B2.1

Progress in Defect Characterization of WBG Semiconductors

Peder Bergman¹, L. Lilja¹, A. Ellison² and Björn Magnusson²; ¹Linköping University, Sweden; ²Norstel AB, Sweden.

2:00 PM TH.B2.2

Direct Observation of Stress Relaxation Process in 4H-SiC Homoepitaxial Layers via *In Situ* Synchrotron X-Ray Topography

Jianqiu Guo, Yu Yang, Balaji Raghothamachar and Michael Dudley; Stony Brook University, United States.

2:15 PM TH.B2.3

Extension, Closure and Conversion of In-Grown Stacking Faults in 4H-SiC Epilayers

Zhe Li^{1,2}, Li-Guo Zhang¹, Tao Ju¹, Ze-Hong Zhang¹, Xuan Zhang¹ and Bao-Shun Zhang¹; ¹Suzhou Institute of Nano-Tech and Nano-Bionics, China; ²University of Chinese Academy of Sciences, China.

2:30 PM TH.B2.4

***In Situ* Synchrotron X-Ray Topography Observation of Double Ended Frank-Read Sources in PVT-Grown 4H-SiC Wafers**

Yu Yang, Jianqiu Guo, Balaji Raghothamachar and Michael Dudley; Stony Brook University, United States.

2:45 PM TH.B2.5

Decay Time of Photoluminescence from ISSFs and PDs in 4H-SiC

Masashi Kato¹, Shinya Katahira¹, Yoshihito Ichikawa¹, Shunta Harada² and Tsunenobu Kimoto³; ¹Nagoya Institute of Technology, Japan; ²Nagoya University, Japan; ³Kyoto University, Japan.

3:00 PM TH.B2.6

An Application of Si-Vapor Etching to Control the Surface Stability of 4H-SiC (0001) On-Axis Substrate Revealed by LE-ECCI of SEM

Daichi Dojima, Kazunori Koide, Natsuki Yoshida, Tomoya Ihara, Koji Ashida and Tadaaki Kaneko; Kwansai Gakuin University, Japan.

FRIDAY

ORAL PRESENTATIONS

Tutorial

SiC Processing
Session Chair: Victor Veliadis
Thursday Afternoon, September 21, 2017
Thurgood Marshall Ballroom, North Salon
4:15 pm – 5:15 pm

4:15 PM

SiC Processing—An Exercise in Si Fabrication with a High Temperature Twist

Victor Veliadis, PowerAmerica, North Carolina State University

* Invited Paper

Radiation Effects and Harsh Environment Integrated Circuits

Session Chair: Carl-Mikael Zetterling
Friday Morning, September 22, 2017
Thurgood Marshall Ballroom, North Salon
8:30 am – 10:00 am

8:30 AM *FR.D1.1

Taking SiC Power Devices to the Final Frontier—Addressing Challenges of the Space Radiation Environment

Jean-Marie Lauenstein and Megan C. Casey; NASA Goddard Space Flight Center, United States.

9:00 AM FR.D1.2

Electrical Characterization of the Operational Amplifier Consisting of 4H-SiC MOSFETs after Gamma Irradiation

Masahiro Masunaga¹, Shntaro Sato¹, Ryo Kuwana¹, Isao Hara² and Akio Shima¹; ¹Hitachi, Japan; ²Hitachi, Japan.

9:15 AM FR.D1.3

Comparison of the Effect of Electron and Proton Irradiation on 4H-SiC and Si Device Structures

Alexander A. Lebedev¹, Klavdia S. Davydovskaya¹, Anatoly M. Strel'chuk¹, Andrey N. Yakimenko² and V. Kozlovski²; ¹Ioffe Institute, Russian Federation; ²Peter the Great St. Petersburg State Polytechnic University, Russian Federation.

9:30 AM FR.D1.4

Prolonged 500 °C Operation of 100+ Transistor Silicon Carbide Integrated Circuits

David J. Spry¹, Philip G. Neudeck¹, Dorothy Lukco², Liangyu Chen³, Michael J. Krasowski¹, Norman F. Prokop¹, Carl W. Chang² and Glenn M. Beheim¹; ¹NASA Glenn Research Center, United States; ²Vantage Partners LLC, United States; ³Ohio Aerospace Institute, United States.

9:45 AM FR.D1.5

First Demonstration of Lateral MOSFETs Fabricated on Semi-Insulating 4H-SiC Substrates

Ogyun Seok¹, Hyun Soo Lee^{1,2}, Jeong Hyun Moon¹, Hyoung Woo Kim¹, In Ho Kang¹ and Wook Bahng¹; ¹Korea Electrotechnology Research Institute, Korea (the Republic of); ²Gyeongsang University, Korea (the Republic of).

10:00 AM BREAK