

Organizers: *Peter Friedrichs* (Infineon Technologies AG, Germany)
Francesco La Via (CNR-IMM, Italy)
Fabrizio Roccaforte (CNR-IMM, Italy)

Tutorial Program

8:15 ***Registration***

8:45-9:00 ***Welcome and Introduction***

9:00-10:00 ***J. Palmour*** (Cree Inc., USA)
Introduction to SiC materials and technology

10:00-11:00 ***T. Ujihara*** (Nagoya University, Japan)
Introduction of SiC Solution Growth - in comparison with other growth methods

11:00-11:15 ***Coffee Break***

11:15-12:15 ***W.J. Choyke*** (University of Pittsburgh, USA)
Practical Aspects of the Optical Characterization of SiC Polytypes

12:15-14:00 ***Lunch Break***

14:00-15:00 ***J. Cooper*** (Purdue University, USA)
Introduction to SiC devices : physics, working principles, architectures

15:00-16:00 ***D. Peters*** (Infineon Technologies AG, Germany)
Processing issues in SiC devices technology

16:00-17:0 *High-Efficiency Power Conversion Using Silicon Carbide Power Electronics*

- Tutorial Day Partially Sponsored by Infineon Technologies -

ORAL PRESENTATIONS

Opening

Monday, Oct. 5 (08:45-09:15)

PLENARIA

Mo-PL: Plenary Session

Monday, Oct. 5 (09:15-10:45)

PLENARIA

Session Chairs: **Fabrizio Roccaforte (CNR-IMM, Italy)**

Francesco La Via (CNR-IMM, Italy)

09.15 Mo-PL-1

Wide Bandgap Semiconductor Technology for Energy Efficiency

Anant Agarwal¹, John Muth², Pawel Gradzki³, Laura Marlino⁴, Robert Ivester¹, Nickolas Justice²

¹ U.S. Department of Energy, Washington, DC, USA, ² North Carolina State University, USA,

³ Booz Allen Hamilton, Washington, DC, USA, ⁴ Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA

10.00 Mo-PL-2

SiC power electronic devices in the year 2015

Peter Friedrichs¹

¹ Infineon Technologies, Germany

Invited Poster Announcement

Monday, Oct. 5 (10:45-11:00)

PLENARIA

10.45 Mo-IP-1

Impact of NO annealing on flatband voltage instability due to charge trapping in SiC MOS devices

Yoshihito Katsu¹, Takuji Hosoi¹, Yuichiro Nanen², Tsunenobu Kimoto², Takayoshi Shimura¹, Heiji Watanabe¹

¹ Osaka University, ² Kyoto University

10.50 Tu-IP-1

Comparison of test methods for proper characterization of V_T in SiC MOSFETs

Daniel Habersat¹, Aivars Lelis¹, Ronald Green¹, Mooro El¹

¹ Sensors and Electron Devices Directorate, U.S. Army Research Laboratory

10.55 We-IP-1

Double Shockley stacking fault formation in higher doping regions of PVT-grown 4H-SiC wafers

Yu Yang¹, Jianqiu Guo¹, Ouloide Goue¹, Balaji Raghothamachar¹, Michael Dudley¹, Gil Chung², Edward Sanchez², Jeff Quast², Ian Manning², Darren Hansen²

¹ Stony Brook University, ² Dow Corning Inc.

11.00-11:20 Coffee Break

- Sponsored by SICC -

Session Chairs: James Cooper (Purdue University, USA)

Dethard Peters (Infineon Technologies AG, Germany)

11.20 Mo-1A-1

Silicon carbide Schottky rectifiers with improved avalanche ruggedness

Andrei Konstantinov¹, Song Jinman¹, Sungmo Young¹, Brian Lee¹, Fredrik Allerstam¹, Thomas Neyer¹, Sal Akram¹

¹⁾ Fairchild Semiconductor, Sweden

11.40 Mo-1A-2

Low Resistivity SiC Devices Optimized with Variational Approach

Takaaki Tominaga¹, Naoyuki Kawabata¹, Akihiro Koyama¹, Takanori Tanaka¹, Hiroshi Watanabe¹, Nobuyuki Tomita¹, Naruhisa Miura², Takeharu Kuroiwa¹, Satoshi Yamakawa¹

¹⁾ Mitsubishi Electric Corporation, Japan, ²⁾ Head Office, Mitsubishi Electric Corporation, Japan

12.00 Mo-1A-3

Current Gain Stability of SiC Junction Transistors subjected to long duration DC and Pulsed Current Stress

Siddarth Sundaresan¹, Brian Grummel¹, Ranbir Singh¹

¹⁾ GeneSiC Semiconductor, USA

12.20 Mo-1A-4

Efficient hydrogen generation by a 3C-SiC on 4H-SiC photoelectrode

Naoto Ichikawa¹, Masashi Kato¹, Masaya Ichimura¹

¹⁾ Nagoya Institute of Technology, Japan

12.40-14:15 Lunch

Session Chairs: Roberta Nipoti (CNR-IMM, Italy)

Daniel Alquier (University of Tours, France)

11.20 Mo-1B-1

Alternative highly homogenous drift layer doping for 650 V SiC devices

Roland Rupp¹, Werner Schustereder², Tobias Höchbauer², Ronny Kern², Michael Rüb³, Constantin Csato³, Florian Krippendor³, Johannes von Borany⁴

¹Infinion Technologies AG, Germany, ²Infinion Technologies AG, Austria,

³Ernst-Abbe-Hochschule Jena, Germany, ⁴HZDR, Germany

11.40 Mo-1B-2

Al doping from laser irradiated Al film deposited on 4H-SiC

Akihiro Ikeda¹, Rikuho Sumina¹, Hiroshi Ikenoue¹, Tanemasa Asano¹

¹Kyushu University, Japan

12.00 Mo-1B-3

Electrically Detected Magnetic Resonance Study on Interface Defects Responsible for Threshold-Voltage Shift in C-face 4H-SiC Metal-Oxide-Semiconductor Field-Effect Transistors

Shijie Ma¹, Geonwoo Kim¹, Mitsuo Okamoto², Shinsuke Harada², Takahiro Makino³, Takeshi Ohshima³, Ryo Arai¹, Takahide Umeda¹

¹University of Tsukuba, Japan, ²AIST, Japan, ³Japan Atomic Energy Agency, Japan

12.20 Mo-1B-4

High Efficiency Activation of Phosphorus Atoms in 4H-SiC by Atmospheric Pressure Thermal Plasma Jet Annealing

Hiroaki Hanafusa¹, Keisuke Maruyama¹, Ryosuke Ishimaru¹, Seiichiro Higashi¹

¹Hiroshima University, Japan

12.40-14:15 Lunch

Session Chairs: Hiroshi Yano (University of Tsukuba, Japan)

Adolf Schöner (Ascatron, Sweden)

14.15 Mo-2A-1 * INVITED *

High-mobility SiC MOSFETs with Alkaline Earth Interface Passivation

Daniel Lichtenwalner¹, Vipindas Pala¹, Brett Hull¹, Scott Allen¹, John Palmour¹

¹⁾ Cree Inc., USA

14.45 Mo-2A-2

Accurate evaluation of interface state densities of 4H-SiC(0001) MOS structures annealed in POCl₃ by C- ψ_s method

Takuma Kobayashi¹, Takafumi Okuda¹, Jun Suda¹, Tsunenobu Kimoto¹

¹⁾ Kyoto University, Japan

15.05 Mo-2A-3

Effect of Activation Annealing and Reactive Ion Etching on MOS Channel Properties of (11-20) Oriented 4H-SiC

Sauvik Chowdhury¹, Kensaku Yamamoto², T. Paul Chow¹

¹⁾ Rensselaer Polytechnic Institute, USA, ²⁾ DENSO Corp., Japan

15.25 Mo-2A-4

Combination of High-temperature Oxidation and Low-temperature O₂-Annealing toward Nearly-Ideal MOS Characteristics on 4H-SiC (0001)

Koji Kita¹, Richard Heihachiro Kikuchi¹, Hirohisa Hirai¹

¹⁾ University of Tokyo, Japan

15.45 Mo-2A-5

Conduction mechanisms at SiO₂/4H-SiC interfaces in MOS-based devices subjected to post deposition annealing in N₂O

Patrick Fiorenza¹, Filippo Giannazzo¹, Alessia Frazzetto², Alfio Guarnera², Mario Saggio², Fabrizio Roccaforte¹

¹⁾ CNR-IMM, Italy, ²⁾ STMicroelectronics, Italy

16.05-16:25 Coffee Break - Sponsored by Sumitomo Heavy Ind. -

Session Chairs: Peter Wellmann (University of Erlangen-Nürnberg, Germany)**Didier Chaussende (CNRS, France)****14.15 Mo-2B-1 * INVITED *****Bulk Growth of Large Area SiC Crystals**

Adrian Powell¹, Joseph Sumakaris¹, Yuri Khlebnikov¹, Mike Paisley¹, Robert Leonard¹, Eugene Deyneka¹, Sumit Gangwal¹, Jyothi Ambati¹, Valeri Tsevtkov¹, Jeff Seaman¹, Andy McClure¹, Jianqiu Guo², Michael Dudley², Elif Balkas¹, Vijay Balakrishna¹

¹) Cree Inc., USA, ²) Stony Brook University, USA

14.45 Mo-2B-2**Large Area 4H SiC Products for Power Electronic Devices**

Ian Manning¹, Jie Zhang¹, Edward Sanchez¹, Darren Hansen¹, Daniel Adams¹, Gilyong Chung¹, Kevin Moeggenborg¹, Chris Parfeniuk¹, Jeffrey Quast¹, Bernd Thomas¹, Victor Torres¹, Clinton Whiteley¹

¹) Dow Corning, USA

15.05 Mo-2B-3**Using ray tracing simulations for direct determination of Burgers vectors of threading mixed dislocations in 4H-SiC c-plane wafers grown by PVT method**

Jianqiu Guo¹, Yu Yang¹, Fangzhen Wu¹, Ouloide Goue¹, Balaji Raghothamachar¹, Michael Dudley¹, Joseph Sumakeris², Robert Leonard²

¹) Stony Brook University, USA, ²) Cree Inc., USA

15.25 Mo-2B-4**Trials of solution growth of dislocation-free 4H-SiC bulk crystals**

Katsunori Danno¹, Satoshi Yamaguchi², Kazuaki Sato¹, Takeshi Bessho¹

¹) Toyota Motor Corporation, Japan, ²) Toyota Central R&D Labs., Inc., Japan

15.45 Mo-2B-5**Consideration of threading dislocation conversion phenomena during SiC solution growth based on the elastic strain energy**

Shunta Harada¹, Shiyu Xiao¹, Kenta Murayama¹, Kenta Aoyagi¹, Takenobu Sakai¹, Miho Tagawa¹, Toru Ujihara¹

¹) Nagoya University, Japan

16.05-16:25 Coffee Break - Sponsored by Sumitomo Heavy Ind. -

Session Chairs: **Adam Gali (Budapest Univ. of Tech. and Econ., Hungary)**

Alexander Lebedev (IOFFE Phys. Tech. Inst., Russia)

08.30 Tu-1A-1 * INVITED *

Doping of 4H-SiC with group IV elements

Michael Krieger¹, Maximilian Rühl^{1,2}, Tomasz Sledziewski¹, Günter Ellrott¹, Theresa Palm¹, Heiko B. Weber¹, Michel Bockstedte^{2,3}

¹⁾ Applied Physics, FAU Erlangen-Nürnberg, Germany, ²⁾ Solid State Theory, FAU Erlangen-Nürnberg, Germany, ³⁾ Universität Salzburg, Austria

09.00 Tu-1A-2

Temperature dependence of Hall scattering factor in p-type 4H-SiC with various doping concentrations

Satoshi Asada¹, Takafumi Okuda¹, Tsunenobu Kimoto¹, Jun Suda¹

¹⁾ Kyoto University, Japan

09.20 Tu-1A-3

High temperature variable range hopping in heavy Al implanted 4H-SiC

Antonella Parisini¹, Andrea Parisini², Marco Gorni¹, Roberta Nipoti²

¹⁾ University of Parma, DiFeST-CNISM, Italy, ²⁾ CNR-IMM, Italy

09.40 Tu-1A-4

Photoluminescence of 10H SiC

Anne Henry¹, Hiroshi Yano^{2,3}, Tomoaki Hatayama²

¹⁾ Linköping University, Sweden, ²⁾ Nara Institute of Science and Technology, Japan, ³⁾ Power Electronics Lab., Japan

10.00 Tu-1A-5

Magnetic Field Sensing with Atomic Scale Defects in SiC Devices

Corey Cochran¹, Jordana Blacksberg¹, Patrick Lenahan², Mark Anders²

¹⁾ California Institute of Technology, USA, ²⁾ Pennsylvania State University, USA

10.20-10:40 Coffee Break - Sponsored by STMicroelectronics -

Session Chairs: Birgit Kallinger (Fraunhofer IISB, Germany)**Gan Feng (EpiWorld, China)****08.30 Tu-1B-1 * INVITED *****Advances in Fast Epitaxial Growth of 4H-SiC and Defect Reduction**

Hidekazu Tsuchida¹, Isaho Kamata¹, Masahiko Ito¹, Tetsuya Miyazawa¹, Hideyuki Uehigashi², Hiroaki Fujibayashi², Masami Naitou², Kazukuni Hara², Keisuke Fukada³, Hiroshi Osawa³, Toshikazu Sugiura⁴, Takahiro Kozawa⁵

¹ CRIEPI, Japan, ² DENSO Corp., Japan, ³ Showa Denko K.K., Japan, ⁴ Toyota Motor Corporation, Japan, ⁵ Toyota Central R&D Labs., Inc., Japan

09.00 Tu-1B-2**Long charge carrier lifetime in as-grown 4H-SiC epilayer**

Robin Karhu¹, Ian Booker¹, Jawad Ul Hassan¹, Erik Janzén¹

¹ Linköping University, Sweden

09.20 Tu-1B-3**Epitaxial growth of 4H-SiC on substrates fabricated with solution growth and electrical characterization of Schottky barrier diodes**

Katsunori Danno¹, Akinori Seki¹, Makoto Saito¹, Takayuki Shirai¹, Kazuaki Sato¹, Takeshi Bessho¹

¹ Toyota Motor Corporation, Japan

09.40 Tu-1B-4**Homoepitaxial Chemical Vapor Deposition of up to 150 µm Thick 4H-SiC Epilayers in a 10×100mm Batch Reactor**

Bernd Thomas¹, Jie Zhang¹, Gilyong Chung¹, Willie Bowen¹, Victor Torres¹, Daniel Adams¹, Edward Sanchez¹

¹ Dow Corning, USA

10.00 Tu-1B-5**Improvement of 4H-SiC epitaxial layers grown on 2° offcut Si-face substrate**

Hirokuni Asamizu^{1,2}, Kentaro Tamura^{1,2}, Chiaki Kudou^{1,3}, Johji Nisihio^{1,4}, Keiko Masumoto^{1,5}, Kazutoshi Kojima^{1,5}

¹ FUPET, Japan, ² ROHM Co., Ltd., Japan, ³ Panasonic Corp., Japan, ⁴ Toshiba Corporation, Japan, ⁵ AIST, Japan

10.20-10:40 Coffee Break**- Sponsored by STMicroelectronics -**

Session Chairs: Yoshiyuki Yonezawa (AIST, Japan)

Kevin Matocha (Monolith Semiconductor Inc., USA)

10.40 Tu-2A-1 * INVITED *

Ultrahigh-Voltage SiC Bipolar Devices for Future Power Infrastructure

Tsunenobu Kimoto¹

¹⁾ *Kyoto University, Japan*

11.10 Tu-2A-2

An Analysis of Forward Conduction Characteristics of Ultra High Voltage 4H-SiC N-IGBTs

Sei-Hyung Ryu¹, Craig Capell¹, Charlotte Jonas¹, Michael O'Loughlin¹, Jack Clayton¹, Khiem Lam¹, Edward Van Brunt¹, Yemane Lemma¹, Jim Richmond¹, David Grider¹, Scott Allen¹, John Palmour¹, Miguel Hinojosa², C. Wesley Tipton², Charles Scozzie²

¹⁾ *Cree Inc., USA*, ²⁾ *Army Research Laboratory, USA*

11.30 Tu-2A-3

4H-SiC n-channel IGBTs on (0001) and (000-1) Oriented Lightly Doped Free-standing Substrates

Sauvik Chowdhury¹, Collin Hitchcock¹, Rajendra Dahal¹, Ishwara Bhat¹, T. Paul Chow¹

¹⁾ *Rensselaer Polytechnic Institute, USA*

11.50 Tu-2A-4

3.3 kV-class 4H-SiC UMOSFET by Double-trench with Tilt Angle Ion Implantation

Yusuke Kobayashi^{1,2}, Shinsuke Harada^{1,3}, Hiroshi Ishimori³, Shinji Takasu³, Takahito Kojima^{1,2}, Keiko Ariyoshi^{1,4}, Mitsuru Sometani^{1,2}, Junji Senzaki^{1,3}, Manabu Takei^{1,2}, Yasunori Tanaka^{1,3}, Hajime Okumura^{1,3}

¹⁾ *FUPET, Japan*, ²⁾ *Fuji Electric Co., Ltd., Japan*, ³⁾ *AIST, Japan*, ⁴⁾ *Toshiba Corporation, Japan*

12.10 Tu-2A-5

High Performance 1.2kV-2.5kV 4H-SiC MOSFETs with Excellent Process Capability and Robustness

Peter Losee¹, Alexander Bolotnikov¹, Stacey Kennerly¹, Chris Collazo¹, David Lilienfeld¹, Greg Dunne¹, Peter Deeb¹, Ljubisa Stevanovic¹

¹⁾ *GE Global Research, USA*

12.30-14:00 Lunch

Session Chairs: Michael Dudley (Stony Brook University, USA)

Adrian Powell (Cree Inc.,USA)

10.40 Tu-2B-1 * INVITED *

Developing Technologies of SiC Gas Source Growth Method

Jun Kojima^{1,2}, Yuichiro Tokuda^{1,2}, Emi Makino^{1,2}, Naohiro Sugiyama^{1,2}, Norihiro Hoshino³,
Isaho Kamata³, Hidekazu Tsuchida³

¹⁾ FUPET, Japan, ²⁾ DENSO Corp., Japan, ³⁾ CRIEPI, Japan

11.10 Tu-2B-2

Limitations in Very Fast Growth of 4H-SiC Crystals by High-Temperature Gas Source Method

Norihiro Hoshino¹, Isaho Kamata¹, Yuichiro Tokuda^{2,3,4}, Emi Makino^{2,3}, Naohiro Sugiyama^{2,3},
Jun Kojima^{2,3}, Hidekazu Tsuchida¹

¹⁾ CRIEPI, Japan, ²⁾ FUPET, Japan, ³⁾ DENSO Corp., Japan, ⁴⁾ AIST, Japan

11.30 Tu-2B-3

High temperature solution growth of SiC by the Vertical Bridgman method using a metal free Si-C-melt at 2300°C

Lars Fahlbusch¹, Michael Schöler¹, Sarah Schnitzer¹, Peter J. Wellmann¹

¹⁾ Crystal Growth Lab, Germany

11.50 Tu-2B-4

2D nucleation of 3C-SiC on 4H-SiC (0001) at 1680 - 1880 K investigated by in-situ observation of solution growth interface

Sakiko Kawanishi¹, Takeshi Yoshikawa¹

¹⁾ University of Tokyo, Japan

12.10 Tu-2B-5

Effect of aluminum during the high temperature solution growth of Si-face 4H-SiC

Didier Chaussende¹, Lucile Parent-Bert¹, Yun Ji Shin¹, Thierry Ouisse¹, Takeshi Yoshikawa²

¹⁾ Univ. Grenoble Alpes, CNRS, LMGP, France, ²⁾ University of Tokyo, Japan

12.30-14:00 Lunch

Session Chairs: Konstantinos Zekentes (FORTH, Greece)

Roland Rupp (Infineon Technologies AG, Germany)

14.00 Tu-3A-1 * INVITED *

Novel 3C-SiC microstructure for MEMS applications

Daniel Alquier¹, Marc Portail², Rami Khazaka¹, Marcin Zielinski³, Thierry Chassagne³, Jean-Francois Michaud¹

¹⁾ Université François Rabelais, GREMAN, CNRS-UMR 7347, France, ²⁾ CRHEA - CNRS, France,

³⁾ NOVASiC, France

14.30 Tu-3A-2

Fabrication of epitaxial tungsten carbide metal/4H-SiC contacts with low Schottky barrier height

Lars Knoll¹, Renato Amaral Minamisawa¹

¹⁾ ABB Corporate Research Center, Switzerland

14.50 Tu-3A-3

Thermally stable ohmic contact to p-type 4H-SiC based on Ti₃SiC₂ phase

Tony Abi Tannous¹, Maher Soueidan¹, Gabriel Ferro², Mihai Lazar¹, Christophe Raynaud¹, Dominique Planson¹

¹⁾ Université de Lyon, CNRS, Laboratoire Ampère, INSA-Lyon, France, ²⁾ Université de Lyon, CNRS, Laboratoire des Multimatériaux et Interfaces, France

15.10 Tu-3A-4

Low thermal budget ohmic contact formation by laser anneal

Fulvio Mazzamuto¹, Sébastien Halty², Hideaki Tanimura², Mori Yoshihiro²

¹⁾ LASSE, Gennevilliers, France, ²⁾ Screen Semiconductor Solutions, Japan

15.30 Tu-3A-5

Leakage current conduction mechanism at directly bonded Si/6H-SiC interface

Daiki Sodeoka¹, Yukihiko Sasada¹, Hiroyuki Kinoshita¹, Hidetoshi Ishida², Masahiro Yoshimoto^{1,2}

¹⁾ Dept. of Electronics, Kyoto Inst. of Technology, Japan, ²⁾ Nano Material and Dev. Research Center, Kyoto Inst of Technology, Japan

15.50-16:10 Coffee Break

- Sponsored by Lasertec -

Session Chairs: T. Paul Chow (Rensselaer Polytechnic Institute, USA)

Antonino La Magna (CNR-IMM, Italy)

14.00 Tu-3B-1 * INVITED *

Development of GaN-Based Gate-Injection Transistors and Its Power Switching Applications

Tatsuo Morita¹, Tetsuzo Ueda¹

¹Panasonic Corp., Japan

14.30 Tu-3B-2

Metal/p-GaN contacts on AlGaIn/GaN heterostructures for normally-off HEMTs

Giuseppe Greco¹, Ferdinando Iucolano², Salvatore Di Franco¹, Domenico Corso¹, Emanuele Smecca¹, Alessandra Alberti¹, Alfonso Patti², Fabrizio Roccaforte¹

¹CNR-IMM, Italy, ²STMicroelectronics, Italy

14.50 Tu-3B-3

Growth of crack-free GaN on Si HEMTs with Fe-doped GaN using un-doped GaN interlayer

Atsushi Era¹, Susumu Hatakenaka¹, Hiroyuki Okazaki¹, Yoshitaka Kamo¹, Takehiro Nishida¹, Hitoshi Watanabe¹

¹Mitsubishi Electric Corporation, Japan

15.10 Tu-3B-4

Visualization of polarization and two dimensional electron gas distribution in AlGaIn/GaN heterostructure using scanning nonlinear dielectric microscopy

Kotaro Hirose¹, Norimich Chinone¹, Yasuo Cho¹

¹Tohoku University, Japan

15.30 Tu-3B-5

III-Nitride/SiC Heterojunction Ultraviolet Photodiodes

Anand Sampath¹, Yoajia Chen², Quigui Zhou², Ryan Enck¹, Gregory Garrett¹, Brenda Vanmil¹, Roy Chung¹, Meredith Reed¹, H. Shen¹, Joe Campbell², Michael Wraback¹

¹Army Research Laboratory, USA, ²University of Virginia, USA

15.50-16:10 Coffee Break

- Sponsored by Lasertec -

Session Chairs: Tsunenobu Kimoto (Kyoto University, Japan)

Bengt Svensson (University of Oslo, Norway)

08.30 We-1A-1 * INVITED *

Enhancement of carrier lifetimes in p-type 4H-SiC epitaxial layers

Takafumi Okuda¹, Tsunenobu Kimoto¹, Jun Suda¹

¹⁾ Kyoto University, Japan

09.00 We-1A-2

Hole and electron capture cross sections of deep levels in p-type 4H-SiC

Ian Booker¹, Robin Karhu¹, Jawad Hassan¹, Einar Sveinbjörnsson^{1,2}, Erik Janzén¹

¹⁾ Linköping University, Sweden, ²⁾ University of Iceland, Iceland

09.20 We-1A-3

Control of Carrier Lifetimes in Thick n-type 4H-SiC Epilayers by High-Temperature Annealing

Eiji Saito¹, Jun Suda¹, Tsunenobu Kimoto¹

¹⁾ Kyoto University, Japan

09.40 We-1A-4

Ultrafast pump-probe spectroscopy of V-doped SiC: Insights into recombination mechanisms through amphoteric centers

Paulius Grivickas¹, Stephen Sampayan¹, Kipras Radeckas², Mikas Vengris², Vytaitas Grivickas²

¹⁾ Lawrence Livermore National Laboratory, USA, ²⁾ Vilnius University, Lithuania

10.00 We-1A-5

Extraction of electron effective mobility of 4H-SiC MOS inversion channel with thermally-grown SiO₂ by high-frequency split C-V technique

Hirohisa Hirai¹, Koji Kita¹

¹⁾ University of Tokyo, Japan

10.20-10:40 Coffee Break - Sponsored by Toray Research Center -

Session Chairs: Danilo Crippa (LPE, Italy)**Gabriel Ferro (University of Lyon, France)****08.30 We-1B-1 * INVITED *****p-type doping of 3C- and 4H-SiC epitaxial layers**

Marcin Zielinski¹, Roxana Arvinte¹, Thierry Chassagne¹, Adrien Michon², Marc Portail², Pawel Kwasnicki³, Leszek Konczewicz³, Sylvie Contreras³, Sandrine Juillaguet³, Hervé Peyre³

¹) NOVASiC, France, ²) CRHEA - CNRS, France, ³) CNRS - LCC, France

09.00 We-1B-2**Single-crystal 3C-SiC seeding layers for bulk growth**

Valdas Jokubavicius¹, Gholam Reza Yazdi¹, Rickard Liljedahl¹, Ivan G. Ivanov¹, Jianwu Sun¹, Xinyu Liu¹, Philipp Schuh², Martin Wilhelm², Peter J. Wellmann², Rositsa Yakimova¹, Mikael Syväjärvi¹

¹) Linköping University, Sweden, ²) Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

09.20 We-1B-3**Structural study of 3C-SiC(111) film heteroepitaxied on Si(110)/3C-SiC(001)/Si(001) heterostructure**

Rami Khazaka^{1,2}, Jean Francois Michaud¹, Philippe Vennéguès², Daniel Alquier¹, Marc Portail²

¹) Université François Rabelais, GREMAN, CNRS-UMR 7347, France, ²) CRHEA, CNRS-UPR10, France

09.40 We-1B-4**Stacking Fault Analysis of Epitaxial 3C-SiC on Si(001) Ridges**

Moimir Meduňa¹, Thomas Kreiliger², Marco Mauceri³, Marco Puglisi³, Fulvio Mancarella⁴, Francesco La Via⁵, Danilo Crippa⁶, Leo Miglio^{7,8}, Hans von Känel^{2,7}

¹) Masaryk University, Czech Republic, ²) ETH Zurich, Switzerland, ³) Epitaxial Technology Center srl, Italy, ⁴) CNR-IMM Bologna, Italy, ⁵) CNR-IMM Catania, Italy, ⁶) LPE SpA, Italy, ⁷) PileGrowth Tech srl, Italy, ⁸) Università di Milano Bicocca, Italy

10.00 We-1B-5**Crystallographic and morphological analysis of 3C-SiC layer grown on pseudomorphic-Si/Si_{1-x}Ge_x/Si(001) heterostructures**

Massimo Camarda¹, Matteo Bosi², Nicolò Piluso^{3,4}, Ruggero Anzalone^{3,4}, Andrea Severino^{3,4}, Stefania Privitera⁴, Francesco La Via⁴

¹) PSI, Switzerland, ²) CNR-IMEM, Italy, ³) STMicroelectronics, Italy, ⁴) CNR-IMM, Italy

10.20-10:40 Coffee Break - Sponsored by Toray Research Center -

Session Chairs: Mario Saggio (STMicroelectronics, Italy)

Ljubisa Stevanovic (General Electric, USA)

10.40 We-2A-1 * INVITED *

Progress in SiC unipolar devices for power electronics

Takashi Nakamura¹, H. Otake¹, Masatoshi Aketa¹, Yuki Nakano¹, Hirokazu Asahara¹

¹⁾ ROHM Co., Ltd., Japan

11.10 We-2A-2

Design of Area-efficient, Robust and Reliable Junction Termination Extension in SiC Devices

Alexander Bolotnikov¹, Peter Losee¹, Peter Deeb¹, Mengli Wang¹, Stephen Arthur¹, Ljubisa Stevanovic¹

¹⁾ GE Global Research, USA

11.30 We-2A-3

Advanced SiC Power MOSFETs Manufactured on 150mm SiC wafers

Kevin Matocha¹, Sujit Banerjee¹, Kiran Chatty¹

¹⁾ Monolith Semiconductor Inc., USA

11.50 We-2A-4

Trench-MOSFETs on 4H-SiC

Christian Tobias Banzhaf¹, Stephan Schwaiger¹, Dick Scholten¹, Stefan Noll¹, Michael Grieb¹

¹⁾ Robert Bosch GmbH, Germany

12.10 We-2A-5

Characteristics of High-Threshold-Voltage Low-Loss 4H-SiC MOSFETs with Improved MOS Cell Structure

Yuji Ebiike¹, Toshikazu Tanioka¹, Masayuki Furuhashi², Ai Osawa², Masayuki Imaizumi¹

¹⁾ Mitsubishi Electric Corp., Japan, ²⁾ Mitsubishi Electric Corporation, Japan

12.30-14:00 Lunch

Session Chairs: Filippo Giannazzo (CNR-IMM, Italy)**Rositza Yakimova (University of Linköping, Sweden)****10.40 We-2B-1 * INVITED *****Band structure engineering by intercalation in epitaxial graphene on SiC(0001): Extreme doping levels and many-body interactions**Ulrich Starke¹¹⁾ *Max-Planck-Institut für Festkörperforschung, Germany***11.10 We-2B-2****Towards wafer-scale graphene based devices**A. Nath¹, A.D. Koehler², V.D. Wheeler², A.K. Boyd³, Kevin M. Daniels⁴, M. Currie², N. Nepal⁵, Rachael L. Myers-Ward², P.M. Campbell², A.B. Shuskov⁶, H.D. Drew⁶, K.D. Hobart², D.Kurt Gaskill², F.J. Kub²¹⁾ *George Mason University, USA*, ²⁾ *Naval Research Laboratory, USA*, ³⁾ *ASEE Postdoctoral Fellow Residing at NRL, USA*, ⁴⁾ *NRC Postdoctoral Fellow Residing at NRL*, ⁵⁾ *Sotera Defense Solutions, USA*, ⁶⁾ *University of Maryland, USA***11.30 We-2B-3****Sub 2-dimensional graphene nanostructures formed on SiC(1-108) facets - semiconducting and ballistic transport**Satoru Tanaka¹, Kohei Fukuma¹, Shingo Hayashi¹, Kohei Morita¹, Takashi Kajiwara¹, Anton Visikovskiy¹, Takushi Iimori², Koichiro Ienaga², Koichiro Yaji², Kan Nakatsuji², Fumio Komori², Hirokazu Tanaka³, Akinobu Kanda³, Nguyen Thanh Cuong⁴, Susumu Okada³¹⁾ *Kyushu University, Japan*, ²⁾ *Univ. of Tokyo, Japan*, ³⁾ *Univ. of Tsukuba, Japan*, ⁴⁾ *AIST, Japan***11.50 We-2B-4****Modified Epitaxial Graphene on SiC for Extremely Sensitive and Selective Gas Sensors**Jens Eriksson¹, Donatella Puglisi¹, Carl Strandqvist², Rickard Gunnarsson¹, Sebastian Ekeröth¹, Ulf Helmersson¹, Rositza Yakimova¹, Anita Lloyd Spetz¹¹⁾ *Linköping University, Sweden*, ²⁾ *Graphensic AB, Sweden***12.10 We-2B-5****Graphitized silicon carbide on silicon substrates: a wafer -level platform for unparalleled electrical conduction in integrated devices**Francesca Iacopi¹, Neeraj Mishra¹, Atieh Ranjbar Kermany¹, Aiswarya Pradeepkumar¹, Dayle Goding¹, Zulfiqar H Khan¹, Benjamin V Cunning¹, Sima Dimitrijević¹, Ryan E Brock², Reinhold H. Dauskardt², John J Boeckl³¹⁾ *Griffith University, Australia*, ²⁾ *Stanford University, USA*, ³⁾ *Air Force Research Labs, USA***12.30-14:00 Lunch**

Session Chairs: Ulrike Grossner (ETH Zürich, Switzerland)**Ranbir Singh (GeneSiC Semiconductor, USA)****14.00 We-3A-1 * INVITED *****Threshold-Voltage Instability in SiC MOSFETs***Aivars Lelis¹, Ronald Green¹, Daniel Habersat¹*¹⁾ Army Research Laboratory, USA**14.30 We-3A-2****Improvement of SiO₂/4H-SiC interface quality by post-oxidation annealing in N₂ at high-temperatures***Atthawut Chanthaphan¹, Takuji Hosoi¹, Takayoshi Shimura¹, Heiji Watanabe¹*¹⁾ Osaka University, Japan**14.50 We-3A-3****Time Dependent Dielectric Breakdown in high quality SiC MOS capacitors***Zakariae Chbili^{1,2}, Kin Cheung¹, Jason Campbell¹, Jaafar Chbili^{1,3}, Mhamed Lahbabi³, Dimitris Ioannou², Kevin Matocha⁴*¹⁾ National Institute of Standards and Technology, USA, ²⁾ George Mason University, USA,³⁾ Faculté des Sciences et Techniques, Morocco, ⁴⁾ Monolith Semiconductor Inc., USA**15.10 We-3A-4****High Channel Mobility 4H-SiC MOSFETs by As and P Implantation prior to Thermal Oxidation in N₂O***A.I. Mikhaylov^{1,2}, Sergey A. Reshanov¹, Adolf Schöner¹, Alexey V. Afanasyev², V.V. Luchinin², Lars Knoll³, R.A. Minamisawa³, Giovanni Alfieri³, Holger Bartolf³*¹⁾ Ascatron AB, Sweden, ²⁾ St. Petersburg Electrotechnical University "LETI", Russia, ³⁾ ABB Schweiz AG, Switzerland**15.30 We-3A-5****Negative Bias Temperature Instability of SiC MOSFET***Cheng-Tyng Yen¹, Hsiang-Ting Hung¹, Chien-Chung Hung¹, C. Y. Lee¹, H.Y. Lee², L.S. Lee¹, Y.F. Huang¹, C. Y. Cheng¹, P. J. Chuang¹, F. J. Hsu¹*¹⁾ Hestia Power Incorporation, Taiwan, ²⁾ Industrial Technology Research Institute, Taiwan**15.50-16:10 Coffee Break - Sponsored by Ion Beam Services -**

Session Chairs: Hidekazu Tsuchida (CRIEPI, Japan)

Philip Mawby (University of Warwick, UK)

14.00 We-3B-1 * INVITED *

Advances in 3x150 mm Hot-Wall and 6x150 mm Warm-Wall SiC Epitaxy for 10kV-Class Power Devices

Michael O'Loughlin¹, Albert Burk¹, Denis Tsvetkov¹, Scott Ustin¹, John Palmour¹

¹ Cree Inc., USA

14.30 We-3B-2

Effect of H₂ carrier gas on CVD growth rate for 4H-SiC trench filling

Shiyang Ji¹

¹ Advanced Power Electronics Research Center, Japan

14.50 We-3B-3

Development of new activation annealing method using Si vapor ambient anneal in TaC/Ta composite materials.

Norihito Yabuki¹, Satoshi Torimi¹, Satoru Nogami¹, Tadaaki Kaneko²

¹ Toyo Tanso Co., Ltd., Japan, ² Kwansei Gakuin University, Japan

15.10 We-3B-4

Mitigation of BPD by Pre-Epigrowth High Temperature Substrate Annealing

Nadeemullah Mahadik¹, Robert Stahlbush¹, Eugene Imhoff¹, Marko Tadjer¹, Gary Ruland²

¹ Naval Research Laboratory, USA, ² II-VI Incorporated, USA

15.30 We-3B-5

Effect of catalyst potential on removal reaction in catalyst-referred etching for 4H-SiC (0001) in pure water

Ai Isohashi¹, Wataru Yamaguchi¹, Takahito Sugiura¹, Tatsuaki Inada¹, Satoshi Matsuyama¹, Yasuhisa Sano¹, Kazuto Yamauchi¹

¹ Osaka University, Japan

15.50-16:10 Coffee Break - Sponsored by Ion Beam Services -

Session Chairs: Peter Friedrichs (Infineon Technologies AG, Germany)

Scott Allen (Cree Inc., USA)

08.30 Th-1A-1 * INVITED *

History and recent developments of packaging technology for SiC power devices

Karl O. Dohnke¹

¹⁾ Infineon Technologies AG, Germany

09.00 Th-1A-2

Highly Efficient 3.3 kV SiC-Si Hybrid Power Module with Novel SiC JBS Diode and Si Advanced Trench TiGT

Renichi Yamada¹, Norifumi Kameshiro¹, Yoshiaki Toyota¹, Takashi Hirao¹, Kan Yasui¹, Hidekatsu Onose¹, Kazuhiro Mochizuki¹, Hiroshi Miki¹, Natsuki Yokoyama¹, Hiroyuki Okino¹, Hiroyuki Matsushima¹, Tetsuo Oda², Jiro Hasegawa², Mutsuhiro Mori¹

¹⁾ Hitachi Ltd., R&D Group, Japan, ²⁾ Hitachi Power Semiconductor Device, Japan

09.20 Th-1A-3

Using SiC MOSFET's full potential – Switching faster than 190 kV/μs

Otto Kreutzer¹, Thomas Heckel¹, Martin Maerz¹

¹⁾ Fraunhofer IISB, Germany

09.40 Th-1A-4

Comparative Simulation Study of Dynamic Behavior of the Body-Diode for 4H-SiC JFET and MOSFET

Rudolf Elpelt¹, Bernd Zippelius¹, Daniel Domes²

¹⁾ Infineon Technologies AG, Erlangen, Germany, ²⁾ Infineon Technologies AG, Warstein, Germany

10.00 Th-1A-5

Utilization of SiC MOSFETs in Voltage Source Inverter of Inductive Power Transfer System for Enduring Capacitive Loads

Georgios Kampitsis¹, Eleni Gati¹, Stavros Papathanassiou¹, Stefanos Manias¹

¹⁾ National Technical University of Athens, Greece

10.20-10:40 Coffee Break

- Sponsored by ULVAC -

Session Chairs: Nguyen Tien Son (University of Linköping, Sweden)**Takeshi Ohshima (JAEA, Japan)****08.30 Th-1B-1 * INVITED *****Room temperature Single Photon Sources in Silicon Carbide***Stefania Castelletto^{1,2}, Alexander Lohrmann³, Brett Johnson³, Zoltan Bodrog⁴, Takeshi Ohshima⁴, Adam Gali⁴**¹ RMIT University, Australia, ² Swinburne University of Technology, Australia, ³ University of Melbourne, Australia, ⁴ Hungarian Academy of Sciences, Hungary***09.00 Th-1B-2****Optical nuclear spin polarization of divacancies in SiC***Viktor Ivády^{1,2}, Krisztián Szász^{1,3}, Abram Falk^{4,5}, Paul V. Klimov^{4,6}, David J. Christle^{4,6}, William F. Koehl⁴, Erik Janzén², Igor A. Abrikosov^{2,7,8}, David D. Awschalom⁴, Adam Gali^{1,9}**¹ Hungarian Academy of Sciences, Hungary, ² Linköping Univ., Sweden, ³ Loránd Eötvös Univ., Hungary, ⁴ Univ. of Chicago, USA, ⁵ IBM T. J. Watson Res. Center, USA, ⁶ Univ. of California, USA, ⁷ Nat. Univ. of Science and Tech. 'MISIS', Russia, ⁸ Tomsk State Univ., Russia, ⁹ Budapest Univ. of Tech. and Economics, Hungary***09.20 Th-1B-3****Creation of single defects in 4H-SiC for quantum applications***Sanq-Yun Lee¹, Matthias Widmann¹, Nguyen Tien Son², Erik Janzén², Takeshi Ohshima³, Adam Gali^{4,5}, Joerg Wrachtrup¹**¹ Univ. of Stuttgart, Germany, ² Linköping Univ., Sweden, ³ Japan Atomic Energy Ag., Japan, ⁴ Hungarian Academy of Sci., Hungary, ⁵ Budapest Univ. of Tech. and Economics, Hungary***09.40 Th-1B-4****Radiation engineering of atomic-scale defects in silicon carbide, and their application in thermometry and magnetometry***Hannes Kraus^{1,2}, Dmitriy Simin², Shinobu Onoda¹, Franziska Fuchs², Victor A. Soltamov³, Andreas Sperlich², Takahiro Makino¹, Pavel G. Baranov³, Vladimir Dyakonov^{2,4}, Takeshi Ohshima¹, Georgy V. Astakhov²**¹ Japan Atomic Energy Agency, Japan, ² Julius Maximilian University of Würzburg, Germany, ³ Ioffe Physical-Technical Institute, RAS, Russia, ⁴ ZAE Bayern, Germany***10.00 Th-1B-5****Single-photon emitting diodes in 4H- and 6H-SiC***Alexander Lohrmann¹, Naruto Iwamoto², Zoltan Bodrog³, Stefania Castelletto⁴, Takeshi Ohshima², Timothy Karle¹, Steven Prawer¹, Jeffrey McCallum¹, Adam Gali^{3,5}, Brett Johnson⁶**¹ School of Physics, Univ. of Melbourne, Australia, ² Japan Atomic Energy Agency, Japan, ³ Hungarian Academy of Sciences, Hungary, ⁴ RMIT Univ., Australia, ⁵ Budapest Univ. of Tech. and Economics, Hungary, ⁶ Centre for Quantum Comp. and Comm. Tech., Univ. of Melbourne, Australia*

Session Chairs: John Palmour (Cree Inc., USA)

Dominique Planson (Laboratoire Ampère, France)

10.40 Th-2A-1 * INVITED *

Readiness of SiC MOSFETs for Aerospace and Industrial Applications

Ljubisa Stevanovic¹, Peter Losee¹, Stacey Kennerly¹, Alexander Bolotnikov¹, Joseph Smolenski¹, Maja Harfman-Todorovic¹, Stephen Arthur¹, David Lilienfeld¹, Brian Rowden¹, David Esler¹, Ravisekhar Raju¹, Fengfeng Tao¹, Greg Dunne¹, Philip Cioffi¹

¹⁾ GE Global Research, USA

11.10 Th-2A-2

Failure Analysis of SiC MOS Capacitor with Poly-Si Electrode

Soshi Sato¹, Kikuo Yamabe², Tetsuo Endoh¹, Masaaki Niwa¹

¹⁾ Tohoku University, Japan, ²⁾ University of Tsukuba, Japan

11.30 Th-2A-3

Short Circuit Robustness of 1200 V SiC Junction Transistors and power MOSFETs

Siddarth Sundaresan¹, Brian Grummel¹, Ranbir Singh¹

¹⁾ GeneSiC Semiconductor, USA

11.50 Th-2A-4

Repetitive Short-Circuit tests on SiC VMOS devices

Maxime Berthou¹

¹⁾ Laboratoire Ampère, France

12.10 Th-2A-5

Avalanche capabilities of commercial 1200 V 4H-SiC power MOSFETs

Christina DiMarino¹, Brett Hull²

¹⁾ Virginia Tech, USA, ²⁾ Cree Inc., USA

12.30-14:00 Lunch

Session Chairs: Robert Stahlbush (Naval Research Lab., USA)

Philip Neudeck (Nasa Glenn Research Center, USA)

10.40 Th-2B-1 * INVITED *

Three-Dimensional Imaging of Extended Defects in 4H-SiC

Ryohei Tanuma¹, Isaho Kamata¹, Hidekazu Tsuchida¹

¹⁾ CRIEPI, Japan

11.10 Th-2B-2

Dislocation Characterization in 4H SiC Crystals

Joseph Sumakeris¹

¹⁾ Cree Inc., USA

11.30 Th-2B-3

Electrical properties of defects in 4H-SiC investigated by Photo-Induced-Currents measurements

Stefania Privitera¹, Massimo Camarda¹, Nicolò Piluso¹, Francesco La Via¹

¹⁾ CNR-IMM, Italy

11.50 Th-2B-4

Bipolar degradation of 6.5 kV SiC pn-diodes: result prediction by photoluminescence

Larissa Wehrhahn-Kilian¹, Karl O. Dohnke¹, Daniel Kaminzky², Birgit Kallinger², Steffen Oppel³

¹⁾ Infineon Technologies AG, Germany, ²⁾ Fraunhofer IISB, Germany, ³⁾ Intego GmbH, Germany

12.10 Th-2B-5

3C-SiC microdisks for visible photonics

M. Radulaski¹, T.M. Babinec¹, J.L. Zhang¹, S.M. Buckley¹, Y.A. Kelaita¹, K. Müller¹, K.G. Lagoudakis¹, K. Alasaad², Gabriel Ferro², J. Vučković¹

¹⁾ Stanford University, USA, ²⁾ LMI, University of Lyon, France

12.30-14:00 Lunch

Session Chairs: Anping Zhang (Xi'an Jiaotong University, China)

Sei-Hyung Ryu (Cree Inc., USA)

14.00 Th-3A-1 * INVITED *

6.5 kV n-Channel 4H-SiC IGBT with Low Switching Loss Achieved by Extremely Thin Drift Layer

Naoki Watanabe¹, Hiroyuki Yoshimoto¹, Akio Shima¹, Renichi Yamada¹, Yasuhiro Shimamoto¹

¹⁾ Hitachi, Ltd., Japan

14.30 Th-3A-2

Silicon Carbide MOSFETs for Medium Voltage Megawatt Scale Systems

Vipindas Pala¹, Edward Van Brunt¹, Brett Hull¹, Scott Allen¹, John Palmour¹

¹⁾ Cree Inc., USA

14.50 Th-3A-3

Impact Ionization Coefficients and Critical Electric Field Strength in 4H-SiC

Hiroki Niwa¹, Jun Suda¹, Tsunenobu Kimoto¹

¹⁾ Kyoto University, Japan

15.10 Th-3A-4

Breaking SiC Unipolar Limit with Series Connection of Low Voltage Devices

Alexander Bolotnikov¹, Peter Losee¹, Ravisekhar Raju¹, Ljubisa Stevanovic¹

¹⁾ GE Global Research, USA

15.30 Th-3A-5

Promise and Limitation of Ultrahigh-Voltage SiC PiN Diodes with Long Carrier Lifetimes Studied by Device Simulation

Kyosuke Yamada¹, Hiroki Niwa¹, Takashi Okuda¹, Jun Suda¹, Tsunenobu Kimoto¹

¹⁾ Kyoto University, Japan

15.50-16:10 Coffee Break - Sponsored by Mitsui Electronics -

Session Chairs: Peder Bergman (University of Linköping, Sweden)**Wolfgang J. Choyke (University of Pittsburgh, USA)****14.00 Th-3B-1 * INVITED *****Formation and annihilation of carbon vacancies in 4H-SiC***Hussein M. Ayedh¹, Viktor Bobal¹, Roberta Nipoti², Anders Hallen³, Bengt G. Svensson¹**¹ University of Oslo, Norway, ² CNR-IMM, Italy, ³ KTH Royal Institute of Technology, Sweden***14.30 Th-3B-2****Carbon interstitial clusters in 4H-SiC***X. T. Trinh¹, Viktor Ivády¹, K. Kawahara², Jun Suda², Tsunenobu Kimoto², Adam Gali^{3,4}, Igor A. Abrikosov¹, Erik Janzén¹, Nguyen Tien Son¹**¹ Linköping University, Sweden, ² Kyoto University, Japan, ³ Hungarian Academy of Sciences, Hungary, ⁴ Budapest University of Technology and Economics, Hungary***14.50 Th-3B-3****Carbon-antisite carbon-vacancy pair in SiC revisited: Optical properties of the neutral and positively-charged states***Ivan G. Ivanov¹, Andreas Gällström¹, Björn Magnusson¹, Nguyen Tien Son¹, Takeshi Ohshima², Erik Janzén¹**¹ Linköping University, Sweden, ² Japan Atomic Energy Agency, Japan***15.10 Th-3B-4****First principles identification of divacancy related photoluminescence lines in 4H and 6H-SiC***Viktor Ivády^{1,2}, Abram L. Falk^{3,4}, Krisztián Szász², Paul V. Klimov^{3,5}, Erik Janzén¹, Igor A. Abrikosov^{1,6,7}, David D. Awschalom³, Adam Gali^{2,8}**¹ Linköping University, Sweden, ² Hungarian Academy of Sciences, Hungary, ³ University of Chicago, USA, ⁴ IBM T. J. Watson Research Center, USA, ⁵ University of California, USA, ⁶ National University of Science and Technology 'MISIS', Russia, ⁷ Tomsk State University, Russia, ⁸ Budapest University of Technology and Economics, Hungary***15.30 Th-3B-5****Thermal Stability of Deep-Level Defects in High Purity Semi-Insulating 4H-SiC Substrate Studied by Admittance Spectroscopy***Naoya Iwamoto¹, Alexander Azarov¹, Takeshi Ohshima², Anne Marie M. Moe³, Bengt G. Svensson¹**¹ University of Oslo, Norway, ² Japan Atomic Energy Agency, Japan, ³ Washington Mills AS, Norway***15.50-16:10 Coffee Break****- Sponsored by Mitsui Electronics -**

Session Chairs: Philippe Godignon (CNM, Spain)

Takashi Nakamura (Rohm Co. Ltd., Japan)

08.30 Fr-1A-1

Processing and Prolonged 500 °C Testing of 4H-SiC JFET Integrated Circuits with Two Levels of Metal Interconnect

David Spry¹, Philip Neudeck¹, Liangyu Chen², Dorothy Lukco³, Carl Chang³, Glenn Beheim¹, Michael Krasowski¹, Norman Prokop¹

¹) NASA Glenn Research Center, USA, ²) Ohio Aerospace Institute, USA, ³) Vantage Partners LLC, USA

08.50 Fr-1A-2

A 500 °C Monolithic SiC BJT Latched Comparator

Ye Tian¹, Luigia Lanni¹, Ana Rusu¹, Carl-Mikael Zetterling¹

¹) KTH Royal Institute of Technology, Sweden

09.10 Fr-1A-3

Ni₂Si/4H-SiC Schottky Photodiodes for Ultraviolet Light Detection

Massimo Mazzillo¹, Antonella Sciuto², Fabrizio Roccaforte², Roberto Modica¹, Salvatore Marchese², Paolo Badala¹, Denise Cali¹, Francesco Patanè², Beatrice Carbone¹, Alfio Russo¹, Salvatore Coffa¹

¹) STMicroelectronics, Italy, ²) CNR-IMM, Italy

09.30 Fr-1A-4

Experimental and Theoretical Study of 4H-SiC JFET Threshold Voltage Body Bias Effect from 25 °C to 500 °C

Philip Neudeck¹, David Spry¹, Liangyu Chen²

¹) NASA Glenn Research Center, USA, ²) Ohio Aerospace Institute, USA

09.50 Fr-1A-5

Exploration of the physical parameters of 4H-SiC SBD and JBS over a wide temperature rang

Besar Asllani¹

¹) Laboratoire Ampère, France

10.10-10:40 Coffee Break

Session Chairs: Michael Krieger (University of Erlangen-Nürnberg, Germany)

Anton Bauer (Fraunhofer IISB, Germany)

08.30 Fr-1B-1

Mechanisms of Nitrogen incorporation at 4H-SiC/SiO₂ interface during Nitric Oxide passivation – A first principles study

Devanarayanan Ettisserry¹, Neil Goldsman¹, Akin Akturk¹, Aivars Lelis²

¹University of Maryland College Park, USA, ²Army Research Laboratory, USA

08.50 Fr-1B-2

Theoretical study on the identity of positive mobile ions in SiC-MOSFET and their diffusion process

Hiroki Shirakawa¹, Masaaki Araidai¹, Katsumasa Kamiya², Heiji Watanabe³, Kenji Shiraishi¹

¹Nagoya University, Japan, ²Kanagawa Institute of Technology, Japan, ³Osaka University, Japan

09.10 Fr-1B-3

On the origin of threshold voltage instability under operating conditions of 4H-SiC n-channel MOSFETs

Gregor Pobegen¹, Julietta Weisse², Martin Hauck², Heiko B. Weber², Michael Krieger²

¹KAI GmbH, Austria, ²Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

09.30 Fr-1B-4

Pragmatic Approach to the Characterization of traps at SiC/SiO₂ Interfaces near the Conduction Band with Split C-V and Hall Measurements

Tetsuo Hatakeyama^{1,2}, Kazuto Takao¹, Yoshiyuki Yonezawa², Hiroshi Yano³

¹Toshiba Corporation, Japan, ²AIST, Japan, ³University of Tsukuba, Japan

09.50 Fr-1B-5

Nondestructive and local evaluation of SiO₂/SiC interface using super-higher-order scanning nonlinear dielectric microscopy

Norimich Chinone¹, Ryoji Kosugi², Yasunori Tanaka³, Shinsuke Harada², Hajime Okumura²,

Yasuo Cho¹

¹Tohoku University, Japan, ²AIST, Japan, ³Council for Science, Technology and Innovation Policy, Japan

10.10-10:40 Coffee Break

Fr-PL: Plenary Session

Friday, Oct. 9 (10:40-12:10)

PLENARIA

Session Chairs: Fabrizio Roccaforte (CNR-IMM, Italy)

Francesco La Via (CNR-IMM, Italy)

10.40 Fr-PL-1

SiC- and GaN-based power devices: technologies, products and applications

Salvatore Coffa¹

¹⁾ *STMicroelectronics, Catania, Italy*

11.25 Fr-PL-2

Installation of all-SiC Inverter System to Hybrid Electric Vehicle

Kimimori Hamada¹

¹⁾ *Toyota Motor Corporation*

Closing Remarks

Friday, Oct. 9 (12:10-12:40)

PLENARIA

12.40-14:10 Lunch

POSTER PRESENTATIONS

Mo-IP-1 * INVITED POSTER***Impact of NO annealing on flatband voltage instability due to charge trapping in SiC MOS devices**

Yoshihito Katsu¹, Takuji Hosoi¹, Yuichiro Nanen², Tsunenobu Kimoto², Takayoshi Shimura¹, Heiji Watanabe¹

¹ Osaka University, ² Kyoto University

Mo-P-1**Deep level characterization for p-type SiC photo cathodes**

Masashi Kato¹, Naoto Ichikawa¹, Masaya Ichimura¹, Yoshitaka Nakano²

¹ Nagoya Institute of Technology, Japan, ² Chubu University, Japan

Mo-P-2**Characterization of the interfacial chemical structure of silicon dioxide on 4H-SiC(0001) by Fourier transform infrared spectroscopy**

Hirofumi Seki¹, Masanobu Yoshikawa¹, Takuma Kobayashi², Tsunenobu Kimoto²

¹ Toray Research Center Inc., Japan, ² Kyoto University, Japan

Mo-P-3**Characterization of stress around 4H-SiC metal-oxide semiconductor field-effect transistor (MOSFET) using Raman spectroscopy**

Masanobu Yoshikawa¹, Hirohumi Seki¹, Kenichi Kosaka¹, Ryuichi Sugie¹, Junichiro Sameshima¹, Tsunenobu Kimoto²

¹ Toray Research Center Inc., Japan, ² Kyoto University, Japan

Mo-P-4**Investigation of Mo defects in 4H-SiC by means of density functional theory**

András Csóré¹, Andreas Gällström², Erik Janzén², Ádám Gali¹

¹ Budapest University of Technology and Economics, Hungary, ² Linköping University, Sweden

Mo-P-5**Electron effects in Raman spectra of aluminum-doped 4H-SiC epilayers**

Olga Milikofu¹, Tomomi Kozu¹, I. Hayward², Kazukuni Hara³, Masami Naito³, Hiroaki Fujibayashi³

¹ Renishaw KK, Japan, ² Renishaw PLC, UK, ³ DENSO Corp., Japan

Mo-P-6

Deep level characterization of 5 MeV proton irradiated SiC pin diodes

Hussein M. Ayedh¹, Bengt G. Svensson¹, Pavel Hazdra², Philippe Godignon³, José Millán³, Andrei Mihaila⁴, Giovanni Alfieri⁴

¹ University of Oslo, Norway, ² Czech Technical University in Prague, Czech Republic,

³ CNM-IMB – CSIC, Spain, ⁴ ABB Corporate Research, Switzerland

Mo-P-7

ESR study on hydrogen passivation of intrinsic defects in p-type and semi-insulating 4H-SiC

Kohki Murakami¹, Soki Tanai¹, Takafumi Okuda², Jun Suda², Tsunenobu Kimoto², Takahide Umeda¹

¹ University of Tsukuba, Japan, ² Kyoto University, Japan

Mo-P-8

An interfacial defect complex (the P8/9 centers) in C-face 4H-SiC MOSFET studied by electrically detected magnetic resonance

Takahide Umeda¹, Ryo Arai¹, Mitsuo Okamoto², Ryoji Kosugi², Shinsuke Harada²

¹ University of Tsukuba, Japan, ² AIST, Japan

Mo-P-9

Identifying Performance Limiting Defects within Silicon Carbide pn-Junctions: A Theoretical and Experimental Study

Jonathon Cottom¹, Thomas Aichinger², Gernot Gruber³, Gregor Pobegen³, Alexander Shluger¹

¹ University College London, UK, ² Infineon Technologies AG, Austria, ³ KAI GmbH, Austria

Mo-P-10

First-principles electronic-structure calculation for defect at SiC(0001)/SiO₂ interface

Tomoya Ono^{1,2}, Christopher Kirkham¹

¹ University of Tsukuba, Japan, ² JST-PRESTO, Japan

Mo-P-11

First principal calculation of electronic properties on 4H-AlN/4H-SiC(11-20) and 4H-SiC/4H-AlN(0001) interfaces

Kentaro Endo¹, Hiroki Shirakawa¹, Masaaki Araidai¹, Kenji Shiraishi¹

¹ Nagoya University, Japan

Mo-P-12

A Surprising Result: "Bulk" SiC Defects in the Negative Bias Instability in 4H-SiC MOSFETs

Mark Anders¹, Patrick Lenahan¹, Aivars Lelis²

¹ Pennsylvania State University, USA, ² Army Research Laboratory, USA

Mo-P-13

Effects of sulfur passivation on 6H-SiC(0001) surface and Si/6H-SiC interface

Xiao-Min He¹, Zhi-ming Chen¹, Lei Huang¹

¹ Xi'an University of Technology, China

Mo-P-14

First-Principles Simulations of Initial Etching Process of SiC with Water Assisted by Platinum Catalyst

Pho Van Bui¹, Kouji Inagaki¹, Hidetoshi Kizaki¹, Yasuhisa Sano¹, Kazuto Yamauchi^{1,2}, Yoshitada Morikawa^{1,2}

¹⁾ Dept. of Precision Science and Technology, Osaka University, Japan, ²⁾ Res. Center for Ultra-Precision Science and Technology, Osaka University, Japan

Mo-P-15

Etching rate behavior of 4H-silicon carbide epitaxial film using chlorine trifluoride gas

Asumi Hirooka¹, Hitoshi Habuka¹, Tomohisa Kato²

¹⁾ Yokohama National University, Japan, ²⁾ AIST, Japan

Mo-P-16

Barrier inhomogeneities of Pt contacts to 4H-SiC

Lingqin Huang¹

¹⁾ Jiangsu Normal University, China

Mo-P-17

Laser-Assisted Spalling of Silicon Carbide Using COLD SPLIT

Jan Richter¹, Christian Beyer¹, Marko Swoboda¹, Wolfram Drescher¹

¹⁾ Siltectura GmbH, Germany

Mo-P-18

Impact of contact material deposition technique on the properties of Ti/4H-SiC Schottky structures

Laura Stöber¹, Michael Schneider¹, Ulrich Schmid¹

¹⁾ Vienna University of Technology, Austria

Mo-P-19

Schottky barrier height lowering at silicon carbide by carbon nanotubes

Masafumi Inaba¹, Kazuma Suzuki¹, Yu Hirano¹, Wataru Norimatsu², Michiko Kusunoki², Hiroshi Kawarada¹

¹⁾ Waseda University, Japan, ²⁾ Nagoya University, Japan

Mo-P-20

An Investigation of SiC Schottky Contact Barrier Inhomogeneity

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Mo-P-21

Low resistance ohmic contact formation on 4H-SiC c-face with NbNi silicidation using nano-second laser annealing

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Mo-P-22

Study on laser slicing technique for SiC wafer production

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Mo-P-23

Evidence of Processing Non-Idealities in 4H-SiC Integrated Circuits Fabricated With Two Levels of Metal Interconnect

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Mo-P-24

Ohmic Contact Reliability of Commercially Available SiC MOSFETs Isothermally Heated for Long Periods at 300°C

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Mo-P-25

Effect of post thermal annealing on forward I-V characteristics of 4H-SiC Schottky barrier diodes

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Mo-P-26

4H-SiC nMOSFETs with As-doped S/D and NbNi silicide ohmic contacts

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Mo-P-27

Development of wire-bonding-less SiC power module operating in a wide temperature range

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Mo-P-28

Electrical performance of 4H-SiC based drift step recovery diodes

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Mo-P-29

Forward current of Al⁺ implanted 4H-SiC diodes: a study on the periphery and the area components

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Mo-P-30

Cascode Configuration of SiC-BGSIT and Si-MOSFET with Low On-Resistance and High Transconductance

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Mo-P-31

The Influence of Surface Pit Shape on 4H-SiC MOSFETs Reliability under High Temperature Bias Tests

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Mo-P-32

3D Integration of Si-based Peltier device onto 4H-SiC power device

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Mo-P-33

Investigation of Pressure Dependent Thermal Contact Resistance between Silver Metallized SiC chip and Molybdenum substrate and between Molybdenum substrate and bulk Copper

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Mo-P-34

Novel Dual Trench 4H-SiC AccuFET with Ultra-low On-state Resistance and Enhanced Oxide Robustness

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Mo-P-35

Application of 25mΩ SiC MOSFETs in a 10kVA grid-connected AC/DC converter

Szymon Piasecki¹, Jacek Rąbkowski¹, Marian P. Kaźmierkowski¹

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Mo-P-36

Ion implanted 4H-SiC UV pin diodes for solar radiation detection - simulation and characterization

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Mo-P-37

Radiation hardness of 4H-Silicon Carbide and Silicon high energy detectors

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Mo-P-38

Comparison of bottom-up and top-down 3C-SiC NWFETs

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Mo-P-39

Electro-thermal TCAD model for 20 kV silicon carbide IGBTs

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Mo-P-40

15 MeV Protons Irradiation of the GaN Schottky Diodes

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Mo-P-41

Hot Electron Transistors based on graphene/AlGaN/GaN vertical heterostructures

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Mo-P-42

Design and Optimization of AlGaN Solar-blind Double Heterojunction Ultraviolet Phototransistor

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Mo-P-43

Characterization of freestanding AlN crystals by synchrotron radiation imaging and x-ray diffraction study

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Mo-P-44

Study and optimization of a 600V Pseudo-vertical GaN-on-silicon rectifier by finite elements simulation

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Mo-P-45

HVPE GaN growth on 4H SiC and die dicing

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Mo-P-46

Trapping states in SiO₂/GaN MOS capacitors fabricated on recessed AlGaN/GaN heterostructures

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Mo-P-47

Tri-Gate Al_{0.2}Ga_{0.8}N/AlN/GaN HEMTs on SiC/Si-substrates

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Mo-P-48

High-speed solution growth of single crystal AlN from Cr-Co-Al solvent

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Mo-P-49

Quantitative analysis of interfaces in multilayer structures grown on SiC

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Mo-P-50 (LATE NEWS)

Analysis of Gate Oxide Nitridation Effect on SiC MOSFETs by Using Hall Measurement and Split C-V Measurement

Masatoshi Tsujimura¹, Hidenori Kitai¹, Hiromu Shiomi¹, Kazutoshi Kojima¹, Kenji Fukuda¹, Kunihiro Sakamoto¹, Kimiyoshi Yamasaki², Shin-ichi Takagi³, Hajime Okumura¹

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Mo-P-51 (LATE NEWS)

Analysis and Reduction of Stacking Faults in Fast Epitaxial Growth

Hideyuki Uehigashi¹, Hiroaki Fujibayashi¹, Masami Naitou¹, Kazukuni Hara¹, Isaho Kamata², Masahiko Ito², Keisuke Fukada³, Hiroshi Osawa³, Takahiro Kozawa⁴, Hidekazu Tsuchida²

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Mo-P-52 (LATE NEWS)

Electrical Properties of n-type and p-type Layers Formed by Ion Implantation into High-Purity Semi-Insulating 4H-SiC Substrates

Hiroaki Fujihara¹, Jun Suda¹, Tsunenobu Kimoto¹

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Mo-P-53 (LATE NEWS)

Impact of Al Doping Concentration at Channel Region on Mobility and Threshold Voltage Instability in 4H-SiC Trench n-MOSFETs

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Mo-P-54 (LATE NEWS)

Cathodoluminescence study of SiO₂/4H-SiC structures treated with high-temperature post-oxidation annealing

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Mo-P-55 (LATE NEWS)

Dipole Type Behaviour of NO Grown Oxides on 4H-SiC

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Mo-P-56 (LATE NEWS)

Effects of Basal Plane Dislocation Density in 4H-SiC Substrate on Degradation of Body-diode Forward Voltage

Naoyuki Kawabata¹, Atsushi Tanaka^{1,2}, Masatoshi Tsujimura¹, Yoshinori Uej³, Kazuhiko Omote³, Hiroataka Yamaguchi¹, Hirofumi Matsuhata¹, Kenji Fukuda¹

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Mo-P-57 (LATE NEWS)

Characterization of Threading Screw Dislocations of Burgers Vectors with a-components in 4H-SiC

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Mo-P-58 (LATE NEWS)

Cause for the mobility drop in SiC MOSFETs with heavily-doped p-bodies

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Mo-P-59 (LATE NEWS)

Systematic Investigation of 4H-SiC Trench Properties Dependence on Channel Concentration, Crystallographic Plane, and MOS Interface Treatment

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Mo-P-60 (LATE NEWS)

Analytical evaluation of thermally oxidized and deposited dielectric in NMOS-PMOS devices

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Mo-P-61 (LATE NEWS)

Silicon Carbide recrystallization by non-equilibrium melting laser anneal

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¹) LASSE, France, ²) Screen Semiconductor Solutions, Japan

Tu-IP-1 * INVITED POSTER***Comparison of test methods for proper characterization of V_T in SiC MOSFETs**

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Tu-P-1**150 mm 4H-SiC substrate with low defect density**

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Tu-P-2**Influence of impurities in SiC powder for high quality SiC crystal growth**

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Tu-P-3**Temperature-dependent stability of stacking faults in heavily nitrogen-doped 4H-SiC crystals**

Chisato Taniguchi¹, Aiko Ichimura¹, Noboru Ohtani^{1,2}, Masakazu Katsuno³, Tatsuo Fujimoto³,
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Tu-P-4**Growth of High Purity semi-insulating 4H-SiC**

Kun Yang¹, Xianglong Yang¹, Xiufang Chen¹, Xiaobo Hu¹, Xiangang Xu¹

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Tu-P-5**6-inch SiC bulk single crystal growth by Physical Vapor Transport**

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Tu-P-6

The role of porous graphite plate for high quality SiC crystal growth by PVT metho

Hee-Won Shin¹, Hee-Jun Lee¹, Hwang-Ju Kim¹, Dong-Hoon Lee¹, Mi-Seon Park¹, Yeon-Suk Jang¹, Won-Jae Lee¹, Im-Gyu Yeo², Myoung-Chul Chun³, Si-Hyun Lee⁴, Jung-Gon Kim⁵

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Tu-P-7

Doping Fluctuation and Defect Formation in Fast 4H-SiC Crystal Growth using a High-Temperature Gas Source Method

Isaho Kamata¹, Norihiro Hoshino¹, Yuichiro Tokuda^{2,3}, Emi Makino^{2,3}, Naohiro Sugiyama^{2,3}, Jun Kojima^{2,3}, Hidekazu Tsuchida¹

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Tu-P-8

Evolution of threading edge dislocations at earlier stages of PVT growth for 4H-SiC single crystals

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Tu-P-9

Structural Transformation from TSDs to Frank-type Stacking Faults by giant bunched steps in PVT-grown 4H-SiC Single Crystals

Shinya Sato¹, Tatsuo Fujimoto¹, Hiroshi Tsuge¹, Masakazu Katsuno¹, Masashi Nakabayashi¹, Shoji Ushio¹, Komomo Tani¹, Takayuki Yano¹

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Tu-P-10

Sublimation growth of 4 and 6 inch 4H-SiC low defect bulk crystals in Ta (TaC) crucibles

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Tu-P-11

In Situ cleaning process of silicon carbide epitaxial reactor for removing film-type deposition formed on susceptor

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Tu-P-12

Structure of straight-line defect and its effect on the electrical properties of Schottky barrier diodes

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Tu-P-13

3C-SiC Epitaxy on Deeply Patterned Si(111) substrates

Thomas Kreiliger¹, Marco Mauceri², Marco Puglisi², Fulvio Mancarella³, Francesco La Via⁴, Danilo Crippa⁵, Wlodek Kaplan⁶, Adolf Schöner⁶, Anna Marzegalli⁷, Leo Miglio^{7,8}, Hans von Känel^{1,8}

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Tu-P-14

Interface voids reduction effects on 3C-SiC film residual stress

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Tu-P-15

The relationship between surface pits density and growth parameters during the epitaxial growth of 4H-SiC

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Tu-P-16

Formation and Reduction of Large Growth Pits on 100 mm 4° 4H-SiC

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Tu-P-17

Smooth 4H-SiC epilayers grown with high growth rates with silane/propane chemistry on 4° off-cut substrates

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Tu-P-18

Optimization of the silicidation process for 3C-SiC growth on diamond substrate

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Tu-P-19

Study of Ehrlich-Schwoebel barrier and step-bunching during the 4H-SiC epitaxial growths

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Tu-P-20

Heteropolytypic Superlattices

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Tu-P-21

Fluorescent p-type 4H-SiC grown by PVT method

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Tu-P-22

Accurate Doping Density Determination in SiC with Constant Surface Potential Corona Charging; Industry Ready Alternative to Hg-CV

Alexandre Savtchouk¹

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Tu-P-23

Accuracy of the energy distribution of the interface states at the SiO₂/SiC interface by conductance method

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Tu-P-24

An Improved Reliability Test Method for Characterizing Threshold-Voltage Instability in SiC MOSFETs

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Tu-P-25

Density-functional calculation of Carbon interstitial energies in a 4H-SiC(0001)-SiO₂ interface

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Tu-P-26

Boron-implanted 3C-SiC for intermediate band solar cells

*Quanbao Ma*¹, *Augustinas Galeckas*¹, *Alexander Azarov*¹, *Annett Thogersen*², *Patricia Carvalho*², *Daniel N. Wright*², *Spyros Diplas*², *Ole M. Lovvik*², *Valdas Jokubavicius*³, *Xinyu Liu*³, *Jianwu Sun*³, *Mikael Syväjärvi*³, *Bengt G. Svensson*³

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Tu-P-27

Junction Barrier Schottky (JBS) Rectifier Interface Engineering Facilitated by Two-Dimensional (2D) Dopant Imaging

Harald Rene Rossmann^{1,2}, Urs Gysin², Alexander Bubendorf², Thilo Glatzel², Sergey A. Reshanov³, Andy Zhang³, Adolf Schöne³, Thomas Andreas Jung^{1,2}, Ernst Meyer², Holger Bartolf⁴

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Tu-P-28

A novel approach to analysis of F-N tunneling characteristics in MOS capacitor having oxide thickness fluctuation

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Tu-P-29

Threshold voltage instabilities of present SiC power MOSFETs under positive bias stress

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Tu-P-30

Interface Analysis of p-type 4H-SiC/Al₂O₃ using Synchrotron XPS

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Tu-P-31

Characterization of thermally oxidized SiO₂/SiC interfaces by gate leakage current under high electric field, cathode luminescence (CL), X-ray photoelectron spectroscopy (XPS) and high resolution Rutherford backscattering spectroscopy (HR-RBS)

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Tu-P-32

Electrical transport properties of highly aluminum doped p-type 4H-SiC

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Tu-P-33

Conductivity Compensation of Low Doped n- and p-4H-SiC by Electron Irradiation.

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Tu-P-34

1950°C annealing of Al⁺ implanted 4H-SiC: dependence on the annealing time

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Tu-P-35

Controlling the carbon vacancy concentration in 4H-SiC subjected to high temperature treatment

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Tu-P-36

Warpage structure of 4H-SiC after implantation and annealing processes

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Tu-P-37

Impact of phosphorus implantation on the electrical properties of SiO₂/4H-SiC interfaces annealed in N₂O

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Tu-P-38

Passivation and generation of states at P-implanted thermally grown and deposited n-type 4H-SiC/SiO₂ interfaces

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Tu-P-39

Irradiation and Post-Annealed nMOSFETs with Al implanted p-well: Limit of Robustness

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Tu-P-40

An investigation of the residual damages recovery in Al-implanted 4H-SiC after activation annealing

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Tu-P-41

Ion implantation defects in 4H-SiC DIMOSFET

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Tu-P-42

Variation of interfacial phosphorus concentration on 4H-SiC MOS devices with phosphosilicate glass gate dielectric

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Tu-P-43

Isothermal current-voltage characteristics and surge current capabilities of high-voltage 4H-SiC junction barrier Schottky rectifiers

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Tu-P-44

3300V-class 4H SiC Implantation-Epitaxial MOSFETs with Low Specific On-resistance of 11.6mΩcm² and High Avalanche Withstanding Capability

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Tu-P-45

Large Area Visible Blind 4H-SiC P⁺/N UV Photodiode Obtained by Aluminium Implantation

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Tu-P-46

Development of junction termination for 10kV 4H-SiC JBS Diodes

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Tu-P-47

Optimum Design of 4H-SiC Junction Barrier Schottky Diode with Consideration of the Anisotropic Avalanche

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Tu-P-48

Effect of electron irradiation on 1700V 4H-SiC MOSFET characteristics

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Tu-P-49**Electrical Characterization of 1.2 kV-class SiC MOSFET at High Temperature up to 380°C**

Yuichiro Nanen¹, Masatoshi Aketa¹, Yuki Nakano¹, Hirokazu Asahara¹, Takashi Nakamura¹

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Tu-P-50**Gamma-ray irradiation response of the motor-driver circuit with SiC MOSFETs**

Yugo Kobayashi¹, Takashi Yokoseki¹, Takuma Matsuda¹, Satoshi Mitomo¹, Koichi Murata¹, Michihiro Hachisuka¹, Yasuyoshi Kaneko¹, Takahiro Makino², Akinori Takeyama², Shinobu Onoda², Takeshi Ohshima², Yuki Tanaka³, Mikio Kandori³, Toru Yoshie³, Yasuto Hijikata¹

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Tu-P-51**Structural Optimization of 4H-SiC BJT for Ultraviolet detection with High optical gain**

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Tu-P-52**Comparison of 2.5D and 3D simulation methods for limiting the debiasing effect of 4H-SiC interdigitated devices**

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Tu-P-53**Study of 4H-SiC Junction Barrier Diode using various junction structures**

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Tu-P-54**Parasitics and Switching Performance**

Konstantin Kostov¹, Jang-Kwon Lim¹, Yafan Zhang¹, Mietek Bakowski¹

¹⁾ Acreo Swedish ICT, Sweden

Tu-P-55**High-voltage ultra-fast pulse diode stack based on 4H-SiC**

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Tu-P-56

Modelling of Trench-Implanted 4H-SiC VJFETs

Konstantinos Zekentes¹, Konstantin Vassilevski², Antonis Stavrinidis¹, George Konstantinidis¹, Maria Kayambaki¹, Konstantinos Vamvoukakis¹, Emmanuel Vassakis¹, Hervé Peyre³, Nicolaos Makris⁴, Matthias Bucher⁴, Patrick Schmid⁵

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Tu-P-57 (LATE NEWS)

Surface morphology and wetting property of solvent/SiC interface in solution growth of 4H-SiC with SiCrAlSn solvents

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¹ National Inst. of Advanced Industrial Science and Technology, Japan

Tu-P-58 (LATE NEWS)

Physical vapor growth of double position boundary free, quasi-bulk 3C-SiC on high quality 3C-SiC on Si CVD templates

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Tu-P-59 (LATE NEWS)

Surface recombination velocities for polished p-type 4H-SiC

Masashi Kato¹, Kimihiro Kohama¹, Hiroto Shibata¹, Masaya Ichimura¹, Tsunenobu Kimoto¹

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We-IP-1 * INVITED POSTER***Double Shockley stacking fault formation in higher doping regions of PVT-grown 4H-SiC wafers**

Yu Yang¹, Jianqiu Guo¹, Ouloide Goue¹, Balaji Raghothamachar¹, Michael Dudley¹, Gil Chung², Edward Sanchez², Jeff Quast², Ian Manning², Darren Hansen²

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We-P-1**Thermodynamic modeling of high temperature chemical vapor deposition for SiC bulk growth using metal organic precursors**

Yura Kang¹, Chang-Hyoung Yoo², Deok-Hui Nam³, Myung-Hyun Lee³, Won-Seon Seo³, Suklyun HONG⁴, Seong-Min Jeong³

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We-P-2**Top seeded solution growth of 4H-SiC single crystal using graphite block with rough surface**

Ji-Young Yoon¹, Byeong Geun Kim¹, Ji-Eun Lee¹, Myung-Hyun Lee¹, Won-Seon Seo¹, Won-Jae Lee¹, Yong-Gun Shul², Yun-Ji Shin³, Didier Chaussende⁴, Seong-Min Jeong¹

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We-P-3**Characterization of lattice plane bending and stress distribution in physical vapor transport-grown 4H-SiC crystals**

Yoshihito Teramoto¹, Yuuki Tabuchi¹, Daisuke Fukunaga¹, Kouhei Ohtomo¹, Noboru Ohtani^{1,2}, Masakazu Katsuno³, Tatsuo Fujimoto³, Shinya Sato³, Hiroshi Tsuge³, Takayuki Yano³

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We-P-4**Effect of solution drift on crystalline morphology in the solution growth of off-axis 4H-SiC**
Takashi Kato¹, Kazuaki Seki², Kazuhiko Kusunoki^{1,2}, Kazuhito Kamei³

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We-P-5

Stress in SiC single crystal caused by the difference of thermal expansion coefficients of SiC seed and graphite holder

Alexey Fadeev¹, Andrey Lebedev^{1,2}, Yuri Tairov¹

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We-P-6

Newly-developed crucible material for sublimation growth of bulk crystals

Daisuke Nakamura¹

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We-P-7

Distribution of nitrogen doping concentration in 4H-SiC grown by solution method

Wang Zhenjiang¹, Kawaguchi Takahiko¹, Murayama Kenta¹, Aoyagi Kenta¹, Harada Shunta¹, Sakai Takenobu¹, Tagawa Miho¹, Ujihara Toru¹

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We-P-8

Growth of low resistivity p-type 4H-SiC crystals by sublimation method with using aluminum and nitrogen co-doping

Kazuma Eto¹, Hiromasa Suo^{1,2}, Tomohisa Kato¹, Hajime Okumura¹

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We-P-9

Experimental investigation of the seeding stage during SiC solution growth using Si and Si-Al solvents

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We-P-10

Effects of Hydrogen Concentration on the Growth of High Purity 4H-SiC Single Crystal Grown by Sublimation Method

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We-P-11

Application of in-situ 3D computed tomography during PVT growth of 4H-SiC for the study of source material consumption under varying growth conditions

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We-P-12

Solution Growth of 4H-SiC using Cr Solvent

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We-P-13

Concentration Profile Simulation of SiC/Si Heterostructures

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We-P-14

A competitive lattice model Monte Carlo method for simulation of competitive growth of different polytypes in SiC single crystal

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We-P-15

The Mechanism of Polytype Transformation in Growth of 4H-SiC Crystals

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We-P-16

Dislocations in SiC revealed by NaOH vapor etching and a comparison with X-ray topography taken with various g-vectors

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We-P-17

Cross section and plan view STEM analysis on identical conversion point of basal plane dislocation to threading edge dislocation of 4H-SiC

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We-P-18

Photoluminescence enhancement in nano-textured fluorescent SiC passivated by atomic layer deposited Al₂O₃ films

Weifang Lu¹, Yiyu Ou¹, Valdas Jokubavicius², Ahmed Fadil¹, Mikael Syväjärvi², Volker Buschmann³, Steffen Ruttiger³, Paul Michael Petersen¹, Haiyan Ou¹

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We-P-19

Post-Growth Defect Formation in SiC

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We-P-20

Lifetime Measurement in Silicon Carbide by Mean of the Microwave Phase-shift

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We-P-21

Surface Voltage and μ PCD Mapping of Defects in Epitaxial SiC

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We-P-22

An ultrafast I(V) measurement technique accounting for capacitive and leakage currents in reverse mode for SiC power devices

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We-P-23

Spin-coupling and transport in heavily nitrogen-doped 4H-SiC

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We-P-24

Modelling of effective minority carrier lifetime in 4H-SiC n-type epilayers

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We-P-25

Oxidation-induced majority and minority carrier traps in n- and p-type 4H-SiC

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We-P-26

Coherent Spin Manipulation of Si-Vacancies in Silicon Carbide

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We-P-27

Determination of 4H-SiC ionization rates using OBIC based on two-photon absorption

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We-P-28

Identification and magneto-optical properties of the NV-center in 4H-SiC: a combined magnetic resonance and DFT modeling study

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We-P-29

X-Ray Topographic Study for Three-Dimensional Dislocation Networks in SiC Crystals

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We-P-30

Microscopic difference between dry and wet oxidations of C-face 4H-SiC MOSFETs studied by electrically detected magnetic resonance

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We-P-31

X-ray irradiation on 4H-SiC MOS capacitors processed under different annealing conditions

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We-P-32

Investigation of the Interface Quality and Reliability of 4H-SiC MOS Structure with NO and Forming Gas Annealing Treatment

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We-P-33

Temperature stability and responsivity improvement of hydrogen sensor based on SiC-MOS capacitor by N₂ high-temperature annealing

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We-P-34

Time resolved gate oxide stress of 4H-SiC planar MOSFETs and NMOS capacitors

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We-P-35

Alkali metal re-distribution after oxidation of 4H-SiC

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We-P-36

Improved channel mobility by oxide nitridation for n-channel MOSFET on 3C-SiC(001)/Si

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We-P-37

Correlation of Reliability and Interface Quality for 4H-SiC Gate Oxides Grown at High Temperature

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We-P-38

High Temperature Nitridation of 4H-SiC MOSFET

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We-P-39

Development of a Pspice Model for SiC MOSFET Power Modules

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We-P-40

Anomalous scatter of forward current-voltage characteristics of He⁺ - irradiated Ni/4H-SiC Schottky diodes

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We-P-41

Si/SiC substrates for the implementation of linear-doped power LDMOS with minimal self-heating

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We-P-42

Design and Fabrication of 1.2kV 4H-SiC normally-off JFET

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We-P-43

Epitaxial layer thickness dependence on heavy ion induced charge collection in 4H-SiC Schottky Barrier Diodes

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We-P-44

Solar driven energy conversion applications based on 3C-SiC

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We-P-45

Change in Characteristics of SiC MOSFETs by Gamma-ray Irradiation at High Temperature

Takuma Matsuda^{1,2}, Takashi Tokoseki^{1,2}, Satoshi Mitomo^{1,2}, Koichi Murata^{1,2}, Takahiro Makino², Hiroshi Abe², Akinori Takeyama², Shinobu Onoda², Yuki Tanaka³, Mikio Kandori³, Toru Yoshie³, Yasuto Hijikata¹, Takeshi Ohshima²

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We-P-46

A New Type of Single Carrier Conduction Rectifier on SiC

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We-P-47

High Performance of 5.7kV 4H-SiC JBSs with Optimized non-uniform Field Limiting Rings Termination

Hao Yuan^{1,1}, Qingwen Song^{1,1}, Xiaoyan Tang^{1,1}, Yuming Zhang^{1,1}, Hui Guo^{1,1}, Yuehu Wang^{1,1}, Yimeng Zhang^{1,1}, Renxu Jia^{1,1}, Yimen Zhang^{1,1}

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We-P-48

Conduction Loss Reduction for Bipolar Injection Field-Effect-Transistors (BIFET)

Andreas Hürner¹, Tobias Erlbacher², Heinz Mitlehner², Anton. J. Bauer², Lothar Frey^{1,2}

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We-P-49

Vertical termination filled with adequate dielectric for SiC devices in HVDC applications

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We-P-50

Exploring the gas sensing performance of catalytic metals and metal oxides on 4H-SiC field effect transistors

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We-P-51

SPICE Modeling of Advanced Silicon Carbide High Temperature Integrated Circuits

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We-P-52

Reliability evaluation of SiC power device package by power cycle test

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We-P-53

Geometrical Effect Dependency on the On-State Characteristics in 5.6 kV 4H-SiC BJTs

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We-P-54

Modification of Etched Junction Termination Extension for the High Voltage 4H-SiC Power Devices

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We-P-55

High-temperature transient thermal analysis near SiC device for high-density power module structure

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We-P-56 (LATE NEWS)

SiC power switches evaluation for space applications requirements

Philippe Godignon¹, Silvia Massetti², Xavier Jordà¹, Victor Soler¹, Juan Moreno³, Demetrio Lopez³, Enrique Maset⁴

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We-P-57 (LATE NEWS)

SiC for Biomedical Applications

Stephen Sadow¹, Christopher Frewin², Fabioila Araujo-Cespedes¹, Mario Gazziro³, Sylvia Thomas¹

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We-P-58 (LATE NEWS)

Investigations on 600 °C SiC MISFET gas sensor operation

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We-P-59 (LATE NEWS)

Design and Economic Considerations to Achieve the Price Parity of SiC MOSFETs with Silicon IGBTs

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We-P-60 (LATE NEWS)

Characterization of 4H-SiC nMOSFETs in Harsh Environments; High-Temperature and High Gamma-Ray Radiation

Shin-Ichiro Kuroki¹, Hirofumi Nagatsuma¹, Milantha De Silva¹, Seiji Ishikawa^{1,2}, Tomonori Maeda^{1,2}, Hiroshi Sezaki^{1,2}, Takamaro Kikkawa¹, Takahiro Makino³, Takeshi Ohshima³, Mikael Östling⁴, Carl-Mikael Zetterling⁴

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We-P-61 (LATE NEWS)

Electrical switching of fluorescence of single silicon vacancies in a 4H-SiC pin diode at ambient condition

Matthias Widmann¹, Sang-Yun Lee¹, Matthias Niethammer¹, Ian Booker², Takeshi Oshima³, Torsten Rendler¹, Ilja Gerhardt¹, Adam Gali^{4,5}, Nguyen Tien Son², Eric Janzén², Jörg Wrachtrup¹

¹) University of Stuttgart, Germany, ²) Linköping University, Sweden, ³) Japan Atomic Energy Agency, Japan, ⁴) Wigner Research Centre for Physics, Hungary, ⁵) Budapest Univ. of Tech. and Economics, Hungary

Th-P-1**Hydrogen flux influence on homo-epitaxial 4H-SiC doping concentration profile for high power application**

Ruggero Anzalone¹, Marco Salantri¹, Simona Lorenti¹, Alberto Campione¹, Nicolò piluso¹, Francesco La Via², Patrick Fiorenza², Cinzia Maria Pia Marcellino¹, salvatore coffa¹

¹) STMicroelectronics, Italy, ²) CNR-IMM, Italy

Th-P-2**4H-SiC(0001) surface faceting during interaction with liquid Si**

Véronique Soulière¹, Davy Carole¹, Massimo Camarda², J. Wörle^{2,3}, Ulrike Grossner³, Olivier Dezellus¹, Gabriel Ferro¹

¹) LMI, University of Lyon, France, ²) PSI, Switzerland, ³) ETH Zurich, Switzerland

Th-P-3**Improvement on 150 mm 4H-SiC epitaxial wafer quality**

Tatsuya Masuda¹, Akira Miyasaka¹, Jun Norimatsu¹, Yutaka Tajima¹, Daisuke Muto¹, Kenji Momose¹, Hiroshi Osawa¹

¹) Showa Denko K.K., Japan

Th-P-4**Study of in-plane orientation of epitaxial Si films grown on 6H-SiC(0001)**

Lianbi Li^{1,2}, Zhiming Chen², Yuan Zang²

¹) Xi'an Polytechnic University, China, ²) Xi'an University of Technology, China

Th-P-5**Study of 3C-SiC formation on nearly on-axis 4H-SiC substrates**

Ren-Wei Zhou^{1,2},

¹) Shanghai Institute of Ceramics, China, ²) Graduate School of the Chinese Academy of Sciences, China

Th-P-6**Low temperature epitaxy of crystalline 3C-SiC on standard Si substrates**

Maksym Myronov¹, Gerard Colston¹, Stephen Rhead¹

¹) University of Warwick, UK

Th-P-7**Elimination of BPD in 5~30um thick 4H-SiC Epitaxial Layers Grown in a Warm-Wall Planetary Reactor**

Gan Feng¹, Yongqian Sun¹, Weining Qian¹, Liping Lv¹, Jian H. Zhao¹, Domon Tsai², Mukundkrishna Raghunathan², Yang Fei²

¹) EpiWorld International Co., Ltd., China, ²) KLA-Tencor Corporation, USA

Th-P-8

Optimization of VLS Growth Process for 4H-SiC P/N Junctions

Selsabil Sejjil¹

¹) LMI, University of Lyon, France

Th-P-9

Ultra-Fast SiC Wafer Surface Roughness Mapping

Yoshihiro Nakano¹, Albert Burk², Jeff Seaman², Hirokazu Seki¹, Yuji Asakawa¹

¹) Lasertec Corporation, Japan, ²) Cree Inc., USA

Th-P-10

Observation of pair structures of threading dislocation and surface defect in 4H-SiC wafer by mirror projection electron microscopy

Toshiyuki Isshiki¹, Masaki Hasegawa²

¹) Kyoto Institute of Technology, Japan, ²) Hitachi High-Technologies Corporation, Japan

Th-P-11

Surface treatment of silicon carbide powder and characterization

Ta Ching Hsiao¹, Shen Tsao¹, Sergey Nagalyuk², Evgeny Mokhov²

¹) ITRI, Taiwan, ²) Ioffe Physical-Technical Institute, RAS, Russia

Th-P-12

SiC interlayer formation in the top seeded solution growth of SiC single crystal growth

Ji-Eun Lee¹, Ji-Young Yoon¹, Byeong Geun Kim¹, Myung-Hyun Lee¹, Won-Seon Seo¹, Younghee Kim¹, Won-Jae Lee², Heon-Jin Cho³, Yun-Ji Shin⁴, Didier Chaussende⁵, Seong-Min Jeong¹

¹) Korea Institute of Ceramic Engineering and Technology, Korea, ²) Dong-Eui University, Korea, ³) Yonsei University, Korea, ⁴) LMGP / Grenoble INP, France, ⁵) LMGP/CNRS, France

Th-P-13

HRTEM structural characterization of the 4H-SiC /15R-SiC interface

Efstathios Polychroniadis¹, Narendraraj Chandran¹, Nikolaos Frangis¹

¹) Aristotle University of Thessaloniki, Greece

Th-P-14

Surface passivation on p-type 4H-SiC epitaxial layers by deposited SiO₂ with POCl₃ annealing

Takafumi Okuda¹, Takuma Kobayashi¹, Tsunenobu Kimoto¹, Jun Suda¹

¹) Kyoto University, Japan

Th-P-15

Developing of recognition procedure for epitaxial film defects on n-type 4H-SiC wafers

Junji Senzaki^{1,2}, Tamotsu Yamashita^{1,2}, Takanori Naijo^{1,2}, Keiichi Yamada^{1,2}, Hirokuni Asamizu¹, Tsutomu Osanai^{1,2}, Asuka Yaguchi^{1,2}, Natsuko Yoshitomi^{1,2}, Hajime Okumura^{1,2}

¹) FUPET, Japan, ²) AIST, Japan

Th-P-16

Mapping the strain state and tilt of 3C-SiC/Si(001) suspended structures using μ -XRD

Gerard Colston¹, Stephen Rhead¹, Vishal Shah², Oliver Newell¹, Igor Dolbnya³, Ian Pape³, Kawal Sawhney³, David Leadley¹, Maksym Myronov¹

¹⁾ The University of Warwick, UK, ²⁾ University of Warwick, UK, ³⁾ Diamond Light Source, UK

Th-P-17

Mapping of Threading Screw Dislocations in 4HN SiC wafers

Alexandre Ellison¹, Erik Sörman¹, Björn Sundqvist¹, Björn Magnusson¹, Balaji Raghothamachar², Jianqiu Guo², Yu Yang², Michael Dudley²

¹⁾ Norstel AB, Sweden, ²⁾ Stony Brook University, USA

Th-P-18

Recombination processes in 4H-SiC pn structures

Anatoly Strel'chuk¹, Baptiste Berenguier², Eugene Yakimov³, Laurent Ottaviani²

¹⁾ Ioffe Physical-Technical Institute, RAS, Russia, ²⁾ IM2NP – Université Aix-Marseille, France,

³⁾ Institute of Microelectronics Technology RAS, Russia

Th-P-19

Correlation of Lifetime Mapping of 4H-SiC epilayers with Structural Defects Using Synchrotron X-ray Topography

Ouloide Goue¹, Yu Yang¹, Jianqiu Guo¹, Balaji Raghothamachar¹, Michael Dudley¹, John Hostetler², Rachael L. Myers-Ward³, Paul B. Klein⁴, D.Kurt Gaskill³

¹⁾ Stony Brook University, USA, ²⁾ United Silicon Carbide, Inc., USA, ³⁾ Naval Research Laboratory, USA, ⁴⁾ Sotera Defense Solutions, USA

Th-P-20

Characterisation of 4H-SiC Schottky and PiN diodes formed on defects identified by PL imaging

Yeganeh Bonyadi¹, Peter Gammon¹, Vishal Shah¹, Craig Fisher¹, David M. Martin¹, Philip A. Mawby¹

¹⁾ University of Warwick, UK

Th-P-21

Study of nanoscale inhomogeneities in silicon carbide crystals via small-angle X-ray scattering

Mikhail Loqunov¹, Vladimir Neverov¹, Boris Mamin¹, Denis Skvortsov¹, Roman Sidorov¹

¹⁾ Ogarev Mordovia State University, Russia

Th-P-22

In-situ observation of the SiC surface during thermal decomposition by synchrotron x-ray surface diffraction

Masahiro Yoshida¹, Yasunori Kutsuma¹, Daichi Dohjima¹, Kenji Ohwada², Toshiya Inami², Noboru Ohtani², Tadaaki Kaneko¹, Jun'ichiro Mizuki¹

¹⁾ Kwansai Gakuin University, Japan, ²⁾ Japan Atomic Energy Agency, Japan

Th-P-23

Understanding the basis of laterally varying minority carrier lifetimes in epitaxial 4H-SiC
D.Kurt Gaskill¹, Rachael L. Myers-Ward¹, Anthony B. Boyd¹, Kevin M. Daniels¹, John Hostetler², Paul B. Klein³

¹ Naval Research Laboratory, USA, ² United Silicon Carbide, Inc., USA, ³ Sotera Defense Solutions, USA

Th-P-24

Study on Interface State Density of La₂O₃/SiO₂/4H-SiC Stacking Gate Dielectric MOS Capacitors

Yucheng Wang¹, Yuming Zhang¹, Renxu Jia¹

¹ Xidian University, China

Th-P-25

Measurement of the SiO₂/SiC interface state density in a wide energy-level range using capacitance transient spectroscopy

Junichi Hasegawa¹, Munetaka Noguchi², Masayuki Furuhashi², Shuhei Nakata², Takayuki Iwasaki¹, Tetsuo Kodera¹, Tadashi Nishimura¹, Mutsuko Hatano¹

¹ Tokyo Institute of Technology, Japan, ² Mitsubishi Electric Corporation, Japan

Th-P-26

Atomic layer deposition of Al₂O₃ thin films for metal insulator semiconductor applications on 4H-SiC

Emanuela Schilirò^{1,2}, Salvatore Di Franco¹, Patrick Fiorenza¹, Cristina Tudisco², Guglielmo Guido Condorelli², Hassan Gargouri³, Mario Saggio⁴, Raffaella Lo Nigro¹, Fabrizio Roccaforte¹

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⁴ STMicroelectronics, Italy

Th-P-27

Flatband voltage shift depending on SiO₂/SiC interface charges in 4H-SiC MOS capacitors with AlON/SiO₂ stacked gate dielectrics

Takuji Hosoi¹, Shuji Azumo², Kenji Yamamoto³, Masatoshi Aketa³, Yusaku Kashiwagi², Shigetoshi Hosaka², Hirokazu Asahara³, Takashi Nakamura³, Takayoshi Shimura¹, Heiji Watanabe¹

¹ Osaka University, Japan, ² Tokyo Electron, Japan, ³ ROHM Co., Ltd., Japan

Th-P-28

Schottky Barrier Height of Ni/TiO₂/4H-SiC MIS diodes

Ivan Rodrigo Kaufmann¹, Marcelo Barbalho Pereira², Henri Ivanov Boudinov²

¹ PGMICRO, Univ. Federal do Rio Grande do Sul, Brazil, ² Inst. de Física, Univ. Federal do Rio Grande do Sul, Brazil

Th-P-29

Influence of oxide processing on the defects at the SiC-SiO₂ interface measured by electrically detected magnetic resonance

Gernot Gruber^{1,2}, Thomas Aichinger³, Gregor Pobegen¹, Dethard Peters⁴, Markus Koch², Peter Hadley²

¹) KAI GmbH, Austria, ²) Graz University of Technology, Austria, ³) Infineon Technologies AG, Austria, ⁴) Infineon Technologies AG, Germany

Th-P-30

Organosilane-functionalized 4H-SiC Test Device Structures for Biomedical Applications

Taeseop Lee¹, Min-Seok Kang¹, Anders Hallén², Carl-Mikael Zetterling², Sang-Mo Koo¹

¹) Kwangwoon University, Korea, ²) KTH Royal Institute of Technology, Sweden

Th-P-31

Processing and characterization of MOS capacitors fabricated on 2°-off axis 4H-SiC epilayers

Marilena Vivona¹, Patrick Fiorenza¹, Filippo Giannazzo¹, Tomasz Sledziewski², Alexandra Gkanatsiou³, Michael Krieger², Thierry Chassagne⁴, Fabrizio Roccaforte¹

¹) CNR-IMM, Italy, ²) Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, ³) Aristotle University of Thessaloniki, Greece, ⁴) NOVASIC, France

Th-P-32

4H-SiC Surface Structures and Oxidation Mechanism Revealed by Using First-Principles and Classical Molecular Dynamics Simulations

Takahiro Yamasaki^{1,2}, Nobuo Tajima^{1,2}, Tomoaki Kaneko^{1,2}, Nobutaka Nishikawa^{3,2}, Jun Nara^{1,2}, Tatsuo Schimizu⁴, Koichi Kato⁴, Takahisa Ohno^{1,2,5}

¹) National Institute for Materials Science, Japan, ²) MARCEED, Japan, ³) Mizuho I&R Inst. Inc., Japan, ⁴) Toshiba Corporation, Japan, ⁵) University of Tokyo, Japan

Th-P-33

Design of Silicon Carbide devices to minimize the impact of variation of epitaxial parameters

Rahul Radhakrishnan¹, Tony Witt¹, Seungchul Lee¹, Richard Woodin¹

¹) Global Power Technologies Group, USA

Th-P-34

Improved Simulation Models for Designing the Novel Edge Termination and Current Spreading Layers for 3300V-class 4H-SiC Implantation-Epitaxial MOSFETs with Low On-resistance and Robustness

Hiromu Shiomi¹, Takashi Tsuji², Naoyuki Ohse², Yasuhiko Onishi², Kenji Fukuda³

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Th-P-35

NO_x sensing with SiC Field Effect Transistors

Peter Möller¹, Mike Andersson^{1,2,3}, Anita Lloyd Spetz^{1,3}, Jarkko Puustinen³, Jyrki Lappalainen³, Jens Eriksson¹

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Th-P-36

Studies on Floating Contact Press-Pack Diodes Surge Current Capability

Viorel Banu¹, Maxime Berthou², Josep Montserrat³, Xavier Jordá³, José Millán³, Philippe Godignon³

¹ D+T Microélectronica A.I.E., Spain, ² Laboratoire Ampère, France, ³ CNM-IMB – CSIC, Spain

Th-P-37

Optimization of 1700V 4H-SiC JBS Diode Parameters

Rupendra Kumar Sharma¹, Pavel Hazdra¹, Stanislav Popelka¹, Andrei Mihaila², Holger Bartolf²

¹ Czech Technical University in Prague, Czech Republic, ² ABB Corporate Research, Switzerland

Th-P-38

Label-free DNA detection using 4H-SiC nanowire based sensor

Edwige Bano¹

¹ Grenoble INP, France

Th-P-39

High voltage diffusion-welded stacks on the basis of SiC Schottky diodes

Oleg Korolkov¹, Natalja Sleptsuk¹, Paul Annus¹, Raul Land¹, Toomas Rang¹

¹ Tallinn University of Technology, Estonia

Th-P-40

Quantified density of active near interface oxide traps in 4H-SiC MOS capacitors

Hamid Amini Moghadam^{1,2}, Sima Dimitrijević^{1,2}, Jisheng Han¹, Amirhessein Aminbeidokhti^{1,2}, Daniel Haasmann^{1,2}

¹ Queensland Micro- and Nanotechnology Centre, Griffith Univ., Australia, ² School of Engineering, Griffith Univ., Australia

Th-P-41

Distribution of PN Diode Breakdown and Schottky Barrier Height on 6" 4H-SiC Wafer

Benedetto Buono¹, Hrishikesh Das¹, Swapna Sunkari¹, Krister Gumaelius¹

¹ Fairchild Semiconductor

Th-P-42

Newly Developed Switching Analysis Method for 3.3 kV 400 A Full SiC Module

Satoshi Hatsukawa¹, Shigenori Toyoshima¹, Takashi Tsuno¹, Yasuki Mikamura¹

¹ Sumitomo Electric Industries, Ltd., Japan

Th-P-43

Analytical Description of the Input Capacitance of 4H-SiC DMOSFETs in Presence of Oxide-Semiconductor Interface Traps

Gian Domenico Licciardo¹, Luigi Di Benedetto¹, Salvatore Bellone¹

¹⁾ *University of Salerno, Italy*

Th-P-44

Comparison of Energy Losses in High-Current 1700 V Switches

Siddarth Sundaresan¹, Brian Grummel¹, Ranbir Singh¹

¹⁾ *GeneSiC Semiconductor, USA*

Th-P-45

Design Impact on Static and Short-Circuit Characteristics of SiC-SiC With Non-uniform Channel Doping

Shiqin Niu¹, Maxime Berthou¹, Dominique Tournier¹

¹⁾ *Université de Lyon, CNRS, Laboratoire Ampère, INSA-Lyon, France*

Th-P-46

Potential of SiC CMOS for high temperature applications using advanced lateral p-MOSFETs

Matthäus Albrecht¹, Tobias Erlbacher², Anton. J. Bauer², Lothar Frey¹

¹⁾ *Chair of Electron Devices, Germany*, ²⁾ *Fraunhofer IISB, Germany*

Th-P-47

Large Area Silicon Carbide Photodiode, and Monolithic Readout Design and Fabrication

Akin Akturk¹, Brendan Cusack¹, Neil Goldsman¹

¹⁾ *CoolCAD Electronics LLC, USA*

Th-P-48

Novel bipolar logic technology in 4H-SiC

Hazem Elgabra¹, Amna Siddiqui¹, Shakti Singh¹

¹⁾ *Khalifa Univ. of Science, Technology and Research, United Arab Emirates*

Th-P-49

Interfacial disorder of graphene grown at high temperatures on 4H-SiC(000-1)

Filippo Giannazzo¹, Giuseppe Nicotra¹, Ioannis Deretzis¹, Aurora Piazza^{1,2}, Gabriele

Fischella¹, Simon Pietro Agnello², Corrado Spinella¹, Fabrizio Roccaforte¹, Rositzta Yakimova³

¹⁾ *CNR-IMM, Italy*, ²⁾ *University of Palermo, Italy*, ³⁾ *Linköping University, Sweden*

Th-P-50

Wafer-scale graphene on 4 inch SiC

Wancheng Yu¹, Xiufang Chen¹, Xiaobo Hu¹, Xiangang Xu¹

¹⁾ *Shandong University, China*

Th-P-51

Graphene-Silicon Heterojunction Infrared Photodiode at 1.3/1.55 μm

Tzu-Min Ou¹, Tomoko Borsa¹, Bart Van Zeghbroeck¹

¹⁾ *University of Colorado-Boulder, USA*

Th-P-52

Atomistic simulations and interfacial morphology of graphene grown on SiC(0001) and SiC(000-1) substrates

Antonino La Magna¹, Giuseppe Nicotra¹, Ioannis Deretzi¹, Fabrizio Roccaforte¹, Corrado Spinella¹, Rositsa Yakimova²

¹⁾ CNR-IMM, Italy, ²⁾ Linköping University, Sweden

Th-P-53

Amplification in Graphene Nanoribbon Junctions

Joerg Pezoldt¹, Bernd Haehnlein¹, Frank Schwier²

¹⁾ FG Nanotechnologie, Germany, ²⁾ FG Festkörperelektronik, Germany

Th-P-54

CVD growth of graphene on SiC(0001) in hydrogen-argon atmosphere

Roy Dagher¹, Marc Portail¹, Marcin Zielinski², Thierry Chassagne², Yvon Cordier¹, Adrien Michon¹

¹⁾ CRHEA - CNRS, France, ²⁾ NOVA^{SiC}, France

Th-P-55

The interaction between graphene and the SiC substrate: Ab initio calculations for polar and nonpolar surfaces

Ioannis Deretzi¹, Filippo Giannazzo¹, Antonino La Magna¹

¹⁾ CNR-IMM, Italy

Th-P-56

Highly sensitive NO₂ graphene sensor made on SiC grown in Ta crucible

Yuri Makarov¹, Sergey Novikov², Sergey Lebedev^{3,4}, Alexander Lebedev^{3,4}

¹⁾ Nitride Crystals Inc., USA, ²⁾ Aalto University, Finland, ³⁾ Ioffe Physical-Technical Institute, RAS, Russia, ⁴⁾ St. Petersburg National Research University of Information Technologies, Russia

Th-P-57

P-type Graphene on Ion-Implanted 4H-SiC by CF₄ Plasma Treatment

Yusuke Shiina¹, Tomoaki Nishimura², Tohru Nakamura¹

¹⁾ Department of EEE, Hosei University, Japan, ²⁾ Res. Center of Ion Beam Technology, Hosei University, Japan

Th-P-58

Ni-assisted low-temperature formation of epitaxial graphene on 3C-SiC/Si and its reaction analysis by real-time SR-XPS

Hasegawa Mika¹, Sugawara Kenta¹, Suto Ryota¹, Sambonsuge Shota¹, Teraoka Yuden², Yoshigoe Akitaka², Fukidome Hirokazu¹, Suemitsu Maki^{1,3}

¹⁾ Tohoku University, Japan, ²⁾ Japan Atomic Energy Agency, Japan, ³⁾ JST-CREST, Japan

Th-P-59

Role of the buffer layer on epitaxial graphene thickness uniformity and area upscaling

Gholam Reza Yazdi¹, Ivan G. Ivanov¹, Tihomir Iakimov^{1,2}, Alexi Zakharov³, Rositsa Yakimova^{1,2}

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Th-P-60

Raman Spectra from Heavily Boron-doped Single Crystalline Diamond

Masanobu Yoshikawa¹

¹ Toray Research Center Inc., Japan

Industrial Session

Monday, Oct. 5 (19:30-21:40)

PLENARIA

Session Chairs: Mario Saggio (STMicroelectronics, Italy)

Chris Horton (Cree Inc., USA)

19:30 *Welcome*

19:32 *3D Micromac*

19:40 *Cree, Inc*

19:48 *FAU*

19:56 *II-VI Advanced Materials*

20:04 *Intego*

20:12 *Lasertec Corp.*

20:20 *LPE*

20:28 *Nippon Steel & Sumikin Materials Co.*

20:36 *NuFlare Technology, Inc.*

20:44 *Renishaw*

20:52 *Rigaku*

21:00 *STMicroelectronics*

21:08 *STR Group*

21:16 *Tokyo Seimitsu Co.*

21:24 *Toray Research Center, Inc.*

21:32 *ULVAC*

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