

Technical Program of ICSCRM 2013

Monday, September 30

Opening ***8:45-9:15***

Room: Tenzui

Chair: H. Itoh (JAEA, Japan)

Welcome Address

Announcements to the Attendees

Mo-PL Plenary ***9:15-10:45***

Room: Tenzui

Chairs: T. Kimoto (Kyoto University, Japan)

N. Ohtani (Kwansei Gakuin University, Japan)

9:15 **Mo-PL-1 <Invited>**

Strategic Energy Policy for a Sustainable Society - Expectations for SiC Power Devices

p. 1

K. Kyuma

Mitsubishi Electric Corporation /Council for Science and Technology Policy, Japan

10:00 **Mo-PL-2 <Invited>**

Progress in High Voltage SiC and GaN Power Switching Devices

p. 2

T. P. Chow

Rensselaer Polytechnic Institute, USA

Invited Poster Announcement 10:45-11:00

Room: Tenzui

Chairs: T. Kimoto (Kyoto University, Japan)

N. Ohtani (Kwansei Gakuin University, Japan)

10:45 **Mo-IP-1 <Invited Poster>**

Development of RAF Quality 150mm 4H-SiC Wafer

p. 3

H. Kondo^{1,2)}, H. Takaba^{1,2)}, M. Yamada^{1,2)}, Y. Urakami^{1,2)}, M. Kobayashi^{1,3)}, T. Masuda^{1,3)}, I. Gunjishima^{1,4)}, K. Shigeto^{1,4)}, N. Ooya^{1,2)}, N. Sugiyama^{1,2)}, A. Matsuse^{1,3)}, T. Kozawa^{1,4)}, T. Sato^{1,3)}, F. Hirose^{1,2)}, S. Yamauchi^{1,2)}, and S. Onda^{1,2)}

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾DENSO CORP., Japan, ³⁾SHOWA DENKO K.K., Japan, ⁴⁾TOYOTA Central R&D Labs., Japan

10:48 **Tu-IP-1 <Invited Poster>**

Ge Assisted SiC Epitaxial Growth by CVD on SiC Substrate

p. 4

K. Alassaad¹⁾, V. Soulière¹⁾, B. Doisneau²⁾, F. Cauwet¹⁾, H. Peyre³⁾, D. Carole¹⁾, D. Chaussende²⁾, and G. Ferro¹⁾

¹⁾Université Claude Bernard Lyon 1, France, ²⁾LMGP, Grenoble INP, France, ³⁾Université Montpellier, France

10:51 **We-IP-1 <Invited Poster>**

Study of V and Y Shape Stacking Faults Formation in 4H-SiC Epilayer

p. 5

H. Wang¹⁾, F. Wu¹⁾, S. Byrappa¹⁾, M. Dudley¹⁾, G. Chung²⁾, J. Zhang²⁾, B. Thomas²⁾, E. K. Sanchez²⁾, S. G. Mueller²⁾, D. Hansen²⁾, and M. J. Loboda²⁾

¹⁾Stony Brook University, USA, ²⁾Dow Corning Compound Semiconductor Solutions, USA

10:54 **Th-IP-1 <Invited Poster>**

Development of SiC Super-Junction (SJ) Device by a Multi-Epitaxial Growth

p. 6

R. Kosugi^{1,2)}, Y. Sakuma²⁾, K. Kojima^{1,2)}, S. Itoh²⁾, A. Nagata²⁾, T. Yatsuo^{1,2)}, Y. Tanaka^{1,2)}, and H. Okumura^{1,2)}

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

Mo-1A MOSFET 1 11:20-12:50

Room: Tenzui

Chairs: L. Cheng (Cree, USA)
M. Kitabatake (Panasonic, Japan)

11:20 **Mo-1A-1 <Invited>** p. 7**The Development of Advanced SiC Devices and Modules**

T. Nakamura, Y. Nakano, M. Aketa, and T. Hanada
ROHM Co., Ltd, Japan

11:50 **Mo-1A-2** p. 8**4H-SiC Trench MOSFET with Bottom Oxide Protection**

Y. Kagawa, N. Fujiwara, R. Tanaka, Y. Fukui, Y. Yamamoto, N. Miura, M. Imaizumi, S. Nakata, and S. Yamakawa
Mitsubishi Electric Corporation, Japan

12:10 **Mo-1A-3** p. 9**SiC Trench MOSFET with an Integrated Low Von Unipolar Heterojunction Diode**

W. Ni, T. Marui, K. Emori, Y. Saito, S. Yamagami, T. Hayashi, and M. Hoshi
Nissan Motor Co., Ltd., Japan

12:30 **Mo-1A-4** p.10**Improvement of Channel Mobility in 4H-SiC C-Face MOSFETs by H₂ Rich Wet Re-Oxidation**

M. Okamoto¹⁾, Y. Makifuchi¹⁾, T. Araoka¹⁾, M. Miyazato¹⁾, Y. Sugahara¹⁾, T. Tsutsumi¹⁾, Y. Onishi¹⁾, H. Kimura¹⁾, S. Harada¹⁾, K. Fukuda¹⁾, A. Otsuki²⁾, and H. Okumura¹⁾

¹⁾National Institute of Advanced Industrial Science and Technology, Japan, ²⁾Fuji Electric Co., Ltd., Japan

Mo-1B Material Properties 11:20-13:00

Room: Juyo

Chairs: J. Suda (Kyoto University, Japan)
A. Gali (Budapest University of Technology and Economics, Hungary)

11:20 **Mo-1B-1** p.11**High-Resolution Raman and Luminescence Spectroscopy of Isotope- Pure ²⁸Si¹²C, Natural and ¹³C-Enriched 4H-SiC**

I. G. Ivanov, B. Lundqvist, J. Hassan, P. Stenberg, R. Liljedahl, M. Yazdanfar, O. Kordina, and E. Janzén
Linköping University, Sweden

11:40 **Mo-1B-2** p.12**Characterization of Ge-doped 4H-SiC Homoepitaxial Layers Grown by Chemical Vapor Deposition**

T. Sledziewski¹⁾, S. Beljakowa¹⁾, K. Alassaad²⁾, P. Kwasnicki³⁾, R. Arvinte⁴⁾, S. Juillaguet³⁾, M. Zielinski⁴⁾, V. Souliere²⁾, G. Ferro²⁾, H. B. Weber¹⁾, and M. Krieger¹⁾

¹⁾FAU Erlangen-Nürnberg, Germany, ²⁾LMI, UMR-CNRS, France, ³⁾Université Montpellier 2 and CNRS, France, ⁴⁾NOVASiC, France

12:00 **Mo-1B-3** p.13**Injection and Temperature Dependent Diffusivity and Auger Recombination in 4H-SiC**

P. Ščajev¹⁾, K. Jarašiūnas¹⁾, and P. B. Klein²⁾

¹⁾Vilnius University, Lithuania, ²⁾Naval Research Laboratory, USA

12:20 **Mo-1B-4** p.14**Persistent Conductivity in n-Type 3C-SiC Observed at Low Temperatures**

S. Beljakowa¹⁾, M. Hauck¹⁾, M. Bockstedte¹⁾, H. Nagasawa²⁾, H.B. Weber¹⁾, G. Pensl¹⁾, and M. Krieger¹⁾

¹⁾Universität Erlangen-Nürnberg, Germany, ²⁾Tohoku University, Japan

12:40 **Mo-1B-5 <Late News>** p.15**Carrier Lifetime Improvement in Al-Doped p-Type 4H-SiC Epitaxial Layers by Hydrogen Passivation**

T. Okuda, T. Kimoto, and J. Suda
Kyoto University, Japan

Mo-2A Solution Growth & Others 14:10-15:40

Room: Tenzui

Chairs: D. Chaussende (LMGP, CNRS, France)

K. Kakimoto (Kyushu University, Japan)

14:10 **Mo-2A-1 <Invited>** p.16**Surface Shape-Controlled Solution Growth of 4H-SiC Bulk Crystal**H. Daikoku¹⁾, M. Kado¹⁾, H. Sakamoto¹⁾, T. Bessho¹⁾, K. Kusunoki²⁾, and K. Kamei²⁾¹⁾Toyota Motor Corporation, Japan, ²⁾Nippon Steel Sumitomo & Metal Corporation, Japan14:40 **Mo-2A-2** p.17**Increase in the Growth Rate by Rotating the Seed Crystal at a High Speed during the Solution Growth of SiC**T. Umezaki, D. Koike, S. Harada, and T. Ujihara

Nagoya University, Japan

15:00 **Mo-2A-3** p.18**Dependence of Growth Rate and Surface Morphology of 4H-SiC Crystals Grown from Si-Cr-C and Si-Cr-Al-C Solutions under Various C Solubility and Supersaturation Conditions**T. Mitani^{1,2)}, N. Komatsu¹⁾, T. Takahashi^{1,2)}, T. Kato^{1,2)}, K. Fujii^{1,3)}, I. Nagai^{1,3)}, T. Ujihara⁴⁾, Y. Matsumoto⁵⁾, K. Kurashige^{1,3)}, and H. Okumura^{1,2)}¹⁾R&D Partnership for Future Power Electronics Technology, Japan ²⁾National Institute of Advanced Industrial Science and Technology, Japan, ³⁾Hitachi Chemical Co., Ltd., Japan, ⁴⁾Nagoya University, Japan ⁵⁾Tohoku University, Japan15:20 **Mo-2A-4** p.19**Fast 4H-SiC Crystal Growth by High-Temperature Gas Source Method**N. Hoshino¹⁾, I. Kamata¹⁾, Y. Tokuda^{2,3)}, E. Makino^{2,3)}, J. Kojima^{2,3)}, and H. Tsuchida¹⁾¹⁾Central Research Institute of Electric Power Industry, Japan, ²⁾R&D Partnership for Future Power Electronics Technology, Japan, ³⁾DENSO CORPORATION, Japan**Mo-2B Doping & Contacts 14:10-15:40**

Room: Juyo

Chairs: K. Fukuda (AIST, Japan)

F. Roccaforte (CNR-IMM, Italy)

14:10 **Mo-2B-1 <Invited>** p.20**Applications of Vapor-Liquid-Solid Selective Epitaxy of Highly p-Type Doped 4H-SiC : PiN Diodes with Peripheral Protection and Improvement of Specific Contact Resistance of Ohmic Contacts**N. Thierry-Jebali¹⁾, M. Lazar¹⁾, A. Vo-Ha²⁾, D. Carole²⁾, V. Soulière²⁾, B. Asllani¹⁾, A. Henry³⁾, D. Planson¹⁾, G. Ferro²⁾, H. Peyre⁴⁾, L. Konczewicz⁴⁾, S. Contreras⁴⁾, G. Regula⁵⁾, C. Brylinski²⁾, and P. Brosseard¹⁾¹⁾Université de Lyon, INSA de Lyon, France, ²⁾Université de Lyon 1, France, ³⁾Linköping University, Sweden, ⁴⁾Université de Montpellier, France, ⁵⁾Université Paul Cézanne, France14:40 **Mo-2B-2** p.21**N- and P-Type Doping of 4H-SiC by Wet-Chemical Laser Processing**K. Nishi, A. Ikeda, D. Marui, H. Ikenoue, and T. Asano

Kyushu University, Japan

15:00 **Mo-2B-3** p.22**Contact Property of 4H-SiC with Phosphorus-Doped and Crystallized Amorphous-Silicon Insertion Layer**H. Hanafusa, A. Ohta, R. Ashihara, K. Maruyama, T. Mizuno, S. Hayashi, H. Murakami, and S. Higashi
Hiroshima University, Japan15:20 **Mo-2B-4** p.23**Microwave Annealing of Al⁺ Implanted 4H-SiC: Towards Device Fabrication**A. Nath¹⁾, F. Moscatelli²⁾, A. Parisini³⁾, Y -L. Tian⁴⁾, M.V. Rao¹⁾, and R. Nipoti²⁾¹⁾George Mason University, USA, ²⁾CNR-IMM of Bologna, Italy, ³⁾Università di Parma, Italy, ⁴⁾LT Technologies, USA

- Mo-IP-1 <Invited Poster>** p. 3
Development of RAF Quality 150mm 4H-SiC Wafer
H. Kondo^{1,2)}, H. Takaba^{1,2)}, M. Yamada^{1,2)}, Y. Urakami^{1,2)}, M. Kobayashi^{1,3)}, T. Masuda^{1,3)}, I. Gunjishima^{1,4)}, K. Shigeto^{1,4)}, N. Ooya^{1,2)}, N. Sugiyama^{1,2)}, A. Matsuse^{1,3)}, T. Kozawa^{1,4)}, T. Sato^{1,3)}, F. Hirose^{1,2)}, S. Yamauchi^{1,2)}, and S. Onda^{1,2)}
¹R&D Partnership for Future Power Electronics Technology, Japan, ²DENSO CORP., Japan, ³SHOWA DENKO K.K., Japan, ⁴TOYOTA Central R&D Labs., Japan
- <Bulk Growth>*
- Mo-P-1** p.24
4H-SiC Bulk Growth Using High-Temperature Gas Source Method
Y. Tokuda^{1,2)}, J. Kojima^{1,2)}, K. Hara^{1,2)}, H. Tsuchida³⁾, and S. Onda^{1,2)}
¹R&D Partnership for Future Power Electronics Technology, Japan, ²DENSO CORP., Japan, ³Central Research Institute of Electric Power Industry, Japan
- Mo-P-2** p.25
Solution Growth of n-Type 4H-SiC Bulk Crystals with Low Resistivity
T. Shirai¹⁾, K. Danno¹⁾, A. Seki¹⁾, H. Sakamoto¹⁾, T. Bessho¹⁾, and T. Kimoto²⁾
¹Toyota Motor Corporation, Japan, ²Kyoto University, Japan
- Mo-P-3** p.26
N-Type Doping of 4H-SiC by the Top-Seeded Solution Growth Technique
K. Kusunoki^{1,2)}, K. Kamei¹⁾, K. Seki²⁾, S. Harada²⁾, and T. Ujihara²⁾
¹Nippon Steel and Sumitomo Metal Corporation, Japan, ²Nagoya University, Japan
- Mo-P-4** p.27
High Temperature Chemical Vapor Deposition Using Tetramethylsilane toward Bulk Crystal Growth of SiC
S. -H. Jeong, D. -H. Nam, B. G. Kim, J. -Y. Yoon, K. -H Kim, Y. -J. Yoon, M. -H. Lee, and W. -S. Seo
Korea Institute of Ceramic Engineering and Technology, Korea

- Mo-P-5** p.28
Control of Dislocation Conversion during Solution Growth by Changing Surface Step Structure
S. Harada, Y. Yamamoto, S. Xiao, A. Horio, M. Tagawa, and T. Ujihara
Nagoya University, Japan
- Mo-P-6** p.29
Electromagnetic Enhancement of Carbon Transport in SiC Solution Growth Process: a Numerical Modeling Approach
K. Ariyawong, J. M. Dedulle, and D. Chaussende
LMGP, CNRS UMR5628, Grenoble INP, France
- Mo-P-7** p.30
The Suppression of the Trenches by the Control of Solution Flow above Growth Surface in the Solution Growth of SiC
C. Zhu¹⁾, S. Harada¹⁾, S. Xiao¹⁾, K. Seki²⁾, M. Tagawa¹⁾, Y. Matsumoto³⁾, T. Kato^{4,5)}, K. Kurashige^{5,6)}, H. Okamura^{4,5)}, and T. Ujihara¹⁾
¹Nagoya University, Japan, ²Nagoya University, Japan, ³Tohoku University, Japan, ⁴National Institute of Advanced Industrial Science and Technology, Japan, ⁵R&D Partnership for Future Power Electronics Technology, Japan, ⁶Hitachi Chemical Co., Ltd., Japan
- Mo-P-8** p.31
Interference Observation of the Interface between SiC and Liquid Alloy and Its Application to Dissolution Process of SiC
S. Kawanishi, T. Yoshikawa, and K. Morita
The University of Tokyo, Japan

<Epitaxy>

Mo-P-9 p.32
Dependence of the Growth Parameters on the in-Plane Distribution of 150 mm ϕ Size SiC Epitaxial Wafer

C. Kudou^{1,2)}, K. Tamura^{1,3)}, J. Nishio^{1,4)}, K. Masumoto^{1,5)}, K. Kojima^{1,5)}, and T. Ohno^{1,6)}

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾Panasonic Corporation, Japan, ³⁾ROHM Co., Ltd, Japan, ⁴⁾Toshiba Corporation, Japan,

⁵⁾National Institute of Advanced Industrial Science and Technology, Japan,

⁶⁾Hitachi, Ltd., Japan

Mo-P-10 p.33

Comparative Study of Defects in 4H-SiC Epilayers Grown on 4^o Off-Axis (0001) and (000-1) Substrates

T. Aigo, W. Itoh, T. Fujimoto, and T. Yano

Nippon Steel & Sumitomo Metal Corporation, Japan

Mo-P-11 p.34

3C-SiC Seeded Growth on Diamond Substrate by VLS Transport

A. Vo-Ha¹⁾, D. Carole¹⁾, M. Lazar²⁾, A. Tallaire³⁾, V. Souliere¹⁾, and G. Ferro¹⁾

¹⁾Universite Lyon 1 CNRS, UMR 5615, France, ²⁾Universite de Lyon, INSA de Lyon, France, ³⁾Universite Paris XII, France

Mo-P-12 Moved to Th-P-59

Mo-P-13 p.35

Characterization of the Defects Evolution in Thick Heavily Al-Doped 4H-SiC Epilayers

S. Y. Ji¹⁾, K. Kojima¹⁾, Y. Ishida¹⁾, H. Yamaguchi¹⁾, S. Saito¹⁾, T. Kato¹⁾, H. Tsuchida²⁾, S. Yoshida¹⁾, and H. Okumura¹⁾

¹⁾National Institute of Advanced Industrial Science and Technology, Japan,

²⁾Central Research Institute of Electric Power Industry, Japan

Mo-P-14 p.36

Crystal Growth of Silicon Carbide by Chemical Vapor Deposition with Alternating Gas Supply

T. Nagano and K. Sato

Japan Fine Ceramics Center, Japan

Mo-P-15 p.37

Lateral Enlargement of 3C-SiC on Off-Oriented 4H-SiC Substrates

V. Jokubavicius, P. Chen, R. Yakimova, and M. Syväjärvi

Linköping University, Sweden

Mo-P-16 p.38

Monte Carlo Study of the First Stages Growth of 3C-SiC on Misoriented <11-20> and <1-100> 6H-SiC Substrates by CVD Growth

M. Camarda, A. La Magna, and F. La Via

IMM-CNR, Italy

<Characterization>

Mo-P-17 p.39

Driving Force of Stacking Fault Expansion in 4H-SiC by Electroluminescence Observation *in situ*

K. Konishi, S. Yamamoto, S. Nakata, Y. Toyoda, and S. Yamakawa

Mitsubishi Electric Corporation, Japan

Mo-P-18 p.40

Dislocation Revelation for 4H-SiC by Using Vaporized NaOH: a Possible Way to Distinguish Edge, Screw and Mixed Threading Dislocations by Etch Pit Method

Y. Yao¹⁾, Y. Ishikawa¹⁾, Y. Sugawara¹⁾, K. Sato¹⁾, K. Danno²⁾, H. Suzuki²⁾, H. Sakamoto²⁾, T. Bessho²⁾, S. Yamaguchi³⁾, and K. Nishikawa³⁾

¹⁾Japan Fine Ceramics Center, Japan, ²⁾Toyota Motor Corporation, Japan,

³⁾Toyota Central Research and Development Laboratories Inc., Japan

- Mo-P-19** p.41
Identification of Structures of the Deep Levels in 4H-SiC
H. Nakane¹⁾, M. Kato¹⁾, M. Ichimura¹⁾, and T. Ohshima²⁾
¹⁾Nagoya Institute of Technology, Japan, ²⁾Japan Atomic Energy Agency, Japan
- Mo-P-20** p.42
TEM Observation of Defect Structure of Low-Energy Ion Implanted SiC
T. Kameda, A. Tomita, T. Matsui, and T. Isshiki
 Kyoto Institute of Technology, Japan
- Mo-P-21** p.43
EPR Observation of the Neutral (C-C)_C Split Interstitial in Low-Energy Electron Irradiated 3C-SiC
 H. J. von Bardeleben¹⁾, J. L. Cantin¹⁾, F. Bruneval²⁾, E. Rauls³⁾, and U. Gerstmann³⁾
¹⁾Universite Pierre et Marie Curie, France, ²⁾CEA, DEN, France, ³⁾University of Paderborn, Germany
- Mo-P-22** p.44
Defect Characterization on SiC Substrates for Room-Temperature Single Photon Source
J. Sun¹⁾, Y. Satoh¹⁾, T. Umeda¹⁾, B. C. Johnson²⁾, T. Makino²⁾, S. Onoda²⁾, and T. Ohshima²⁾
¹⁾University of Tsukuba, Japan, ²⁾Japan Atomic Energy Agency, Japan
- Mo-P-23** p.45
Oxidation Induced ON₁, ON_{2,a/b} Defects in 4H-SiC Characterized by DLTS
I. D. Booker¹⁾, H. Abdallah¹⁾, L. Lilja¹⁾, J. ul-Hassan¹⁾, J. P. Bergman¹⁾, E. Ö. Sveinbjornsson^{1,2)}, and E. Janzén¹⁾
¹⁾Linköping University, Sweden, ²⁾University of Iceland, Iceland
- Mo-P-24** p.46
Identification of the Negative Carbon Vacancy at Quasi-Cubic Site in 4H-SiC by EPR and Theoretical Calculations
X. T. Trinh¹⁾, K. Szász²⁾, T. Hornos²⁾, K. Kawahara³⁾, J. Suda³⁾, T. Kimoto³⁾, A. Gali^{2,4)}, E. Janzen¹⁾, and N. T. Son¹⁾
¹⁾Linköping University, Sweden, ²⁾Hungarian Academy of Sciences, Hungary, ³⁾Kyoto University, Japan, ⁴⁾Budapest University of Technology and Economics, Hungary
- Mo-P-25** p.47
First Principle Investigation of Divacancy in SiC Polytypes for Solid State Qubit Application
 K. Szasz¹⁾, V. Ivady²⁾, and A. Gali^{1,3)}
¹⁾Hungarian Academy of Sciences, Hungary, ²⁾Linköping University, Sweden, ³⁾Budapest University of Technology and Economics, Hungary
- Mo-P-26** p.48
Room Temperature Magnetic Resonance on SiC Quantum Defects: a Silicon Carbide MASER?
H. Kraus¹⁾, F. Fuchs¹⁾, V. Soltamov²⁾, S. Väth¹⁾, D. Riedel¹⁾, A. Sperlich¹⁾, P. Baranov²⁾, E. Mokhov²⁾, V. Dyakonov¹⁾, and G. V. Astakhov^{1,3)}
¹⁾Julius Maximilian University of Würzburg, Germany, ²⁾Ioffe Physical-Technical Institute, Russia, ³⁾ZAE Bayern, Germany
- Mo-P-27** p.49
Investigation of Obtuse Triangular Defects on 4H-SiC Epitaxial Layers
L. Dong^{1,2)}, G. S. Sun^{1,2)}, J. Yu²⁾, L. Zheng¹⁾, X. F. Liu¹⁾, F. Zhang¹⁾, G. G. Yan¹⁾, W. S. Zhao¹⁾, L. Wang¹⁾, X. G. Li²⁾, and Z. G. Wang¹⁾
¹⁾Chinese Academy of Sciences, China, ²⁾Tianyu Semiconductor Technology Co., Ltd, China

<Processing>

Mo-P-28 p.50
Al⁺ Implanted 4H-SiC p⁺-i-n Diodes: Evidence for Post-Implantation-Annealing Dependent Defect Activation

U. Grossner¹, M. Moscatelli², G. Pizzochero², and R. Nipoti²

¹ABB Corporate Research, Switzerland, ²CNR-IMM of Bologna, Italy

Mo-P-29 p.51
Temperature Dependence of Electric Conductivities in Femtosecond Laser Modified Areas in Silicon Carbide

S. Takayoshi¹, M. Deki¹, Y. Naoi¹, T. Makino², T. Ohshima², and T. Tomita¹

¹The University of Tokushima, Japan, ²Japan Atomic Energy Agency, Japan

Mo-P-30 p.52
Electrical Characteristics of Schottky Contacts on Ge-Doped 4H-SiC

M. Vivona¹, K. Alassad², V. Soulière², F. Giannazzo¹, F. Roccaforte¹, and G. Ferro²

¹CNR-IMM, Italy, ²University Claude Bernard Lyon 1, France

Mo-P-31 p.53
Temperature-Dependence of the Electrical Characteristics of Ni₂Si Ohmic Contacts to n- and p-Type Implanted 4H-SiC

M. Vivona¹, G. Greco¹, S. Di Franco¹, F. Giannazzo¹, F. Roccaforte¹, A. Frazzetto², S. Rascunà², E. Zanetti², A. Guarnera², and M. Saggio²

¹CNR-IMM, Italy, ²ST Microelectronics, Italy

Mo-P-32 p.54
I-V Characteristics in Surface-Activated Bonding (SAB) Based Si/SiC Junctions at Raised Ambient Temperatures

S. Nishida¹, J. Liang¹, M. Morimoto¹, N. Shigekawa¹, and M. Arai²

¹Osaka City University, Japan, ²New Japan Radio Co., Ltd., Japan

Mo-P-33 p.55
Ti/Al/Si Ohmic Contacts for Both n-Type and p-Type 4H-SiC

H. Tamaso, S. Yamada, H. Kitabayashi, and T. Horii

Sumitomo Electric Industries, Ltd., Japan

Mo-P-34 p.56
Development of a Novel Cap-Free Activation Annealing Technique of 4H-SiC by Si-Vapor Ambient Anneal Using TaC/Ta Composite Materials

S. Torimi¹, S. Nogami¹, and T. Kaneko²

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

Mo-P-35 p.57
Impact of Interface Traps on Current-Voltage Characteristics of 4H-SiC Schottky-Barrier Diodes

H. Amini Moghadam, S. Dimitrijević, and J. Han

Griffith University, Australia

Mo-P-36 p.58
Low Cost Ion Implantation Process with High Heat Resistant Photoresist in Silicon Carbide Device Fabrication

T. Fujiwara¹, Y. Tanigaki¹, Y. Furukawa², K. Tonari², A. Ootsuki³, T. Imai⁴, N. Oose⁴, M. Utsumi⁴, M. Ryo⁴, M. Gotoh⁴, S. Nakamata⁴, T. Sakai⁴, Y. Sakai⁴, M. Miyajima⁴, H. Kimura⁴, K. Fukuda⁴, and H. Okumura⁴

¹Toray Industries, Inc., Japan, ²ULVAC Inc., Japan, ³Fuji Electric Holdings Co. Ltd., Japan, ⁴National Institute of Advanced Industrial Science and Technology, Japan

Mo-P-37 p.59
Characteristics of a Schottky Barrier Diode and the SiC Wafers Sliced by Wire Electrical Discharge Machining

H. Miyake, N. Tomita, Y. Nakaki, T. Furusho, A. Itokazu, T. Hashimoto, Y.

Toyoda, S. Yamakawa, H. Sumitani, T. Kuroiwa, and T. Sato

Mitsubishi Electric Corporation, Japan

Mo-P-38 p.60
Stable Ohmic Nickel/Titanium/Aluminium Contacts to 4H-SiC Characterized from -40°C to 500°C

K. Smedfors, L. Lanni, M. Östling, and C. -M. Zetterling

KTH Royal Institute of Technology, Sweden

- Mo-P-39** p.61
Electrical Properties of Mg-Implanted 4H-SiC
H. Matsuura¹⁾, T. Morine¹⁾, and S. Nagamachi²⁾
¹⁾Osaka Electro-Communication University, Japan, ²⁾Nagamachi Science Laboratory Co., Ltd., Japan
- Mo-P-40** p.62
Low Ohmic Contact Formation of Ni Silicide on Partially Si Ion Implanted n⁺ 4H-SiC
M. de Silva, T. Sato, S. Kuroki, and T. Kikkawa
Hiroshima University, Japan
- <Devices and Circuits>
- Mo-P-41** p.63
Blocking Characteristics of 2.2 kV and 3.3 kV -Class 4H-SiC MOSFETs with Improved Doping Control for Edge Termination
K. Wada, K. Uchida, T. Hiyoshi, R. Kimura, M. Sakai, S. Hatsukawa, K. Hiratsuka, N. Hirakata, and Y. Mikamura
Sumitomo Electric Industries, Ltd., Japan
- Mo-P-42** p.64
Simulation, Fabrication and Characterization of 4500V 4H-SiC JBS Diode
R. Huang¹⁾, G. Chen¹⁾, S. Bai²⁾, R. Li²⁾, and Y. Li²⁾
¹⁾Nanjing Electronic Devices Institute, China, ²⁾Science and Technology on Monolithic Integrated Circuits and Modules Laboratory Nanjing, China
- Mo-P-43** p.65
High Temperature Reliability of the SiC-MOSFET with Copper Metallization
H. Okabe, M. Yoshida, T. Tominaga, J. Fujita, K. Endo, Y. Yokoyama, K. Nishikawa, Y. Toyoda, and S. Yamakawa
Mitsubishi Electric Corporation, Japan
- Mo-P-44** p.66
Investigation on Internally Unbalanced Switching Behavior for Realization of 1-cm² SiC- MOSFET
S. Hino, M. Ito, N. Miura, M. Imaizumi, and S. Yamakawa
Mitsubishi Electric Corporation, Japan
- Mo-P-45** p.67
Effect of Current-Spreading Layer Formed by Ion Implantation on the Electrical Properties of High-Voltage 4H-SiC p-Channel IGBTs
T. Deguchi^{1,2)}, S. Katakami^{1,2)}, H. Fujisawa^{1,3)}, K. Takenaka^{1,3)}, M. Takei^{1,3)}, H. Ishimori¹⁾, S. Takasu¹⁾, M. Arai^{1,2)}, Y. Yonezawa¹⁾, and K. Fukuda¹⁾
¹⁾National Institute of Advanced Industrial Science and Technology, Japan, ²⁾New Japan Radio Co., Ltd., Japan, ³⁾Fuji Electric Co., Ltd., Japan
- Mo-P-46** p.68
Improved Analytical Expressions for Avalanche Breakdown in 4H-SiC
Z. Stum^{1,2)}, Y. Tang¹⁾, H. Naik¹⁾, and T. P. Chow¹⁾
¹⁾Rensselaer Polytechnic Institute, USA, ²⁾General Electric Global Research, USA
- Mo-P-47** p.69
Reliability Performance of 1200 V and 1700 V 4H-SiC DMOSFETs for Next Generation Power Conversion Applications
D. A. Gajewski, S. -H. Ryu, M. Das, and B. Hull, J. Young, and J. Palmour
Cree, Inc., USA
- Mo-P-48** p.70
Evaluation of SiC Stack Cascode for 200°C Operations
X. Li, P. Alexandrov, J. Hostetler, and A. Bhalla
United Silicon Carbide, Inc., USA

Mo-P-49 p.71
Beam Acceleration Experiment with SiC Based Power Supply and the Next Generation SiC- JFET Package
K. Okamura¹, Y. Osawa², M. Wake¹, and K. Takayama¹
¹High Energy Accelerator Research Organization, Japan, ²Shindengen Electric Manufacturing, Japan

Mo-P-50 p.72
Comparison of 5kV 4H-SiC JBS and PiN Diodes
M. Berthou¹, P. Godignon¹, J. Calvo¹, A. Mihaila², E. Bianda², and I. Nistor²
¹CNM-CSIC, Spain, ²ABB Switzerland Ltd, Switzerland

Mo-P-51 p.73
Selection of SPICE Parameters and Equations for Effective Simulation of Circuits with 4H-SiC Power MOSFETs
P. Tanner, S. Dimitrijević, H. Aminimoghadam, A. Aminbeidokhti, and J. Han
Griffith University, Australia

Mo-P-52 p.74
Modeling and Characterization of a Novel Advanced 4H-SiC Trench MOS Barrier Schottky Diode (TMBS)
L. Zheng, F. Zhang, S. B. Liu, L. Dong, X. F. Liu, B. Liu, G. G. Yan, L. Wang, W. S. Zhao, and G. S. Sun
Chinese Academy of Sciences, China

Mo-P-53 p.75
FLR with Partially Surface Doped Structure for 5kV 4H-SiC PiN Diode
H. W. Kim¹, W. Bahng¹, N. K. Kim¹, and J. Y. Jo²
¹Korea Electrotechnology Research Institute, Korea, ²Ajou University, Korea

Mo-P-54 p.76
Comparison of 600V Si, SiC and GaN Power Devices
S. Chowdhury¹, Z. M. Stum², Z. Li¹, and T. P. Chow¹
¹Rensselaer Polytechnic Institute, USA, ²General Electric Global Research, USA

Mo-P-55 p.77
The Cryogenic Testing and Characterisation of SiC PiN Diodes
P. M. Gammon¹, C. A. Fisher¹, V. A. Shah², M. R. Jennings¹, A. Pérez-Tomás³, S. E. Burrows², M. Myronov², D. R. Leadley², and P. A. Mawby¹
¹University of Warwick, UK, ²University of Warwick, UK, ³IMB-CNM-CSIC, Spain

<Late News: Characterization>

Mo-P-56 p.78
Defect Structure Characterization of AlN/SiC(11-20) Interface by Two Dimensional Photoelectron Diffraction Spectroscopy
N. Maejima¹, F. Matsui¹, M. Horita¹, H. Matsui¹, T. Ota¹, R. Ishi¹, M. Fujita¹, K. Yasuda¹, T. Matsushita², and H. Daimon¹
¹Nara Institute of Science and Technology, Japan, ²JASRI/SPring-8, Japan

Mo-P-57 p.79
Defect Levels in High Purity Semi-Insulating 4H-SiC Studied by Alpha Particle Induced Charge Transient Spectroscopy
N. Iwamoto, S. Onoda, N. Fujita, T. Makino, and T. Ohshima
Japan Atomic Energy Agency, Japan

Mo-P-58 p.80
Direct Observation of the Edge Termination of Surface Steps on 4H/6H-SiC {0001} by Tilted Low-Voltage Scanning Electron Microscopy
K. Ashida, T. Kajino, Y. Kutsuma, N. Ohtani, and T. Kaneko
Kwansei Gakuin University, Japan

<Late News: Processing>

Mo-P-59 p.81
Deep Interface Traps in 4H-SiC MOS Capacitors Investigated by Deep Level Transient Spectroscopy
E. Ö. Sveinbjörnsson^{1,2} and Ó. Gíslason¹
¹University of Iceland, Iceland, ²Linköping University, Sweden

Mo-P-60 p.82
4H-SiC MOS Capacitors and MOSFET Fabrication with Gate Oxidation at 1400°C

H. Naik and T. P. Chow
Rensselaer Polytechnic Institute, USA

Mo-P-61 p.83
Improving Uniformity of Schottky Barrier Height of 4H-SiC Schottky Barrier Diode by Nitrided Sacrificial Oxidation

D. Lee¹⁾, C. Kim¹⁾, H. Lee¹⁾, S. Lee¹⁾, H. Kang¹⁾, H. Kim¹⁾, Jeong Hyun Moon²⁾, and H. J. Kim¹⁾

¹⁾Seoul National University, Korea, ²⁾Korea Electrotechnology Research Institute, Korea

Mo-P-62 p.84
On the Ti₃SiC₂ Metallic Phase Formation for Robust P-Type 4H-SiC Ohmic Contacts

M. R. Jennings¹⁾, C. A. Fisher¹⁾, D. Walker¹⁾, A. Sanchez¹⁾, A. Pérez-Tomás²⁾, D. P. Hamilton¹⁾, P. J. Gammon¹⁾, S. E. Burrows¹⁾, S. M. Thomas¹⁾, Y. Sharma¹⁾, F. Li¹⁾, and P. A. Mawby¹⁾

¹⁾University of Warwick, UK, ²⁾IMB-CNM-CSIC, Spain

Industrial Session ***19:00-21:00***

Room: Tenzui and Juyo

Tuesday, October 1

Tu-1A High Voltage Devices I 8:30-10:20

Chairs: Y. Yonezawa (AIST, Japan)

Room: Tenzui

8:30 **Tu-1A-1 <Invited>** p.85
Strategic Overview of High-Voltage SiC Power Device Development Aiming at Global Energy Savings

L. Cheng¹⁾, J. W. Palmour¹⁾, A. K. Agarwal^{1,2)}, E. V. Brunt¹⁾, V. Pala¹⁾, S. T. Allen¹⁾, M. O'Loughlin¹⁾, A. Burk¹⁾, D. Grider¹⁾, G-Y Wang³⁾, A. Q. Huang³⁾, and C. Scozzie⁴⁾

¹⁾Cree Inc., USA, ²⁾U.S. Dept. of Energy, USA, ³⁾North Carolina State University, USA, ⁴⁾U.S. Army Research Laboratory, USA

9:00 **Tu-1A-2** p.86
Ultrahigh-Voltage (> 20 kV) SiC PiN Diodes with a Space-Modulated JTE and Lifetime Enhancement Process via Thermal Oxidation

N. Kaji, H. Niwa, J. Suda, and T. Kimoto
Kyoto University, Japan

9:20 **Tu-1A-3** p.87
Optical Triggering of High Current (1300 A), High-Voltage (12 kV) 4H-SiC Thyristor

S. Romyantsev^{1,2)}, M. Levinshtein¹⁾, M. Shur²⁾, L. Cheng³⁾, A. Agarwal³⁾, and J. Palmour³⁾

¹⁾Ioffe Physico-Technical Institute of Russian Academy of Sciences, Russia, ²⁾Rensselaer Polytechnic Institute, USA, ³⁾Cree Inc., USA

9:40 **Tu-1A-4** p.88
Designing and Fabrication of the VLD Edge Termination for 3.3 kV SiC Devices

K. Ebihara, Y. Yamamoto, Y. Nakaki, S. Aya, S. Nakata, M. Imaizumi, Y. Toyoda, and S. Yamakawa
Mitsubishi Electric Corporation, Japan

10:00 **Tu-1A-5 <Late News>** p.89
Static and Dynamic Performance Evaluation of >13KV SiC-ETO and Its Application as A Solid-State Breaker

M. A. Rezaei¹⁾, G. Wang¹⁾, A. Q. Huang¹⁾, and L. Cheng²⁾

¹⁾North Carolina State University, USA, ²⁾CREE Inc., USA

Tu-1B Physical Vapor Transport Growth 8:30-10:20

Chairs: M. Pons (INPG, CNRS, France)

S. Nishizawa (AIST, Japan)

Room: Juyo

8:30 **Tu-1B-1 <Invited>** p.90
Open Issues in SiC Bulk Growth

D. Chaussende, K. Ariyawong, N. Tsavdaris, M. Seiss, Y.J. Shin, J-M. Dedulle, R. Madar, E. Sarigiannidou, J. La Manna, O. Chaix-Pluchery, and T. Ouisse
LMGP, CNRS UMR5628, Grenoble INP-Minatec, France

9:00 **Tu-1B-2** p.91
ZMP and Ultralow BPD SiC Substrates in Manufacturing

A.R. Powell, R.L. Leonard, Y. Khlebnikov, E. Deyneka, M. McKay, J.J. Sumakeris, V. Tsvetkov, and E. Balkas
Cree, Inc., USA

9:20 **Tu-1B-3** p.92
Dislocation Density-Based Modeling of Plastic Behavior of 4H-SiC Single Crystals by the Alexander- Haasen Model during PVT Growth

B. Gao¹⁾, S. Nishizawa²⁾, and K. Kakimoto¹⁾

¹⁾Kyushu University, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

9:40 **Tu-1B-4** p.93
Real-Time Measurement of the Evolution of Growth Facets during SiC PVT Bulk Growth Using 3-D X-Ray Computed Tomography

G. Neubauer¹⁾, M. Salamon²⁾, N. Uhlmann²⁾, and P.J. Wellmann¹⁾

¹⁾University of Erlangen-Nürnberg, Germany, ²⁾EZRT, Germany

10:00 **Tu-1B-5** p.94
Effect of Facet Occurrence on Polytype Destabilization during Bulk Crystal Growth of SiC by Seeded Sublimation

N. Tsavdaris, K. Ariyawong, O. Chaix-Pluchery, E. Sarigiannidou, J.M. Dedulle, and D. Chaussende
LMGP, CNRS UMR5628, Grenoble INP-Minatec, France

Tu-2A Epitaxy I: Defect Reduction 10:40-12:30

Room: Tenzui

Chairs: A. Burk (Cree, USA)

G. Ferro (University Claude Bernard Lyon I, France)

10:40 **Tu-2A-1 <Invited>** p.95**Evolution of Fast 4H-SiC CVD Growth and Defect Reduction Techniques**H. Tsuchida¹⁾, I. Kamata¹⁾, M. Ito¹⁾, T. Miyazawa¹⁾, N. Hoshino¹⁾, H. Fujibayashi¹⁾, H. Ito¹⁾, E. Makino^{2,3)}, Y. Tokuda^{2,3)}, and J. Kojima^{2,3)}¹⁾Central Research Institute of Electric Power Industry, Japan, ²⁾R&D Partnership for Future Power Electronics Technology, Japan, ³⁾DENSO CORPORATION, Japan11:10 **Tu-2A-2** p.96**Evidence of Two-Dimensional Nucleation during 4H-SiC Homoepitaxy on 4° Off-Cut Substrates**M. Abadier¹⁾, R.L. Myers-Ward²⁾, N.A. Mahadik²⁾, R.E. Stahlbush²⁾, V.D. Wheeler²⁾, L.O. Nyakiti²⁾, C.R. Eddy, Jr.²⁾, D.K. Gaskill²⁾, H. Song³⁾, T.S. Sudarshan³⁾, Y.N. Picard¹⁾, and M. Skowronski¹⁾¹⁾Carnegie Mellon University, USA, ²⁾Naval Research Laboratory, USA, ³⁾University of South Carolina, USA11:30 **Tu-2A-3** p.97**Demonstration of High Quality 4H-SiC Epitaxial Growth with Extremely Low Basal Plane Dislocation Density**T. Tanaka, N. Kawabata, Y. Mitani, N. Tomita, M. Tarutani, T. Kuroiwa, Y. Toyoda, M. Imaizumi, H. Sumitani, and S. Yamakawa
Mitsubishi Electric Corporation, Japan11:50 **Tu-2A-4** p.98**Analysis of the Effects of Growth Rate on the Quality of 4H Silicon Carbide Films for MOSFET Applications**M. Camarda¹⁾, S. Privitera¹⁾, R. Anzalone¹⁾, N. Piluso¹⁾, P. Fiorenza¹⁾, A. Alberti¹⁾, A. La Magna¹⁾, F. La Via¹⁾, C. Vecchio²⁾, M. Mauceri²⁾, G. Litrico²⁾, A. Pecora²⁾, and D. Crippa³⁾¹⁾IMM-CNR, Italy, ²⁾Epitaxial Technology Center, Italy, ³⁾LPE spa, Italy12:10 **Tu-2A-5** p.99**Conversion of Basal Plane Dislocations to Threading Edge Dislocations in Growth of Epitaxial Layers on 4H-SiC Substrates with Vicinal Off-Angle**K. Masumoto^{1,2)}, S. Ito^{1,2)}, H. Goto²⁾, K. Tamura^{1,3)}, C. Kudou^{1,4)}, J. Nishio^{1,5)}, K. Kojima^{1,2)}, T. Ohno^{1,6)}, and H. Okumura^{1,2)}¹⁾R&D Partnership for Future Power Electronics Technology, Japan ²⁾National Institute of Advanced Industrial Science and Technology, Japan ³⁾ROHM Co., Ltd, Japan, ⁴⁾Panasonic Corporation, Japan ⁵⁾Toshiba Corporation, Japan ⁶⁾Hitachi, Ltd, Japan**Tu-2B GaN & Related Materials 10:40-12:40**

Room: Juyo

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

K. Ueno (Fuji Electric, Japan)

10:40 **Tu-2B-1 <Invited>** p.100**Commercialization of High 600 V GaN-on-Silicon Power HEMTs**P. Parikh, Y. Wu, and L. Shen

Transphorm Inc., USA

11:10 **Tu-2B-2 <Invited>** p.101**Diamond Based Power Device**S. Shikata¹⁾, H. Umezawa¹⁾, Y. Kato¹⁾, H. Yamada¹⁾, N. Tsubouchi¹⁾, Y. Mokuno¹⁾, A. Chayahara¹⁾ and T. Funaki²⁾¹⁾National Institute of Advanced Industrial Science and Technology, Japan, ²⁾Osaka University, Japan11:40 **Tu-2B-3** p.102**Magnetoresistance of AlGaN/GaN High Electron Mobility Transistors on Silicon**S. Roensch¹⁾, V. Sizov²⁾, T. Yagi²⁾, S. Murad²⁾, L. Groh²⁾, S. Lutgen²⁾, M. Sickmoeller²⁾, M. Krieger¹⁾, and H. B. Weber¹⁾¹⁾FAU Erlangen-Nuremberg, Germany, ²⁾AZZURRO Semiconductors, Germany12:00 **Tu-2B-4** p.103**Evidence of Low Temperature Decomposition of GaN Hetero-Epitaxial Layers on c-Plane Sapphire Surface Characterized by Differential Scanning Calorimetry**N. Thierry-Jebali^{1,2)}, R. Chiriac¹⁾, and C. Brylinski¹⁾¹⁾Université Lyon 1, CNRS, UMR, France, ²⁾Université de Lyon, INSA de Lyon, France12:20 **Tu-2B-5** p.104**A Proposal to Apply Effective Acceptor Level for Representing Increased Ionization Ratio of Mg Acceptors in Extrinsic Photon-Recycled GaN**K. Mochizuki¹⁾, T. Mishima²⁾, Y. Ishida³⁾, Y. Hatakeyama³⁾, K. Nomoto³⁾, N. Kaneda²⁾, T. Tsuchiya²⁾, A. Terano¹⁾, T. Tsuchiya¹⁾, H. Uchiyama¹⁾, S. Tanaka¹⁾, and T. Nakamura³⁾¹⁾Hitachi, Ltd., Japan, ²⁾Hitachi Cable, Ltd., Japan, ³⁾Hosei University, Japan

Tu-3A Epitaxy 2 : High Throughput 13:45-15:35

Room: Tenzui

Chairs: A. Henry (Linköping University, Sweden)

H. Tsuchida (CRIEPI, Japan)

**13:45 Tu-3A-1 <Invited> p.105
Progress in Large-Area 4H-SiC Epitaxial Layer Growth in a Warm-Wall Planetary Reactor**

B. Thomas, D. M. Hansen, J. Zhang, M. J. Loboda, J. Uchiyama, T. J. Toth, G. Chung, I. C. Manning, J. P. Quast, and S.G. Mueller
Dow Corning Corporation, USA

**14:15 Tu-3A-2 p.106
C-Face Epitaxial Growth of 4H-SiC on Quasi-150-mm Diameter Wafers with High Throughput**

J. Nishio^{1,2)}, C. Kudou^{1,3)}, K. Tamura^{1,4)}, K. Masumoto^{1,5)}, K. Kojima^{1,5)} and T. Ohno^{1,6)}
¹R&D Partnership for Future Power Electronics Technology, Japan, ²Toshiba R&D Center, Japan, ³Panasonic Corporation, Japan, ⁴ROHM Co., Ltd, Japan, ⁵National Institute of Advanced Industrial Science and Technology, Japan, ⁶Hitachi, Ltd, Japan

**14:35 Tu-3A-3 p.107
Latest SiC Epitaxial Layer Growth Results in a High-Throughput 6x150 mm Warm-Wall Planetary Reactor**

A. A. Burk, D. Tsvetkov, M. J. O'Loughlin, S. Ustin, and L. Garrett
Cree, Inc., USA

**14:55 Tu-3A-4 p.108
Fast 150 mm 4H-SiC Epitaxial Growth with High-Speed Wafer Rotation**

H. Fujibayashi^{1,2)}, M. Ito¹⁾, H. Ito^{1,3)}, I. Kamata¹⁾, M. Naito²⁾, K. Hara²⁾, S. Yamauchi²⁾, K. Suzuki³⁾, M. Yajima³⁾, S. Mitani³⁾, K. Suzuki⁴⁾, H. Aoki⁴⁾, K. Nishikawa⁵⁾, T. Kozawa⁵⁾, and H. Tsuchida¹⁾
¹Central Research Institute of Electric Power Industry, Japan, ²DENSO CORPORATION Research Laboratories, Japan, ³NuFlare Technology, Inc., Japan, ⁴Toyota Motor Corporation, Japan, ⁵Toyota Central R&D Labs, Japan

**15:15 Tu-3A-5 p.109
SiC-4H Epitaxial Layer Grown on 150 mm Automatic Horizontal Hot Wall Reactor PE106**

D. Crippa¹⁾, M. Mauceri²⁾, A. Pecora²⁾, G. Litrico²⁾, C. Vecchio²⁾, M. Puglisi²⁾, N. Piluso³⁾, M. Camarda³⁾, and F. La Via³⁾
¹LPE, Italy, ²ETC Epitaxial Technology Center, Italy, ³CNR-IMM, Italy

Tu-3B Quantum Systems & MOS Characterization 13:45-15:35

Chairs: N.T. Son (Linköping University, Sweden)

Room: Juyo

R. Stahlbush (Naval Research Laboratory, USA)

**13:45 Tu-3B-1 <Invited> p.110
Engineering Defect Spin States in SiC for Sensing and Computation**

A. L. Falk¹⁾, W. F. Koehl¹⁾, B. B. Buckley²⁾, G. Calusine²⁾, F. J. Heremans¹⁾, V. V. Dobrovitski³⁾, A. Politi²⁾, and D. D. Awschalom^{1,2)}
¹University of Chicago, USA, ²University of California, Santa Barbara, USA, ³Iowa State University, USA

**14:15 Tu-3B-2 p.111
Theoretical Investigation of the Single Photon Emitter Carbon Antisite-Vacancy Pair in 4H-SiC**

V. Ivády^{1,2)} and A. Gal^{2,3)}
¹Linköping University, Sweden, ²Wigner Research Centre for Physics of the Hungarian Academy of Sciences, Hungary, ³Budapest University of Technology and Economics, Hungary

**14:35 Tu-3B-3 p.112
Silicon Carbide Light-Emitting Diode as a Prospective Room Temperature Source for Single Photons**

F. Fuchs¹⁾, V. Soltamov²⁾, S. Váth¹⁾, H. Kraus¹⁾, P. Baranov²⁾, E. Mokhov²⁾, G. Astakhov¹⁾, and V. Dyakonov^{1,3)}
¹Julius Maximilian University of Würzburg, Germany, ²Ioffe Physical-Technical Institute, Russia, ³ZAE Bayern, Germany

**14:55 Tu-3B-4 p.113
Retarded Oxide Growth on 4H-SiC(0001) Substrates Due to Sacrificial Oxidation**

T. Hosoi¹⁾, Y. Uenishi¹⁾, Y. Nakano²⁾, T. Nakamura²⁾, T. Shimura¹⁾, and H. Watanabe¹⁾
¹Osaka University, Japan, ²ROHM Co., Ltd., Japan

**15:15 Tu-3B-5 p.114
Structural Difference between Near Interface Oxides Grown on Si and C Faces of 4H-SiC Characterized by FTIR-ATR Method**

H. Hirai¹⁾ and K. Kita^{1,2)}
¹The University of Tokyo, ²JST-PRESTO, Japan

Tu-IP-1 <Invited Poster> p.4

Ge Assisted SiC Epitaxial Growth by CVD on SiC Substrate

K. Alassaad¹⁾, V. Soulière¹⁾, B. Doisneau²⁾, F. Cauwet¹⁾, H. Peyre³⁾, D. Carole¹⁾, D. Chaussende²⁾, and G. Ferro¹⁾

¹⁾Université Claude Bernard Lyon 1, France, ²⁾LMGP, Grenoble INP, France,

³⁾Université Montpellier, France

<Bulk Growth>

Tu-P-1 p.115

Impurity Behavior of High Purity SiC Powder during SiC Crystal Growth

D. -G. Shin¹⁾, H. -R. Son²⁾, S. Heo²⁾, B. -S. Kim²⁾, J. -E. Han²⁾, K. -S Min²⁾, and D. -H. Lee²⁾

¹⁾Korea Institute of Ceramic Engineering and Technology, Korea, ²⁾LG Innotek Co., Ltd., Korea

Tu-P-2 p.116

Effect of TaC-Coated Crucible on SiC Single Crystal Growth

D. -H. Lee¹⁾, H. -T. Lee¹⁾, B. -J. Bae¹⁾, H. -J. Lee¹⁾, S. -I. Lee¹⁾, M. -S. Park¹⁾, W. -J. Lee¹⁾, I. -G. Yeo²⁾, T. -H. Eun²⁾, and M. -C. Chun³⁾

¹⁾Dong-Eui University, Korea, ²⁾RIST, Pohang, Kyungbuk, Korea, ³⁾POSCO Center, Korea

Tu-P-3 p.117

Low-Defect 4" 4H-SiC Single Crystal Growth by Using High Temperature Reaction Seed Adhesion Method

J. W. Choi, J. H. Park, J. G. Kim, K. R. Ku, M. O. Kyun, J. D. Seo, B. G. Chang, and J. R. Oh

SKC, Korea

Tu-P-4 p.118

Interaction between Vapor Species and Graphite Crucible during the Growth of SiC by PVT

K. Ariyawong, N. Tsavdaris, J. M. Dedulle, E. Sarigiannidou, T. Ouisse, and D. Chaussende

LMGP, CNRS UMR5628, Grenoble INP, France

Tu-P-5 p.119

Comparison of Thermodynamic Databases for the Modeling of SiC Growth by PVT

K. Ariyawong¹⁾, E. Blanquet²⁾, J. M. Dedulle¹⁾, T. Ouisse¹⁾, and D. Chaussende¹⁾

¹⁾LMGP, CNRS UMR5628, Grenoble INP, France, ²⁾SIMAP, CNRS UMR5266, Grenoble INP, France

Tu-P-6 p.120

Spiral Step Dissociation on PVT Grown SiC Crystals

M. Seiss, T. Ouisse, and D. Chaussende

LMGP, CNRS UMR5628, Grenoble INP, France

Tu-P-7 p.121

Reciprocal Space Mapping Studies of the Initial Stage of the PVT Growth of 4H-SiC Crystals Parallel and Perpendicular to the c-Axis

C. Ohshige¹⁾, T. Takahashi¹⁾, N. Ohtani^{1,2,3)}, M. Katsuno⁴⁾, T. Fujimoto⁴⁾, S. Sato⁴⁾, H. Tsuge⁴⁾, T. Yano⁴⁾, H. Matsuhata²⁾, and M. Kitabatake²⁾

¹⁾Kwansei Gakuin University, Japan, ²⁾R&D Partnership for Future Power Electronics Technology, Japan, ³⁾Kwansei Gakuin University, Japan, ⁴⁾Nippon Steel & Sumitomo Metal Corporation, Japan

Tu-P-8 p.122

4" 4H-SiC Crystals Grown Using W Coating Crucible by PVT

J. H. Park, J. W. Choi, J. G. Kim, K. R. Ku, M. O. Kyun, J. D. Seo, B. G. Chang, and J. R. Oh

SKC, Korea

- Tu-P-9** p.123
Sublimation Growth of 4 Inch 4H Bulk SiC Crystals in Presence of Ta
Y. Makarov¹, D. Litvin², A. Vasiliev², and S. Nagalyuk²
¹Nitride Crystals Inc., USA, ²Nitride Crystals Ltd., Russia
- <Epitaxy>
- Tu-P-10** p.124
A Study of the Intermediate Layer in 3C-SiC/6H-SiC Heterostructures
A. A. Lebedev, M. V. Zamoryanskaya, S. Y. Davydov, D. A. Kirilenko, S. P. Lebedev, L. M. Sorokin, D. B. Shustov, and M. P. Shcheglov
 Ioffe Physical-Technical Institute, Russia
- Tu-P-11** p.125
4H-SiC Epitaxial Growth on C-Face 150 mm SiC Substrate
A. Miyasaka, J. Norimatsu, K. Fukada, Y. Tajima, Y. Kageshima, D. Muto, Y. Kimura, M. Odawara, T. Okano, K. Momose, Y. Osawa, H. Osawa, and T. Sato
 SHOWA DENKO K.K., Japan
- Tu-P-12 Withdrawn** p.126
- Tu-P-13** p.127
Study of Surface Morphologies of On-Axis 6H-SiC Wafer after High-Temperature Etching and Epitaxial Growth
X. -C. Liu, B. Shi, J. Xin, H. -K. Kong, X. Liu, W. Huang, Y. -Q. Zheng, and E. -W. Shi
 Chinese Academy of Sciences, China
- Tu-P-14** p.128
First-Principles Study on Step Bunching and Nanofacet Formation on SiC(0001) Vicinal Surfaces
K. Sawada, J. -I. Iwata, and A. Oshiyama
 The University of Tokyo, Japan
- Tu-P-15** p.129
Improved Epilayer Surface Morphology on 2° Off-Cut 4H-SiC Substrates
 L. Lilja, J. Hassan, E. Janzén, and J. P. Bergman
 Linköping University, Sweden
- Tu-P-16** p.130
Formation of an Interfacial Buffer Layer for 3C-SiC Heteroepitaxy on AlN/Si Substrates
K. Meguro, T. Narita, K. Noto, and H. Nakazawa
 Hirosaki University, Japan
- Tu-P-17** p.131
Putting an End to BPDs Starts with Hydrogen Etching
 R. L. Myers-Ward, V. D. Wheeler, N. A. Mahadik, R. E. Stahlbush, L. O. Nyakiti, Z. Robinson, A. Nath, C. R. Eddy, and Jr., D. K. Gaskill
 U. S. Naval Research Laboratory, USA
- <Characterization>
- Tu-P-18** p.132
Dislocation Analysis of 4H-SiC Using KOH Low Temperature Etching
T. Sato¹, Y. Suzuki¹, H. Ito¹, T. Isshiki², and M. Fukui¹
¹Hitachi High-Technologies Corp., Japan, ²Kyoto Institute of Technology, Japan
- Tu-P-19** p.133
Characterization of Damages Induced by Electric Discharge Machining and Wiresawing with Loose Abrasive at the Subsurface of SiC Crystal
Y. Ishikawa¹, Y. Yao¹, K. Sato¹, Y. Sugawara¹, Y. Okamoto², and N. Hayashi²
¹Japan Fine Ceramics Center, Japan, ²ACT Corporation, Japan

Tu-P-20 p.134
Observation of Dissociated Threading Dislocation Formed in 4H-SiC by Transmission Electron Microscopy
Y. Sugawara¹⁾, M. Nakamori¹⁾, Y. Yao¹⁾, Y. Ishikawa¹⁾, K. Danno²⁾, H. Suzuki²⁾, T. Bessho²⁾, S. Yamaguchi³⁾, K. Nishikawa³⁾, and Y. Ikuhara^{1,4)}
¹⁾Japan Fine Ceramics Center, Japan, ²⁾Toyota Motor Corporation, Japan, ³⁾Toyota Central Research and Development Laboratories Inc., Japan, ⁴⁾The University of Tokyo, Japan

Tu-P-21 p.135
Microstructural Analysis of Damage Layer Introduced during Chemo-Mechanical Polishing
H. Sako¹⁾, T. Yamashita¹⁾, K. Tamura¹⁾, M. Sasaki¹⁾, M. Nagaya¹⁾, T. Kido¹⁾, K. Kawata¹⁾, T. Kato^{1,2)}, H. Matsuhata^{1,2)}, and M. Kitabatake¹⁾
¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

Tu-P-22 p.136
Origin Analyses of Trapezoid-Shape Defects in 4-Deg.-Off 4H-SiC Epitaxial Wafers by Synchrotron X-Ray Topography
T. Yamashita^{1,2)}, H. Matsuhata^{1,3)}, Y. Miyasaka^{1,2)}, K. Momose^{1,2)}, T. Sato^{1,2)}, and M. Kitabatake¹⁾
¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾SHOWA DENKO K.K., Japan, ³⁾National Institute of Advanced Industrial Science and Technology, Japan

Tu-P-23 p.137
Micro-Raman Characterization of 4H-SiC Stacking Faults
N. Piluso, M. Camarda, R. Anzalone, and F. La Via
IMM - CNR, Italy

Tu-P-24 p.138
Defects Grouping and Characterizations of PL-Imaging Methods for 4H-SiC Epitaxial Layers
M. Odawara, K. Kamei, Y. Miyasaka, T. Yamashita, S. Takahashi, Y. Kageshima, K. Momose, H. Osawa, and T. Sato
SHOWA DENKO K.K., Japan

Tu-P-25 p.139
Characterization of Vacant Broken Line Defects in a-Face Grown Crystal of Silicon Carbide
N. Sugiyama^{1,2)}, M. Yamada^{1,2)}, Y. Urakami^{1,2)}, M. Kobayashi^{1,3)}, T. Masuda^{1,3)}, K. Shigetoh^{1,4)}, I. Gunjishima^{1,4)}, F. Hirose^{1,2)}, and S. Onda^{1,2)}
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Tu-P-26 p.140
Formation of Double Stacking Faults from Polishing Scratches on 4H-SiC (0001) Substrate
S. Ushio, T. Fujimoto, H. Tsuge, M. Katsuno, S. Sato, K. Tani, H. Hirano, and T. Yano
Nippon Steel & Sumitomo Metal Corporation, Japan

Tu-P-27 p.141
Nano Mechanical Analysis of Triangular Defects in 4H-SiC Epilayer
Y. J. Shin^{1,2)}, S. I. Kim³⁾, K. Y. Lee³⁾, H. J. Jung¹⁾, C. W. Lee³⁾, and W. Bahng¹⁾
¹⁾KERI, Korea, ²⁾LMGP, Grenoble-INP, France, ³⁾Kookmin University, Korea

Tu-P-28 p.142
High Resolution 3D Raman Spectroscopy of Growth Defects in 4H-SiC Epitaxial Films
O. Drozdova¹⁾, I. Miura¹⁾, and N. Ohtani²⁾
¹⁾Renishaw KK, Japan, ²⁾Kwansei Gakuin University, Japan

Tu-P-29 p.143
Analysis of Generation of Localized Step-Bunchings on 4H-SiC (0001) Si Face by Synchrotron X-Ray Topography

M. Sasaki¹⁾, K. Tamura¹⁾, H. Sako¹⁾, M. Kitabatake¹⁾, K. Kojima^{1,2)}, and H. Matsuhata^{1,2)}

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²⁾National Institute of Advanced Industrial Science and Technology, Japan

<Processing>

Tu-P-30 p.144
Development of Silicon Carbide Dry Etcher Using Chlorine Trifluoride Gas

D. Yajima¹⁾, H. Habuka¹⁾, and T. Kato²⁾

¹⁾Yokohama National University, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

Tu-P-31 p.145
Reliability Improvement and Optimization of Trench Orientation of 4H-SiC Trench Gate Oxide

T. Kojima^{1,2)}, S. Harada^{1,3)}, K. Ariyoshi^{1,4)}, J. Senzaki^{1,3)}, M. Takei^{1,2)}, Y. Yonezawa^{1,3)}, Y. Tanaka^{1,3)}, and H. Okumura^{1,3)}

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾Fuji Electric Co., Ltd., Japan, ³⁾National Institute of Advanced Industrial Science and Technology, Japan, ⁴⁾Toshiba Corporation, Japan

Tu-P-32 Withdrawn

Tu-P-33 p.146
Impact of a High Temperature Anneal on 4H-SiC Trench Profiles

C. T. Banzhaf¹⁾, M. Rambach¹⁾, A. Trautmann¹⁾, A. J. Bauer²⁾, and L. Frey^{2,3)}

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Tu-P-34 p.147
MOS Interfacial Studies Using Hall Measurement and Split C-V Measurement in n-Channel Carbon-Face 4H-SiC MOSFET

S. Ono¹⁾, E. Waki¹⁾, M. Arai¹⁾, K. Yamasaki¹⁾, and S. Takagi²⁾

¹⁾New Japan Radio Co., Ltd., Japan, ²⁾The University of Tokyo, Japan

Tu-P-35 p.148
Conduction Mechanism of Leakage Current in Thermal Oxide on 4H-SiC

M. Sometani^{1,2)}, D. Okamoto¹⁾, S. Harada¹⁾, H. Ishimori¹⁾, S. Takasu¹⁾, T. Hatakeyama¹⁾, M. Takei^{1,2)}, Y. Yonezawa¹⁾, K. Fukuda¹⁾, and H. Okumura¹⁾

¹⁾National Institute of Advanced Industrial Science and Technology, Japan, ²⁾Fuji Electric Co. Ltd, Japan

Tu-P-36 p.149
Systematic Analysis of the High- and Low-Field Channel Mobility in Lateral 4H-SiC MOSFETs

C. Strenger^{1,4)}, V. Uhnevionak^{1,4)}, V. Mortet^{2,4)}, G. Ortiz^{2,4)}, A. Burenkov^{1,4)}, A. J. Bauer^{1,4)}, T. Erlbacher^{1,4)}, F. Cristiano^{2,4)}, E. Bedel-Pereira^{2,4)}, P. Pichler^{1,4)}, and H. Ryssel^{1,3)}

¹⁾Fraunhofer IISB, Germany, ²⁾LAAS-CNRS, France, ³⁾Chair of Electron Devices, Germany, ⁴⁾The Wide Bandgap Semiconductor Alliance (WISEA), Germany/France

Tu-P-37 p.150
Die Attach for High Temperature Applications

J. -F. Barbot and A. Drevin-Bazin

Université de Poitiers, France

Tu-P-38 p.151
Experimental Studies on Water Vapor Plasma Oxidation and Thermal Oxidation of 4H-SiC (0001) for Clarification of the Atomic-Scale Flattening Mechanism in Plasma Assisted Polishing

H. Deng, K. Endo, and K. Yamamura

Osaka University, Japan

Tu-P-39 p.152
Degradation of SiO₂/SiC Interface Properties due to Mobile Ions Intrinsically Generated by High-Temperature Hydrogen Annealing

A. Chanthaphan¹⁾, T. Hosoi¹⁾, Y. Nakano²⁾, T. Nakamura²⁾, T. Shimura¹⁾, and H. Watanabe¹⁾

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Tu-P-40 p.153
Reliability of Gate Oxides on 4H-SiC Epitaxial Surface Planarized by CMP Treatment

K. Yamada¹⁾, O. Ishiyama¹⁾, K. Tamura¹⁾, T. Yamashita¹⁾, A. Shimosato²⁾, T. Kato^{1,2)}, J. Senzaki^{1,2)}, H. Matsuhata^{1,2)}, and M. Kitabatake¹⁾

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

Tu-P-41 p.154
NF₃ Added Oxidation of 4H-SiC(0001) and Suppression of Interface Degradation

R. Hasunuma, M. Nagoshi, and K. Yamabe
University of Tsukuba, Japan

<Devices and Circuits>

Tu-P-42 p.155
High Voltage SiC JBS Diodes with Multiple Zone Junction Termination Extension Using Single Etching Step

X. Deng, C. Rao, J. Wei, H. Jiang, M. Chen, X. Wang, and B. Zhang
University of Electronic Science and Technology of China, China

Tu-P-43 p.156
Improved 4H-SiC Layer Exfoliation for Monolithic Integration of SiC Devices with Si Circuits and for Reduced Cost Device-Quality SiC Substrates

V. P. Amarasinghe¹⁾, G. Liu¹⁾, L. Wielunski¹⁾, A. Barcz²⁾, L. C. Feldman¹⁾, and G. K. Celler¹⁾

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Tu-P-44 p.157
Development of DC Circuit Breakers with SiC-BGSITs Applied for HVDC Distribution System

Y. Tanaka¹⁾, A. Takatsuka¹⁾, H. Bao Cong²⁾, Y. Satoh²⁾, A. Fukui³⁾, A. Matsumoto³⁾, M. Yamasaki⁴⁾, and H. Ohashi¹⁾

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Tu-P-45 p.158
A 600V-Class V-Groove SiC MOSFETs

Y. Saitoh¹⁾, M. Furumai¹⁾, T. Hiyoshi¹⁾, K. Wada¹⁾, T. Masuda¹⁾, K. Hiratsuka¹⁾, Y. Mikamura¹⁾, and T. Hatayama²⁾

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Tu-P-46 p.159
Properties of a SiC Schottky Barrier Diode Fabricated with a Thin Substrate

Y. Nakanishi, T. Tominaga, H. Okabe, Y. Suehiro, K. Sugahara, Y. Toyoda, S. Yamakawa, H. Murasaki, K. Kobayashi, and H. Sumitani
Mitsubishi Electric Corporation, Japan

Tu-P-47 p.160
Gate-Drive Voltage Design for 600-V Vertical-Trench Normally-Off SiC JFETs toward 94% Efficiency Server Power Supply

S. Akiyama, K. Katoh, H. Shimizu, A. Hatanaka, T. Ogawa, N. Yokoyama, and K. Ishikawa
Hitachi Ltd., Japan

Tu-P-48 p.161
High Temperature Hydrogen Sensor Based on Silicon Carbide (SiC) MOS Capacitor Structure

B. Ofrim, G. Brezeanu, F. Draghici, and I. Rusu
University POLITEHNICA of Bucharest, Romania

- Tu-P-49** p.162
Development of 3.3 kV SiC-MOSFET: Suppression of Forward Voltage Degradation of the Body Diode
S. Yamamoto, Y. Nakao, N. Tomita, S. Nakata, and S. Yamakawa
Mitsubishi Electric Corporation, Japan
- Tu-P-50** p.163
Modeling of High Performance 4H-SiC Emitter-Coupled Logic Circuits
S. Singh, N. El Sayed, T. ElBoshra, M. Wahbah, and M. Al Zaabi
Khalifa University of Science, Technology, and Research, United Arab Emirates
- Tu-P-51** p.164
Characterization of 4H-SiC BJT at High Temperatures
N. Zhang, Y. Rao, N. Xu, and A. P. Pisano
University of California, Berkeley, USA
- Tu-P-52** p.165
4H-SiC Schottky Diode Avalanche Breakdown Voltage Estimation by Simulation and Experimental Analysis
H. Rong¹⁾, F. Li¹⁾, Y. Sharma¹⁾, M. R. Jennings^{1,2)}, and P. A. Mawby^{1,2)}
¹⁾The University of Warwick, UK, ²⁾Anvil Semiconductors Ltd, UK
- Tu-P-53** p.166
Variant of Excess Current in 4H-SiC pn Structures
A. M. Strel'chuk¹⁾, E. V. Kalinina¹⁾, A. A. Lebedev¹⁾, I. K. Boricheva²⁾, and V. V. Pavshukov²⁾
¹⁾Ioffe Physical-technical Institute of the Russian Academy of Sciences, Russia,
²⁾Polytechnical University, Russia
- Tu-P-54** p.167
High-Temperature and High-Power Operation of 4H-SiC Nanoribbon Field Effect Transistors
M. -S. Kang¹⁾, A. Hallén²⁾, C. -M. Zetterling²⁾, and S. -M. Koo¹⁾
¹⁾Kwangwoon University, Korea, ²⁾KTH, Royal Institute of Technology, Sweden
- Tu-P-55** p.168
14.7 mΩcm² 3.3kV DIMOSFET on 4H-SiC (000-1)
H. Kono^{1,2)}, M. Furukawa^{1,2)}, K. Ariyoshi^{1,2)}, T. Suzuki^{1,2)}, Y. Tanaka^{1,3)}, and T. Shinohe^{1,2)}
¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾Toshiba Corp., Japan, ³⁾National Institute of Advanced Industrial Science and Technology, Japan
- Tu-P-56** p.169
Discriminating High κ Dielectric Gas Sensors
S. K. Roy, K. V. Vassilevski, C. J. O'Malley, N. G. Wright, and A. B. Horsfall
Newcastle University, UK
- Tu-P-57** **Withdrawn**
<Late News: Devices and Circuits>
- Tu-P-58** p.170
Stability of Current Gain in SiC BJTs
B. Buono, F. Allerstam, M. Domeij, A. Konstantinov, K. Gumaelius, H. Das, and T. Neyer
Fairchild Semiconductor, Sweden
- Tu-P-59** p.171
Fabrication of 700V 4H-SiC SBDs with Ultra-Low Resistance of 0.22mΩ-cm² nearby the SiC Material Limit
T. Sakaguchi, M. Aketa, Y. Miura, H. Asahara, and T. Nakamura
ROHM Co., Ltd., Japan
- <Late News: Bulk Growth>*
- Tu-P-60** p.172
Solution Growth of P-Type 4H-SiC Bulk Crystals with Low Resistivity
T. Shirai, K. Danno, A. Seki, H. Sakamoto, and T. Bessho
Toyota Motor Corporation, Japan

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Top-Seeded Solution Growth of 4H-SiC Bulk Crystal Using Metal Solvents

K.Kusunoki¹⁾, K. Kamei¹⁾, K. Moriguchi¹⁾, N. Okada¹⁾, H. Kaido¹⁾, H. Daikoku²⁾, M. Kado²⁾, K. Danno²⁾, H. Sakamoto²⁾, and T. Bessho²⁾

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p.174

Growth of Low Resistivity N-Type 4H-SiC Bulk Crystals by Sublimation Method Using Co-Doping Technique

T. Kato^{1,2)}, S. Takagi²⁾, T. Miura^{1,2)}, K. Eto^{1,2)}, Y. Urakami^{2,3)}, H. Kondo^{2,3)}, F. Hirose^{2,3)}, and H. Okumura^{1,2)}

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Tu-P-63

p.175

Evidence of High-Quality and Very Fast 4H-SiC Crystal Growth by the High-Temperature Gas Source Method

I. Kamata¹⁾, N. Hoshino¹⁾, Y. Tokuda^{2,3)}, E. Makino^{2,3)}, J. Kojima^{2,3)}, and H. Tsuchida¹⁾

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Wednesday, October 2

We-1A MOSFET 2 8:30-10:20

Room: Tenzui

Chairs: T. Nakamura (ROHM, Japan)
J. Palmour (Cree, USA)

8:30 **We-1A-1 <Invited>** p.176
Electrical Characteristics/Reliability Affected by Defects Analyzed by the Integrated Evaluation Platform for SiC Epitaxial Films

M. Kitabatake

R&D Partnership for Future Power Electronics Technology, Japan,

9:00 **We-1A-2** p.177
Novel Gate Oxide Process for Realization of High Threshold Voltage in 4H-SiC MOSFET

M. Furuhashi, T. Tanioka, M. Imaizumi, N. Miura, and S. Yamakawa
Mitsubishi Electric Corporation, Japan

9:20 **We-1A-3** p.178
Impact of Hot Carrier Degradation and Positive Bias Stress on Lateral 4H-SiC nMOSFETs

G. Pobegen^{1,3)}, T. Aichinger²⁾, A. Salinaro²⁾, and T. Grasser³⁾

¹⁾KAI GmbH, Austria, ²⁾Infineon Technologies AG, Austria, ³⁾Vienna University of Technology, Austria

9:40 **We-1A-4** p.179
1700 V, 5.5 mΩ-cm² 4H-SiC DMOSFETs with Stable 225°C Operation

K. Matocha, K. Chatty, S. Banerjee, and L. Rowland
Monolith Semiconductor Inc., USA

10:00 **We-1A-5 <Late News>** p.180
A Novel Truncated V-groove 4H-SiC MOSFET with High Avalanche Breakdown Voltage and Low On-resistance

T. Masuda¹⁾, K. Wada¹⁾, T. Hiyoshi¹⁾, Y. Saitou¹⁾, H. Tamaso¹⁾, M. Sakai¹⁾, K. Hiratsuka¹⁾, Y. Mikamura¹⁾, M. Nishiguchi¹⁾, T. Hatayama²⁾, and H. Yano²⁾

¹⁾Sumitomo Electric Industries, Ltd, Japan, ²⁾Nara Institute of Science and Technology, Japan

We-1B Epitaxy 3: Novel Approaches 8:30-10:20

Room: Juyo

Chairs: B. Thomas (Dow Corning, USA)
J. Nishio (Toshiba, Japan)

8:30 **We-1B-1 <Invited>** p.181
Development of Homoepitaxial Growth Technique on 4H-SiC Vicinal off Angled Substrate

K. Kojima^{1,2)}, K. Masumoto^{1,2)}, S. Ito²⁾, A. Nagata²⁾ and H. Okumura^{1,2)}

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

9:00 **We-1B-2** p.182
Homo-Epitaxial Growth on Low-Angle Off Cut 4H-SiC Substrate

X. Li, E. Janzén, and A. Henry
Linköping University, Sweden

9:20 **We-1B-3** p.183
Epitaxial Growth of Thick Multi-Layer 4H-SiC for the Fabrication of Very High-Voltage C-Face n-Channel IGBT

T. Miyazawa¹⁾, S. Ji²⁾, K. Kojima²⁾, Y. Ishida²⁾, K. Nakayama³⁾, A. Tanaka³⁾, K. Asano³⁾, and H. Tsuchida¹⁾

¹⁾Central Research Institute of Electric Power Industry, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan, ³⁾Kansai Electric Power Co., Inc., Japan

9:40 **We-1B-4** p.184
Chloride-Based CVD of 4H-SiC Using Methane as Carbon Precursor

M. Yazdanfar, H. Pedersen, O. Kordina, and E. Janzén
Linköping University, Sweden

10:00 **We-1B-5** p.185
Heteroepitaxial CVD Growth of 3C-SiC on Diamond Substrate

V. Soulière, A. Vo-Ha, D. Carole, and G. Ferro
Université Claude Bernard Lyon 1, CNRS, France

We-2A JFET & BJT 10:40-12:30

Room: Tenzui

Chairs: M. Domeij (Fairchild Semiconductor, Sweden)
R. Rupp (Infineon Technologies, Germany)

10:40 **We-2A-1 <Invited>** p.186
High-Efficiency Power Conversion Using Silicon Carbide Power Electronics
H. -P. Nee¹⁾, J. Rabkowski¹⁾, D. Peftitsis¹⁾, G. Tolstoy¹⁾, J. Colmenares¹⁾, D. Sadik¹⁾, M. Bakowski²⁾, J. -K. Lim²⁾, A. Antonopoulos¹⁾, L. Ängquist¹⁾, and M. Zdanowski³⁾

¹⁾KTH Royal Institute of Technology, Sweden, ²⁾Acreo, Sweden, ³⁾Technical University of Warsaw, Poland

11:10 **We-2A-2** p.187
3 kV Normally-Off 4H-SiC Buried Gate Static Induction Transistors (SiC-BGSITs)

A. Takatsuka¹⁾, Y. Tanaka¹⁾, K. Yano²⁾, N. Matsumoto¹⁾, T. Yatsuo¹⁾, and K. Arai¹⁾

¹⁾National Institute of Advanced Industrial Science and Technology, Japan,
²⁾University of Yamanashi, Japan

11:30 **We-2A-3** p.188
Rapidly Maturing SiC Junction Transistors Featuring Current Gain (β) > 130 and Blocking Voltages up to 2700 V

S. Sundaresan, S. Jeliakov, B. Grummel, and R. Singh
GeneSiC Semiconductor Inc., USA

11:50 **We-2A-4** p.189
650 V SiC JFET for High Efficiency Applications
W. Bergner¹⁾, R. Rupp²⁾, U. Kirchner¹⁾, and D. Kück¹⁾
¹⁾Infineon Technologies Austria AG, Austria, ²⁾Infineon Technologies AG, Germany

12:10 **We-2A-5 <Late News>** p.190
40m Ω /1700V DioMOS (Diode in SiC MOSFET) for High Power Switching Applications
A. Ohoka, N. Horikawa, T. Kiyosawa, H. Sorada, M. Uchida, Y. Kanzawa, K. Sawada, T. Ueda, and E. Fujii
Panasonic Corporation, Japan

We-2B Graphene I 10:40-12:30

Room: Juyo

Chairs: S. Tanaka (Kyushu University, Japan)
M. Hundhausen (University of Erlangen-Nürnberg, Germany)

10:40 **We-2B-1 <Invited>** p.191
Exceptional Ballistic Transport in Epitaxial Graphene Nanoribbons
W. A. de Heer¹⁾, J. Baringhaus²⁾, M. Ruan¹⁾, F. Edler²⁾, A. Tejada^{3,4)}, M. Sicot³⁾, A. Taleb-Ibrahimi⁴⁾, Z. Jiang¹⁾, E. Conrad¹⁾, C. Berger^{1,5)}, and C. Tegenkamp²⁾

¹⁾Georgia Institute of Technology, USA, ²⁾Leibniz Universität, Germany, ³⁾CNRS. Univ. de Nancy UPV-Metz, France, ⁴⁾CNRS/Synchrotron SOLEIL, France, ⁵⁾CNRS-Institut Neel, France

11:10 **We-2B-2** p.192
Stability and Reactivity of [11-20] Step in Initial Stage of Epitaxial Graphene Growth on SiC(0001)

H. Kageshima¹⁾, H. Hibino¹⁾, H. Yamaguchi¹⁾, and M. Nagase²⁾

¹⁾NTT Corporation, Japan, ²⁾University of Tokushima, Japan

11:30 **We-2B-3** p.193
A Novel Ordered Phase Observed on an Epitaxial Graphene Superlattice on SiC(0001) Induced by the Intercalation of Cu Atoms

S. Forti¹⁾, A. Stöhr¹⁾, Y. R. Niu²⁾, A. A. Zakharov²⁾, and U. Starke¹⁾

¹⁾Max Planck Institute for Solid State Research, Germany, ²⁾MAX Lab Synchrotron Radiation Facility, Sweden

11:50 **We-2B-4** p.194
Thickness Uniformity and Wrinkling in Epitaxial Graphene Grown on SiC Polytypes

G.R. Yazdi¹⁾, T. Iakimov¹⁾, M. Neek-Amal²⁾, F.M. Peeters²⁾, A. Zakharov³⁾, and R. Yakimova¹⁾

¹⁾Linköping University, Sweden, ²⁾Universiteit Antwerpen, Belgium, ³⁾Max Lab, Sweden

12:10 **We-2B-5** p.195
Disentangling the Effects of Strain and Charge on the Raman Lines of Epitaxial Graphene

F. Fromm¹⁾, P. Wehrfritz¹⁾, M. Hundhausen²⁾, and T. Seyller¹⁾

¹⁾TU Chemnitz, Germany, ²⁾Universität Erlangen-Nürnberg, Germany

We-3A MOS Interface 13:45-15:35

Room: Tenzui

Chairs: H. Watanabe (Osaka University, Japan)
S. Dimitrijevic (Griffith University, Australia)

- 13:45 **We-3A-1 <Invited>** p.196
Accurate Characterization of Interface State Density of SiC MOS Structures and the Impacts on Channel Mobility
H. Yoshioka^{1,2)}, T. Nakamura³⁾, J. Senzaki²⁾, A. Shimozato²⁾, Y. Tanaka²⁾, H. Okumura²⁾, and T. Kimoto¹⁾
¹⁾Kyoto University, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan, ³⁾Rohm Co., Ltd., Japan
- 14:15 **We-3A-2** p.197
Deep-Level Transient Spectroscopy Characterization of Mobility-Limiting Interface States in SiO₂/4H-SiC Structures
T. Hatakeyama^{1,2)}, M. Sometani¹⁾, K. Fukuda¹⁾, H. Okumura¹⁾, and T. Kimoto³⁾
¹⁾National Institute of Advanced Industrial Science and Technology, Japan, ²⁾Toshiba Corporation, Japan, ³⁾Kyoto University, Japan
- 14:35 **We-3A-3** p.198
Comparative Study of Threshold Voltage Instability in 4H-SiC MOSFETs with POCl₃- and NO- Annealed Gate Oxides
H. Yano, A. Osawa, T. Hatayama, and T. Fuyuki
Nara Institute of Science and Technology, Japan
- 14:55 **We-3A-4** p.199
Reduction of Density of 4H-SiC/SiO₂ Interface Traps by Pre-Oxidation Phosphorus Implantation
T. Sledziewski¹⁾, A. Mikhaylov²⁾, S. Reshanov³⁾, A. Schöner^{2,3)}, H. B. Weber¹⁾, and M. Krieger¹⁾
¹⁾FAU Erlangen-Nürnberg, Germany, ²⁾Acreo Swedish ICT AB, Sweden, ³⁾Ascatron AB, Sweden
- 15:15 **We-3A-5** p.200
Nitridation Effects of Gate Oxide on Channel Properties of SiC Trench MOSFETs
K. Ariyoshi^{1,2)}, S. Harada^{1,3)}, J. Senzaki^{1,3)}, T. Kojima^{1,4)}, K. Kojima^{1,3)}, Y. Tanaka^{1,3)}, and T. Shinoh^{1,2)}
¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾Toshiba Corporation, Japan, ³⁾National Institute of Advanced Industrial Science and Technology, Japan

We-3B Extended Defects 13:45-15:35

Room: Juyo

Chairs: M. Dudley (Stony Brook University, USA)
B. Kallinger (Fraunhofer Institute, Germany)

- 13:45 **We-3B-1 <Invited>** p.201
Photoluminescence Imaging and Discrimination of Threading Dislocations in 4H-SiC Epilayers
M. Nagano, I. Kamata, and H. Tsuchida
Central Research Institute of Electric Power Industry, Japan
- 14:15 **We-3B-2** p.202
Polarized Photoluminescence from Partial Dislocations in 4H-SiC
R. Hirano^{1,2)}, H. Tsuchida³⁾, M. Tajima¹⁾, K. M. Itoh²⁾, K. Maeda⁴⁾
¹⁾JAXA, Japan, ²⁾Keio University, Japan, ³⁾Central Research Institute of Electric Power Industry, Japan, ⁴⁾The University of Tokyo, Japan
- 14:35 **We-3B-3** p.203
Post-Growth Reduction of Basal Plane Dislocations by High Temperature Annealing in 4H-SiC Epilayers
N. A. Mahadik¹⁾, A. Nath²⁾, R. E. Stahlbush¹⁾, E. A. Imhoff¹⁾, M. J. Tadjer¹⁾, B. N. Feygelson¹⁾ and R. Nipoti³⁾
¹⁾Naval Research Laboratory, USA, ²⁾George Mason University, USA, ³⁾CNR-IMM, Italy
- 14:55 **We-3B-4** p.204
Measurement of Critical Thickness for the Formation of Misfit Dislocation in 4H-SiC Epilayer via X-Ray Topography
H. Wang¹⁾, F. Wu¹⁾, S. Byrappa¹⁾, M. Dudley¹⁾, G. Chung²⁾, J. Zhang²⁾, B. Thomas²⁾, E. K. Sanchez²⁾, S. G. Mueller²⁾, D. Hansen²⁾, and M. J. Loboda²⁾
¹⁾Stony Brook University, USA, ²⁾Dow Corning Compound Semiconductor Solutions, USA
- 15:15 **We-3B-5** p.205
Basal Plane Dislocations from Inclusions in 4H-SiC Epitaxy
R. E. Stahlbush¹⁾, N. A. Mahadik¹⁾, and M. J. O'Loughlin²⁾
¹⁾Naval Research Laboratory, USA, ²⁾Cree, Inc., USA

We-IP-1 <Invited Poster> p.5
Study of V and Y Shape Stacking Faults Formation in 4H-SiC Epilayer
H. Wang¹, F. Wu¹, S. Byrappa¹, M. Dudley¹, G. Chung², J. Zhang², B. Thomas², E. K. Sanchez², S. G. Mueller², D. Hansen², and M. J. Loboda²
¹Stony Brook University, USA, ²Dow Corning Compound Semiconductor Solutions, USA

<Epitaxy>

We-P-1 p.206
The Influence of the Carbonization Mechanisms on the Crystalline Quality of the Carbonization Layer for Heteroepitaxial Growth of 3C-SiC
Y. Watanabe^{1,2,3}, T. Horikawa², and K. Kamimura³
¹Seiko Epson Co., Japan, ²Advanced Industrial Science and Technology, Japan, ³Shinshu University, Japan

We-P-2 Withdrawn p.207

We-P-3 p.208
HCl Assisted Growth of Thick Epilayers for Bipolar Power Devices
B. Kallinger, C. Ehlers, P. Berwian, J. Friedrich, and M. Rommel
Fraunhofer IISB, Germany

We-P-4 p.209
Homo-Epitaxial Growth on 2° Off-Cut 4H-SiC(0001) Si-Face Substrates Using H₂-SiH₄-C₃H₈ CVD System
K. Tamura^{1,3}, C. Kudou^{1,4}, K. Masumoto^{1,2}, J. Nishio^{1,5}, and K. Kojima^{1,2}
¹R&D Partnership for Future Power Electronics Technology, Japan, ²National Institute of Advanced Industrial Science and Technology, Japan, ³Rohm Co., Ltd., Japan, ⁴Panasonic Corporation, Japan, ⁵Toshiba R&D Center, Japan

We-P-5 p.210
Investigation of Aluminum Incorporation in 3C-SiC Epitaxial Layers Grown by CVD
R. Arvinte¹, M. Zielinski¹, T. Chassagne¹, M. Portail², A. Michon², P. Kwasnicki³, S. Juillaguet³, and H. Peyre³
¹NOVASiC, France, ²CRHEA-CNRS UPR 10, France, ³CNRS, Laboratoire Charles Coulomb UMR 5221, France

We-P-6 p.211
Simulations of SiC CVD - Perspectives on the Need for Surface Reaction Improvements
Ö. Danielsson, O. Kordina, and E. Janzén
Linköping University, Sweden

We-P-7 p.212
Simulation Studies on Giant Step Bunching in 4H-SiC Epitaxial Growth: Cluster Effect
Y. Ishida and S. Yoshida
National Institute of Advanced Industrial Science and Technology, Japan

<Characterization>

We-P-8 p.213
Drain-Current Deep Level Transient Spectroscopy Investigation on Epitaxial Graphene / 6H-SiC Field Effect Transistors
S. Roensch¹, S. Hertel¹, S. Reshanov², A. Schoener², M. Krieger¹, and H. B. Weber¹
¹FAU Erlangen-Nuremberg, Germany, ²ACREO AB, Sweden

We-P-9 p.214
Non Destructive Inspection of Dislocations in SiC Wafer by Mirror Projection Electron Microscopy
T. Isshiki¹ and M. Hasegawa²
¹Kyoto Institute of Technology, Japan, ²Hitachi, Ltd., Japan

- We-P-10** p.215
High-Sensitivity High-Resolution Full-Wafer Imaging of Properties of Large n-Type SiC Using Relative Reflectance of Two Terahertz Waves
A. Hamano¹⁾, S. Ohno^{2,3)}, H. Minamide²⁾, H. Ito²⁾, and Y. Usuki¹⁾
¹⁾Furukawa Co., Ltd., Japan, ²⁾RIKEN ASI, Japan, ³⁾Tohoku University, Japan
- We-P-11** p.216
Mechanical Properties and Residual Stress of Thin 3C-SiC(111) Films Determined Using MEMS Structures
 B. Häehnlein¹⁾, M. Stubenrauch¹⁾, S. Michael²⁾, and J. Pezoldt¹⁾
¹⁾FG Nanotechnologie, TU Ilmenau, Germany, ²⁾IMMS gGmbH, Germany
- We-P-12** p.217
Estimation of Surface Recombination Velocities for n-Type 4H-SiC Surfaces Treated by Various Processes
Y. Mori, M. Kato, and M. Ichimura
 Nagoya Institute of Technology, Japan
- We-P-13** p.218
The Silicon Monovacancy in SiC: Beyond the 1- Charge State
 H. J. von Bardeleben¹⁾, J. L. Cantin¹⁾, F. Bruneval²⁾, and U. Gerstmann³⁾
¹⁾Universite Pierre et Marie Curie, France, ²⁾CEA, DEN, Service de Metallurgie Physique, France, ³⁾University of Paderborn, Germany
- We-P-14** p.219
Influence of P⁺-Implantation and Post-Annealing on Warpage Structure of 4H-SiC Wafers
K. Ishiji¹⁾, S. Kawado¹⁾, Y. Hirai¹⁾, and S. Nagamachi²⁾
¹⁾Kyushu Synchrotron Light Research Center, Japan, ²⁾Nagamachi Science Laboratory Co., Ltd., Japan
- We-P-15** p.220
Residual Stress Measurements of 4H-SiC Crystals Using X-Ray Diffraction
M. Nakabayashi¹⁾, T. Fujimoto¹⁾, H. Tsuge¹⁾, K. Kojima²⁾, K. Abe²⁾, and K. Shimomura²⁾
¹⁾Nippon Steel and Sumitomo Metal Corporation, Japan, ²⁾Nippon Steel and Sumikin Metal Corporation, Japan
- We-P-16** p.221
On Photoelectric Properties of 6H-SiC Bulk Crystals PVT-Grown on Different Substrates
G. Liaugaudas¹⁾, K. Jarašiūnas¹⁾, N. Tsavdaris²⁾, E. Sarigiannidou²⁾, and D. Chaussende²⁾
¹⁾Vilnius University, Lithuania, ²⁾Grenoble INP-Minatec, France
- We-P-17** p.222
First-Principles Study of the 3C-SiC(1-10) and 4H-SiC(11-20) Surface Electronic States
H. Koyama^{1,3)}, J. Nara^{1,3)}, and T. Ohno^{1,2,3)}
¹⁾National Institute for Materials Science, Japan, ²⁾The University of Tokyo, Japan, ³⁾MARCEED (Materials Research Consortium for Energy Efficient Electronic Devices), Japan
- We-P-18** p.223
Observation of the Electronic Structure of Si/6H-SiC(0001) Reconstruction Surfaces by Metastable Atom Induced Electron Spectroscopy
K. Muraoka¹⁾, Y. Kumai¹⁾, Y. Suehiro¹⁾, A. Morioka²⁾, M. Naitoh²⁾, and T. Ikari¹⁾
¹⁾Ube National College of Technology, Japan, ²⁾Kyushu Institute of Technology, Japan
- We-P-19** p.224
Low Frequency Noise Analysis of Monolithically Fabricated 4H-SiC CMOS Field Effect Transistors
L. C. Martin¹⁾, H. K. Chan¹⁾, D. Clark²⁾, E. P. Ramsay²⁾, A. E. Murphy²⁾, D. A. Smith²⁾, R. F. Thompson²⁾, R. A. R. Young²⁾, J. P. Goss¹⁾, N. G. Wright¹⁾, and A. B. Horsfall¹⁾
¹⁾Newcastle University, UK, ²⁾Raytheon UK, UK

We-P-20 Withdrawn

<Processing>

We-P-21 p.225

Rapid Thermal Oxidation of Si-Face n and p-Type On-Axis 4H-SiC

M. Florentin¹⁾, J. Montserrat¹⁾, P. Brosselard²⁾, A. Henry³⁾, and P. Godignon¹⁾

¹⁾IMB-CNM CSIC, Spain, ²⁾Laboratoire AMPERE, INSA Lyon, France,

³⁾Linköping University, Sweden

We-P-22 p.226

Influence of Diverse Post-Trench Processes on the Electrical Performance of Thick Bottom Oxide 4H-SiC Trench-MOS Structures

C. T. Banzhaf¹⁾, M. Grieb¹⁾, A. Trautmann¹⁾, A. J. Bauer²⁾, and L. Frey^{2,3)}

¹⁾Robert Bosch GmbH, Germany, ²⁾Fraunhofer Institute for Integrated Systems and Device Technology, Germany, ³⁾University of Erlangen-Nuremberg, Germany

We-P-23 p.227

Characterization of SiO₂/SiC Interfaces Annealed in N₂O or POCl₃

P. Fiorenza¹⁾, L. K. Swanson¹⁾, M. Vivona¹⁾, F. Giannazzo¹⁾, C. Bongiorno¹⁾, S. Lorenti²⁾, A. Frazzetto²⁾, and F. Roccaforte¹⁾

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

We-P-24 p.228

Growth of Gate Oxides on 4H-SiC by O₂/NO Mixture at Low-Partial-Pressures

D. E. Haasmann, S. Dimitrijević, J. Han, and A. Iacopi
Griffith University, Australia

We-P-25 p.229

Fabrication of 4H-SiC MOSFETs Using Stacked Al₂O₃ Gate Insulator with Pre-Annealed Al₂O₃ Buffer Layer

H. Yamada¹⁾, S. Hino²⁾, N. Miura²⁾, M. Imaizumi²⁾, S. Yamakawa²⁾, and E. Tokumitsu^{1,3)}

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

³⁾Japan Advanced Institute of Science and Technology, Japan

We-P-26 p.230

Effect of Shallow n-Doping on Field Effect Mobility in p-Doped Channels of 4H-SiC MOSFET Transistors

S. Noll¹⁾, M. Rambach¹⁾, M. Grieb¹⁾, D. Scholten¹⁾, A. Bauer²⁾, and L. Frey^{2,3)}

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We-P-27 p.231

Preparation and Characterization of Nitridation Layer on 4H SiC (0001) Surface by Direct Plasma Nitridation

Y. Akahane, T. Kano, K. Kimura, H. Komatsu, Y. Watanabe, T. Yamakami, and K. Kamimura

Shinshu University, Japan

We-P-28 p.232

Impact of Oxidation Temperature on the Interface Trap Density in 4H-SiC MOS Capacitors

S. M. Thomas, Y. K. Sharma, M. R. Jennings, C. A. Fisher, and P. A. Mawby
University of Warwick, UK

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We-P-30 p.233

Step-Bunching Dependence of Lifetime of MOS Capacitor for 4^o Off Si-Face 4H-SiC Epitaxial Wafers

A. Bandoh, K. Suzuki, H. Osawa, and T. Sato

SHOWA DENKO K.K., Japan

We-P-31 p.234

Re-Investigation of the Post-Oxidation Effects on 4H-SiC MOS Interface with High- Temperature Thermal Oxide

R. H. Kikuchi¹⁾ and K. Kita^{1,2)}

¹⁾The University of Tokyo, Japan, ²⁾JST-PRESTO, Japan

<Devices and Circuits>

We-P-32 p.235
Investigation of Stacking Faults Affecting on Reverse Leakage Current of 4H-SiC Junction Barrier Schottky Diodes Using Device Simulation

J. Hasegawa¹⁾, K. Konishi²⁾, Y. Nakamura²⁾, K. Ohtsuka²⁾, S. Nakata²⁾, Y. Nakamine¹⁾, T. Nishimura¹⁾, and M. Hatano¹⁾

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

We-P-33 p.236
Comparative Study of 4H-SiC DMOSFETs with N₂O Thermal Oxide and Deposit Oxide with Post Oxidation Anneal

C. Yen^{1,4)}, C. Hung^{1,4)}, A. Mikhailov²⁾, C. Lee^{1,4)}, L. Lee^{1,4)}, J. Wei⁴⁾, T. Chiu⁴⁾, C. Huang^{4,5)}, S. Reshanov³⁾, and A. Schoner³⁾

¹⁾Hestia Power Inc., Taiwan, ²⁾Acreo AB, Sweden, ³⁾Ascatron AB, Sweden,

⁴⁾Industrial Technology Research Institute, Taiwan, ⁵⁾National Tsing Hua University, Taiwan

We-P-34 p.237
1200 V 4H-SiC DMOSFET with an Integrated Gate Buffer

S. Ryu, C. Jonas, C. Capell, Y. Lemma, A. Agarwal, D. Grider, S. Allen, and J. Palmour

Cree, Inc., USA

We-P-35 p.238
Two Packaging Solutions for High Temperature SiC Diode Sensors

G. Brezeanu¹⁾, F. D. Draghici¹⁾, M. Badila¹⁾, F. Craciunoiu²⁾, G. Pristavu¹⁾, R. Pascu²⁾, and F. Bernea³⁾

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We-P-36 p.239
Pressure Dependence of Thermal Contact Resistance between Copper Heat Sink and Copper DBC Surfaces in SiC Power Device Packages

Z. Toth-Pal¹⁾, T. Hammam¹⁾, and H. Nee²⁾

¹⁾Swerea KIMAB, Sweden, ²⁾Royal Institute of Technology, Sweden

We-P-37 p.240
Transient Simulation of Mobile Ion Effects in Silicon Carbide MOS Gate Oxides

D. B. Habersat¹⁾, A. J. Lelis¹⁾, and N. Goldsman²⁾

¹⁾U. S. Army Research Laboratory, USA, ²⁾University of Maryland, USA

We-P-38 p.241
SiC Power Devices Operation from Cryogenic to High Temperature: Investigation of Various 1.2kV SiC Power Devices

T. Chailloux, C. Calvez, N. Thierry-Jebali, D. Tournier, and D. Planson
University of Lyon, France

We-P-39 p.242
Low Power Silicon Carbide Devices and Integrated Circuits for Harsh Environment Applications

A. Maralani and A. P. Pisano

University of California, Berkeley, USA

We-P-40 p.243
Silicon Carbide Field Effect Transistors for Detection of Ultra-Low Concentrations of Hazardous Volatile Organic Compounds

D. Puglisi¹⁾, J. Eriksson¹⁾, C. Bur^{1,2)}, A. Schuetze²⁾, A. Lloyd Spetz^{1,3)}, and M. Andersson¹⁾

¹⁾Linköping University, Sweden, ²⁾Saarland University, Germany, ³⁾Oulu University, Finland

We-P-41 p.244
Effect of Threading Dislocations on the Characteristics of 4H-SiC Schottky Barrier Diodes

I. Kang¹⁾, S. B. Yun^{1,2)}, M. K. Na¹⁾, J. H. Moon¹⁾, and W. Bahng¹⁾

¹⁾Korea Electrotechnology Research Institute, Korea, ²⁾Kyungnam University, Korea

We-P-42 p.245
Designing of Quasi-Modulated Region in 4H-SiC Lateral RESURF MOSFETs

Y. Nanen, J. Suda, and T. Kimoto
Kyoto University, Japan

We-P-43 p.246
Single Event Gate Rupture in SiC MOS Capacitors with Different Gate Oxide Thicknesses

M. Deki¹⁾, T. Makino²⁾, K. Kojima³⁾, T. Tomita¹⁾, and T. Ohshima²⁾
¹⁾The University of Tokushima, Japan, ²⁾Japan Atomic Energy Agency, Japan,
³⁾National Institute of Advanced Industrial Science and Technology, Japan

We-P-44 p.247
Nuclear Radiation Detectors Based on 4H-SiC p⁺-n Junction

F. Issa¹⁾, L. Ottaviani¹⁾, V. Vervisch¹⁾, M. Lazar²⁾, A. Kuznetsov³⁾, A. Klix⁴⁾, D. Szalkai⁴⁾, O. Palais¹⁾, L. Vermeeren⁵⁾, and A. Lyoussi⁶⁾
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³⁾University of Oslo, Norway, ⁴⁾KIT-Neutron Laboratory TU Dresden and Reactor Technology Helmholtz-Zentrum, Germany, ⁵⁾SCK/CEN, Belgium,
⁶⁾CEA, DEN, DER, Instrumentation Sensors and Dosimetry Laboratory, France

We-P-45 p.248
High Temperature Electrical Characterization of 4H-SiC MESFET Basic Logic Gates

M. Alexandru¹⁾, V. Banu¹⁾, P. Godignon¹⁾, X. Jordà¹⁾, M. Vellvehi¹⁾, and D. Tournier²⁾
¹⁾CNM-IMB, CSIC, Spain, ²⁾AMPERE, INSA Lyon, France

We-P-46 p.249
The Fabrication of 4H-SiC Floating Junction SBDs (FJ_SBDs)
H. Yuan, X. Tang, Y. Zhang, Y. Zhang, H. Lv, Y. Wang, Y. Zhou, and Q. Song
Xidian University, China

We-P-47 p.250
Breakdown Voltage Enhancement in 4H-SiC Schottky Diode Employing Field Plate Edge Termination Using High-k Dielectrics

B. Shankar^{1,2)}, S. K. Gupta¹⁾, W. R. Taube¹⁾, J. Singh¹⁾, A. Asati²⁾, and J. Akhtar¹⁾
¹⁾CSIR-Central Electronics Engineering Research Institute, India, ²⁾Birla Institute of Technology and Science, India

<Graphene, GaN, and Related Materials>

We-P-48 p.251
Evaluation of Degradation due to Electron Irradiation of Si_{1-x}C_x S/D n-Type Si MOSFET

M. Hori¹⁾, Y. Asai²⁾, M. Yoneoka¹⁾, I. Tsunoda¹⁾, K. Takakura¹⁾, T. Nakashima^{3,4)}, B. M. Gonzalez⁵⁾, E. Simoen⁶⁾, and C. Claeys^{6,7)}
¹⁾Kumamoto National College of Technology, Japan, ²⁾Kyushu University, Japan,
³⁾University of Miyazaki, Japan, ⁴⁾Chuo Denshi Kogyo Co. LTD, Japan, ⁵⁾Institut de Microelectronica de Barcelona, Spain, ⁶⁾imec, Belgium, ⁷⁾KU Leuven, Belgium

We-P-49 p.252
Elastic and Dielectric Characteristics of the Graphene-Like A_NB_{8-N} Compounds

S. Y. Davydov¹⁾, A. A. Lebedev¹⁾, and O. V. Posrednik²⁾
¹⁾Ioffe Physical Technical Institute, Russia, ²⁾St. Petersburg Electrotechnical University, Russia

We-P-50 p.253
Size Confinement Effect in Bilayer Graphene Grown on 6H-SiC (0001) Substrate

A. A. Lebedev¹⁾, V. M. Mikoushkin¹⁾, V. V. Shnitov¹⁾, S. P. Lebedev¹⁾, E. V. Likhachev¹⁾, R. Yakimova²⁾, and O. Y. Vilkov^{3,4)}
¹⁾Ioffe Institute, Russia, ²⁾Linköping University, Sweden, ³⁾Technische Universität Dresden, Germany, ⁴⁾St. Petersburg State University, Russia

We-P-51 p.254
ENDOR Studies of the Nitrogen Split Interstitial (N-N)_N⁰ > in GaN
H. J. von Bardeleben¹, J. L. Cantin¹, H. Vrielinck², L. Binet³, and U. Gerstmann⁴
¹Universite Pierre et Marie Curie, France, ²Ghent University, Belgium, ³Ecole nationale Supérieure de Chimie de Paris, France, ⁴University of Paderborn, Germany

We-P-52 p.255
Structural Analysis of ZnO Thin Films Grown in Room Temperature on PET Film
H. Yamamoto, K. Idehara, R. Kimura, H. Nishizaki, N. Hasuike, H. Harima, and T. Isshiki
Kyoto Institute of Technology, Japan

We-P-53 p.256
HVPE for the Growth of UV LED Heterostructures
S. Y. Kurin¹, A. A. Antipov¹, I. S. Barash¹, A. D. Roenkov¹, H. I. Helava², B. P. Papchenko³, and Y. N. Makarov²
¹Nitride Crystals Ltd., Russia, ²Nitride Crystals Inc., USA, ³University ITMO, Russia

We-P-54 p.257
Control of Graphene Doping through Hydrogenation of SiC Surface during CVD Growth
A. Michon¹, B. Jabakhanji², F. Cheynis³, P. Lefevre⁴, F. Bertran⁴, A. Tiberj², J.-R. Huntzinger², F. Leroy³, P. Müller³, S. Vézian¹, D. Lefebvre¹, T. Chassagne⁵, M. Zielinski⁵, A. Taleb-Ibrahimi⁴, M. Portail¹, Y. Cordier¹, and B. Jouault²
¹CRHEA-CNRS, France, ²L2C-CNRS-UM 2, France, ³CINaM-CNRS-Univ. Aix-Marseille, France, ⁴Soleil Synchrotron, France, ⁵NOVASiC, France

We-P-55 p.258
Band Structure Engineering in Epitaxial Graphene on SiC(0001) by Atomic Intercalation
U. Starke¹, S. Forti¹, A. Stöhr¹, T. Denig¹, Y. R. Niu², and A. A. Zakharov²
¹Max Planck Institute for Solid State Research, Germany, ²Lund University, Sweden

We-P-56 p.259
Adjusting the Electronic Properties and Gas Reactivity of Epitaxial Graphene by Thin Surface Metallizations
J. Eriksson, D. Puglisi, Y. Kang, R. Yakimova, and A. Lloyd Spetz
Linköping University, Sweden

We-P-57 p.260
Backside Monitoring of Graphene on SiC by Raman Spectroscopy
F. Fromm¹, M. Hundhausen², and T. Seyller¹
¹TU Chemnitz, Germany, ²University Erlangen, Germany

We-P-58 p.261
Ion-Beam Irradiation Effect in the Growth Process of Graphene Using SiC-on-Insulator Substrates
M. Okano¹, D. Edamoto¹, K. Uchida¹, I. Omura¹, T. Ikari², M. Nakao¹, and M. Naitoh¹
¹Kyushu Institute of Technology, Japan, ²Ube National College of Technology, Japan

We-P-59 p.262
Planarization of the Gallium Nitride Substrate Grown by the Na Flux Method Applying the Catalyst-Referred Etching
W. Yamaguchi, S. Sadakuni, A. Isohashi, H. Asano, Y. Sano, M. Imade, M. Maruyama, M. Yoshimura, Y. Mori, and K. Yamauchi
Osaka University, Japan

We-P-60 p.263
SiC-CNT One-Dimensional Linear Heterojunction Formed by Wick Effect of CNT Forests

S. Cha, Y. Shin, and W. Bahng
Korea Electrotechnology Research Institute, Korea

We-P-61 p.264
First-Principles Study of Hydrolysis Reaction of Ga-Terminated GaN Surfaces and the Effect of Catalyst in the Process

K. Inagaki, M. Oue, P. Bui, N. Kidani, K. Yamauchi, and Y. Morikawa
Osaka University, Japan

<Late News: Processing>

We-P-62 p.265
Suppression of Mobile Ion Diffusion with AlON/SiO₂ Stacked Gate Dielectrics for Improving Bias-Temperature Instability in SiC-MOS Devices

A. Chanthaphan¹, T. Hosoi¹, Y. Nakano², T. Nakamura², T. Shimura¹, and H. Watanabe¹

¹Osaka University, Japan, ²ROHM Co., Ltd., Japan

We-P-63 p.266
Multilevel Modeling of Threshold Voltage Degradation in MOSFETs

I. Iskandarova, A. Knizhnik, A. Konovalov, A. Scherbinin, A. Vasiliev, and B. Potapkin
Kintech Lab Ltd., Russia

Thursday, October 3

Th-1A MOS Reliability 8:30-10:20

Room: Tenzui

Chairs: H. Yano (NAIST, Japan)

P. Godignon (CNM-CSIC, Spain)

8:30 **Th-1A-1 <Invited>** p.267

Threshold-Voltage Stability: Key Reliability Issue for SiC Power MOSFETs

A. Lelis, R. Green, D. Habersat, and M. El

U.S. Army Research Laboratory, USA

9:00 **Th-1A-2** p.268

Thin PSG Process for 4H-SiC MOSFET

Y. K. Sharma¹, A. C. Ahyi², T. Issacs-Smith², A. Modic², Yi Xu³, E. Garfunkel³, M. R. Jennings¹, C Fisher¹, S. M. Thomas¹, P. Mawby¹, S. Dhar², L. C. Feldman³, J. R. Williams²

¹University of Warwick, UK, ²Auburn University, USA, ³Rutgers University, USA

9:20 **Th-1A-3** p.269

Depletion-Mode TDDB for n-Type MOS Capacitors of 4H-SiC

T. Watanabe, S. Hino, Y. Ebiike, N. Miura, M. Imaizumi, and S. Yamakawa

Mitsubishi Electric Corporation, Japan

9:40 **Th-1A-4** p.270

Threshold Voltage Instability of SiC-MOSFETs on Various Crystal Faces

J. Senzaki^{1,2}, A. Shimozato², K. Kojima^{1,2}, S. Harada^{1,2}, K. Ariyoshi¹, T. Kojima¹, Y. Tanaka^{1,2}, H. Okumura^{1,2}

¹R&D Partnership for Future Power Electronics Technology, Japan, ²National Institute of Advanced Industrial Science and Technology, Japan

10:00 **Th-1A-5** p.271

Low Energy Proton Radiation Impact on 4H-SiC nMOSFET Gate Oxide Stability

M. Florentin¹, M. Alexandru¹, A. Constant², B. Schmidt³, and P. Godignon¹

¹CNM-IMB CSIC, Spain, ²ON Semiconductor, Belgium, ³HZDR, Germany

Th-1B Point Defects 8:30-10:20

Room: Juyo

Chairs: M. Kato (Nagoya Institute Technology, Japan)

M. Krieger (University of Erlangen-Nürnberg, Germany)

8:30 **Th-1B-1 <Invited>** p.272

The Carbon Vacancy in SiC

N. T. Son¹, X. T. Trinh¹, K. Kawahara², J. Suda², T. Kimoto², L. S. Løvlie³, B. G. Svensson³, K. Szasz⁴, T. Hornos⁴, A. Gali⁴, T. Umeda⁵, J. Isoya⁵, T. Makino⁶, T. Ohshima⁶, and E. Janzén¹

¹Linköping University, Sweden, ²Kyoto University, Japan, ³University of Oslo, Norway, ⁴Wigner Research Center for Physics, Hungary, ⁵University of Tsukuba, Japan, ⁶Japan Atomic Energy Agency, Japan

9:00 **Th-1B-2** p.273

Minority Carrier Transient Spectroscopy of As-Grown, Electron Irradiated, and Thermally Oxidized p-Type 4H-SiC

G. Alfieri and T. Kimoto

Kyoto University, Japan

9:20 **Th-1B-3** p.274

Si Related Intrinsic Defect Generation in SiC Induced by Oxidation

K. Chokawa¹, K. Kamiya¹, and K. Shiraishi²

¹University of Tsukuba, Japan, ²Nagoya University, Japan

9:40 **Th-1B-4** p.275

Annealing of Electron Irradiated, Thick, Ultrapure 4H SiC between 1100°C and 1500°C and Measurements of Lifetime and Photoluminescence

W. M. Klahold¹, R. P. Devaty¹, W. J. Choyke¹, T. Kimoto², and T. Ohshima³

¹University of Pittsburgh, USA, ²Kyoto University, Japan, ³Japan Atomic Energy Agency, Japan

10:00 **Th-1B-5** p.276

Two E' Centers Which Limit the Performance of 4H SiC MOSFETs

P. M. Lenahan¹, J. J. Follman¹, M. A. Anders¹, C. J. Cochrane¹, A. J. Lelis², S. D. Arthur³, J. McMahon³, L. Yu³, and X. Zhu³

¹Penn State University, USA, ²U.S. Army Research Laboratory, USA, ³GE Global Research, USA

Th-2A High Voltage Devices 2 10:40-12:30

Room: Tenzui

Chairs: P. Friedrichs (Infineon Technologies, Germany)
Y. Tanaka (AIST, Japan)10:40 **Th-2A-1 <Invited>** p.277**Temperature Dependence of Impact Ionization Coefficients in 4H-SiC**H. Niwa, J. Suda, and T. Kimoto
Kyoto University, Japan11:10 **Th-2A-2** p.278**19 kV 4H-SiC N-IGBTs**S. Ryu¹, C. Capell¹, C. Jonas¹, M. O'Loughlin¹, J. Clayton¹, E. Van Brunt¹, K. Lam¹, J. Richmond¹, A. Kadavelgu², S. Bhattacharya², A. Burk¹, A. Agarwal¹, D. Grider¹, S. Allen¹, and J. Palmour¹¹Cree, Inc, USA, ²North Carolina State University, USA11:30 **Th-2A-3** p.279**Fabrication of 10 kV PiN Diodes Using On-Axis 4H-SiC**A. Salemi¹, B. Buono^{1, 2)}, A. Hallén¹, J. Hassan³⁾, J. P. Bergman³⁾, C. -M. Zetterling¹, and M. Östling¹¹KTH Royal Institute of Technology, Sweden, ²Fairchild Semiconductor, Sweden, ³Linköping University, Sweden11:50 **Th-2A-4** p.280**High Voltage and Fast Switching Reverse Recovery Characteristics of 4H-SiC PiN Diode**K. Nakayama¹, S. Ogata¹, T. Hayashi¹, T. Hemmi¹, A. Tanaka¹, T. Izumi¹, K. Asano¹, D. Okamoto²⁾, Y. Tanaka²⁾, T. Mizushima^{2,3)}, M. Yoshikawa²⁾, H. Fujisawa^{2,3)}, K. Takenaka^{2,3)}, M. Takei^{2,3)}, Y. Yonezawa²⁾, K. Fukuda²⁾ and H. Okumura²⁾¹Kansai Electric Power Co., Inc., Japan, ²National Institute of Advanced Industrial Science and Technology, Japan, ³Fuji Electric Co. Ltd., Japan12:10 **Th-2A-5** p.281**Study of 4H-SiC Schottky-Diode Designs for 3.3kV Applications**H. Bartolf¹, V. Sundaramoorthy¹, A. Mihaila¹, M. Berthou²⁾, P. Godignon²⁾, and J. Millan²⁾¹ABB Switzerland Ltd, Switzerland, ²CNM, Spain**Th-2B MOS Fundamentals 10:40-12:30**

Room: Juyo

Chairs: T. Hatakeyama (AIST, Japan)
A. J. Lelis (US Army Research Laboratory, USA)10:40 **Th-2B-1 <Invited>** p.282**Intrinsic SiC Oxidation Problems Obtained by First Principle Calculations**K. Shiraishi^{1,2)}, K. Chokawa²⁾, and K. Kamiya²⁾¹Nagoya University, Japan, ²University of Tsukuba, Japan11:10 **Th-2B-2** p.283**Hall Factor Calculation for the Characterization of Transport Properties in n-Channel 4H-SiC MOSFETs**V. Uhnevionak^{1,4)}, A. Burenkov^{1,4)}, C. Strenger^{1,4)}, V. Mortet^{3,4)}, E. Bedel-Pereira^{3,4)} F. Cristiano^{3,4)}, A. J. Bauer^{1,4)}, and P. Pichler^{1,2,4)}¹Fraunhofer IISB , Germany, ²Chair of Electron Devices, Germany, ³CNRS, France, ⁴The Wide Bandgap Semiconductor Alliance (WISEA)11:30 **Th-2B-3** p.284**Characterization of La,Hf₂O Gate Dielectrics in 4H-SiC MOS Capacitor**J. -H. Xia^{1,2)}, D. Martin¹⁾, S. S. Suvanam¹⁾, C. -M. Zetterling¹⁾, and M. Östling¹⁾¹KTH Royal Institute of Technology, Sweden, ²Xi'an Jiaotong University, China11:50 **Th-2B-4** p.285**Si Emission into the Oxide Layer during Oxidation of Silicon Carbide**Y. Hijikata, Y. Akasaka, S. Yagi, and H. Yaguchi

Saitama University, Japan

12:10 **Th-2B-5 <Late News>** p.286**High Mobility 4H-SiC MOSFETs Using Lanthanum Oxide Interfacial Engineering and ALD Deposited SiO₂**X. Yang, B. Lee, and V. Misra

North Carolina State University, USA

Th-3A Etching & Polishing 13:45-15:25

Room: Tenzui

Chairs: Y. Sano (Osaka University, Japan)

A. Schöner (Ascatron, Sweden)

13:45 **Th-3A-1** P.287**Single-Crystalline 4H-SiC Microcantilever Resonators with a 10 times Higher Quality Factor than 3C-SiC**K. Adachi¹⁾, H. Okamoto²⁾, H. Yamaguchi²⁾, T. Kimoto¹⁾, and J. Suda¹⁾¹⁾Kyoto University, Japan, ²⁾NTT Corporation, Japan14:05 **Th-3A-2** P.288**4H-SiC Planarization Using Catalyst-Referred Etching with Pure Water**A. Isohashi, Y. Sano, S. Sadakuni, and K. Yamauchi

Osaka University, Japan

14:25 **Th-3A-3** P.289**Junction Formation by Direct Bonding of Si and 6H-SiC**Y. Sasada, T. Kurumi, R. Araki, H. Shimizu, H. Kinoshita, and M. Yoshimoto

Kyoto Institute of Technology, Japan

14:45 **Th-3A-4** P. 290**Thinning of a Two-Inch SiC Wafer by Plasma Chemical Vaporization Machining Using a Slit Electrode**Y. Okada, H. Nishikawa, Y. Sano, K. Yamamura, and K. Yamauchi

Osaka University, Japan

15:05 **Th-3A-5** <Late News> p.291**High Quality and High Speed Cutting of 4H-SiC JFET Wafers Including PCM Structures by Using Thermal Laser Separation**D. Lewke¹⁾, M. Koitzsch¹⁾, K. O. Dohnke²⁾, M. Schellenberger¹⁾, H. -U. Zühlke³⁾, L. Pfitzner¹⁾, and H. Rysse¹⁾¹⁾Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany, ²⁾Infineon Technologies AG, Germany, ³⁾JENOPTIK Automatisierungstechnik GmbH, Germany**Th-3B Graphene 2 13:45-15:25**

Room: Juyo

Chairs: W. de Heer (Georgia Institute of Technology, USA)

H. Kageshima (NTT, Japan)

13:45 **Th-3B-1** P.292**Bandgap Opening on Graphene Nanoribbons Grown on Vicinal 6H- and 4H-SiC Surfaces by Molecular Beam Epitaxy**T. Kajiwara¹⁾, A. Visikovskiy¹⁾, T. Iimori²⁾, F. Komori²⁾, K. Nakatsuji³⁾ and S. Tanaka¹⁾¹⁾Kyushu University, Japan, ²⁾University of Tokyo, Japan, ³⁾Tokyo Institute of Technology, Japan14:05 **Th-3B-2** P.293**Controlling the Carrier Concentration of Epitaxial Graphene by Ultraviolet Illumination**R. Pearce¹⁾, V. Eless¹⁾, O. Kazakova¹⁾, R. Yakimova²⁾, and A. Tzalenchuk¹⁾¹⁾NPL Hampton road, UK, ²⁾Linköping University, Sweden14:25 **Th-3B-3** P.294**Electrical Nanocharacterization of Epitaxial Graphene/Silicon Carbide Schottky Contacts**F. Giannazzo¹⁾, S. Hertel²⁾, A. Albert²⁾, A. La Magna¹⁾, F. Roccaforte¹⁾, M. Krieger²⁾, and H. B. Weber²⁾¹⁾CNR-IMM, Italy, ²⁾University of Erlangen-Nürnberg, Germany14:45 **Th-3B-4** P.295**Carrier Mobility as a Function of Temperature in As-Grown and H-Intercalated Epitaxial Graphenes on 4H-SiC**M. Winters¹⁾, E. B. Thorsteinsson²⁾, E. Ö. Sveinbjörnsson²⁾, H. P. Gislason²⁾, J. Hassan³⁾, E. Janzén³⁾, and N. Rorsman¹⁾¹⁾Chalmers University of Technology, Sweden, ²⁾ University of Iceland, Iceland, ³⁾Linköping University, Sweden15:05 **Th-3B-5** <Late News> P.296**Thickness Determination of Graphene on SiC by Reflectivity Mapping**I. G. Ivanov¹⁾, J. Hassan¹⁾, T. Iakimov¹⁾, A. Zakharov²⁾, R. Yakimova¹⁾, and E. Janzén¹⁾¹⁾Linköping University, Sweden, ²⁾Lund University, Sweden

Th-IP-1 <Invited Poster> p.6
Development of SiC Super-Junction (SJ) Device by a Multi-Epitaxial Growth
R. Kosugi^{1,2)}, Y. Sakuma²⁾, K. Kojima^{1,2)}, S. Itoh²⁾, A. Nagata²⁾, T. Yatsuo^{1,2)}, Y. Tanaka^{1,2)}, and H. Okumura^{1,2)}
¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

<Epitaxy>

Th-P-1 p.297
Understanding Residual Stresses and Their Gradients in Hetero-Epitaxial 3C-SiC on Silicon
F. Iacopi, L. Hold, G. Walker, L. Wang, N. Mishra, and A. V. Iacopi
Griffith University, Australia

Th-P-2 p.298
Optical Investigation of 3C-SiC Hetero-Epitaxial Layers Grown by Sublimation Epitaxy under Gas Atmospheres
P. Kwasnicki¹⁾, V. Jokubavicius²⁾, J. Sun²⁾, H. Peyre³⁾, R. Yakimova²⁾, M. Syväjärvi²⁾, J. Camassel¹⁾, and S. Juillaguet³⁾
¹⁾CNRS, L2C UMR 5221, France, ²⁾Linköping University, Sweden, ³⁾Universite Montpellier 2, France

Th-P-3 p.299
Effect of Surface Roughness on Dislocation Conversion in 4° Off-Axis 4H-SiC Epitaxial Layers
M. Yazdanfar, H. Pedersen, O. Kordina, and E. Janzén
Linköping University, Sweden

Th-P-4 p.300
50 µm-Thick 100mm 4H-SiC Epilayer Growth by a Warm-Wall Planetary Reactor
Y. Sun, G. Feng, Z. Li, L. Lv, J. Luo, J. Wu, Y. Li, and J. Zhang
EpiWorld International Co., LTD, China

Th-P-5 p.301
Demonstration of High Quality 4H-SiC Epitaxy by Using the Two-Step Growth Method
Y. Mitani, N. Tomita, K. Hamano, M. Tarutani, T. Tanaka, A. Ohno, T. Kuroiwa, Y. Toyoda, M. Imaizumi, H. Sumitani, and S. Yamakawa
Mitsubishi Electric Corporation, Japan

Th-P-6 p.302
Simulation Study of High-Speed Wafer Rotation Effects in 150 mm Vertical 4H-SiC Epitaxial Reactor
M. Ito¹⁾, H. Fujibayashi^{1,2)}, H. Ito^{1,3)}, I. Kamata¹⁾, M. Naito²⁾, K. Hara²⁾, S. Yamauchi²⁾, K. Suzuki³⁾, M. Yajima³⁾, S. Mitani³⁾, K. Suzuki⁴⁾, H. Aoki⁴⁾, K. Nishikawa⁵⁾, T. Kozawa⁵⁾, and H. Tsuchida¹⁾
¹⁾Central Research Institute of Electric Power Industry, Japan, ²⁾DENSO corporation, Japan, ³⁾NuFlare Technology, Inc., Japan, ⁴⁾Toyota Motor Corporation, Japan, ⁵⁾Toyota Central R&D Labs, Japan

Th-P-7 p.303
Revisiting the Chemical Database - How Reliable Are They?
P. Sukkaew, L. Ojamäe, Ö. Danielsson, O. Kordina, and E. Janzén
Linköping University, Sweden

Th-P-8 p.304
Fast Growth Rate Epitaxy on 4° Off-Cut 4-Inch Diameter 4H-SiC Wafers
J. Ul Hassan¹⁾, H. T. Bae²⁾, L. Lilja¹⁾, I. Kim²⁾, I. Farkas¹⁾, P. Stenberg¹⁾, J. Sun¹⁾, O. Kordina¹⁾, J. P. Bergman¹⁾, S. Ha²⁾, and E. Janzén¹⁾
¹⁾Linköping University, Sweden, ²⁾LG Innotek Co., Ltd., Korea

<Characterization>

Th-P-9 p.305
Crystallographic Structure of 8H- and 10H-SiC Analyzed by Raman Spectroscopy and Diffraction Methods
T. Hatayama, R. Hori, H. Yano, and T. Fuyuki
Nara Institute of Science and Technology, Japan

- Th-P-10** p.306
Correlation between Microwave Reflectivity and Excess Carrier Concentrations in 4H-SiC
M. Kato, Y. Mori, and M. Ichimura
Nagoya Institute of Technology, Japan
- Th-P-11** p.307
Radiative and Nonradiative Recombination in 3C-SiC
P. Ščajev, M. Karaliūnas, E. Kuokštis, V. Grivickas, and K. Jarašiūnas
Vilnius University, Lithuania
- Th-P-12** p.308
Carrier Density Dependence of Fano Type Interference in Raman Spectra of p-Type 4H-SiC
T. Mitani, S. Nakashima, M. Tomobe, J. Shi-yang, K. Kojima, and H. Okumura
National Institute of Advanced Industrial Science and Technology, Japan
- Th-P-13** p.309
Diffusion of Alkali Metals in SiC
M. K. Linnarsson and A. Hallén
KTH Royal Institute of Technology, Sweden
- Th-P-14** p.310
Comparison of Carrier Lifetime Measurements and Mapping Using Photoluminescence and μ -PCD
B. Kallinger¹, M. Rommel¹, L. Lilja², J. Hassan², I. Booker², E. Janzen², and J. P. Bergman²
¹Fraunhofer IISB, Germany, ²Linköping University, Sweden
- Th-P-15** p.311
Optical and Surface Science Studies of 3C-SiC on Si Grown by Chemical Vapor Deposition
D. Xie¹, Y. T. He², T. Mei¹, Z. R. Qiu², and Z. C. Feng³
¹South China Normal University, China, ²Sun Yat-Sen University, China, ³National Taiwan University, Taiwan
- Th-P-16** p.312
Temperature and Electrical Field Dependence of Ambipolar Mobility in n-Doped 4H-SiC
A. Hürner¹, C. Bonse¹, B. Kallinger², H. Mitlehner², T. Erlbacher², V. Häublein², A. J. Bauer², and L. Frey^{1,2}
¹University Erlangen-Nuremberg, Germany, ²Fraunhofer IISB, Germany
- Th-P-17** p.313
Impact of Carrier Lifetime on Efficiency of Photolytic Hydrogen Generation by SiC
K. Miyake¹, T. Yasuda¹, M. Kato¹, M. Ichimura¹, T. Hatayama², and T. Ohshima³
¹Nagoya Institute of Technology, Japan, ²Nara Institute of Science and Technology, Japan, ³Japan Atomic Energy Agency, Japan
- Th-P-18** p.314
Microscopic Mechanism of Band-Gap Variations in SiC Polytypes Based on *ab initio* Calculations: Roles of Peculiar Electron State Floating in Internal Space
Y. Matsushita^{1,2} and A. Oshiyama¹
¹The University of Tokyo, Japan, ²Max-Planck Institute of Microstructure Physics, Germany
- Th-P-19** p.315
Light Absorption Loss in Fluorescent SiC
F. Teramae^{1,2}, T. Maeda¹, E. Akazawa², Y. Kuroyanagi², K. Naniwae¹, M. Syväjärvi³, R. Yakimova³, M. Iwaya², T. Takeuchi², S. Kamiyama^{1,2}, and I. Akasaki²
¹EL-SEED Corp., Japan, ²Meijo University, Japan, ³Linköping University, Sweden
- Th-P-20** p.316
Evaluation of Mechanical and Optical Properties of Hetero-Epitaxial Single Crystal 3C-SiC Squared-Membrane
R. Anzalone, G. D'Arrigo, M. Camarda, N. Piluso, and F. La Via
IMM-CNR, Italy

<Processing>

Th-P-21 p.317
Curvature Evaluation of Si/3C-SiC/Si Hetero-Structure Grown by Chemical Vapor Deposition

R. Anzalone¹, M. Camarda¹, A. Severino², N. Piluso¹, and F. La Via¹
¹IMM-CNR, Italy, ²ST-Microelectronics, Italy

Th-P-22 p.318
Removal of Mechanical-Polishing-Induced Surface Damages on 4H-SiC Wafers by Using Chemical Etching with Molten KCl+KOH

Y. Yao, Y. Ishikawa, Y. Sugawara, and K. Sato
Japan Fine Ceramics Center, Japan

Th-P-23 p.319
Dicing of SiC Wafer by Atmospheric-Pressure Plasma Etching Process with Slit Mask for Plasma Confinement

Y. Sano, H. Nishikawa, Y. Okada, K. Yamamura, S. Matsuyama, and K. Yamauchi
Osaka University, Japan

Th-P-24 p.320
Multi-Wire Electrical Discharge Slicing for Silicon Carbide Part 2: Improvement on Manufacturing Wafers by 40-Wire EDS

A. Itokazu, H. Miyake, T. Hashimoto, and K. Fukushima
Mitsubishi Electric Corporation, Japan

Th-P-25 p.321
Barrier Heights Investigation of Dissociative Adsorption of HF on SiC Surfaces in Catalyst- Referred Etching

P. V. Bui, K. Inagaki, Y. Sano, K. Yamauchi, and Y. Morikawa
Osaka University, Japan

Th-P-26 p.322
Effects of Machining Fluid on Electric Discharge Machining of SiC Ingot
N. Yamamoto¹, S. Yamaguchi¹, and T. Kato^{2,3}

¹Chubu University, Japan, ²R&D Partnership for Future Power Electronics Technology, Japan, ³National Institute of Advanced Industrial and Technology, Japan

Th-P-27 p.323
Hydrogen Effects in ECR-Etching of 3C-SiC(100) Mesa Structures
L. Hiller¹, T. Stauden¹, R. M. Kemper², J. K. N. Lindner², D. J. As², and J. Pezoldt¹

¹TU Ilmenau, Germany, ²Universität Paderborn, Germany

Th-P-28 p.324
Off-Orientation Influence on C-Face (0001) 4H-SiC Surface Morphology Produced by Etching Using Chlorine Trifluoride Gas

Y. Fukumoto¹, H. Habuka¹, and T. Kato²
¹Yokohama National University, Japan, ²National Institute of Advanced Industrial and Technology, Japan

Th-P-29 p.325
A Novel Grinding Technique for 4H-SiC Single-Crystal Wafers Using Tribo-Catalytic Abrasives

T. Kido^{1,2}, M. Nagaya^{1,3}, K. Kawata^{1,4}, and T. Kato^{1,4}
¹R&D Partnership for Future Power Electronics Technology, Japan, ²Showa Denko K.K., Japan, ³DENSO CORPORATION, Japan, ⁴National Institute of Advanced Industrial Science and Technology, Japan

Th-P-30 p.326
High-Speed Slicing of SiC Ingot by High-Speed Multi Wire Saw
H. Maeda^{1,3}, R. Takanabe^{1,4}, A. Takeda^{1,3}, S. Matsuda^{1,3}, and T. Kato^{1,2}

¹R&D Partnership for Future Power Electronics Technology, Japan, ²AIST Advanced Power Electronics Research center, Japan, ³Takatori Corporation, Japan, ⁴Asahi Diamond Industrial Co., Ltd., Japan

- Th-P-31** p.327
Microstructure Characterisation of Ni/Si Contact Layers on n-Type 4H-SiC by Plan-View TEM and XEDS
M. Wzorek¹⁾, A. Czerwinski¹⁾, J. Ratajczak¹⁾, M. Borysiewicz¹⁾, A. V. Kuchuk²⁾, A. Piotrowska¹⁾, and J. Kątecki¹⁾
¹⁾Institute of Electron Technology, Poland, ²⁾V. Lashkaryov Institute of Semiconductor Physics, Ukraine
- Th-P-32** p.328
Nano-Scale Native Oxide on 6H-SiC Surface and Its Effect to the Interface Band Bending
W. Huang¹⁾, S. -H. Chang¹⁾, X. -C. Liu¹⁾, E. -W. Shi¹⁾, W. -H. Zhang²⁾, and J. -F. Zhu²⁾
¹⁾Chinese Academy of Sciences, China, ²⁾University of Science and Technology of China, China
- Th-P-33** p.329
Fabrication of Electrostatically Actuated 4H-SiC Microcantilever Resonators by Using n/p/n Epitaxial Structures and Doping-Selective Electrochemical Etching
K. Sato¹⁾, K. Adachi¹⁾, H. Okamoto²⁾, H. Yamaguchi²⁾, T. Kimoto¹⁾, and J. Suda¹⁾
¹⁾Kyoto University, Japan, ²⁾NTT Basic Research Laboratories, Japan
- <Devices and Circuits>
- Th-P-34** p.330
V_F Degradation of 4H-SiC PiN Diodes Using Low-BPD Wafers
C. Ota, J. Nishio, K. Takao, and T. Shinohe
 Toshiba Corp., Japan
- Th-P-35** p.331
SiC Epi-Channel Lateral MOSFETs
C. Yen^{1,4)}, M. Bakowski²⁾, C. Hung^{1,4)}, S. Reshanov³⁾, A. Schoner³⁾, C. Lee^{1,4)}, L. Lee^{1,4)}, J. Wei¹⁾, T. Chiu¹⁾, and C. Huang^{1,5)}
¹⁾Industrial Technology Research Institute, Taiwan, ²⁾Acreo AB, Sweden, ³⁾Ascatron AB, Sweden, ⁴⁾Hestia Power Inc, Taiwan, ⁵⁾National Tsing Hua University, Taiwan

- Th-P-36** p.332
Evaluation of Buried Grid JBS Diodes
J. -K. Lim¹⁾, D. Pefitsis²⁾, D. -P. Sadik²⁾, M. Bakowski¹⁾, and H. -P. Nee²⁾
¹⁾Acreo Swedish ICT AB, Sweden, ²⁾Royal Institute of Technology, Sweden
- Th-P-37** p.333
13-kV, 20-A 4H-SiC PiN Diodes for Power System Applications
D. Okamoto¹⁾, Y. Tanaka¹⁾, T. Mizushima^{1,2)}, M. Yoshikawa¹⁾, H. Fujisawa^{1,2)}, K. Takenaka^{1,2)}, S. Harada¹⁾, S. Ogata³⁾, T. Hayashi³⁾, T. Izumi³⁾, T. Hemmi³⁾, A. Tanaka³⁾, K. Nakayama³⁾, K. Asano³⁾, K. Matsumoto¹⁾, N. Ohse^{1,2)}, M. Ryo^{1,2)}, C. Ota⁴⁾, K. Takao⁴⁾, M. Mizukami⁴⁾, T. Kato¹⁾, M. Takei^{1,2)}, Y. Yonezawa¹⁾, K. Fukuda¹⁾, and H. Okumura¹⁾
¹⁾National Institute of Advanced Industrial Science and Technology, Japan, ²⁾Fuji Electric Co. Ltd., Japan, ³⁾Kansai Electric Power Co., Inc., Japan, ⁴⁾Toshiba Corporation, Japan
- Th-P-38** p.334
Radiation-Induced Currents in 4H-SiC Dosimeters for Real-Time Gamma-Ray Dose Rate Monitoring
N. Fujita, N. Iwamoto, S. Onoda, T. Makino, and T. Ohshima
 Japan Atomic Energy Agency, Japan
- Th-P-39** p.335
Characterization of SiO₂/4H-SiC Interface by Device Simulation and Temperature Dependence of On-Resistance of SiC MOSFET
K. Ohtsuka, S. Hino, A. Nagae, R. Tanaka, Y. Kagawa, N. Miura, and S. Nakata
 Mitsubishi Electric Corporation, Japan
- Th-P-40** p.336
On the TCAD Based Design Diagnostic Study of 4H-SiC Based IGBTs
M. Nawaz and F. Chimento
 ABB Corporate Research, Sweden

- Th-P-41** p.337
SiC Etching and Sacrificial Oxidation Effects on the Performance of 4H-SiC BJTs
L. Lanni, B. G. Malm, M. Östling, and C. -M. Zetterling
 KTH Royal Institute of Technology, Sweden
- Th-P-42** p.338
Temperature and dI_{DS}/dT Dependence of the Switching Energy of SiC Schottky Diode in Clamped Inductive Switching Applications
S. Jahdi, O. Alatise, and P. Mawby
 University of Warwick, UK
- Th-P-43** p.339
SiC Current Limiting FET (CLFs) for DC Applications
D. Tournier¹⁾, P. Godignon²⁾, S. Niu¹⁾, and J. F. de Palma³⁾
¹⁾University of Lyon, France, ²⁾CNM-CSIC, Spain, ³⁾MERSEN FRANCE, France
- Th-P-44** p.340
Unexpected Effect of Thermal Storage Observed on SiC Power DMOSFET
Z. Chbili¹⁾, P. Shreshta¹⁾, J. P. Campbell¹⁾, J. S. Suehle¹⁾, D. E. Ioannou²⁾, and K. P. Cheung¹⁾
¹⁾NIST, USA, ²⁾George Mason University, USA
- Th-P-45** p.341
Optical and Electrical Simulation of Silicon Carbide-Based Photodiodes
S. Biondo, W. Vervisch, R. Ferone, and L. Ottaviani
 IM2NP Aix-Marseille Université, France
- Th-P-46** p.342
Radiation-Induced Trapped Charging Effects in SiC Power MOSFETs
R. Green, A. J. Lelis, D. P. Urciuoli, M. S. Litz, and J. J. Carroll
 U.S. Army Research Laboratory, USA
- Th-P-47** p.343
The Role of Substrate Compensation on DC Characteristics of 4H-SiC MESFET with Buffer Layer: A Combined Two-Dimensional Simulations and Analytical Study
 M. H. L. Rao and N. V. L. N. Murty
 Indian Institute of Technology Bhubaneswar, India
- Th-P-48** p.344
Utilization of SiC MOSFET Body Diode in Hard Switching Applications
A. V. Bolotnikov, J. Glaser, J. Nasadoski, P. Losee, S. Klopman, and L. Stevanovic
 General Electric Global Research Center, USA
- Th-P-49** p.345
Monolithic Integration of Power MESFET for High Temperature SiC Integrated Circuits
V. Banu¹⁾, J. Montserrat²⁾, M. Alexandru²⁾, X. Jordà²⁾, J. Millán²⁾, and P. Godignon²⁾
¹⁾D+T Microelectrónica, Spain, ²⁾IMB-CNM, CSIC, Spain
- <Graphene, GaN, and Related Materials>
- Th-P-50** p.346
Epitaxial Graphene Formation on 3C-SiC(111)/4H-AlN(0001) Double Layer Stacking on Si(111) Substrates
S. Jiao¹⁾, H. Fukidome^{1,2)}, H. Nagasawa¹⁾, S. Filimonov³⁾, M. Tateno⁴⁾, I. Makabe⁴⁾, T. Nakabayashi⁴⁾, and M. Suemitsu¹⁾
¹⁾Tohoku University, Japan, ²⁾JST-CREST, Japan, ³⁾Tomsk State University, Russia, ⁴⁾Sumitomo Electric Industries. Ltd., Japan
- Th-P-51** p.347
Influence of Atomic Step Structures on Epitaxial Graphene Growth on SiC(0001)
M. Inoue¹⁾, Y. Kangawa¹⁾, H. Kageshima²⁾, S. Tanaka¹⁾, and K. Kakimoto¹⁾
¹⁾Kyushu University, Japan, ²⁾NTT Basic Research Laboratories, Japan

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Optimizing the Vacuum Growth of Epitaxial Graphene on 6H-SiC
T. Hopf¹⁾, K. V. Vassilevski¹⁾, E. Escobedo-Cousin¹⁾, N. G. Wright¹⁾, A. G. O'Neill¹⁾, A. B. Horsfall¹⁾, J. P. Goss¹⁾, A. J. Barlow¹⁾, G. Wells²⁾, and M. R. Hunt²⁾
¹⁾Newcastle University, UK, ²⁾Durham University, UK

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Formation of Graphene onto Atomically Flat 6H-SiC
G. Rius¹⁾, N. Mestres²⁾, Y. Tanaka¹⁾, O. Eryu¹⁾, and P. Godignon³⁾
¹⁾Nagoya Institute of Technology, Japan, ²⁾Institut Ciencia de Materials, Spain, ³⁾Centro Nacional de Microelectronica, Spain

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Growth Control of Carbon Nanotubes Using Ion-Beam Irradiation in the SiC Surface Decomposition Method
K. Seo¹⁾, H. Takedo¹⁾, M. Naitoh¹⁾, and T. Ikari²⁾
¹⁾Kyushu Institute of Technology, Japan, ²⁾Ube National College of Technology, Japan

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Intermediate C-Rich (Sqrt [3] x Sqrt [3]) R30 Structure Preceding Graphene Buffer Layer Formation on SiC (0001)
S. Hayashi, A. Visikovskiy, T. Kajiwara, and S. Tanaka
Kyushu University, Japan

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Polytype Dependence of Graphene Growth on SiC (000-1)
Z. R. Robinson¹⁾, K. Bussmann¹⁾, G. G. Jernigan¹⁾, L. O. Nyakiti¹⁾, R. L. Myers-Ward¹⁾, V. D. Wheeler¹⁾, A. Nath²⁾, M. V. Rao²⁾, C. R. Eddy Jr.¹⁾, and D. K. Gaskill¹⁾
¹⁾U. S. Naval Research Laboratory, USA, ²⁾George Mason University, USA

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Solid Phase Growth of Graphene on Silicon Carbide by Nickel Silicidation: Graphene Formation Mechanisms
E. Escobedo-Cousin, K. Vassilevski, T. Hopf, N. Wright, A. O'Neill, A. Horsfall, and J. Goss
Newcastle University, UK

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Silicon Intercalation at the SiC-Graphene Interface
S. Kimoto, T. Kajiwara, A. Visikovskiy, and S. Tanaka
Kyushu University, Japan

<Epitaxy>

Th-P-59 (moved from Mo-P-12) p.355
Generation of Surface Defects during SiC Epitaxy
Z. H. Zhang¹⁾, Y. M. Fan¹⁾, and T. S. Sudarshan²⁾
¹⁾Chinese Academy of Sciences, China, ²⁾University of South Carolina, USA

<Processing>

Th-P-60 (moved from We-P-29) p.356
Analysis of C-Face 4H-SiC MOS Capacitors with ZrO₂ Gate Dielectric
L. Chan, C. Chung, Y. Chang, and K. Lee
National Taiwan University, Taiwan

<Late News: Epitaxy>

Th-P-61 p.357
Simulation Studies on Giant Step Bunching Accompanying Trapezoid-Shape Defects in 4H-SiC Epitaxial Layer
Y. Ishida and S. Yoshida
National Institute of Advanced Industrial Science and Technology, Japan

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Characterization of 4H-SiC Homoepitaxial Layers Grown on 100-mm-Diameter 4H-SiC/Poly-SiC Bonded Substrates

J. Suda¹⁾, T. Okuda¹⁾, H. Uchida²⁾, A. Minami²⁾, N. Hatta²⁾, T. Sakata²⁾, T. Kawahara²⁾, K. Yagi²⁾, Y. Kurashima³⁾, and H. Takagi³⁾

¹⁾Kyoto University, Japan, ²⁾SICOXS Co., Japan, ³⁾National Institute of Advanced Industrial Science and Technology, Japan

<Late News: Processing>

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Development of Multi-Wire Electric Discharge Machining for SiC Wafer Processing

M. Ogawa¹⁾, K. Mine¹⁾, Y. Ohshita¹⁾, S. Fuchiyama¹⁾, Y. Tawa¹⁾, and T. Kato^{1,2)}

¹⁾R&D Partnership for Future Power Electronics Technology, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan

Banquet 18:30-21:00

“Shosenkyu Green Garden” in the Sheraton Grande Ocean Resort Hotel

(If it rains, the venue will be changed to “Summit Hall (“Tenzui” and “Juyo”)” on the 4th floor of the Convention Center.)

Friday, October 4

Fr-1A Package & Applications 8:40-10:30

Chairs: S. Tanimoto (Nissan Motor, Japan)

K. Matocha (Monolith Semiconductor, USA)

Room: Tenzui

8:40 **Fr-1A-1 <Invited>** p.360

SiC Power Devices as Enabler for High Power Density – Aspects and Prospects

P. Friedrichs

Infineon Technologies AG, Germany

9:10 **Fr-1A-2** p.361

High Temperature Resistant Packaging for SiC Power Devices Using Interconnections Formed by Ni Micro-Electroplating

N. Kato, A. Shigenaga, and K. Tatsumi

Waseda University, Japan

9:30 **Fr-1A-3** p.362

Research of Silver Sintering Process and Reliability for High Temperature Operation of SiC Power Module

Z. Zhang and T. Nakamura

ROHM Co., Ltd, Japan

9:50 **Fr-1A-4** p.363

SiC Power Module for Home Appliances

K. Yamashita, K. Kato, H. Ikeuchi, J. Tanaka, R. Arakawa, and T. Sasaoka

Panasonic Corporation, Japan

10:10 **Fr-1A-5** p.364

Inverter-Rectifier Using SiC Power Devices for Bidirectional Wireless Power Transfer System of Electric Vehicles

M. Hachisuka, T. Fukuhara, Y. Kaneko, and S. Abe

Saitama University, Japan

Fr-1B Advanced Characterization 8:40-10:30

Chairs: P. Bergman (Linköping University, Sweden)

I. Kamata (CRIEPI, Japan)

Room: Juyo

8:40 **Fr-1B-1 <Invited>** p.365

Nanoscale Characterization of SiC Interfaces and Devices

F. Giannazzo¹⁾, P. Fiorenza¹⁾, M. Saggio²⁾, and F. Roccaforte¹⁾

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

9:10 **Fr-1B-2** p.366

Three-Dimensional Imaging of Extended Defects in 4H-SiC by Optical Second-Harmonic Generation

R. Tanuma and H. Tsuchida

Central Research Institute of Electric Power Industry, Japan

9:30 **Fr-1B-3** p.367

Identification of Dislocations in 4H-SiC Epilayers and Substrates using Photoluminescence Imaging

C. Kawahara, J. Suda, and T. Kimoto

Kyoto University, Japan

9:50 **Fr-1B-4** p.368

Zero-Field Spectroscopy in SiC Based Systems

C. J. Cochrane¹⁾, M. Anders¹⁾, P. M. Lenahan¹⁾, and A. J. Lelis²⁾

¹⁾The Pennsylvania State University, USA, ²⁾US Army Research Lab, USA

10:10 **Fr-1B-5** p.369

C-Face Interface Defects in 4H-SiC MOSFETs Studied by Electrically Detected Magnetic Resonance

T. Umeda¹⁾, M. Okamoto²⁾, R. Arai¹⁾, Y. Satoh¹⁾, R. Kosugi²⁾, S. Harada²⁾, H. Okumura²⁾, T. Makino³⁾, and T. Ohshima³⁾

¹⁾University of Tsukuba, Japan, ²⁾National Institute of Advanced Industrial Science and Technology, Japan, ³⁾Japan Atomic Energy Agency, Japan

Fr-PL Plenary ***11:00-11:45***

Room: Tenzui

Chairs: T. Kimoto (Kyoto University, Japan)

T. Shinohe (Toshiba, Japan)

11:00 **Fr-PL-1 <Invited>**

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High Speed Rail Awaits the Next Breakthrough of Power Semiconductors

T. Uzuka and E. Masada

Railway Technical Research Institute, Japan

Closing ***11:45-12:30***

Room: Tenzui

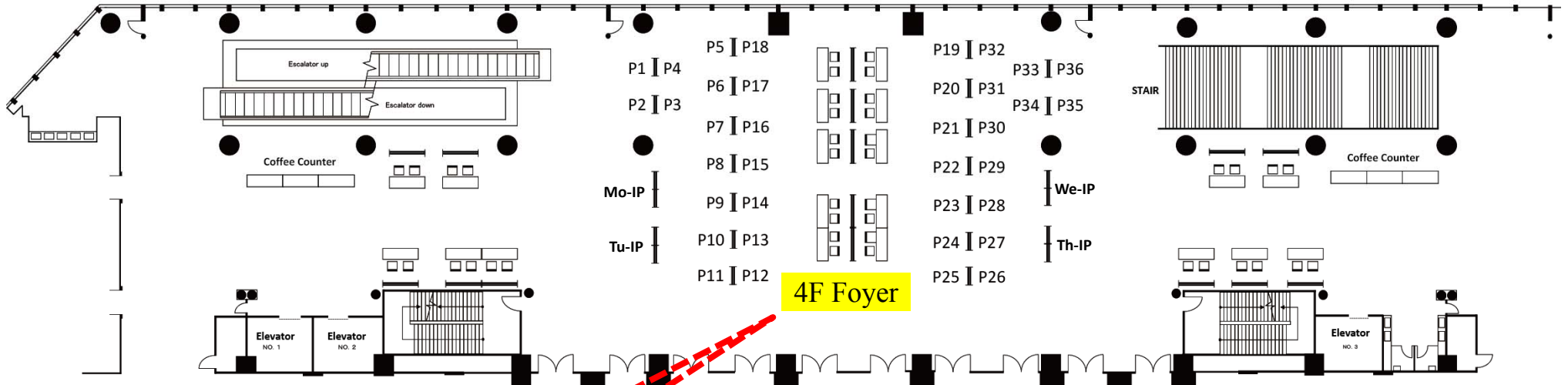
Chair: H. Itoh (JAEA, Japan)

Closing Remarks

ECSCRM 2014 Announcement

ICSCRM 2015 Announcement

Poster Presentation Map



4th Floor

