program

Advanced Power Semiconductor Subcommittee **9th** Lecture

The 9th Meeting on Advanced Power Semiconductors

Sponsored by: Japan Society of Applied Physics, Advanced Power Semiconductor Subcommittee

Venue: Fukuoka International Conference Center

Tuesday, December 20th

time	Venue **A**	Venue **B**	poster venue
9:55-10:00	Opening speech		
10:00-11:30	Session I Keynote speech Kenji Yamada (Yaskawa Electric) Kenya Sano (Toshiba Device & Storage)		
11:30-13:00	lunch break		
13:00-14:00	Session II Invited Lecture (Power electronics application) Nobuo Kishi (SkyDrive) Ken Nakahara (ROHM)	Session ÿ Invited lecture (Wafer/crystal growth) Manabu Shimoyama (SUMCO) Takeshi Mitani (National Institute of Advanced Industrial Science and Technology)	
14:00-14:15	break		
14:15-15:15	Industrial Session		
15:15-16:30			Poster session IA
16:30-17:45			Poster session IB
18:00-20:00	Social gathering (Fukuoka Sun Palace “Palace Room”)		

Wednesday, December 21st

time	Venue **A**	Venue **B**	poster venue
9:00-9:45	Session ÿ Keynote speech Jun Nishioka (Hitachi HVDC Technologies)		
9:45-10:00	break		
10:00-11:15			Poster session IIA
11:15-12:30			Poster session IIB
12:30-14:00	lunch break		
14:00-16:00	Session ÿ Invited lecture (Various material devices) Shinsuke Harada (National Institute of Advanced Industrial Science and Technology) Ken Shono (Transform Japan) Hiroshi Kawarada (Waseda University) Kohei Sasaki (Novel Crystal Technology)	Session ÿ Invited lecture (evaluation/informatics/ high temperature device) Seiichiro Higashi (Hiroshima University) Shunta Harada (Nagoya University) Shigetaka Tomiya (Sony Group) Mitsuaki Kaneko (Kyoto University)	
16:00-16:15	break		
16:15-16:55	Session VII Last Year Encouragement Award Award commemorative lecture Satoshi Asada (Central Research Institute of Electric Power Industry) Taiga Matsuoka (Kyoto University)		
16:55-17:15	Encouragement Award Ceremony closing		

Tuesday, December 20 **(Tuesday 20 December)**

Opening **9:55-10:00** [Venue A]

9:55-10:00 Opening remarks

Secretary General Yasunobu Tanaka (National Institute of Advanced Industrial Science and Technology)

Session I: Keynote speech 10:00-11:30 [Venue A]

10:00-10:45	Application examples and prospects of WBG devices in power electronics equipment
I-1	Applications and Future Prospects of WBG Devices in Power Electronics EquipmentKenji
[Keynote speech]	Yamada (Yaskawa Electric Corporation)
10:45-11:30	Toshiba's wide band gap semiconductor efforts towards carbon neutrality
I-2	Toshiba's Approach of wide-bandgap semiconductor for Carbon NeutralityKenya
[Keynote speech]	Sano (Toshiba Device & Storage Corporation)

(Lunch break: 11:30-13:00)

Session II: Invited lecture (power electronics applications) 13:00-14:00 [Venue A]

13:00-13:30	Challenging the air mobility revolution ~ Development of flying cars and logistics drones from Japan ~
II-1	Leading in the Once-in-a-Century Mobility Revolution
[Invited lecture]	Nobuo Kishi (SkyDrive Inc.)
13:30-14:00	Research and development that connects power devices and power systems
II-2	Research on the correlation between power devices and power systems
[Invited lecture]	Ken Nakahara (ROHM Co., Ltd.)

Session III: Invited lecture (wafer/crystal growth) 13:00-14:00 [Venue B]

13:00-13:30	Latest trends in Si wafers for power semiconductors
III-1	Latest Trend of Si Wafers for Power Semiconductors
[Invited lecture]	Manabu Shimoyama (SUMCO Co., Ltd.)
13:30-14:00	Development of high quality SiC crystal production technology using hybrid growth method
III-2	combining solution method/sublimation method
[Invited lecture]	High quality 4H-SiC bulk crystal growth by the hybrid method combined with solution growth and physical vapor transport growth Takeshi Mitani (National Institute of Advanced Industrial Science and Technology)

(Break: 14:00-14:15)

Industrial session 14:15-15:15 [Venue A]

14:15-15:15 Industrial session

Poster Session I 15:15-17:45 [Poster venue 4th floor rooms 409, 411, 413]

15:15-16:30 first half (ÿA)

16:30-17:45 second half (ÿB)

Social gathering 18:00-20:00 [Fukuoka Sun Palace "Palace Room"]

18:00-20:00 Social gathering

Wednesday, December 21 **(Wednesday 21 December)**

Session IV: Keynote speech 9:00-9:45 [Venue A]

9:00-9:45
IV-1
[Keynote speech]
HVDC contributes to the mass introduction of renewable energy
HVDC enabling the future grid with renewable energy Jun Nishioka (Hitachi HVDC Technologies, Ltd.)

(Break: 9:45-10:00)

Poster Session II 10:00-12:30 [Poster venue 4th floor rooms 409, 411, 413]

10:00-11:15 first half (IIA) 11:15-12:30

second half (ÿB)

(Lunch break: 12:30-14:00)

Session V: Invited lecture (various materials devices) 14:00-16:00 [Venue A]

14:00-14:30
V-1
[Invited lecture]
Development and future of SiC and GaN integrated devices
Development and future prospect of SiC/GaN hybrid device Shinsuke Harada (National Institute of Advanced Industrial Science and Technology)

14:30-15:00
V-2
[Invited lecture]
Development of 1200V GaN power transistor
Development of 1200V GaN Power Transistor Ken Shono, Tsutomu Hosoda (Transform Japan)

15:00-15:30
V-3
[Invited lecture]
C-Si-O Terminated Channel Vertical Diamond Power MOSFET
Oxidized Si terminated diamond power MOSFETs with vertical structure Hiroshi Kawahara (Waseda University)

15:30-16:00
V-4
[Invited lecture]
Gallium oxide crystal growth and power device applications ÿ-Ga2O3
crystal growth and power device applications Kohei Sasaki, Akito Kuramata (Novel Crystal Technology Co., Ltd.)

Session VI: Invited lecture (Evaluation/Informatics/High-temperature devices) 14:00-16:00 [Venue B]

14:00-14:30
VI-1
[Invited lecture]
Three-dimensional imaging of self-heating temperature distribution inside power devices and observation of device deterioration process using optical interference non-contact temperature measurement method
3-D Imaging of Self-heating Temperature Distributions in Power Devices by Optical Interference Contactless Thermometry and Its Application to Observation of Device Degradation Phenomena
Seiichiro Higashi, Keiya Fujimoto, Kotaro Matsuguchi, Hiroaki Hanabusa (Hiroshima University)

14:30-15:00
VI-2
[Invited lecture]
Crystal defect evaluation of power device SiC substrates -- defect distribution/multimodal analysis
Characterization of Crystalline Defects in SiC Wafer ÿ Mapping and Multimodal AnalysisShunta Harada (Nagoya University)

15:00-15:30
VI-3
[Invited lecture]
Measurement informatics in semiconductor materials and devices
Metrology Informatics in Semiconductor Materials and Devices Shigetaka Tomiya (Sony Group Inc. Tokyo Institute of Technology)

15:30-16:00
VI-4
[Invited lecture]
Basic research on SiC complementary JFET for high-temperature operation integrated circuits
Research of SiC complementary JFET toward ICs operational at high temperature Mitsuaki Kaneko, Seiji Nakajima, Ki-min Kim, Noriyuki Maeda, Tsunenobu Kimoto (Kyoto University)

(Break: 16:00-16:15)

Session VII: Last year's Encouragement Award Memorial Lecture 16:15-16:55 [Venue A]

16:15-16:35 Effect of stacking faults on current carrying characteristics of SiC power devices
VII-1 Impacts of stacking faults on current conduction in SiC power devices Satoshi
[Invited lecture] Asada, Koichi Murata, Shuichi Tsuchida (Central Institute of Electric Power Industry)

16:35-16:55 Electrical property evaluation of S ion-implanted n-type SiC layer by Hall effect measurement
VII-2 Electrical properties of sulfur-implanted n-type SiC characterized by Hall effect measurement Taiga Matsuoka,
[Invited lecture] Mitsuaki Kaneko, Tsunenobu Kimoto (Kyoto University)

Encouragement Award Ceremony/Closing 16:55-17:15 [Venue A]

16:55-17:15 Encouragement Award

Ceremony Closing

Poster lecture (ÿ

written in front of the speaker indicates the speaker, ÿ indicates the presentation is an application for the Encouragement Award)

[IA] (12/20 first half 15:15-16:30)

IA-1 Research on ductile mode machining of SiC using multi-wire saw

Study on ductile mode slicing of SiC by multi-wire saw

Tanaka, Hitoshi Suwabe 1 Kanazawa Institute of Technology [2], Tomohisa Kato Kenichi Ishikawa ÿ• Kotaro [2]

Graduate School, 2 Kanazawa Institute of Technology, 3 National Institute of Advanced Industrial Science and Technology Tsukuba West Office

IA-2 Highly efficient etching of gallium compound semiconductors by atmospheric pressure plasma using hydrogen gas

High-speed etching of gallium compound semiconductors using PCVM with hydrogen gas

Physics, Graduate School of Engineering, Osaka University Yasuhisa Sano Daisetsu Toh Kazuto Yamauchi 1 Department of

IA-3 Improvement of interfacial properties and insulation properties of sputter-deposited SiO2/GaN MOS structure by oxygen and hydrogen heat treatment

Improvement of Interface and Insulating Properties of Sputter-deposited SiO2/GaN MOS Structures by Oxygen and Hydrogen Annealing

ÿ• Kentaro Onishi Takuma Kobayashi Heiji [1], Hidesato Mizobata [1], Mikito Nozaki [1], Akitaka Yoshikoshi [2], Shimura Kokou [1], Watanabe 1 [1]

Osaka University, 2 Japan Atomic Energy Agency

IA-4 Improvement of threshold voltage controllability of vertical gate JFET fabricated by ion implantation into semi-insulating SiC substrate

Improvement of threshold voltage controllability in vertical-gate JFETs fabricated by ion implantation into a semi-insulating SiC substrate

ÿ•Shunya Shibata1 , Taiga Matsuoka1 , Mitsuaki Kaneko1 , Tsunenobu Kimoto1 [1]

Kyoto University Graduate School of Engineering

IA-5 Leakage conduction mechanism of NO nitride SiC(1-100) MOS device

Leak current mechanisms in NO-nitrided SiC(1-100) MOS devices

ÿ•Asato Suzuki Takasumi Nakanuma Takuma Kobayashi Mitsuru Sometani Shimura Koko Heiji [2], Mitsuo Okamoto [2], Akitaka Yoshikoshi [3], Watanabe 1 Graduate School of [1]

Engineering, Osaka University, 2 AIST, 3 Japan Atomic Energy Agency

IA-6 Effect of excimer ultraviolet light irradiation on NO nitride SiO2/SiC(11-20) interface

Effect of Excimer Ultraviolet Light Irradiation on NO-Nitrided SiO2/SiC(11-20) Interfaces

ÿ•Hiroki Fujimoto Takuma Kobayashi Mitsuru Sometani Heiji Watanabe 1 Osaka University, 2 AIST Takao Shimura [1],

IA-7 Control of SiO2/SiC interface luminescence center by oxidation and heat treatment process

Control of color centers at SiO2/SiC interfaces by oxidation and post-annealing

University Graduate School of Engineering, 2 Toyota Central R&D Labs., Inc. Takuma Kobayashi Takasumi Nakanuma Daishi Kimura Katsuhiro Kuchiki Takuma Kobayashi 1 Osaka [1], Heiji Watanabe [1],

IA-8 Low-temperature characteristics evaluation of high-mobility non-polar surface SiC MOSFET fabricated by oxidation suppression process

Low-temperature characteristics of high mobility SiC MOSFETs on nonpolar faces fabricated by the oxidation-minimizing process

ÿ•Kyota Mikami Kaoru Tachiki 1 Kyoto [1], Kaneko Mitsuken [1], Tsunenobu Kimoto [1]

University

IA-9 Evaluation of interface characteristics of SiC MOSFET using 3-level charge pumping method: Oxide film nitriding treatment and interface defect Relationship of depth

Relationship between nitridation process and interface defect density in SiC MOSFETs investigated by 3 level charge pumping method

ÿ•Atsuhiro Akiba Yuji Yano 1 University of [1]

Tsukuba

IA-10 Evaluation of threshold voltage fluctuation of SiC-MOSFET by applying bipolar AC gate stress

Evaluation of threshold voltage shift in SiC-MOSFETs by bipolar AC gate stress

ÿ•Yuya Enjoji Yuji Yano 1 University of Tsukuba

IA-11 Evaluation of GaOx layer at Al2O3/GaN interface by photoelectron holography

Analysis of GaOx Layer at Al2O3/GaN Interface using Photoelectron Holography

ÿ• Shingo Kuwaharada Hiroto Tomita Akitaka Tanaka Son Akira Sawa Tomohiro Matsushita Yukinaru Uraoka 1 Yusuke Hashimoto 1, Nara Institute of Science and Technology

IA-12 Split-off band electrical characteristics of heavily doped p-type SiC Schottky barrier diode

influence of de

Impact of a split-off band on the electrical characteristics of heavily-doped p-type SiC Schottky barrier diodes

ÿ• Takeaki Kitawaki Seita Hara 1 Kyoto University Graduate School of Hajime Tanaka1,2, Kaneko Mitsuken 1, Tsunenobu Kimoto 1
Engineering, 2 Osaka University Graduate School of Engineering

IA-13 Surface analysis of naturally oxidized gallium nitride by photoelectron holography

Surface Analysis of Naturally Oxidized Gallium Nitride by Photoelectron Holography

ÿ•Hiroto Tomita Shingo Kuwaharada Akitaka Tanaka Tomohiro Matsushita 1 Nara Institute of Science and Technology, 2 Kinki University, Son Asahi Sawa

IA-14 Injection angle dependence of depth distribution of Al implanted into SiC by high-energy channeling

Implantation angle dependence of Al depth profile implanted into SiC by high-energy channeling implantation

ÿ•Ei Inoue1 , Mitsuaki Kaneko1 , Yoshiyuki Yonezawa2 , Tsunenobu Kimoto1
Kyoto University Graduate School of Engineering, 2 AIST

IA-15 Birefringence image simulation of dislocations in SiC crystal considering three-dimensional stress distribution

Birefringence image simulation of dislocations in a SiC crystal considering 3D stress fields

ÿ•Yasutaka Matsubara Kenta Murayama Shunta Harada 1 Nagoya
University Institute for Future Materials and Systems, 2Mipox Co., Ltd.

IA-16 Theoretical analysis of electron scattering due to step/terrace structure generated at SiC MOS interface

Theoretical Analysis of Electron Scattering by Step-Terrace Structures at SiC MOS Interface

ÿ• Keisuke Utsumi Hajime Tanaka 1 Graduate School of Engineering, Osaka University

IA-17 Pseudo-two-dimensional electronic structure analysis of 4H-SiC MOS inversion layer based on empirical pseudopotential method

Analysis of Quasi-Two-Dimensional Electronic States in 4H-SiC MOS Inversion Layer Based on Empirical Pseudopotential Method

ÿ• Yukishu Nagamizo Kazuya Tanaka Shinya 1 Osaka
University Graduate School of Engineering

Structural design of 4H-SiC lateral p-ch SJ-MOSFET for IA-18 monolithic complementary inverter

Structure optimization of 4H-SiC lateral p-ch SJ-MOSFET for monolithic complementary inverters

ÿ•Kaito Mori 1 Noriyuki Iwamuro Yuji Yano
University of Tsukuba

IA-19 Study on short channel effects in SiC side-gate JFET using device simulation

TCAD-based Study on Short-Channel Effects in SiC Side-Gate JFETs

ÿ• Noriyuki Maeda Tsunenobu Kimoto 1 Kyoto Kaneko Mitsuken School of Engineering

[IB] (12/20 second half 16:30-17:45)

IB-1 Effect of changes in growth furnace pressure on SiC crystal growth rate and quality in high-temperature gas growth method

Effect of Pressure Change in the Reactor on SiC Crystal Growth Rate and Quality in HTCVD Method

ÿ• Satoshi Sakakibara Takeshi Okamoto Nobuyuki Oya Takashi Kanemura Daisuke Tegashi Technologies Co., Ltd.

IB-2 Improving simulation accuracy and applying machine learning to SiC gas growth method

Improving Simulation Accuracy and Application of Machine Learning for SiC Gas Growth

ÿ• Satoshi Matsuzawa Other Institutions Kiyoshi Ekinaka Kentaro Kutsukake Shuichi Tsuchida Fumihiro Fujiei 1 Central Research Power Industry, 2 RIKEN Center for Advanced Intelligence Project

IB-3 Estimation of off-angle from surface morphology images of GaN using deep learning

Prediction of off-angle from GaN surface morphology images using deep learning

ÿ•Ishimoto Takara 1 , Tokunaga Asahi Shugo Nitta 1 Kyushu , Hirotaka Watanabe Institute of Technology, 2 Nagoya University

IB-4 SiC epitaxial growth using multi-substrate sublimation (MCSS) method

SiC Epitaxial Growth by Multi-Wafer Close-Space Sublimation (MCSS) Method

•Hiroyuki Nagasawa ,Tetsuya Chiba 1 CUSIC Co., Ltd., 2 Dry Chemicals Co., Ltd.

Development of processing fluid for SiC wafer polishing using IB-5 grinding wheel surface plate

Development of Processing Fluid for SiC Wafer Polishing with Lapping Stone Plate

Shinya Takanashi1 , Mana Taguchi1 , Junji Nagahashi2, Tomohisa Kato 1 Palace Chemical Co., Ltd., 2 Mizuho Co., Ltd., 3 National Institute of Advanced Industrial Science and Technology

IB-6 Development of large diameter SiC polishing process using fixed abrasive lapping surface plate

Development of a lapping process for large diameter SiC wafers with the lapping stone plate

ÿ• Atsunori Nozoe Junji Nagahashi Chuichi Miyashita Minami Nakazawa Kenji Kawata Tomohisa Kato Yoshiaki Onchi 1 Mizuho Co., Ltd., 2 Fujikoshi Machinery Co., Ltd., 3 National Institute of Advanced Industrial Science and Technology

IB-7 High-rate polishing technology for SiC wafers using high-speed polishing equipment and grinding wheel surface plate

High-rate lapping technology for SiC wafers with high-speed rotation equipment and lapping stone plate

•Yuko Yamamoto1 , Chuichi Miyashita1, Atsunori Nozoe1, Minami Nakazawa1, Tomohisa Kato1, Junji Nagahashi2,1 Fujikoshi Machinery Co., Ltd., 2 Mizuho Co., Ltd., 3 National Institute of Advanced Industrial Science and Technology

Lapping of GaN wafer using IB-8 grinding wheel surface plate

The lapping of GaN wafer with the lapping stone plate

ÿ•Hayato Kitade1 , Junji Nagahashi2 , Eiken Son1 , Kazuya Yamamura 1 Graduate School of Engineering, Osaka University, 2 Mizuho Co., Ltd.

IB-9 Improving SiC wafer processing quality

SiC Wafer processing quality improvement

Murakami ÿ•Hiroaki Ito Yusuke Kawai Masaaki Kanno 1 Rokko Electronics Co., Ltd., Hiroyuki Kuribayashi , Hidemori Kobayashi , Tomonori Kanda

IB-10 Back side thinning processing of SiC-MOSFET chip using PCVM (Plasma Chemical Vaporization Machining)

Backside thinning process of SiC-MOSFET chip by PCVM

ÿ•Masaaki Oshima Yuma Nakanishi Junpei Yamada Shunto Sasaki Kazuto Yamauchi 1 Graduate School of Engineering, Osaka University, Daisetsu Fuji

IB-11 Angle detection of channeling ion implantation using optical method

Angular detection for channeling ion implantation by optical techniques

ÿ•Takumi Maruhashi Toshiya Sato Yoshiyuki Yonezawa Masafumi Kato 1 Nagoya Institute of Technology, 2 Advanced Power Electronics Research Center, National Institute of Advanced Industrial Science and Technology

IB-12 Suppression of bipolar degradation by H + injection into SiC PiN diodes

Suppression of bipolar degradation by H+ injection into SiC PiN diodes

ÿ•Watanabe Ohga Shunta Harada Tatsuki Mitsui Sakane Masashi Kato 1,Nagoya Institute of Technology, 2 Nagoya University, 3 Atex Sumishige

IB-13 Differences in PL signals for GaN epilayers on HVPE and OVPE substrates

Difference in PL signals for GaN epilayers on HVPE and OVPE substrates

ÿ•Tatsuya Ishii1 , Shigeka Usami 2, Yusuke Mori 2, Hirotaka Watanabe 3, Shugo Nitta Hiroshi 3, Yoshio Honda 3, Amano Masashi 3,Kato 1 Nagoya Institute of Technology Graduate School of Engineering, 2 Osaka University Graduate School of Engineering, 3 Nagoya University Graduate School of Engineering

IB-14 Real-time simulation of high-speed plasma processing of SiC wafers based on optical interferometric non-contact temperature measurement (OICT)

Development of temperature measurement technology

Development of a Real-Time Temperature Measurement Technique for SiC Wafer During Rapid Plasma Processing Based on Optical-Interference Contactless Thermometry (OICT)

ÿ•YU JIAWEN1 , Kotaro Matsuguchi Hiroaki Hanabusa Seiichiro Azuma 1 Graduate School of Advanced Science and Engineering, Hiroshima University

IB-15 Three-dimensional observation of dislocations inside SiC using focused polarized laser

3D observation of dislocation SiC using a focused polarized laser

ÿ• Toshiya Sato1 , Tomohisa Kato2 , Shunta Harada3, Masashi Kato 1 Nagoya Institute of Technology, 2 National Institute of Advanced Industrial Science and Technology, 3 Nagoya University

IB-16 4H-SiC CMOS SRAM noise margin evaluation

Noise Margin Evaluation of 4H-SiC CMOS SRAM

ÿ•Touya Kai Kazusato Kojima Takeshi Oshima Yasunobu Tanaka Shinichiro Kuroki 1 Nanodevice Research Institute, Hiroshima University, 2 National Institute of Advanced Industrial Science and Technology, 3 National Institute of Quantum Science and Technology

IB-17 Two-dimensional evaluation of Ni/n-GaN Schottky electrode with tails using voltage-applied interface microphotoresponse method

Two-dimensional characterization of the Ni/n-GaN Schottky contacts with electrode edge tailing under applied voltage by scanning internal photoemission microscopy

•Hiroki Imabayashi Tomoyoshi Mishima Kenji Shiohshima 1 University of Fukui, 2 Hosei University

IB-18 2 MGy radiation effect evaluation of 4H-SiC pixel sensor

Evaluation of 2 MGy radiation effect on 4H-SiC pixel sensor

ÿ•Masayuki Tsutsumi1 , Tatsuya Meguro1 , Akinori Takeyama2 , Takeshi Oshima2 , Yasunobu Tanaka3 , Shinichiro Kuroki 1 Nanodevice Institute, Hiroshima University, 2 National Institute of Quantum Science and Technology, 3 National Institute of Advanced Industrial Science and Technology

IB-19 4H-SiC MOSFET Based High-Temperature Electronics for Harsh Environment Applications

4H-SiC MOSFET Based High-Temperature Electronics for Harsh Environment Applications

ÿ•Vuong Van Cuong1 , Tatsuya Meguro1 , Seiji Ishikawa2 , Tomonori Maeda2 , Sezaki Hiroshi2 , Shin-Ichiro Kuroki1

1 Hiroshima University Nano Device Research Institute, 2 Phenitec Semiconductor

[IIA] (12/21 first half 10:00-11:15)

IIA-1 High-speed growth of ÿ150mm 4H-SiC wafer using high-temperature gas growth method

Fast growth of 150-mm 4H-SiC Wafers Grown by a High-temperature Chemical Vapor Deposition Method

Takashi Kanemura Special Hideyuki Ishigami Kamata Shinichi Tsuchida Kazuhiro Mirize Technologies Takeshi Okamoto Nobuyuki Oya [1], Satoshi Sakakibara [1], 2 Central Research Institute of Electric Power Industry

IIA-2 Effect of graphite material on growing crystal during SiC crystal growth

Influence of graphite on SiC crystal growth

•Naoya Tomatsu Jun Ohashi Tomohisa Kato Kazuma Eto 1 IBIDEN Co., Ltd., 2 National Institute of Advanced Industrial Science and Technology

IIA-3 Reaction analysis at the SiC-hydrogen peroxide water interface using first-principles calculations

Ab initio study of chemical reactions at the SiC-H2O2 solution interface

•Tetsuya Morishita Tomohisa Kato Akira Kayama 1 National Institute of Advanced Industrial Science and Technology CD-FMat, 2 National Institute of Advanced Industrial Science and Technology ADPERC

IIA-4 Interface structure of 3C-SiC and 4H-SiC formed by simultaneous lateral epitaxial method

Interface Structure of 3C-SiC and 4H-SiC Generated by Simultaneous Lateral Epitaxy

•Hiroyuki Nagasawa [1] Masao Sakuraba Shigeo Sato 1 CUSIC Co., Ltd., 2 Tohoku University Institute of Telecommunications

IIA-5 Development of GaN substrate reclamation process

Development of GaN wafer recycling process

•Atsushi Ohara1 , Masatake Nagaya1 , Shinichi Hoshi1 , Takashi Kanemura1 , Kazuhiro Tsuruta1 , Daisuke Kawaguchi2 , Keisuke Hara2 , Koji Kuno2 , Tetsuya Yokojima2 , Jun Kojima3 , Shoichi Onda3, Chiaki Sasaoka3 , Jun Suda1 Mirize Technologies Co., Ltd., 2 Hamamatsu Photonics Co., Ltd.

3 Tokai National University Organization Nagoya University

IIA-6 Evaluation of Mg laser doping on GaN substrates

Evaluation of Mg laser doping to GaN substrate

•Kaname Imogawa, Ryoichi Notomi, Hiroshi Kawasaki Yasuaki Gigaphoton Co., Ltd., 2 Graduate School of Systems Information Research, Kyushu University

IIA-7 High-sensitivity temperature measurement using silicon hole quantum sensor using simultaneous ground and excited level resonance ODMR

High-sensitive temperature sensing using silicon vacancy quantum sensor by simultaneous-resonated optically detected magnetic resonance

•Yuichi Yamazaki Yuta Masuyama Kazusato Kojima 1 QST, 2 [2], Takeshi Oshima [1] AIST

IIA-8 OICT 3D temperature imaging technology inside silicon wafer during electrical heating

Three-dimensional imaging technique of temperature distribution inside silicon wafer during Joule's heating by Optical-Interference Contactless Thermometry (OICT)

•Kotaro Matsuguchi [1], Jiawen Yu1 , Hiroaki Hanabusa Seiichiro Higashi 1 Graduate School of Advanced Science and Engineering, Hiroshima University

IIA-9 Partial dislocation structure and origin analysis in extended stop region of band-shaped single Shockley stacking fault in 4H-SiC

Partial dislocation structures at expansion terminating areas of bar-shaped single Shockley stacking faults and originating basal plane dislocation analysis in 4H-SiC

•Joji Nishio Chiharu Ota Ryosuke Iijima 1Toshiba Corporation Research and Development Center

IIA-10 Observation of trench edge cavity defects during CVD backfill growth of 4H-SiC using X-ray CT

X-ray Computed Tomography on the voids defect at the sides of CVD filled 4H-SiC trenches

•Seyo Ki1 , Kazusato Kojima1 , Akio Yoneyama2 , Hirotaka Yamaguchi1 National Institute of Advanced Industrial Science and Technology, 2 Kyushu Synchrotron Optical Research Center

IIA-11 Direct evaluation of trench slope effect on 4H-SiC UMOS channel characteristics using 3D-VDP

Direct characterization of trench tilt impacts on 4H-SiC UMOS channel properties by 3D-VDP device

•Yuhisa Hirai Mitsuo Okamoto Mitsuru Someya Shinsuke Harada 1 Advanced Power [1], Hiroshi Yamaguchi [1]

Electronics Research Center, AIST

IIA-12 Current increase due to trap-assisted tunneling in Schottky junction on SiC with high concentration P ion implantation

Large and reduced contact resistance

Enhanced tunneling current and low contact resistivity resulting from trap-assisted tunneling at Schottky contacts formed on heavily P+ -implanted SiC

• Seitai Hara Tsunenobu Kimoto Kyoto University [1]

IIA-13 Two-dimensional evaluation of ultra-high pressure annealed n-GaN Schottky contact using interfacial microphotoresponse method

Mapping of Ultra-High-Pressure Annealed n-GaN Schottky Contacts Using Scanning Internal Photoemission Microscopy

•Hiroki Imabayashi 1 [1], Kenji Shioshima [1], Toru Kaji [2]

University of Fukui, 2 Nagoya University

IIA-14 Energy level of C dangling bond defect existing at SiO2/SiC interface

Energy levels of carbon dangling-bond at 4H-SiC(0001)/SiO2 interface

Sometani Yuichiro Matsushita Yukimasa Nishitani Ren Kondo Reina Sato Mitsuo [1] [2] [3] [3], Yukihiro Hirai [2], Dai Okamoto [3], Institute of Technology, [2], Yukihide Umeda [3]

3 University of Tsukuba

IIA-15 Excitation intensity dependence of surface recombination rate of oxidized 4H-SiC

Excitation dependence of surface recombination velocities for oxidized 4H-SiC

•Hiji Ogawa1 , Lei Han1 , Tomohisa Kato2, Masashi Kato 1 Nagoya Institute [1] of Technology, 2 AIST

IIA-16 Quantification and analysis of hole mobility anisotropy in 4H-SiC

Experimental and theoretical study on hole mobility anisotropy in 4H-SiC

•Ryoya Ishikawa Hajime Tanaka1,2 , Mitsuaki Kaneko Tsunenobu Kimoto [1], Kyoto University Graduate School of [1]

Engineering, 2 Osaka University Graduate School of Engineering

IIA-17 Comparison of short channel effects in 4H-SiC n/p channel MOSFETs

Comparison of Short-Channel Effects in 4H-SiC n/p-channel MOSFETs

•Mitsuo Okamoto Shinsuke Harada 1 National Institute of [1]

Advanced Industrial Science and Technology

IIA-18 Consideration on modeling SiC MOS inversion layer mobility in TCAD

On the modeling of the Mobility in SiC MOSFETs in TCAD

•Tetsuo Hatakeyama, Yuhisa Hirai, Mitsuru Someya, Dai Okamoto, Mitsuo Okamoto 1 Toyama Prefectural University of [1] [2] [2], Shinsuke Harada [2]

Engineering, 2 Advanced Power Electronics, AIST

Design of 30kW 3-phase interleaved LLC DC/DC converter for EV fast charger using IIA-19 SiC

SiC-PowerMOSFET 30kW THREE-PHASE INTERLEAVED LLC DC/DC CONVERTER

•Noriaki Mukaide 1 [1]

Wolfspeed Japan

[IIB] (12/21 second half 11:15-12:30)

IIB-1 ÿ150mm SiC substrate regeneration technology using thick film epitaxial growth

ÿ150mm SiC substrate recycle technology using thick epitaxial growth

Fujibayashi, Masatake Nagaya 1Mirise [1], Junji Ohara Shinichi Hoshi Takashi Kanemura •Hiroaki [1], Kazuhiro Tsuruta [1]

Technologies Co., Ltd.

IIB-2 Effects of dislocation density and seed crystal thickness in SiC ingots fabricated by high-temperature gas growth method

Relationship of dislocation density of SiC boule grown by HTCVD Method to initial seed thickness

•Keisho Horiai Norihiro,Hoshino Takeshi Okamoto Takashi Kanda Shuichi Tsushida 1Mirize Technologies Co., [2], Kiyoshi Betsuyaku [2],

Research Institute of Electric Power [2]

Industry

IIB-3 Relationship between performance and component blend ratio/dispersibility in SiC power semiconductor wafer grinding wheels

Relationship Between Performance and Component Ratio/Dispersibility of Grinding Wheel for SiC Power-semiconductor Wafer

• Kei Mineshima [1], Yutaro Iida [1], Shota Ino [1], Daishi Tsuzuki [1], Satoshi Shimada [1], Takashi Kojima [1],

Tomohisa Kato [2]

1 JTEKT Grinding Tools Co., Ltd., 2 National Institute of Advanced Industrial Science and Technology

IIB-4 Development of diamond abrasive-free planarization processing technology for SiC wafers using electrical discharge machining

Development of Diamond-abrasive-free Planarization Technology for SiC Wafers by EDM

•Yosuke Kiryu1 , Yasunori Tawa1 , Takahiro Yoshimatsu1 , Yoshitaka Inui1 , Tomohisa Kato1 Yasunaga [2]

Corporation, 2 National Institute of Advanced Industrial Science and Technology

IIB-5 Research on high-efficiency electropolishing method using SiC anodic oxidation reaction

Study of the high efficiency electrolytic polishing method using an anodizing reaction of SiC

•Kenji Kawata1 , Tomohisa Kato1 , Chuichi Miyashita1 National [2]

Institute of Advanced Industrial Science and Technology, 2 Fujikoshi Machinery Co., Ltd.

IIB-6 Defect evaluation of SiC using PL and KOH etching

Evaluation of defects in SiC by PL and KOH etching

•Yuya Yamada Muneo [1],Sasaki Yoshiki Tanaka Yosuke Matsushita Kazuaki Kamimoto [1], [1], Kazumi Takano [2],

[2], Yasuyuki Igarashi 1 [2]

Shiga Prefectural Industrial Technology Center, 2 ITES Co., Ltd.

IIB-7 Evaluation of diamond dislocations using polarized Raman spectroscopy

Analysis of diamond dislocations by RAMAN polarization measurement

Marika Takeuchi, Miki Yasuoka, Marino Ishii, Noboru Otani, •Shinichi Shikata 1 Kwansei Gakuin University [1]

IIB-8 Evaluation of the influence of carbon vacancies on SiC substrates fabricated by high-temperature gas growth method

Estimation of Influence on Carbon Vacancy regarding SiC Substrate grown by HTCVD method

•Hideyuki Johigashi Keisho Takeshi Takahiro Kanda Takashi Kanemura Kazuhiro Tsuruta 1 Mirize Technologies [1],

Takeshi Okamoto [1]

Co., Ltd. [1],

IIB-9 Structural evaluation of linear defects with stacking fault complex-like structure existing in 4H-SiC epitaxial substrates

Characterization of Line-shaped Surface Defect having Similar Structures to Stacking Fault Complex in 4H-SiC Epitaxial Wafer

•Hideki Sako Kentaro Ohira Kenji Kobayashi 1 Toray Research [2], Shohei Hayashi [1], Toshiyuki Isshiki [3]

Center, Inc., 2 Hitachi High-Tech, Inc., 3 Kyoto Institute of Technology

IIB-10 Optimization of simultaneous magnetic field and temperature measurement method using simultaneous resonance method using VSi in SiC

Optimization of simultaneous measurement of magnetic field and temperature measurement using simultaneous resonance by VSi in SiC

•Tomoaki Tanaka1 , Yuichi Yamazaki1 , Kazusato Kojima2 , Takeshi Oshima 1 National Institute of Advanced [1]

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

IIB-11 Linear increase in scratch width and dislocation pattern size on (0001)GaN wafers

Linear increase of dislocation pattern size on the scratch width on (0001) GaN

Center, 2 Nagaoka University of Technology, 3 Yamaguchi University

IIB-12 Forward bias deterioration evaluation of 4H-SiC PiN diode formed on 4H-SiC bonded substrate

Evaluation of Forward Bias Degradation in 4H-SiC PiN Diodes Fabricated on 4H-SiC Bonded Substrates

Advanced Industrial Science and Technology, 3 Phenitec Semiconductor Co., Ltd.

IIB-13 Characteristic deterioration evaluation when gate voltage stress is applied to SiC-MOSFET

Evaluation of Degradation of SiC-MOSFETs by Applying Constant Gate Voltage Stress

of Advanced Industrial Science and Technology

IIB-14 Effect of thermal oxidation treatment on electrical properties of n-type and p-type ion-implanted layers on high-purity semi-insulating SiC substrate

Impact of thermal oxidation on electrical properties of n- and p-type ion-implanted layers in high-purity semi-insulating SiC substrates

Graduate School of Engineering

IIB-15 Localization of conduction band wave function near SiO2/4H-SiC interface by applying electric field

Localization of conduction band wavefunction near SiO2/4H-SiC interface by applied electric field

National Institute of Advanced Industrial Science and Technology, 2 Tokyo Institute of Technology, 3 Quemix Inc., 4 National Institute for Quantum and Radiological Science and Technology

IIB-16 Theoretical analysis of tail states caused by phonon scattering in two-dimensional systems

Theoretical Analysis of Tail States Induced by Phonon Scattering in Two-dimensional Systems

University

IIB-17 Threshold voltage stability of 4H-SiC JFET exposed to high-dose gamma ray irradiation

Threshold voltage instability in gamma-rays irradiated 4H-SiC junction field effect transistors

Radiological Science and Technology Takasaki Quantum Applied Research Institute Quantum Function Creation Research Center, 2 Advanced Power Electronics Research Center, National Institute of Advanced Industrial Science and Technology, 3 Hiroshima University Nanodevice Research Institute

IIB-18 Design of JTE structure for vertical devices using p-type GaN epilayer with conductivity control by boron ion implantation

JTE structure design for vertical GaN devices using boron-implanted p-epi layer with controlled-conductivity

Advanced Industrial Science and Technology

industrial session

Date and time: December 20, 2022 (Tuesday) 14:15-15:15

Presentation time: 3 minutes per company [Punctuality]

Location: Venue A (3F Main Hall) Chairs:

Masashi Kato (Nagoya Institute of Technology), Shunta Harada (Nagoya University)

IS-1 Kozu Seiki Co., Ltd.

IS-2 Tomoe Industries Co., Ltd.

IS-3 Ceramic Forum Co., Ltd.

IS-4 STR Japan Co., Ltd.

IS-5 New Metals End Chemicals Corporation

IS-6 ITES Co., Ltd.

IS-7 Lasertec Co., Ltd.

IS-8 Tokyo Electron Ltd.

IS-9 Hitachi High-Tech Co., Ltd.

IS-10 Toki Tsusho Co., Ltd.

IS-11 Tsukuba Power Electronics Constellation (TPEC)

IS-12 Rokko Electronics Co., Ltd.

IS-13 Pulstec Industrial Co., Ltd.

IS-14 Toray Research Center Co., Ltd.

IS-15 Nippon Synopsys LLC

IS-16 Oxford Instruments Ltd.

IS-17 Beneq Co., Ltd.

IS-18 Aehr Test Systems