

8th International WorkShop on New Group IV Semiconductor Nanoelectronics  
and  
JSPS Core-to-Core Program Joint Seminar  
"Atomically Controlled Processing for Ultralarge Scale Integration"

January 29-30, 2015,  
**Conference Room (4th Floor),**  
Laboratory for Nanoelectronics and Spintronics,  
Research Institute of Electrical Communication (RIEC), Tohoku University, Sendai,  
Japan

Co-sponsored by

- Japan Society for the Promotion of Science (JSPS): Core-to-Core Program "Atomically Controlled Processing for Ultralarge Scale Integration"
- Japan Society for the Promotion of Science (JSPS): 154th Committee on Semiconductor Interfaces and Their Applications in University-Industry Cooperative Research Committees

## Technical Program

### January 29 (Thursday), 2015

**10:00 - 10:10**

Introductory Junichi Murota (Tohoku Univ.)

#### [ Session I: Invited & Regular Talks ]

**10:10 - 10:40** (30 min)

I-01. " High quality local GeOI fabrication by lateral selective growth of Germanium",  
(Invited)

Yuji Yamamoto<sup>1</sup>, Markus Andreas Schubert<sup>1</sup>, Christian Reich<sup>1</sup> and Bernd Tillack<sup>1,2</sup>

<sup>1</sup> *IHP (Germany)*

<sup>2</sup> *Technische Universität Berlin (Germany)*

**10:40 - 11:00** (20 min)

O-01. " Effects of strain, interface states and back bias on electrical characteristics of Ge-source UTB strained-SOI tunnel FETs",

Minsoo Kim<sup>1,2</sup>, Yuki K. Wakabayashi<sup>1</sup>, Ryosho Nakane<sup>1</sup>, Masafumi Yokoyama<sup>1,2</sup>, Mitsuru Takenaka<sup>1,2</sup> and Shinichi Takagi<sup>1,2</sup>

<sup>1</sup> *The Univ. of Tokyo (Japan)*

<sup>2</sup> *JST-CREST (Japan)*

**11:00 - 11:20** (20 min)

O-02. " Characterization of Electroluminescence from Multiply-Stack of Doped Si Quantum Dots",

Takahisa Yamada<sup>1</sup>, Katsunori Makihara<sup>1</sup>, Mitsuhsa Ikada<sup>2</sup> and Seiichi Miyazaki<sup>1</sup>

<sup>1</sup> *Graduate School of Engineering, Nagoya University (Japan)*

<sup>2</sup> *Graduate School of Advanced Sciences of Matter, Hiroshima University (Japan)*

**11:20 - 11:40** (20 min)

O-03. " Characterization of Electron Field Emission from High Density Self-aligned Si-based Quantum Dots",

Daichi Takeuchi<sup>1</sup>, Katsunori Makihara<sup>1</sup>, Akio Ohta<sup>2</sup>, Mitsuhsa Ikeda<sup>3</sup> and Seiichi Miyazaki<sup>1</sup>

<sup>1</sup> Graduate School of Engineering, Nagoya University (Japan)

<sup>2</sup> VBL, Nagoya University (Japan)

<sup>3</sup> Graduate School of Advanced Sciences of Matter, Hiroshima University (Japan)

**11:40 - 12:00** (20 min)

O-04. " Study of Raman Peak Shift in Heavily Doped Germanium - A new research opportunity using ultra-thin GeOI",

Shoichi Kabuyanagi<sup>1,2</sup>, Tomonori Nishimura<sup>1,2</sup>, Takeaki Yajima<sup>1,2</sup> and Akira Toriumi<sup>1,2</sup>

<sup>1</sup> Department of Materials Engineering, The University of Tokyo (Japan)

<sup>2</sup> JST-CREST (Japan)

**12:00 - 13:20** Lunch

[ Session II: Invited & Regular Talks ]

**13:20 - 13:50** (30 min)

I-02. " Growth of Germanium-Lead Alloys by Pulsed Laser Induced Epitaxy",  
(Invited)

Stefan Stefanov<sup>1</sup>, Carmen Serra<sup>2</sup>, Alessandro Benedetti<sup>2</sup>, E. Martín<sup>3</sup>, Peter Zaumseil<sup>4</sup>, Dan Buca<sup>5</sup> and Stefano Chiussi<sup>1</sup>

<sup>1</sup> Dpto. Física Aplicada, E. I. Industrial, Univ. de Vigo (Spain)

<sup>2</sup> CACTI, Univ. de Vigo (Spain)

<sup>3</sup> Dpto. Mecánica, Máquinas, Motores Térmicos y Fluidos, Univ. de Vigo (Spain)

<sup>4</sup> IHP (Germany)

<sup>5</sup> Peter Grünberg Institute 9 and JARA-FIT, Forschungszentrum-Jülich (Germany)

**13:50 - 14:10** (20 min)

O-05. " Impact of Hydrogen-induced Out-diffusion of Oxygen from Ge Surface on Junction Leakage and Electron Mobility in Ge n-MOSFETs",

C. H. Lee<sup>1,2</sup>, T. Nishimura<sup>1,2</sup>, C. Lu<sup>1,2</sup>, S. Kabuyanagi<sup>1,2</sup>, and A. Toriumi<sup>1,2</sup>

<sup>1</sup> Department of Materials Engineering, The University of Tokyo (Japan)

<sup>2</sup> JST-CREST (Japan)

**14:10 - 14:30** (20 min)

O-06. " Composition-controlled SiGe crystals on insulator by rapid-melting growth -Analysis and control of SiGe segregation-",

Ryo Matsumura<sup>1,2</sup>, Taizoh Sadoh<sup>1</sup>, and Masanobu Miyao<sup>1</sup>

<sup>1</sup> Department of Electronics, Kyushu University (Japan)

<sup>2</sup> JSPS Research Fellow (Japan)

**14:30 - 14:50** (20 min)

O-07. " Impact of Post Metallization Annealing on Chemical Bonding Features and Interfacial Reactions in Ge-MIS Structure with HfO<sub>2</sub>/TaGe<sub>x</sub>O<sub>y</sub> Dielectric Stack",

Akio Ohta<sup>1</sup>, Hideki Murakami<sup>2</sup>, Katsunori Makihara<sup>3</sup>, and Seiichi Miyazaki<sup>3</sup>

<sup>1</sup> Venture Business Laboratory, Nagoya University (Japan)

<sup>2</sup> Graduate School of Advanced Science of Matter, Hiroshima University (Japan)

<sup>3</sup> Graduate School of Engineering, Nagoya University (Japan)

**14:50 - 15:10** Break (20 min)

[ Session III: Invited & Regular Talks ]

**15:10 - 15:40** (30 min)

I-03. " Electrical Properties of Metal/Ge contacts with Nitrogen-Contained Amorphous Interlayers",

Keisuke Yamamoto<sup>1</sup>, Ryutaro Noguchi<sup>1</sup>, Masatoshi Mitsuhashi<sup>1</sup>, Minoru Nishida<sup>1</sup>, Toru Hara<sup>2</sup>, Dong Wang<sup>1</sup> and Hiroshi Nakashima<sup>1</sup>

<sup>1</sup> Kyushu University (Japan)

<sup>2</sup> National Institute for Materials Science (Japan)

**15:40 - 16:00** (20 min)

O-08. " Dielectric Film Engineering for Ge-rich SiGe MOS Gate Stacks",

C-T. Chang, T. Nishimura and A. Toriumi

Department of Materials Engineering, The University of Tokyo (Japan)

**16:00 - 16:20** (20 min)

O-09. " Fabrication and Characterization of n<sup>+</sup>Si/pGe Heterojunctions by Narrow Membrane Bonding",

Tony C. Liu<sup>1,2</sup>, Shoichi Kabuyanagi<sup>1,2</sup>, Tomonori Nishimura<sup>1,2</sup> and Akira Toriumi<sup>1,2</sup>

<sup>1</sup> Department of Materials Engineering, The University of Tokyo (Japan)

<sup>2</sup> JST-CREST (Japan)

**16:20 - 16:40** (20 min)

O-10. " Crystal growth of Si<sub>1-x</sub>Sn<sub>x</sub> alloys with high Sn contents",

Masashi Kurosawa<sup>1,2</sup>, Motohiro Kato<sup>1</sup>, Yuki Nagae<sup>1</sup>, Takashi Yamaha<sup>1</sup>, Osamu Nakatsuka<sup>1</sup> and Shigeaki Zaima<sup>1,3</sup>

<sup>1</sup> Graduate School of Engineering, Nagoya University (Japan)

<sup>2</sup> JSPS Research Fellow (Japan)

**18:00 - 20:00** Banquet (Hotel Bel Air Sendai, 2nd Floor)

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**January 30 (Friday), 2015**

[ Session IV : Short Talks for Poster ]

**09:30 - 09:35** (5 min)

P-01. " Epitaxial Growth of Ge<sub>1-x</sub>Sn<sub>x</sub> Thin Films by using Metal-Organic Chemical Vapor Deposition",

Yuki Inuzuka<sup>1</sup>, Shinichi Ike<sup>1,2</sup>, Takanori Asano<sup>1,2</sup>, Wakana Takeuchi<sup>1</sup>, Osamu Nakatsuka<sup>1</sup>, and Shigeaki Zaima<sup>1,3</sup>

<sup>1</sup> Graduate School of Engineering, Nagoya University (Japan)

<sup>2</sup> *Research Fellow of the Japan Society for the Promotion of Science (Japan)*

<sup>3</sup> *EcoTopia Science Institute, Nagoya University (Japan)*

**09:35 - 09:40** (5 min)

P-02. " Ultra-Low-Temperature Crystallization of a-GeSn on Insulator for Flexible Electronics",

H. Chikita <sup>1</sup>, R. Matsumura <sup>1,2</sup>, Y. Kai <sup>1</sup>, T. Sadoh <sup>1</sup> and M. Miyao <sup>1</sup>

<sup>1</sup> *Department of Electronics, Kyushu University (Japan)*

<sup>2</sup> *JSPS Research Fellow (Japan)*

**09:40 - 09:45** (5 min)

P-03. " High Density Formation of Mn-Ge Nanodots Induced by Remote Hydrogen Plasma",

Y. Wen, K. Makihara, A. Ohta and S. Miyazaki

*Graduate School of Engineering, Nagoya University (Japan)*

**09:45 - 09:50** (5 min)

P-04. " Formation of strain-free Si<sub>1-x-y</sub>Ge<sub>x</sub>Sn<sub>y</sub> layers on Ge surfaces by using solid-liquid coexisting annealing",

Motohiro Kato <sup>1</sup>, Masashi Kurosawa <sup>1,2</sup>, Takashi Yamaha <sup>1</sup>, Noriyuki Taoka <sup>1,†</sup>, Osamu Nakatsuka <sup>1</sup> and Shigeaki Zaima <sup>1,3</sup>

<sup>1</sup> *Graduate School of Engineering, Nagoya University (Japan)*

<sup>2</sup> *JSPS (Japan)*

<sup>3</sup> *EcoTopia Science Institute, Nagoya University (Japan)*

<sup>†</sup> *Present affiliation: IHP (Germany)*

**09:50 - 09:55** (5 min)

P-05. " Impact of Magnetic-Field Application on Electron Transport Through FePt Alloy Nanodots",

Yuuki Kabeya, Hai Zhang, Akio Ohta, Katsunori Makihara and Seiichi Miyazaki

*Graduate School of Engineering, Nagoya University (Japan)*

**09:55 - 10:00** (5 min)

P-06. " Formation and Characterization of High Density FePt Alloy Nanodots Induced by Remote Hydrogen Plasma",

Yusuke Mitsuyuki, Yuuki Kabeya, Katsunori Makihara, Takeshi Kato, Satoshi Iwata and Seiichi Miyazaki

*Graduate School of Engineering, Nagoya University (Japan)*

**10:00 - 10:05** (5 min)

P-07. " Effect of Si(100)c(4×4) surface reconstruction on Ge dots formation",

Yuhki Satoh, Yuhki Itoh, Tomoyuki Kawashima, and Katsuyoshi Washio

*Graduate School of Engineering, Tohoku University (Japan)*

**10:05 - 10:10** (5 min)

P-08. " Impact of Remote Hydrogen Plasma on Micro-roughness and Electronic States at 4H-SiC (0001) Surface",

Truyen xuan Nguyen <sup>1</sup>, Akio Ohta <sup>2</sup>, Daichi Takeuchi <sup>1</sup>, Hai Zhang <sup>1</sup>, Katsunori Makihara <sup>1</sup> and Seiichi Miyazaki <sup>1</sup>

<sup>1</sup> *Graduate School of Engineering, Nagoya University (Japan)*

<sup>2</sup> *Venture Business Laboratory, Nagoya University (Japan)*

**10:10 - 10:15** (5 min)

P-09. " Photoluminescence Properties of Si Quantum Dots with Ge Core",  
Keigo Kondo, Katsunori Makihara and Seiichi Miyazaki  
*Graduate School of Engineering, Nagoya University (Japan)*

**10:15 - 10:20** (5 min)

P-10. " Influence of Partial Pressures upon Rate Coefficients of SiH<sub>4</sub> and GeH<sub>4</sub> in ECR Ar Plasma CVD of Si<sub>1-x</sub>Ge<sub>x</sub> on Si(100) without Substrate Heating",  
Naofumi Ueno, Masao Sakuraba and Shigeo Sato  
*Laboratory for Nanoelectronics and Spintronics, Research Institute of Electrical Communication, Tohoku University (Japan)*

[ Session V : Poster Presentation ]

**10:20 - 11:50** Poster Presentation (P-01 ~ P-10, 90 min)

**11:50 - 13:10** Lunch

[ Session VI: Invited & Regular Talks ]

**13:10 - 13:40** (30 min)

I-04. " Formation mechanism of aluminum germanate layer on germanium substrate by radical-enhanced atomic layer deposition",

(Invited)

Hiroshi Okamoto<sup>1</sup>, Tomoya Yokohira<sup>2</sup>, Kosei Yanachi<sup>2</sup>, Chiaya Yamamoto<sup>3</sup>, Byeonghaku Yoo<sup>3</sup>, Junji Yamanaka<sup>4</sup>, Tetsuya Sato<sup>3</sup>, Toshiyuki Takamatsu<sup>5</sup>, Hidefumi Narita<sup>1</sup> and Yukio Fukuda<sup>2</sup>

<sup>1</sup> *Hirosaki University (Japan)*

<sup>2</sup> *Tokyo University of Science, Suwa (Japan)*

<sup>3</sup> *University of Yamanashi (Japan)*

<sup>4</sup> *University of Yamanashi (Japan)*

<sup>5</sup> *SST Inc. (Japan)*

**13:40 - 14:00** (20 min)

O-11. " Effect of Al post metallization annealing on Al<sub>2</sub>O<sub>3</sub>/GeO<sub>x</sub>/Ge gate stack",

Yuta Nagatomi<sup>1</sup>, Yuichi Nagaoka<sup>1</sup>, Sintaro Tanaka<sup>1</sup>, Keisuke Yamamoto<sup>2</sup>, Dong Wang<sup>1</sup> and Hiroshi Nakashima<sup>2</sup>

<sup>1</sup> *Interdisciplinary Graduate School of Engineering Sciences, Kyushu University (Japan)*

<sup>2</sup> *Art, Science and Technology Center for Cooperative Research, Kyushu University (Japan)*

**14:00 - 14:20** (20 min)

O-12. " Crystalline and Optical Properties of Ge<sub>1-x-y</sub>Si<sub>x</sub>Sn<sub>y</sub> Ternary Alloy Layers for Solar Cell Application",

Takashi Yamaha<sup>1</sup>, Shunsuke Asaba<sup>1</sup>, Tatsuya Terashima<sup>1</sup>, Takanori Asano<sup>1,2</sup>, Wakana Takeuchi<sup>1</sup>, Mitsuo Sakashita<sup>1</sup>, Noriyuki Taoka<sup>1</sup>, Osamu Nakatsuka<sup>1</sup>, and Shigeaki Zaima<sup>1,3</sup>

<sup>1</sup> *Graduate School of Engineering, Nagoya University (Japan)*

<sup>2</sup> *JSPS Research Fellow (Japan)*

<sup>3</sup> *EcoTopia Science Institute, Nagoya University (Japan)*

**14:20 -14:40** (20 min)

- O-13. " High Density Formation of Fe-Silicide Nanodots Induced by Remote Hydrogen Plasma",  
Hai Zhang <sup>1</sup>, Katsunori Makihara <sup>1</sup>, Akio Ohta <sup>2</sup>, Mitsuhsa Ikeda <sup>3</sup> and Seiichi Miyazaki <sup>1</sup>  
<sup>1</sup> *Graduate School of Engineering, Nagoya University (Japan)*  
<sup>2</sup> *Ventur Busines Laboratory, Nagoya University (Japan)*  
<sup>3</sup> *Graduate School of Advanced Science of Matter, Hiroshima University (Japan)*

**14:40 - 15:00** Break (20 min)

[ Session VII: Invited & Regular Talks ]

**15:00 - 15:30** (30 min)

- I-05. " Behaviors of tin related defects in Sb doped n-type germanium",  
(Invited)  
W. Takeuchi <sup>1</sup>, N. Taoka <sup>1</sup>, M. Sakashita <sup>1</sup>, O. Nakatsuka <sup>1</sup> and S. Zaima <sup>1,2</sup>  
<sup>1</sup> *Grad. Sc. of Eng., Nagoya Univ. (Japan)*  
<sup>2</sup> *EcoTopia Science Institute, Nagoya Univ. (Japan)*

**15:30 - 15:50** (20 min)

- O-14. " Effect of sub-monolayer carbon on Ge/Si(100) layer on Ge dot formation",  
Yuhki Itoh, Shinji Hatakeyama, Tomoyuki Kawashima and Katsuyoshi Washio  
*Graduate School of Engineering, Tohoku University (Japan)*

**15:50 - 16:10** (20 min)

- O-15. " Photoluminescence Property of Ge<sub>1-x</sub>Sn<sub>x</sub> Epitaxial Layers Grown on Ge(001) substrates",  
Takanori Asano <sup>1,2</sup>, Koya Hozaki <sup>1</sup>, Takeshi Koyama <sup>3</sup>, Noriyuki Taoka <sup>1,†</sup>, Osamu  
Nakatsuka <sup>1</sup>, Hideo Kishida <sup>3</sup> and Shigeaki Zaima <sup>1,4</sup>  
<sup>1</sup> *Department of Crystalline Materials Science, Graduate School of Engineering, Nagoya  
University (Japan)*  
<sup>2</sup> *Research Fellow of the Japan Society for the Promotion of Science (Japan)*  
<sup>3</sup> *Department of Applied Physics, Graduate School of Engineering, Nagoya University  
(Japan)*  
<sup>4</sup> *EcoTopia Science Institute, Nagoya University (Japan)*  
<sup>†</sup> *Present affiliation: IHP (Germany)*

**16:10 - 16:30** Closing Remarks

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