

**10th International WorkShop on New Group IV Semiconductor Nanoelectronics  
and  
JSPS Core-to-Core Program Joint Seminar  
"Atomically Controlled Processing for Ultralarge Scale Integration"**

February 13-14, 2017,  
**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
- Cooperative Research Project Program of the Research Institute of Electrical Communication, Tohoku University

## Technical Program

### February 13 (Monday), 2017

**09:20 - 09:30**

Introductory Junichi Murota (Tohoku Univ.)

#### [ Session 1-1 : Invited & Regular Talks ]

**09:30 - 10:00 (30 min)**

I-01. " Progress on Laser processing of Group-IV semiconductors at the New Materials Group of the University of Vigo",

(Invited)

S. Chiussi<sup>1</sup>, S. Stefanov<sup>1</sup>, E. Martin<sup>2</sup>, C. Serra<sup>3</sup>, A. Benedetti<sup>3</sup>, Ralph Delmdahl<sup>4</sup>, P. Gonzalez<sup>1</sup>

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

<sup>2</sup> *Dpto. Mecanica, Maquinas, Motores Termicos y Fluidos, Univ. de Vigo (Spain)*

<sup>3</sup> *CACTI, Univ. de Vigo (Spain)*

<sup>4</sup> *Coherent LaserSystems GmbH & Co. KG (Germany)*

**10:00 - 10:30 (30 min)**

I-02. " Effect of Oxynitridation Annealing for SiO<sub>2</sub>/SiC Interface on Defects Properties",

(Invited)

Wakana Takeuchi<sup>1</sup>, Kensaku Yamamoto<sup>2</sup>, Mitsuo Sakashita<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> DENSO CORPORATION (Japan)

<sup>3</sup> Institute of Materials and Systems for Sustainability, Nagoya University  
(Japan)

**10:30 - 10:50** (20 min)

O-01. " Effect of n-type doping level on direct band gap light emission intensity for asymmetric metal/Ge/metal diodes",

Takayuki Maekura <sup>1</sup>, Chisato Motoyama <sup>1</sup>, Kentaro Tanaka <sup>1</sup>, Keisuke Yamamoto <sup>1</sup>, Hiroshi Nakashima <sup>2</sup> and Dong Wang <sup>1</sup>

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

<sup>2</sup> Global Innovation Center, Kyushu University (Japan)

**10:50 - 11:10** (20 min)

O-02. " In situ phosphorus doping of Ge and Ge<sub>1-x</sub>Sn<sub>x</sub> epitaxial layers by low-temperature metal-organic chemical vapor deposition",

Shinichi Ike <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> Institute of Materials and Systems for Sustainability, Nagoya University  
(Japan)

**11:10 - 11:30** (20 min)

O-03. " Influence of ALD High-k film deposition on plasma oxidation GeO<sub>x</sub>/Ge gate stacks",

M. Ke, M. Takenaka and S. Takagi

Department of Electrical Engineering, Graduate School of Engineering, The University of Tokyo (Japan)

**11:30 - 12:50** Lunch

[ Session 1-2 : Short Talks for Poster ]

**12:50 - 12:55** (5 min)

P-01. " Suppression effect of secondary phase formation on solid-phase crystallization in V-doped ZnO thin films",

Akihiro Watanabe, Tomoyuki Kawashima and Katsuyoshi Washio  
Graduate School of Engineering, Tohoku University (Japan)

**12:55 - 13:00** (5 min)

P-02. " IR spectroscopic study during air-exposure of silicon nitride films grown at a low substrate temperature using VHF-PECVD",

Shin-ichi Kobayashi

Department of Electronics and Mechatronics, Tokyo Polytechnic University  
(Japan)

**13:00 - 13:05** (5 min)

P-03. " High-quality ZnO thin films grown by V and N co-doping at room temperature",

Tomoya Suzuki, Tomoyuki Kawashima and Katsuyoshi Washio  
Graduate School of Engineering, Tohoku University (Japan)

**13:05 - 13:10** (5 min)

P-04. " Solid phase crystallization of Ge<sub>0.98</sub>Sn<sub>0.02</sub> layers on various insulating substrates",

Isao Yoshikawa<sup>1</sup>, Masashi Kurosawa<sup>1,2</sup>, Wakana Takeuchi<sup>1</sup>, Mitsuo Sakashita<sup>1</sup>, Osamu Nakatsuka<sup>1</sup> and Shigeaki Zaima<sup>1,3</sup>

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

<sup>2</sup> PRESTO, Japan Science and Technology Agency (Japan)

<sup>3</sup> Inst. of Mater. and Sys. for Sustainability, Nagoya University (Japan)

**13:10 - 13:15** (5 min)

P-05. " Rhombohedrally aligned growth of Ge(111) film on c-plane sapphire substrate",

Yamato Kawaguchi<sup>1</sup>, Yuhki Itoh<sup>1,2,3</sup>, Tomoyuki Kawashima<sup>1</sup> and Katsuyoshi Washio<sup>1</sup>

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

<sup>2</sup> Division for International Advanced Research and Education, Tohoku University (Japan)

<sup>3</sup> Japan Society for the Promotion of Science Research Fellow for young Scientists (Japan)

**13:15 - 13:20** (5 min)

P-06. " Influence of atomic layer deposition temperature of GeO<sub>2</sub> layer on electrical properties of Ge and Ge<sub>1-x</sub>Sn<sub>x</sub> gate stack",

Yuichi Kaneda<sup>1</sup>, Masayuki Kanematsu<sup>1</sup>, Mitsuo Sakashita<sup>1</sup>, Wakana Takeuchi<sup>1</sup>, Osamu Nakatsuka<sup>1</sup> and Shigeaki Zaima<sup>1,2</sup>

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

<sup>2</sup> Inst. of Mater. and Sys. for Sustainability, Nagoya University (Japan)

**13:20 - 13:25** (5 min)

P-07. " Influence of carbon binding states at Ge/Si(100) interface on Ge quantum dot formation via carbon mediation",

Kosuke Yasuta<sup>1</sup>, Yuhki Itoh<sup>1,2,3</sup>, Tomoyuki Kawashima<sup>1</sup> and Katsuyoshi Washio<sup>1</sup>

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

<sup>2</sup> Division for International Advanced Research and Education, Tohoku University (Japan)

<sup>3</sup> Japan Society for the Promotion of Science Research Fellow for young Scientists (Japan)

[ Session 1-3 : Poster Presentation ]

**13:25 - 14:15** Poster Presentation (P-01 ~ P-07, 50 min)

[ Session 1-4 : Invited & Regular Talks ]

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

I-03. " Strain relaxation in GeSn alloys",

(Invited)

N. von den Driesch<sup>1</sup>, D. Rainko<sup>1</sup>, S. Wirths<sup>1</sup>, A.T. Tiedemann<sup>1</sup>, U. Breuer<sup>2</sup>, G. Mussler<sup>1</sup>, J.M. Hartmann<sup>3</sup>, S. Mantl<sup>1</sup>, D. Grützmacher<sup>1</sup> and D. Buca<sup>1</sup>

<sup>1</sup> Peter Gruenberg Institute (PGI 9-IT) and JARA – Fundamentals of Future

*Information Technologies, Forschungszentrum Jülich (Germany)*  
*<sup>2</sup> Central Institute for Engineering, Electronics and Analytics (ZEA),  
Forschungszentrum Jülich (Germany)*  
*<sup>3</sup> Univ. Grenoble Alpes and CEA, LETI, MINATEC Campus (France)*

**14:50 - 15:20** (30 min)

I-04. " Optical properties of gated silicon field emitter array",  
(Invited)

H. Shimawaki <sup>1</sup>, M. Nagao <sup>2</sup>, Y. Neo <sup>3</sup> and H. Mimura <sup>3</sup>

<sup>1</sup> *Department of System and Information Engineering, Hachinohe Institute of  
Technology (Japan)*

<sup>2</sup> *Nanoelectronics Research Institute, National Institute of Advanced Industrial  
Science and Technology (Japan)*

<sup>3</sup> *Research Institute of Electronics, Shizuoka University (Japan)*

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

O-04. " Carbon-mediated Ge quantum dot formation via c(4x4) surface reconstruction  
and solid-phase epitaxy",

Yuhki Itoh <sup>1, 2, 3</sup>, Tomoyuki Kawashima <sup>1</sup> and Katsuyoshi Washio <sup>1</sup>

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

<sup>2</sup> *Division for International Advanced Research and Education, Tohoku  
University (Japan)*

<sup>3</sup> *Japan Society for the Promotion of Science Research Fellow for Young  
Scientists (Japan)*

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

[ Session 1-5 : Invited & Regular Talks ]

**16:00 - 16:30** (30 min)

I-05. " Achievement of Ultralow Contact Resistivity of Metal/Ge Contacts with Zr-N-Ge  
Amorphous Interlayer",

(Invited)

Keisuke Yamamoto, Hayato Okamoto, Dong Wang and Hiroshi Nakashima

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

<sup>2</sup> *Global Innovation Center, Kyushu University (Japan)*

**16:30 - 16:50** (20 min)

O-05. " Deposition and solid-phase crystallization of amorphous CuCrO<sub>2</sub>:N thin films  
on c-face sapphire substrate",

Hiroshi Chiba <sup>1,2</sup>, Naotoshi Hosaka <sup>1</sup>, Tomoyuki Kawashima <sup>1</sup> and Katsuyoshi  
Washio <sup>1</sup>

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

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

**16:50 - 17:10** (20 min)

O-06. " Fabrication and characterization of P3HT polymer-based organic thin film  
transistors with electrodes of highly doped P3HT",

Daisuke Tadaki <sup>1</sup>, Teng Ma <sup>1</sup>, Jinyu Zhang <sup>1</sup>, Shohei Iino <sup>1</sup>, Ayumi Hirano-Iwata  
<sup>1,2</sup>, Yasuo Kimura <sup>3</sup>, Richard A. Rosenberg <sup>4</sup> and Michio Niwano <sup>1</sup>

<sup>1</sup> *Research Institute of Electrical Communication, Tohoku University (Japan)*

<sup>2</sup> *Advanced Institute for Materials Research, Tohoku University (Japan)*

<sup>3</sup> *Tokyo University of Technology (Japan)*

<sup>4</sup> *Advanced Photon Source, Argonne National Laboratory (USA)*

**18:00 - 20:00** Banquet (Hotel Bel Air Sendai, 1st Floor Restaurant)

## **February 14 (Tuesday), 2017**

### **[ Session 2-1 : Short Talks for Poster ]**

**09:00 - 09:05** (5 min)

P-08. " Evaluation of Dielectric Function of Oxide Thin Films from Photoemission Measurements",

Taishi Yamamoto, Akio Ohta, Mitsuhsa Ikeda, Katsunori Makihara and Seiichi Miyazaki

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

**09:05 - 09:10** (5 min)

P-09. " Low-Temperature (~250°C) Growth of Large-Grain Sn-Doped Ge (100) on Insulator by Al-Induced Crystallization for Flexible Electronics",

M. Sasaki, M. Miyao and T. Sadoh

*Department of Electronics, Kyushu University (Japan)*

**09:10 - 09:15** (5 min)

P-10. " Luminescence Studies of High Density Si Quantum Dots with Ge core",

Kentaro Yamada, Mitsuhsa Ikeda, Katsunori Makihara and Seiichi Miyazaki

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

**09:15 - 09:20** (5 min)

P-11. " Chemical Analysis of Epitaxial Ag(111) Surface formed on Group-IV Semiconductors",

K. Ito <sup>1</sup>, A. Ohta <sup>1,2</sup>, M. Kurosawa <sup>1,2</sup>, M. Araidai <sup>1,2,3</sup>, M. Ikeda <sup>1</sup>, K. Makihara <sup>1</sup> and S. Miyazaki <sup>1</sup>

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

<sup>2</sup> *Institute for Advanced Research, Nagoya University (Japan)*

<sup>3</sup> *Institute of Materials and Systems for Sustainability, Nagoya University (Japan)*

**09:20 - 09:25** (5 min)

P-12. " Microwire-embedded flexible pressure sensor with poly(vinylidene fluoride) thin film ",

Ryohei Abe <sup>1</sup>, Daisuke Tadaki <sup>1</sup>, Teng Ma <sup>1</sup>, Yuji Imai <sup>2</sup>, Ayumi Hirano-Iwata <sup>1,3</sup> and Michio Niwano <sup>1</sup>

<sup>1</sup> *RIEC, Tohoku Univ. (Japan)*

<sup>2</sup> *Sendai National College of Technology (Japan)*

<sup>3</sup> *AIMR, Tohoku Univ. (Japan)*

**09:25 - 09:30** (5 min)

P-13. " Characterization of Field Electron Emission from Multiply-Stacking Si Quantum Dots",

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

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

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

[ Session 2-2 : Poster Presentation ]

**09:30 - 10:20** Poster Presentation (P-08 ~ P-13, 50 min)

[ Session 2-3: Invited & Regular Talks ]

**10:25 - 10:55** (30 min)

I-06 " Photoluminescence of in-situ Phosphorus Doped Epitaxial Ge",  
(Invited)

Yuji Yamamoto<sup>1</sup>, Michael Reiner Barget<sup>2</sup>, Giovanni Capellini<sup>1,3</sup>, Michele Virgilio<sup>4</sup>, Peter Zaumseil<sup>1</sup>, Anne Hesse<sup>1</sup>, Thomas Schroeder<sup>1,5</sup> and Bernd Tillack<sup>1,6</sup>

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

<sup>2</sup> *Dipartimento di Scienza dei Materiali, Università Milano-Bicocca (Italy)*

<sup>3</sup> *Dipartimento di Scienze, Università degli Studi Roma Tre (Italy)*

<sup>4</sup> *Dipartimento di Fisica 'E Fermi', Università di Pisa (Italy)*

<sup>5</sup> *BTU Cottbus-Senftenberg (Germany)*

<sup>6</sup> *Technische Universität Berlin (Germany)*

**10:55 - 11:25** (30 min)

I-07. " Total Photoelectron Yield Spectroscopy of Electronic States of Oxide Thin Films and Wide Bandgap Semiconductors",

(Invited)

Akio Ohta<sup>1,2</sup>, Taishi Yamamoto<sup>1</sup>, Nguyen Xuan Truyen<sup>1</sup>, Mitsuhsa Ikeda<sup>1</sup>, Katsunori Makihara<sup>1</sup> and Seiichi Miyazaki<sup>1</sup>

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

<sup>2</sup> *Institute for Advanced Research, Nagoya Univ. (Japan)*

**11:25 - 11:45** (20 min)

O-07. " Formation of Si-based Quantum Dots on Sub-micron patterned Si Substrates",  
Mitsuhsa Ikeda, Lei Gao, Kentaro Yamada, Katsunori Makihara, Akio Ohta and Seiichi Miyazaki

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

**11:45 - 12:05** (20 min)

O-08. " Electrical Characteristics of Epitaxial p-n Junctions of Si and SiGe Formed by Plasma CVD without Substrate Heating",

Naofumi Ueno, Masao Sakuraba, Hisanao Akima and Shigeo Sato

*Research Institute of Electrical Communication, Tohoku University (Japan)*

**12:05 - 13:10** Lunch

[ Session 2-4 : Invited & Regular Talks ]

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

- I-08. " Fabrication and characterization of high quality perovskite films",  
(Invited)  
Teng Ma <sup>1</sup>, Ayumi Hirano-Iwata <sup>1,2</sup> and Michio Niwano <sup>1</sup>  
<sup>1</sup> *RIEC, Tohoku Univ. (Japan)*  
<sup>2</sup> *AIMR, Tohoku Univ. (Japan)*

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

- O-09. " Characterization of Remote Plasma CVD SiO<sub>2</sub> on GaN(0001)",  
N. Truyen, A. Ohta, M. Ikeda, K. Makihara and S. Miyazaki  
*Graduate School of Engineering, Nagoya University (Japan)*

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

- O-10. " Potential Change and Electrical Dipole at Ultrathin Oxide/Semiconductor Interfaces as Evaluated by XPS",  
Nobuyuki Fujimura, Akio Ohta, Mitsuhisa Ikeda, Katsunori Makihara and Seiichi Miyazaki  
*Graduate School of Engineering, Nagoya University (Japan)*

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

[ Session 2-5 : Invited Talks ]

**14:40 -15:10** (30 min)

- I-09. " Multifunction ZnO films via vanadium doping",  
(Invited)  
Tomoyuki Kawashima and Katsuyoshi Washio  
*Graduate School of Engineering, Tohoku University (Japan)*

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

- I-10. " Physical implication of metal wave function evanescent at metal/Ge interface",  
(Invited)  
Tomonori Nishimura, Soshi Matsumoto, Takeaki Yajima and Akira Toriumi  
*Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo (Japan)*

**15:40 - 15:50** Closing Remarks & Group Photo