

— NSAP 2012 Scientific Program —

May 10, 2012 (Thursday): Springs Hall, B2, Annex Building

Opening Ceremony

(10:30 - 10:40) *Opening Address & Introductory Talk*

Welcome Message, and Introduction & Scope of the International Workshops on Frontier of NSAP and Extended NSAP “*Frontier of Nitride Semiconductor Alloy Photonics: Emerging Photonic Devices in UV-VIS-NIR-THz*”

Akihiko Yoshikawa (Chiba University) i

1. Fundamentals of Alloy Semiconductor Electronics / Photonics in Miscible and Immiscible Systems

1-1 (10:40 - 11:20) *Keynote Talk*

Fundamentals of Physics and Electronics Alloy Semiconductors

Akio Sasaki (Kyoto University) 1

1-2 (11:20 - 11:50) *Invited*

TEM Characterization of Ordered and Disordered Semiconductor Alloys

Arantxa Vilita Clemente, Marie Pierre Chauvat, Bertrand Lacroix, Geeta Rani Mutta, Yi Wang, Magali Morales, Pierre Ruterana and the RAINBOW Consortium (CAEN-CNRS-G) 11

1-3 (11:50 - 12:20) *Invited*

In-grown and process-induced deep levels in AlGaIn alloys

Tamotsu Hashizume (Hokkaido University) 19

1-4 (12:20 - 12:50) *Invited*

SNOM Characterization on Inhomogeneity and Defects in III-N Alloy Semiconductors

Yoichi Kawakami, Akio Kaneta and Mitsuru Funato (Kyoto University) 25

Lunch (12:50 - 14:00)

1-5 (14:00 - 14:30) *Invited*

Towards Ultimately Efficient InGaIn-based White LEDs

Takashi Mukai (Nichia Corporation) 33

1-6 (14:30 - 15:00) *Invited*

Metastable composite nature of InN and In-rich InGaIn alloys as seen by sophisticated structural, optical and electrical studies

Sergey Ivanov (Ioffe Physical-Technical Institute) 35

1-7 (15:00 - 15:30) *Invited*

Growth of InGaIn Ternary Alloys and InN/GaN Short Period Superlattices by MBE

X.Q. Wang, S.T. Liu, X.T. Zheng, D.Y. Ma, and B. Shen (Peking University) 44

1-8 (15:30 - 16:00) *Invited*

Growth and Characterization of High-In Content InGaIn for Red LEDs by MOVPE

Momoko Deura and Kazuhiro Ohkawa (Tokyo University of Science) 47

Break (16:00 - 16:20)

2. Design, Fabrication, and Characterization of Functionality III-N-based Short-Period Superlattices for Frontier Photonics

- 2-1** (16:20 - 17:00) *Keynote Talk*
Fabrication and Characterization of Al(Ga)N/GaN ISB Devices
E. Monroy, Y. Kotsar, A. Das, S. Valdueza-Felip, P. K. Kandaswamy, R. Songmuang (CEA-CNRS Group), S. Sakr, M. Tchernycheva, F. H. Julien (Institut d'Electronique Fondamentale-CNRS), E. Gross, A. Pesach, and G. Bahir (Technion-Israel Institute of Technology) 52
- 2-2** (17:00 – 17:30) *Invited*
THz Quantum Cascade Lasers with AlN/GaN Short-Period Superlattices
Wataru Terashima and Hideki Hirayama (RIKEN) 56
- 2-3** (17:30 – 18:00) *Invited*
Proposal of SMART III-Nitride Tandem Solar Cells and Development of SMART Epitaxy Processes
Kazuhide Kusakabe and Akihiko Yoshikawa (Chiba University) 64
- 2-4** (18:00 – 18:30) *Invited*
First principles calculations of III-Nitride-based short-period superlattices
Mauro Ribeiro Jr., Lara Kühl Teles, Marcelo Marques, Ronaldo. R. Pela (ITA), Clovis Caetano (Universidade da Fronteira Sul), Jürgen Furthmüller (Friedrich-Schiller-Universität), Luiz Guimarães Ferreira (ITA, USP) and Akihiko Yoshikawa (Chiba University) 68
- 2-5** (18:30 – 19:00) *Invited*
Band structure of short period InN/GaN superlattices: Ab-initio calculations versus experimental studies of the light emission
I. Gorczyca, T. Suski, G. Staszczak (UNIPRESS), E. Dimakis (University of Crete), and T.D. Moustakas (Boston University) 71

Opinion Exchange Meeting: Crystal Room, 3F, Main Building (19:10 - 21:10)

May 11, 2012 (Friday): Crystal Room, 3F, Main Building

3. III-V and III-N-based High Efficiency Solar Cells for Future Energy Harvesting

- 3-1** (9:30 – 10:10) *Keynote Talk*
Recent Advances and Future Prospects of III-V Multijunction & Nanoepitaxial Solar Cells
Masakazu Sugiyama, Kentaroh Watanabe, Yoshiaki Nakano (The University of Tokyo) 74
- 3-2** (10:10 – 10:50) *Keynote Talk*
Present Status and Future Prospects of III-Nitride Based Tandem Solar Cells
Wladek Walukiewicz (Lawrence Berkeley National Laboratory) 81
- 3-3** (10:50 – 11:30) *Keynote Talk*
InGaN-Based Solar Cells for Ultrahigh Efficiency Multijunction Solar Cell Applications
James S. Speck, Robert M. Farrell, Carl J. Neufeld, Nathan G. Young, Michael Iza, Samantha C. Cruz, Emmett E. Perl, Jordan R. Lang, Yan-Ling Hu, Dobri Simeonov, Nihal Singh, Stacia Keller (UCSB), Daniel J. Friedman (NREL), John E. Bowers, Shuji Nakamura, Steven P. DenBaars, and Umesh K. Mishra (UCSB)82

3-4	(11:30 – 12:00) <i>Invited</i>	
	Challenge for the growth of high-In-content InGaN	
	T. Doi, T. Ohata, T. Tabata, S. Nakagawa, Y. Kawai, Y. Honda, M. Yamaguchi, <u>H. Amano</u>	
	(Nagoya University)	85

Lunch (12:00 - 13:10)

3-5	(13:10 – 13:40) <i>Invited</i>	
	Recent Progress in MOVPE grown III-N Solar Cells	
	<u>Akio Yamamoto</u> (University of Fukui) and Ashraful G. Bhuiyan (Khulna University of	
	Engineering and Technology)	90

3-6	(13:40 – 14:10) <i>Invited</i>	
	Fabrication and Characterization of Thin InGaN Solar Cells by Epilayer Transferring	
	Technologies	
	<u>Ray-Hua Horng</u> (National Chung Hsing University), Ming-Chun Tseng (National Cheng Kung	
	University), Wen-Yih Liao (Industrial Technology Research Institute Electronics and	
	Opto-Electronics Research Laboratories), Tsung-Yen Tsai (National Chung Hsing University)..	98

3-7	(14:10 – 14:40) <i>Invited</i>	
	Strategy and Present Status of III-N Solar Cell Development	
	<u>Dong-Seon Lee</u> , Jae-Phil Shim, Seong-Ju Park (Gwangju Institute of Science and Technology)	
	and Seong-Ran Jeon (Korea Photonics Technology Institute)	104

3-8	(14:40 – 15:10) <i>Invited</i>	
	Properties of III-N Solar Cells Grown by PXD	
	<u>Hiroshi Fujioka</u> (The University of Tokyo)	110

Break (15:10 - 15:30)

4. Frontier of III-N-based Alloy Photonics and Its Application for LEDs/LDs

4-1	(15:30 – 16:00) <i>Invited</i>	
	High Performance III-N LEDs Grown on Bulk GaN Substrates	
	<u>Toshiya Yokogawa</u> (Panasonic Corporation)	138 [†]
4-2	(16:00 – 16:30) <i>Invited</i>	
	Semi-polar Growth of High Quality InGaN for Green LDs	
	<u>Takao Nakamura</u> (Sumitomo Electric Industries)	113
4-3	(16:30 – 17:00) <i>Invited</i>	
	Growth and Properties of In-rich InGaN in Nanostructure	
	<u>Katsumi Kishino</u> , Jumpei Kamimura and Akihiko Kikuchi (Sophia University)	117
4-4	(17:00 – 17:30) <i>Invited</i>	
	MOVPE of High-Al Content AlGaIn for Electron Beam Excited 250nm Light Source	
	<u>Hideto Miyake</u> , Fumitsugu Fukuyo, Shunsuke Ochiai, Kazumasa Hiramatsu (Mie University),	
	Harumasa Yoshida and Yuji Kobayashi (Hamamatsu Photonics K.K.)	119

5. Overview and Prospects for “Frontier of NSAP”

5-1 (17:30 – 18:00) *Invited*

Superfine III-As-Based Nanostructures for THz Quantum-Cascade Lasers: Tips for III-N Nanostructures

H. T. Grahn (Paul Drude Institute for Solid State Electronics) 122

5-2 (18:00 – 18:10) *Closing/Summary*

Overview and Prospects for III-N SMART Energy Harvesting and Saving

Wladek Walukiewicz (Lawrence Berkeley National Laboratory)

Special Session for Invited Guests Staying More Nights in Makuhari: Suiran, 2F, Main Building

(18:30 - 20:30)

Free Discussion on SMART Energy Harvesting and Saving with III-Nitride Semiconductors

May 12, 2012 (Saturday): Cattleya Room, 3F, Main Building

Satellite Workshop

6. Extended NSAP: III-N, III-N-As, III-O and Related Semiconductor Alloys

6-1 (9:30 – 9:50) *Opening Remarks & Introductory Talk*

Overview of Material Properties of InGaN Ternary Alloys for III-Nitride Tandem Solar Cells

Akihiko Yoshikawa, Naoki Hashimoto, Kazuhide Kusakabe, and Takaomi Itoi

(Chiba University) 142[†]

6-2 (9:50 – 10:40) *Keynote Talk*

Fundamentals and Properties of III-N-As Alloys

Kentaro Onabe (The University of Tokyo) 124

6-3 (10:40 – 11:30) *Keynote Talk*

Prospective Functions of III-O and Related Alloys

Shizuo Fujita (Kyoto University) 132

6-4 (11:30 – 12:00) *Invited Talk*

SMART Green Innovation with Widegap Semiconductors

Fumio Hasegawa (Tsukuba University)

Special Session for Invited Guests Staying More Nights in Chiba

(18:00 – 20:00)

Free Discussion on SMART Green Innovation

[†] Replaced by editorial reasons