

PROCEEDINGS OF SPIE

Gallium Nitride Materials and Devices VII

**Jen-Inn Chyi
Yasushi Nanishi
Hadis Morkoç
Joachim Piprek
Euijoon Yoon**
Editors

**23–26 January 2012
San Francisco, California, United States**

Sponsored and Published by
SPIE

Volume 8262

Proceedings of SPIE, 0277-786X, v. 8262

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Gallium Nitride Materials and Devices VII*, edited by Jen-Inn Chyi, Yasushi Nanishi, Hadis Morkoç, Joachim Piprek, Euijoon Yoon, Proceedings of SPIE Vol. 8262 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN 0277-786X
ISBN 9780819489050

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Copyright © 2012, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/12/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE 
Digital Library

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

- xi Conference Committee
- xv *Spinoptics: Spin degeneracy removal in nanostructures (Plenary Paper) [8269-100]*
V. Kleiner, N. Shitrit, E. Hasman, Technion-Israel Institute of Technology (Israel)

GROWTH I

- 8262 02 **High growth rate of AlGa_N for buffer structures for GaN on Si to increase throughput (Invited Paper) [8262-01]**
K. Matsumoto, TN EMC Ltd. (Japan); A. Ubukata, K. Ikenaga, K. Naito, Taiyo Nippon Sanso Corp. (Japan); J. Yamamoto, TN EMC Ltd. (Japan); Y. Yano, T. Tabuchi, A. Yamaguchi, Taiyo Nippon Sanso Corp. (Japan); Y. Ban, K. Uchiyama, TN EMC Ltd. (Japan)
- 8262 05 **Pyramid nano-voids in GaN and InGa_N [8262-04]**
A. B. Yankovich, A. V. Kvit, Univ. of Wisconsin-Madison (United States); H. Y. Liu, X. Li, F. Zhang, V. Avrutin, N. Izyumskaya, Ü. Özgür, H. Morkoç, Virginia Commonwealth Univ. (United States); P. M. Voyles, Univ. of Wisconsin-Madison (United States)

GROWTH II

- 8262 08 **GaN substrates with variable vicinal angles for laser diode applications [8262-07]**
M. Sarzyński, Institute of High Pressure Physics (Poland) and TopGaN Ltd. (Poland); T. Suski, G. Staszczak, Institute of High Pressure Physics (Poland); P. Perlin, M. Leszczyński, Institute of High Pressure Physics (Poland) and TopGaN Ltd. (Poland); A. Reszka, B. Kowalski, Institute of Physics (Poland)

DOPING

- 8262 0B **Carbon-doped p-type (0001) plane AlGa_N (Al=0.06 to 0.55) with high hole density (Invited Paper) [8262-10]**
H. Kawanishi, Kogakuin Univ. (Japan)
- 8262 0C **High pressure annealing of Europium implanted GaN [8262-11]**
K. Lorenz, Instituto Tecnológico e Nuclear (Portugal) and Univ. de Lisboa (Portugal); S. M. C. Miranda, Instituto Tecnológico e Nuclear (Portugal) E. Alves, Instituto Tecnológico e Nuclear (Portugal) and Univ. de Lisboa (Portugal); I. S. Roqan, K. P. O'Donnell, Univ. of Strathclyde (United Kingdom); M. Boćkowski, Institute of High Pressure Physics (Poland)
- 8262 0D **A local vibration mode in a carbon doped (1-101)AlGa_N [8262-12]**
N. Sawaki, K. Hagiwara, Aichi Institute of Technology (Japan); K. Yamashita, N. Koide, Y. Honda, M. Yamaguchi, H. Amano, Nagoya Univ. (Japan)
- 8262 0E **AlGa_N polarization doping effects on the efficiency of blue LEDs [8262-13]**
J. Piprek, NUSOD Institute LLC (United States)

MATERIAL CHARACTERIZATION

- 8262 OG **Recombination and diffusion processes in polar and nonpolar bulk GaN investigated by time-resolved photoluminescence and nonlinear optical techniques** [8262-15]
K. Jarašiūnas, P. Ščajev, S. Nargelas, R. Aleksiejūnas, Vilnius Univ. (Lithuania); J. Leach, T. Paskova, Kyma Technologies, Inc. (United States); S. Okur, Ü. Özgür, H. Morkoç, Virginia Commonwealth Univ. (United States)
- 8262 OK **Auger effect in nonpolar quantum wells** [8262-19]
L. Schade, U. T. Schwarz, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany) and Univ. Freiburg (Germany); T. Wernicke, J. Rass, S. Ploch, Technische Univ. Berlin (Germany); M. Weyers, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); M. Kneissl, Technische Univ. Berlin (Germany) and Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany)
- 8262 OL **Mg-hydrogen interaction in AlGaIn alloys** [8262-20]
M. E. Zvanut, U. R. Sunay, J. Dashdorj, W. R. Willoughby, The Univ. of Alabama at Birmingham (United States); A. A. Allerman, Sandia National Labs. (United States)

NANO STRUCTURES AND DEVICES I

- 8262 ON **Scaling of GaN single nanowire MOSFET with cut-off frequency 150GHz** [8262-22]
J.-W. Yu, Y.-R. Wu, L.-H. Peng, National Taiwan Univ. (Taiwan)
- 8262 OO **Hardened planar nitride based cold cathode electron emitter** [8262-23]
R. Pillai, Univ. of Houston (United States); D. Starikov, C. Boney, Univ. of Houston (United States) and Integrated Micro Sensors, Inc. (United States); A. Bensaoula, Univ. of Houston (United States)
- 8262 OP **Influence of nanowire template morphology on the coalescence overgrowth of GaN nanowires on Si by molecular beam epitaxy** [8262-24]
P. Dogan, O. Brandt, C. Hauswald, R. Calarco, A. Trampert, L. Geelhaar, H. Riechert, Paul-Drude-Institut für Festkörperelektronik (Germany)

NANO STRUCTURES AND DEVICES III

- 8262 OW **Electronic and thermal tuning of violet GaN coupled cavity laser** [8262-31]
O. Guziy, Technische Univ. Delft (Netherlands); S. Grzanka, M. Leszczyński, P. Perlin, Institute of High Pressure Physics (Poland) and TopGaN Ltd (Poland); H. W. M. Salemink, Technische Univ. Delft (Netherlands)
- 8262 OX **Lasng action in gallium nitride photonic quasicrystal nanorod arrays** [8262-32]
S.-P. Chang, K.-P. Sou, J.-R. Chang, National Chiao Tung Univ. (Taiwan); Y.-J. Cheng, National Chiao Tung Univ. (Taiwan) and Academia Sinica (Taiwan); Y.-J. Li, Y.-C. Chen, H.-C. Kuo, K.-Y. Hsu, C.-Y. Chang, National Chiao Tung Univ. (Taiwan)

PHOTOVOLTAIC DEVICES

- 8262 0Z **Concentrating properties of nitride-based solar cells using GaInN/GalnN superlattices** [8262-34]
M. Mori, S. Yamamoto, Y. Kuwahara, T. Fujii, T. Sugiyama, M. Iwaya, T. Takeuchi, S. Kamiyama, Meijo Univ. (Japan); I. Akasaki, Meijo Univ. (Japan) and Nagoya Univ. (Japan); H. Amano, Nagoya Univ. (Japan)
- 8262 10 **High efficiency InGaN solar cell with a graded p-InGaN top layer** [8262-35]
N. Sawaki, T. Fujisawa, Aichi Institute of Technology (Japan)
- 8262 13 **Temperature dependent behavior of the SPV for n-type GaN** [8262-38]
J. D. McNamara, M. Foussekis, H. Liu, H. Morkoç, M. A. Reshchikov, A. A. Baski, Virginia Commonwealth Univ. (United States)

LASER DIODES I

- 8262 15 **Analysis of the deep level responsible for the degradation of InGaN-based laser diodes by DLTS** [8262-40]
M. Meneghini, C. de Santi, N. Trivellin, Univ. degli Studi di Padova (Italy); K. Orita, S. Takigawa, T. Tanaka, D. Ueda, Panasonic Corp. (Japan); G. Meneghesso, E. Zanoni, Univ. degli Studi di Padova (Italy)
- 8262 16 **Highly doped GaN: a material for plasmonic claddings for blue/green InGaN laser diodes** [8262-41]
P. Perlin, Institute of High Pressure Physics (Poland) and TopGaN Ltd. (Poland); T. Czystanowski, Technical Univ. of Lodz (Poland); L. Marona, Institute of High Pressure Physics (Poland); S. Grzanka, TopGaN Ltd. (Poland) and Institute of High Pressure Physics (Poland); A. Kafar, S. Stanczyk, Gdańsk Univ. of Technology (Poland) and Institute of High Pressure Physics (Poland); T. Suski, Institute of High Pressure Physics (Poland); M. Leszczyński, M. Boćkowski, Institute of High Pressure Physics (Poland) and TopGaN Ltd. (Poland); G. Muzioł, Institute of High Pressure Physics (Poland); M. Kuc, R. Sarzała, Technical Univ. of Lodz (Poland)
- 8262 17 **Estimation of the recombination coefficients in aged InGaN laser diodes** [8262-42]
L. Marona, S. Grzanka, R. Czernecki, J. Goss, M. Bockowski, P. Perlin, Institute of High Pressure Physics (Poland); P. Kruszewski, Aix-Marseille Univ. (France) and CNRS, IM2NP (France); M. Pluska, A. Czerwinski, Institute of Electron Technology (Poland)

LASER DIODES II

- 8262 18 **Polarization of eigenmodes and the effect on the anisotropic gain in laser structures on nonpolar and semipolar GaN** [8262-43]
J. Rass, T. Wernicke, S. Ploch, Technische Univ. Berlin (Germany); M. Brendel, Technische Univ. Braunschweig (Germany) and Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); A. Kruse, A. Hangleiter, Technische Univ. Braunschweig (Germany); W. Scheibenzuber, U. T. Schwarz, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany); M. Weyers, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); M. Kneissl, Technische Univ. Berlin (Germany) and Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany)

- 8262 19 **Effect of ridge waveguide etch depth on laser threshold of InGaN MQW laser diodes** [8262-44]
L. Redaelli, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); M. Martens, Technische Univ. Berlin (Germany); J. Piprek, NUSOD Institute LLC (United States); H. Wenzel, C. Netzel, A. Linke, Y. V. Flores, S. Einfeldt, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); M. Kneissl, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany) and Technische Univ. Berlin (Germany); G. Tränkle, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany)
- 8262 1A **Modeling gallium-nitride-based violet lasers for data storage of information technology** [8262-45]
M.-M. Shih, Univ. of Florida (United States)

LEDS I

- 8262 1D **Highly efficient InGaN/GaN blue LED on 8-inch Si (111) substrate (Invited Paper)** [8262-47]
J.-Y. Kim, Y. Tak, J. Kim, H.-G. Hong, S. Chae, J. W. Lee, H. Choi, Y. Park, U.-I. Chung, Samsung Advanced Institute of Technology (Korea, Republic of); J.-R. Kim, Sejong Univ. (Korea, Republic of); J.-I. Shim, Hanyang Univ. (Korea, Republic of)
- 8262 1F **Device characteristics of InGaN quantum well light-emitting diodes with AlInN thin barrier insertion** [8262-49]
G. Liu, J. Zhang, Lehigh Univ. (United States); H. Zhao, Case Western Reserve Univ. (United States); N. Tansu, Lehigh Univ. (United States)
- 8262 1G **The impact of active layer design on quantum efficiency of InGaN light emitting diodes** [8262-50]
F. Zhang, X. Li, S. Okur, V. Avrutin, Ü. Özgür, H. Morkoç, Virginia Commonwealth Univ. (United States); S. M. Hong, S. H. Yen, T. S. Hsu, Epistar Corp. (Taiwan); A. Matulionis, Semiconductor Physics Institute of Ctr. for Physical Science and Technology (Lithuania)
- 8262 1H **High-voltage thin GaN LEDs array** [8262-51]
R.-H. Horng, National Chung Hsing Univ. (Taiwan) and National Cheng Kung Univ. (Taiwan); J.-H. Lin, D.-S. Wu, R.-C. Lin, K.-C. Shen, National Chung Hsing Univ. (Taiwan)

LEDS II

- 8262 1J **VLED for Si wafer-level packaging (Invited Paper)** [8262-53]
C.-F. Chu, C. Chen, J.-K. Yen, Y.-W. Chen, SemiLEDs Optoelectronics Co., Ltd. (Taiwan); C. Tsou, C. Chang, Feng Chia Univ. (Taiwan); T. Doan, C. A. Tran, SemiLEDs Optoelectronics Co., Ltd. (United States)
- 8262 1L **Improved performance of 375 nm InGaN/AlGaN light-emitting diodes by incorporating a heavily Si-doped transition layer** [8262-55]
S.-C. Huang, National Chung Hsing Univ. (Taiwan) and Advanced Optoelectronic Technology Inc. (Taiwan); K.-C. Shen, National Chung Hsing Univ. (Taiwan); P.-M. Tu, National Chiao Tung Univ. (Taiwan); D.-S. Wu, National Chung Hsing Univ. (Taiwan) and Da-Yeh Univ. (Taiwan); H.-C. Kuo, National Chiao Tung Univ. (Taiwan); R.-H. Horng, National Cheng Kung Univ. (Taiwan)

LEDS III

- 8262 1O **Carbide- and oxycarbide-based phosphors for LED lighting devices (Invited Paper)** [8262-58]
Y. Li, M. Romanelli, Y. Tian, Lightscape Materials, Inc. (United States)

NOVEL DEVICES

- 8262 1Q **III-nitride intersubband photonics (Invited Paper)** [8262-61]
S. Sakr, M. Tchernycheva, J. Mangeney, E. Warde, N. Isac, L. Rigutti, R. Colombelli, A. Lupu, L. Vivien, F. H. Julien, Institut d'Electronique Fondamentale, CNRS, Univ. Paris-Sud 11 (France); A. Vardi, S. E. Schacham, G. Bahir, Technion-Israel Institute of Technology (Israel); Y. Kotsar, E. Monroy, Nanophysique et Semiconducteurs, CEA-Grenoble (France); E. Giraud, D. Martin, N. Grandjean, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
- 8262 1R **Second harmonic generation in GaN-based photonic crystals for single molecule investigations (Invited Paper)** [8262-62]
D. Coquillat, Lab. Charles Coulomb, CNRS, Univ. Montpellier 2 (France); J. Torres, Institut d'Électronique du Sud, CNRS, Univ. Montpellier 2 (France); M. Le Vassor d'Yerville, D. Cassagne, F. Teppe, N. Dyakonova, W. Knap, Lab. Charles Coulomb, CNRS, Univ. Montpellier 2 (France); R. De La Rue, Univ. of Malaya (Malaysia); S. Bouchoule, Lab. de Photonique et de Nanostructures, CNRS (France); E. Margeat, C. Royer, Ctr. de biochimie Structurale, CNRS, Univ. Montpellier 1 (France)

POSTER SESSION

- 8262 1S **Impact of carrier localization, recombination, and diffusivity on excited state dynamics in InGaN/GaN quantum wells** [8262-63]
T. Malinauskas, A. Kadys, T. Grinys, S. Nargelas, R. Aleksiejūnas, S. Miasojedovas, J. Mickevičius, R. Tomašiūnas, Vilnius Univ. (Lithuania); K. Jarašiūnas, Vilnius Univ. (Lithuania) and Virginia Commonwealth Univ. (United States); M. Vengris, Vilnius Univ. (Lithuania) and Virginia Commonwealth Univ. (United States); S. Okur, V. Avrutin, X. Li, F. Zhang, Ü. Özgür, H. Morkoç, Virginia Commonwealth Univ. (United States)
- 8262 1T **Impact of indium surface segregation on optical properties of ultrathin InGaN/GaN quantum wells** [8262-64]
M. V. Klymenko, Kharkov National Univ. of Radio Electronics (Ukraine); I. A. Sukhoivanov, Univ. de Guanajuato (Mexico); O. V. Shulika, Kharkov National Univ. of Radio Electronics (Ukraine)
- 8262 1U **Measurements of off-state electrical stress in InAlN/AlN/GaN heterostructure field-effect transistors with varying In compositions** [8262-65]
R. A. Ferreyra, C. Kayis, C. Zhu, Ü. Özgür, H. Morkoç, Virginia Commonwealth Univ. (United States)

- 8262 1V **AlGaIn/GaN based field effect transistors for terahertz detection and imaging** [8262-66]
M. Sakowicz, M. B. Lifshits, O. A. Klimenko, D. Coquillat, N. Dyakonova, F. Tepe, Lab. Charles Coulomb, CNRS, Univ. Montpellier 2 (France); C. Gaquière, Institut d'Electronique, de Microélectronique, et de Nanotechnologie (France); M. A. Poisson, S. Delage, Thales Research and Technology (France); W. Knap, Lab. Charles Coulomb, CNRS, Univ. Montpellier 2 (France)
- 8262 1W **Degradation analysis of InAlN/AlN/GaN heterostructure field-effect transistors using low-frequency noise and current-transient methods: hot-phonon effects** [8262-67]
C. Kayis, R. A. Ferreyra, C. Zhu, M. Wu, X. Li, Ü. Özgür, Virginia Commonwealth Univ. (United States); A. Matulionis, Semiconductor Physics Institute of Center for Physical Science and Technology (Lithuania); H. Morkoç, Virginia Commonwealth Univ. (United States)
- 8262 1Y **Investigation of emission polarization and strain in InGaIn/GaN multiple quantum wells on nanorod epitaxially lateral overgrowth templates** [8262-69]
H.-M. Huang, T.-C. Lu, C.-Y. Chang, Y.-P. Lan, S.-C. Ling, W.-W. Chan, H.-C. Kuo, S.-C. Wang, National Chiao Tung Univ. (Taiwan)
- 8262 1Z **Free-standing a-plane GaN substrates grown by HVPE** [8262-70]
Y.-H. Wu, Y.-H. Yeh, K.-M. Chen, Y.-J. Yang, W.-I. Lee, National Chiao Tung Univ. (Taiwan)
- 8262 21 **High performance 375 nm ultraviolet InGaIn/AlGaIn light-emitting diodes by using a heavily Si-doped GaN growth mode transition layer** [8262-72]
S.-C. Huang, P.-M. Tu, S.-K. Yang, Y. Lin, C.-P. Hsu, Advanced Optoelectronic Technology, Inc. (Taiwan)
- 8262 22 **Reduction of efficiency droop in InGaIn-based UV light-emitting diodes with InAlGaIn barrier** [8262-73]
C.-H. Chiu, P.-M. Tu, J.-R. Chang, W.-T. Chang, H.-C. Kuo, C.-Y. Chang, National Chiao Tung Univ. (Taiwan)
- 8262 24 **Effect of MOCVD growth conditions on the optical properties of semipolar (1-101) GaN on Si patterned substrates** [8262-75]
N. Izyumskaya, S. J. Liu, V. Avrutin, S. Okur, F. Zhang, Ü. Özgür, Virginia Commonwealth Univ. (United States); S. Metzner, C. Karbaum, F. Bertram, J. Christen, Otto-von-Guericke-Univ. Magdeburg (Germany); D. J. Smith, Arizona State Univ. (United States); H. Morkoç, Virginia Commonwealth Univ. (United States)
- 8262 25 **Degradation mechanism of InAlN/GaN based HFETs under high electric field stress** [8262-76]
C. Zhu, M. Wu, C. Kayis, F. Zhang, X. Li, R. Ferreyra, V. Avrutin, Ü. Özgür, H. Morkoç, Virginia Commonwealth Univ. (United States)
- 8262 26 **Electrical properties of ZnO:Ga as a transparent conducting oxide in InGaIn based light emitting diodes** [8262-77]
H. Y. Liu, X. Li, F. Zhang, V. Avrutin, N. Izyumskaya, Ü. Özgür, Virginia Commonwealth Univ. (United States); A. B. Yankovich, A. V. Kvit, P. M. Voyles, Univ. of Wisconsin-Madison (United States); H. Morkoç, Virginia Commonwealth Univ. (United States)

- 8262 27 **Effects of polarization fields on avalanche breakdown of AlGaIn quantum-well photodiode**
[8262-78]
S.-K. Zhang, Borough of Manhattan Community College., CUNY (United States); W. Wang,
R. R. Alfano, The City College of New York, CUNY (United States); A. M. Dabiran,
A. M. Wowchak, P. P. Chow, SVT Associates, Inc. (United States)

Author Index

Conference Committee

Symposium Chair

Klaus P. Streubel, OSRAM GmbH (Germany)

Symposium Cochairs

David L. Andrews, University of East Anglia Norwich (United Kingdom)

Liang-Chy Chien, Kent State University (United States)

Program Track Chair

James G. Grote, Air Force Research Laboratory (United States)

Conference Chairs

Jen-Inn Chyi, National Central University (Taiwan)

Yasushi Nanishi, Ritsumeikan University (Japan)

Hadis Morkoç, Virginia Commonwealth University (United States)

Joachim Piprek, NUSOD Institute LLC (United States)

Euijoon Yoon, Seoul National University (Korea, Republic of)

Program Committee

Hiroshi Amano, Nagoya University (Japan)

Jong Hyeob Baek, Korea Photonics Technology Institute (Korea, Republic of)

Shoou-Jinn Chang, National Cheng Kung University (Taiwan)

Shigefusa F. Chichibu, Tohoku University (Japan)

Hiroshi Fujioka, The University of Tokyo (Japan)

Bernard Gil, Université Montpellier 2 (France)

Nicolas Grandjean, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

Shangjr Gwo, National Tsing Hua University (Taiwan)

Hideki Hirayama, RIKEN (Japan)

Detlef Hommel, Universität Bremen (Germany)

Yoichi Kawakami, Kyoto University (Japan)

Nam Seog Kim, Seoul Semiconductor (Korea, Republic of)

Katsumi Kishino, Sophia University (Japan)

Michael Kneissl, Technische Universität Berlin (Germany)

Hao-Chung Kuo, National Chiao Tung University (Taiwan)

Narihiko Maeda, NTT Photonics Laboratory (Japan)

Hideto Miyake, Mie University (Japan)

Yong-Tae Moon, LG Electronics Inc. (Korea, Republic of)

Takashi Mukai, Nichia Corporation (Japan)
Ümit Özgür, Virginia Commonwealth University (United States)
Young Soo Park, Samsung Advanced Institute of Technology (Korea, Republic of)
Ulrich T. Schwarz, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany)
Tae-Yeon Seong, Korea University (Korea, Republic of)
Jong-In Shim, Hanyang University (Korea, Republic of)
Chih-Chung Yang, National Taiwan University (Taiwan)

Session Chairs

- 1 Growth I
Jen-Inn Chyi, National Central University (Taiwan)
- 2 Growth II
Euijoon Yoon, Seoul National University (Korea, Republic of)
- 3 Doping
Yasushi Nanishi, Ritsumeikan University (Japan)
- 4 Material Characterization
Joachim Piprek, NUSOD Institute LLC (United States)
- 5 Nano Structures and Devices I
Ümit Özgür, Virginia Commonwealth University (United States)
- 6 Nano Structures and Devices II
Ray-Hua Horng, National Chung Hsing University (Taiwan)
- 7 Nano Structures and Devices III
Pierre Lefebvre, Université Montpellier 2 (France)
- 8 Photovoltaic Devices
Bernard Gil, Université Montpellier 2 (France)
- 9 Laser Diodes I
Hiroshi Fujioka, The University of Tokyo (Japan)
- 10 Laser Diodes II
Akira Usui, Furukawa Company, Ltd. (Japan)
- 12 LEDs I
Andreas Waag, Technische Universität Braunschweig (Germany)
- 13 LEDs II
Jong-In Shim, Hanyang University (Korea, Republic of)

- 14 LEDs III
Katsumi Kishino, Sophia University (Japan)
- 15 Novel Devices
Jen-Inn Chyi, National Central University (Taiwan)

