

## ***IWUMD-2017***

### Advanced Program

#### **Nov 15, Wednesday**

**Opening1** 9:00-9:10

H. Amano

*Nagoya University, Japan*

**Opening2** 9:10-9:20

H. Miyake

*Mie University, Japan*

Y. Kangawa

*Kyushu University, Japan*

**Plenary 1** (Chair: S. F. Chichibu)

**We-1** 9:20-10:00

**Recent breakthroughs in AlGaIn-based UV light emitters**

R. Kirste,<sup>2</sup> S. Mita,<sup>2</sup> Q. Guo,<sup>1</sup> B. Sarkar,<sup>1</sup> F. Kaess,<sup>1</sup> J. Tweedie,<sup>2</sup> R. Collazo,<sup>1</sup> and Z. Sitar<sup>1,2</sup>

<sup>1</sup>North Carolina State University, <sup>2</sup>Adroit Materials, Inc., USA

**Keynote 1** (Chair: H. Fujioka)

**We-2** 10:00-10:30

**Ultraviolet laser diodes: Recent progress and Applications**

H. Yoshida, Y. Takagi, Y. Aoki, A. Sugiyama, M. Kuwabara, Y. Yamashita, S. Okawara, H. Taketomi, and J. Maeda

*Hamamatsu Photonics K. K., Japan*

**We-3** 10:30-11:00

**Development of AlN Single Crystal Substrates and AlGaIn/GaN Technology for UVC Optoelectronic Applications**

L. J. Schowalter<sup>1,2</sup>

<sup>1</sup>Crystal IS, Inc., USA, <sup>2</sup>Asahi Kasei Corp, Japan

*Coffee break* 11:00-11:30

**Singularity** (Chairs: B. Gil and Y. Kawakami)

**We-4** 11:30-11:50

**Single photon emission from III-Nitride quantum dots**

Y. Arakawa, M. Arita, and M. J. Holmes

*The University of Tokyo, Japan*

**We-5** 11:50-12:10

**The origin of laser-induced subwavelength nanopores in silica glass**

A. Kavokin

*University of Southampton, UK*

**We-6** 12:10-12:30

**Ultraviolet Emitters and Exciton-Polaritons from GaN Nanostructures**

Y.-H. Cho

*Korea Advanced Institute of Science and Technology, Republic of Korea*

**Poster 1 with lunch** 12:30-14:30

**We-P1**

**Encapsulated AlGaIn-based deep-ultraviolet (DUV) LED and 3×4 array using robust optically isotropic fluorine resin**

Y. Nagasawa<sup>1</sup>, A. Hirano<sup>1</sup>, M. Ippommatsu<sup>1</sup>, K. Aosaki<sup>2</sup>, Y. Honda<sup>3</sup>, H. Amano<sup>3</sup>, I. Akasaki<sup>3,4</sup>

<sup>1</sup>UV Craftory Co., Ltd., <sup>2</sup>Asahi Glass, Co., Ltd., <sup>3</sup>Nagoya University, <sup>4</sup>Meijo University, Japan

**We-P2**

**Plasmonic induced UV optical enhancement in wide-band-gap semiconductors**

J. Li, J. Yin, and J. Kang

*Xiamen University, China*

**We-P3**

**Annealing of Ni/Au electrode on p-GaN by femtosecond laser irradiation**

H. Katayama, Y. Yamasaki, H. Kawakami, Y. Naoi, and T. Tomita

*Tokushima University, Japan*

**We-P4**

**Light extraction enhancement of AlGaIn-based ultraviolet light-emitting diodes using substrate sidewall roughening**

Y. Guo<sup>1,2</sup>, Y. Zhang<sup>1,2</sup>, J. Yan<sup>1,2</sup>, H. Xie<sup>1,2</sup>, J. Wang<sup>1,2</sup>, and J. Li<sup>1,2</sup>

<sup>1</sup>Chinese Academy of Sciences, <sup>2</sup>University of Chinese Academy of Sciences, China

**We-P5**

**Formation of Ni ohmic electrode on SiC by femtosecond laser irradiation associated with thermal annealing**

H. Kawakami<sup>1</sup>, Y. Naoi<sup>1</sup>, and T. Tomita<sup>1</sup>

<sup>1</sup>Tokushima University, Japan

### **We-P6**

#### **Titanium nanotubes sculptured with nanoparticles of noble metals**

S. Kutrovska<sup>1</sup>, A. Kucherik<sup>2</sup>, A. Osipov<sup>3</sup>, S. Arakelian<sup>4</sup>, and A. V. Kavokin<sup>4</sup>

<sup>1</sup>Stoletov Vladimir State University, Russia, <sup>2</sup>Russian Quantum Center, Russia, <sup>3</sup>CNR-SPIN, Italy, <sup>4</sup>University of Southampton, UK

### **We-P7**

#### **Unintentionally Grown Thin Barriers of Higher Al Contents in a Deep-UV AlGaIn Quantum Well for Increasing Compressive Strain**

C.-Y. Su, M.-C. Tsai, K.-P. Chou, H.-C. Chiang, H.-H. Lin, M.-Y. Su, Y.-R. Wu, Y.-W. Kiang, and C. C. Yang

National Taiwan University, Taiwan

### **We-P8**

#### **Multifunctional III-nitride photonics toward the internet of things**

Y. Jiang, Z. Shi, X. Gao, J. Yuan, S. Zhang, and Y. Wang

Nanjing University of Posts and Telecommunications, China

### **We-P9**

#### **Crystal defects in MOVPE grown AlN on bulk AlN**

A. Knauer<sup>1</sup>, A. Mogilatenko<sup>1</sup>, M. Weyers<sup>1</sup>, C. Hartmann<sup>2</sup>, J. Wollweber<sup>2</sup>, A. Dittmar<sup>2</sup>, U. Juda<sup>2</sup>, and M. Bickermann<sup>2</sup>

<sup>1</sup>Ferdinand-Braun-Institut, <sup>2</sup>Leibniz-Institut fuer Kristallzuechtung, Germany

### **We-P10**

#### **Effect of Electron Blocking Layer Design and Mg-doping on the Performance of 310 nm Light Emitting Diodes**

T. Kolbe<sup>1,2</sup>, A. Knauer<sup>1</sup>, J. Rass<sup>1,2</sup>, H. K. Cho<sup>1</sup>, S. Hagedorn<sup>1</sup>, N. L. Ploch<sup>1,2</sup>, M. Weyers<sup>1</sup>, M. Kneissl<sup>1,3</sup>, and S. Einfeldt<sup>1</sup>

<sup>1</sup>Ferdinand-Braun-Institut, <sup>2</sup>UVphotonics NT GmbH, <sup>3</sup>Technische Universitaet Berlin, Germany

### **We-P11**

#### **Achieving stimulated emission from III-Nitride based quantum structures**

J. Yan, Y. Zhang, J. Wang, and J. Li

Chinese Academy of Sciences, China

### **We-P12**

#### **Recent progress on the development of III-nitride based UV light-emitting diodes**

Z.-H. Zhang

Hebei University of Technology, China

### **We-P13**

#### **Study of the Optical and Response Characteristics of Green, Blue, and Ultraviolet Nitride-Based Light-Emitting Diodes**

S. H. Kao, K. W. Lin, C. K. Wang, and Y. Z. Chiou

<sup>1</sup>Southern Taiwan University of Science and Technology, Taiwan

**We-P14****Current injection efficiency and leakage characteristics in AlGaIn-based deep-ultraviolet light-emitting diodes**

G.-D. Hao, M. Taniguchi, and S. Inoue

*National Institute of Information and Communications Technology (NICT), Japan*

**We-P15****Internal losses in AlGaIn quantum wells**

F. Nippert<sup>1</sup>, M. T. Mazraehno<sup>1,2</sup>, M. J. Davies<sup>2</sup>, M. P. Hoffmann<sup>2</sup>, H.-J. Lugauer<sup>2</sup>, T. Kure<sup>1</sup>, M. R. Wagner<sup>1</sup>, and A. Hoffmann<sup>1</sup>

<sup>1</sup>Technische Universität Berlin, <sup>2</sup>OSRAM Opto Semiconductors GmbH, Germany

**We-P16****Internal strain effect induced efficiency enhancement of AlGaIn based deep ultraviolet multiple quantum wells**

H. Long<sup>1</sup>, F. Wu<sup>1</sup>, J. Zhang<sup>1</sup>, S. Wang<sup>1</sup>, Z. C. Feng<sup>2</sup>, H. Tian<sup>1</sup>, J. Dai<sup>1</sup>, and C. Chen<sup>1</sup>

<sup>1</sup>Huazhong University of Science and Technology, <sup>2</sup>Guangxi University, China

**We-P17****High-performance photoresponsivity and electrical transport of laterally-grown ZnO/ZnS core/shell nanowires by the piezotronic and piezo-phototronic effect**

S. Jeong<sup>1</sup>, M. W. Kim<sup>1</sup>, Y.-R. Jo<sup>1</sup>, Y.-C. Leem<sup>1</sup>, W.-K. Hong<sup>2</sup>, B.-J. Kim<sup>1</sup>, and S.-J. Park<sup>1</sup>

<sup>1</sup>Gwangju Institute of Science and Technology, <sup>2</sup>Korea Basic Science Institute, Republic of Korea

**We-P18****Polarized light emission of AlGaIn-based ultraviolet emitters with aluminum wire grid polarizers**

S. Oh<sup>1</sup>, J. H. Lee<sup>2</sup>, H.-J. Lee<sup>1</sup>, Y. S. Kim<sup>3</sup>, K.-K. Kim<sup>3</sup>, J. Cho<sup>4</sup>, Y. S. Jung<sup>2</sup>, and S.-J. Park<sup>1</sup>,

<sup>1</sup>Gwangju Institute of Science and Technology, <sup>2</sup>Korea Advanced Institute of Science and Technology, <sup>3</sup>Korea Polytechnic University, <sup>4</sup>Chonbuk National University, Republic of Korea

**We-P19****MOCVD growth of high quality AlN templates based on nano-patterned sapphire substrates**

S. Wang<sup>1</sup>, J. Zhang<sup>1</sup>, S. Du<sup>2</sup>, H. Long<sup>1</sup>, H. Tian<sup>1</sup>, J. Dai<sup>1</sup>, and C. Chen<sup>1</sup>

<sup>1</sup>Huazhong University of Science and Technology, <sup>2</sup>Wuhan UV LED Tek Co., Ltd., China

**We-P20****Significant improvement on the performance of DUV-LEDs via high quality AlN templates and anchored structure-inspired encapsulation**

C. Chen<sup>1</sup>, S. Wang<sup>1</sup>, R. Liang<sup>1</sup>, J. Zhang<sup>1</sup>, H. Long<sup>1</sup>, J. Dai<sup>1</sup>, J. Zhang<sup>2</sup>, H. Zhang<sup>2</sup>, and S. Du<sup>2</sup>

<sup>1</sup>Huazhong University of Science and Technology, <sup>2</sup>Wuhan UV LED Tek Co., Ltd., China

**We-P21****Determination of donor and DX center capture characteristics by photoluminescence**

M. Lamprecht and K. Thonke

*University of Ulm, Germany*

**We-P22****Al<sub>y</sub>Ga<sub>1-y</sub>N Quantum Dots emitting in the 275 - 340 nm range for UV LEDs**

J. Brault<sup>1</sup>, S. Matta<sup>1,2</sup>, M. Al Khalifioui<sup>1</sup>, M. Korytov<sup>1</sup>, M. Leroux<sup>1</sup>, B. Damilano<sup>1</sup>, S. Chenot<sup>1</sup>, P. Vennegues<sup>1</sup>, H. Peyre<sup>2</sup>, L. Konczewicz<sup>2</sup>, S. Contreras<sup>2</sup>, C. Chaix<sup>3</sup>, J. Massies<sup>1</sup>, and B. Gil<sup>2</sup>

<sup>1</sup>Universite Cote d'Azur, France, <sup>2</sup>CNRS-Universite Montpellier, France, <sup>3</sup>RIBER SA, USA

**We-P23****Electrochemical potentiostatic activation for improvement of internal quantum efficiency of 385-nm ultraviolet light-emitting diodes**

S. J. Lee<sup>1</sup>, T. T. Tran<sup>1</sup>, J. K. Lee<sup>1</sup>, W. Z. Tawfik<sup>1</sup>, H. S. Lee<sup>2</sup>, and J. M. Park<sup>2</sup>

<sup>1</sup>Chonnam National University, <sup>2</sup>SBK materials Co, Republic of Korea

**We-P24****Optimization of pulsed sputtering deposition conditions of AlN films**

S. Cho<sup>1</sup>, Y. Cho<sup>2</sup>, J. Choi<sup>1</sup>, D. Ko<sup>1</sup>, S. Lee<sup>1</sup>, M. Lee<sup>1,3</sup>, and J. Chang<sup>1</sup>

<sup>1</sup>Korea Maritime and Ocean University, <sup>2</sup>National Institute for Materials Science (NIMS), <sup>3</sup>Korea Research Institute of Ships and Ocean Engineering, Republic of Korea

**We-P25****Electrical properties of AlN films grown by pulsed sputtering deposition**

D. Ko, J. Choi, S. Cho, S. Lee, and J. Chang

Korea Maritime and Ocean University, Republic of Korea

**We-P26****AlGa<sub>N</sub> Based UV Structures Grown with AMEC Prismo HT MOCVD Platform**

H. Li, J. Hoo, V. Wang, S. Guo, and Z. Du

Advanced Micro-Fabrication Equipment Inc., China

**We-P27****Electronic and optical properties of BAlN**

Y. Ota<sup>1</sup>, M. Imura<sup>2</sup>, R. G. Banal<sup>2</sup>, and Y. Koide<sup>2</sup>

<sup>1</sup>TIRI, <sup>2</sup>NIMS, Japan

**We-P28****Characterization of AlInGa<sub>N</sub>-based 365-nm ultraviolet light emitter**

T. T. Tran<sup>1</sup>, S. J. Lee<sup>1</sup>, J. K. Lee<sup>1</sup>, W. Z. Tawfik<sup>1</sup>, H. S. Lee<sup>2</sup>, and J. M. Park<sup>2</sup>

<sup>1</sup>Chonnam National University, <sup>2</sup>SBK materials Co., Republic of Korea

**We-P29****High-quality GaN/AlN/PSS template prepared for NUV-LEDs**

C. He, W. Zhao, K. Zhang, L. He, H. Wu, and Z. Chen

Guangdong Institute of Semiconductor Industrial Technology, China

**We-P30****Growth and characterization of AlGaIn-based deep ultraviolet light-emitting diodes grown on 4-inch sapphire substrate by metal organic chemical vapor deposition**

J.-S. Kim<sup>1</sup>, D. Lee<sup>2</sup>, W.-T. Lim<sup>1</sup>, H. Kum<sup>1</sup>, J.-S. Lee<sup>1</sup>, D.-G. Lee<sup>1</sup>, H.-S. Noh<sup>1</sup>, H. Yoo<sup>1</sup>, N.-G. Cha<sup>1</sup>, Y.-I. Kim<sup>1</sup>, Y.-S. Park<sup>1</sup>, J. K. Kim<sup>3</sup>, and E. Yoon<sup>2</sup>

<sup>1</sup>Samsung Electronics, <sup>2</sup>Seoul National Univ., <sup>3</sup>Pohang Univ. of Science and Technology, Republic of Korea

**We-P31****Monolithically integrated GaN ultraviolet light communication system**

W. Cai<sup>1,2</sup>, J. Yuan<sup>1</sup>, C. Qin<sup>1</sup>, and Y. Wang<sup>1</sup>

<sup>1</sup>Nanjing University of Posts and Telecommunications, <sup>2</sup>Nanjing Institute of Technology, China

**We-P32****Fabrication of GaN quantum dots induced by a growth interruption**

C. Berger, G. Schmidt, A. Dadgar, H. Schürmann, P. Veit, S. Metzner, F. Bertram, J. Bläsing, J. Christen, and A. Strittmatter

Otto-von-Guericke-University Magdeburg, Germany

**We-P33****High temperature electrical transport study of n-type Si-doped AlN**

S. Contreras<sup>1</sup>, L. Konczewicz<sup>1</sup>, H. Peyre<sup>1</sup>, S. Juillaguet<sup>1</sup>, J. L. Weyher<sup>2</sup>, I. Dzieńcielewski<sup>2</sup>, M. A. Khalfioui<sup>3</sup>, S. Matta<sup>1,3</sup>, M. Leroux<sup>3</sup>, B. Damilano<sup>3</sup>, J. Brault<sup>3</sup>, and B. Gil<sup>1</sup>

<sup>1</sup>CNRS-Université de Montpellier, France, <sup>2</sup>Institute of High Pressure, Poland, <sup>3</sup>Centre National de la Recherche Scientifique, France

**We-P34****Nucleation and growth of epitaxial AlN via pulsed sputter deposition**

F. Hörich, J. Bläsing, M. Wieneke, A. Dadgar, and A. Strittmatter

Otto-von-Guericke-University Magdeburg, Germany

**We-P35****Suspended waveguide ultraviolet photodetector featuring p-n junction InGaIn/AlGaIn multiple quantum wells**

C. Qin<sup>1</sup>, W. Cai<sup>1,2</sup>, J. Yuan<sup>1</sup>, and Y. Wang<sup>1</sup>

<sup>1</sup>Nanjing University of Posts and Telecommunications, <sup>2</sup>Nanjing Institute of Technology, China

**We-P36****Performance improvements of AlGaIn deep ultraviolet light emitter via a 20-nm-thick n-AlGaIn underlying layer**

L. Li, Y. Miyachi, T. Tsutsumi, M. Miyoshi, and T. Egawa

Nagoya Institute of Technology, Japan

**We-P37****Ultraviolet laser utilizing guided mode grating**

X. Gao, Z. Shi, J. Yuan, Y. Jiang, and Y. Wang

Nanjing University of Posts and Telecommunications, China

**We-P38****High-quality AlN grown on nano-patterned sapphire substrates prepared by nano-imprint lithography**

F. Xu, L. Zhang, N. Xie, M. Wang, Z. Qin, and B. Shen

*Peking University, China*

**We-P39****Dislocation reduction and strain relaxation of AlN film by high temperature annealing under N<sub>2</sub>**

M. Wang, F. Xun, Z. Qin, Y. Sun, N. Xie, and B. Shen

*Peking University, China*

**We-P40****Integrated transferable ultraviolet light communication device**

J. Yuan<sup>1</sup>, C. Qin<sup>1</sup>, X. Gao<sup>1</sup>, Z. Shi<sup>1</sup>, W. Cai<sup>1,2</sup>, and Y. Wang<sup>1</sup>

<sup>1</sup>Nanjing University of Posts and Telecommunications, <sup>2</sup>Nanjing Institute of Technology, China

**We-P41****Compositional modulation for high AlN mole fraction Al<sub>x</sub>Ga<sub>1-x</sub>N multiple quantum wells to enhance overlap integral of carrier wavefunctions**

K. Kojima<sup>1</sup>, Y. Hayashi<sup>2</sup>, K. Hiramatsu<sup>2</sup>, H. Miyake<sup>2</sup>, and S. F. Chichibu<sup>1</sup>

<sup>1</sup>Tohoku University, <sup>2</sup>Mie University, Japan

**We-P42****Metal-oxide Nanoparticles for High-performance Deep UV Photo-detection**

S. Mitra, K. Loganathan, A. Aravindh, G. Das, Y. Pak, I. Ajia, E. D. Fabrizio, and I. S. Roqan

*King Abdullah University of Science and Technology, Saudi Arabia*

**We-P43****Improvement Method of High Quality AlN Epitaxial Layer Growth for Mass Production**

M. Choi, B. Lee, and S. Hong

*TOP Engineering, Republic of Korea*

**We-P44****Growth and fabrication of backside illuminated AlGa<sub>N</sub> based solar-blind ultraviolet metal semiconductor metal photodetectors on high quality AlN**

J. Jeong, J. Son, J. Jeong, and J. Jin

*Genicom Co.,Ltd., Republic of Korea*

**We-P45****RF-MBE growth of AlGa<sub>N</sub> on nitridated α-(AlGa)<sub>2</sub>O<sub>3</sub> grown by mist-CVD**

T. Araki<sup>1</sup>, A. Buma<sup>1</sup>, S. Fukushima<sup>1</sup>, Y. Fujiki<sup>1</sup>, Y. Nanishi<sup>1</sup>, T. Sasaki<sup>2</sup>, S. Fujikawa<sup>2</sup>, M. Takahashi<sup>2</sup>, M. Oda<sup>3</sup>, and T. Hitora<sup>3</sup>

<sup>1</sup>Ritsumeikan University, <sup>2</sup>National Institutes for Quantum and Radiological Science and Technology, <sup>3</sup>FLOSFIA, Japan

**We-P46****Device design for avalanche operation of solar-blind AlGaIn-based PiN type UV photodiodes**

M. Okada, Y. Miyachi, M. Miyoshi, and T. Egawa

*Nagoya Institute of Technology, Japan*

**We-P47****Recent progress of III-Nitride based deep-ultraviolet light-emitting diodes in China**

J. Li, J. Yan, and J. Wang

*Chinese Academy of Sciences, China*

**We-P48****Development of Si-doping technique for AlN by pulsed sputtering**

Y. Sakurai<sup>1</sup>, K. Ueno<sup>1</sup>, A. Kobayashi<sup>1</sup>, J. Ohta<sup>1</sup>, and H. Fujioka<sup>1,2</sup>

<sup>1</sup>The University of Tokyo, <sup>2</sup>JST-ACCEL

**We-P49****Field effect UV micro-LEDs : a new concept**

J. Rottner, C. Largeton, I.-C. Robin, D. Vaufrey, H. Haas, A. Dussaigne, and G. Feuillet

*CEA, LETI Grenoble, France*

**We-P50****Using ex-situ sputtered AlN nucleation layer to improve the crystallinity and output power of GaN-based vertical light emitting diodes on 6-inch sapphire substrate**

J.-T. Oh<sup>1,2</sup>, Y.-T. Moon<sup>1</sup>, D.-S. Kang<sup>1</sup>, C.-K. Park<sup>1</sup>, K.-Y. Song<sup>1</sup>, H.-H. Jeong<sup>1</sup>, J.-O. Song<sup>1</sup> and T.-Y. Seong<sup>2</sup>

<sup>1</sup>LG Innotek Co., Ltd, <sup>2</sup>Korea University, Republic of Korea

**We-P51****High temperature growth of GaN by THVPE method**

N. Takekawa<sup>1</sup>, N. Hayashida<sup>1</sup>, D. Ohzeki<sup>1</sup>, A. Yamaguchi<sup>2</sup>, H. Murakami<sup>1</sup>, Y. Kumagai<sup>1</sup>, K. Matsumoto<sup>2</sup>, and A. Koukitu<sup>1</sup>

<sup>1</sup>Tokyo University of A & T, <sup>2</sup>TAIYO NIPPON SANZO Corporation

**We-P52****Heteroepitaxial growth of AlN on ZnO nanowire arrays with strong enhanced UV emission**

H.-L. Lu, Y. Zhang, and D. W. Zhang

*Fudan University, China*



**Growth 1** (Chairs: D. Jena and Y. Li)

**We-7** 14:30-14:50

**High pressure synthesis of cubic and hexagonal boron nitride single crystals and their impurity control**

T. Taniguchi

*National Institute for Materials Science, Japan*

**We-8** 14:50-15:10

**Status and Challenges of AlN Bulk Crystal Growth for Use as Substrates in Deep-UV Emitters**

C. Hartmann<sup>1</sup>, A. Dittmar<sup>1</sup>, J. Wollweber<sup>1</sup>, S. Sintonen<sup>1</sup>, T. Schulz<sup>1</sup>, K. Irmscher<sup>1</sup>, A. Knauer<sup>2</sup>, S. Hagedorn<sup>2</sup>, U. Zeimer<sup>2</sup>, A. Mogilatenko<sup>2</sup>, C. Kuhn<sup>3</sup>, T. Teke<sup>3</sup>, T. Wernicke<sup>3</sup>, M. Kneissl<sup>2,3</sup>, M. Weyers<sup>2</sup>, and M. Bickermann<sup>1</sup>

<sup>1</sup>Leibniz-Institut für Kristallzüchtung (IKZ), <sup>2</sup>Ferdinand-Braun-Institut (FBH), <sup>3</sup>Technische Universität Berlin, Germany

**We-9** 15:10-15:30

**Optical polarization and light extraction properties of AlGaN-based DUV LEDs**

T. Yu, H. Wang, N. Tang, Z. Qin, and B. Shen

*Peking University, China*

**We-10** 15:30-15:45

**Site-controlled GaN Quantum Dots Embedded in AlN Films**

K. Shojiki<sup>1,2</sup>, S. Tamariz<sup>1</sup>, G. Callsen<sup>1</sup>, J.-F. Carlin<sup>1</sup>, I. Rousseau<sup>1</sup>, J. Ciers<sup>1</sup>, G. Jacopin<sup>1</sup>, R. Butté<sup>1</sup>, and N. Grandjean<sup>1</sup>

<sup>1</sup>EPFL, Switzerland, <sup>2</sup>Mie University, Japan

**We-11** 15:45-16:00

**High Quality AlN Single Crystal Substrates for UV Applications**

R. Dalmau, J. Britt, H. S. Craft, and R. Schlessler

*HexaTech, Inc., USA*

**We-12** 16:00-16:15

**Abrupt Polarity Inversion of AlN for Second Harmonics Generation in DUV Region**

Y. Hayashi<sup>1</sup>, H. Miyake<sup>1</sup>, K. Hiramatsu<sup>1</sup>, T. Akiyama<sup>1</sup>, T. Ito<sup>1</sup>, and R. Katayama<sup>2</sup>

<sup>1</sup>Mie University, <sup>2</sup>Osaka University, Japan

**We-13** 16:15-16:30

**Solid-Source Tri-Halide Vapor Phase Epitaxy of Thick GaN and AlGaN using GaCl<sub>3</sub> and AlCl<sub>3</sub>**

Hi. Murakami, M. Takahashi, Y. Kumagai, and A. Koukitu

*Tokyo University of Agriculture and Technology, Japan*

Coffee break 16:30-17:00

**Characterization 1** (Chairs: C. G. Van de Walle and R. Collazo)

**We-14** 17:00-17:20

**Deep UV spectroscopy of dense excitons in AlGaN-based quantum wells**

Y. Yamada

*Yamaguchi University, Japan*

**We-15** 17:20-17:40

**Nanocharacterisation of the structural and luminescence properties**

C. T.-Cowan<sup>1</sup>, G. Naresh-Kumar<sup>1</sup>, M. Nouf-Allahiani<sup>1</sup>, J. Bruckbauer<sup>1</sup>, P. R. Edwards<sup>1</sup>, G. Kusch<sup>1</sup>, C. Brasser<sup>1</sup>, E. Pascal<sup>1</sup>, S. Vespucci<sup>1</sup>, A. Kotzai<sup>1</sup>, D. MacLure<sup>1</sup>, S. Krausel<sup>1</sup>, B. Hourahine<sup>1</sup>, R. W. Martin<sup>1</sup>, Y. Zhang<sup>2</sup>, M. Athanasiou<sup>2</sup>, Y. Gong<sup>2</sup>, J. Bai<sup>2</sup>, K. Xing<sup>2</sup>, X. Yu<sup>2</sup>, B. Xu<sup>2</sup>, Z. Li<sup>2</sup>, Y. Hou<sup>2</sup>, R. M. Smith<sup>2</sup>, T. Wang<sup>2</sup>, E. Le. Boulbar<sup>3</sup>, J. Priesol<sup>3</sup>, D. W. E. Allsopp<sup>3</sup>, P. A. Shields<sup>3</sup>, F. Mehnke<sup>4</sup>, T. Wernicke<sup>4</sup>, C. Kuhn<sup>4</sup>, J. Enslin<sup>4</sup>, M. Kneissel<sup>4,5</sup>, A. Knauer<sup>5</sup>, V. Kueller<sup>5</sup>, M. Weyers<sup>5</sup>, A. Winkelmann<sup>6</sup>, A. Vilalta-Clemente<sup>7</sup>, and A. J. Wilkinson<sup>7</sup>

<sup>1</sup>University of Strathclyde, UK, <sup>2</sup>University of Sheffield, UK, <sup>3</sup>University of Bath, UK, <sup>4</sup>Technische Universitat Berlin, Germany, <sup>5</sup>Leibnitz-Institut fur Hochstfrequenztechnik, Germany, <sup>6</sup>Bruker Nano GmbH, Germany, <sup>7</sup>University of Oxford, UK

**We-16** 17:40-18:00

**Characterization of UV-Emitting GaN Quantum Dots Using Ultra-High-Resolution STEM-CL**

F. Bertram, G. Schmidt, H. Schürmann, S. Metzner, P. Veit, C. Berger, J. Bläsing, A. Dadgar, A. Strittmatter, and J. Christen

*Otto-von-Guericke-University Magdeburg, Germany*

**We-17** 18:00-18:15

**Large radiative emission rate of deep ultraviolet emitter with hyperbolic metamaterial structure**

K.-C. Shen<sup>1</sup>, Y.-J. Cheng<sup>1</sup>, and D. P. Tsai<sup>1,2</sup>

<sup>1</sup>Academia Sinica, <sup>2</sup>National Taiwan University, Taiwan

**We-18** 18:15-18:30

**Characterization of polarized ultraviolet light emitting diode by using subwavelength grating electrode**

Y. Okamoto<sup>1</sup>, Y. Takashima<sup>1,2</sup>, and Y. Naoi<sup>1</sup>

<sup>1</sup>Tokushima University, <sup>2</sup>JSPS, Japan

**We-19** 18:30-18:45

**Quality factor limitation for below 350 nm AlN-on-Si photonic crystal microcavities**

F. Tabataba-Vakili<sup>1,2,3</sup>, I. Roland<sup>1</sup>, T.-M. Tran<sup>1</sup>, X. Chécoury<sup>1</sup>, M. E. Kurdi<sup>1</sup>, S. Sauvage<sup>1</sup>, C. Brimont<sup>4</sup>, T. Guillet<sup>4</sup>, S. Rennesson<sup>5</sup>, J.-Y. Duboz<sup>5</sup>, F. Semond<sup>5</sup>, B. Gayral<sup>2,3</sup>, and P. Boucaud<sup>1</sup>

<sup>1</sup>Univ. Paris-Sud, <sup>2</sup>CEA, <sup>3</sup>Univ. Grenoble Alpes, <sup>4</sup>CNRS-Univ. Montpellier, <sup>5</sup>Universite Cote d'Azur, France

**We-20** 18:45-19:00

**Tuning emission wavelength and mixing of TE and TM polarization of emission in compressive strained Al<sub>x</sub>Ga<sub>1-x</sub>N quantum wells**

R. Kudrawiec<sup>1,2</sup>, M. Gladysiewicz<sup>1</sup>, and D. Hommel<sup>2</sup>

<sup>1</sup>Wroclaw University of Science and Technology, <sup>2</sup>Wroclaw Research Center EIT+, Poland

## **Nov 16, Thursday**

**Growth 2** (Chairs: Z. Sitar and M. Bickermann)

**Th-1** 9:00-9:20

**Controlled growth of h-BN and graphene/h-BN heterostructures by chemical vapor deposition**

H. Ying, X. Li, Q. Yao, W. Liu, and S. Chen  
*Renmin University of China, China*

**Th-2** 9:20-9:40

**Latest progress on B-III-N alloy & impact of TMA preflow on AlN MOVPE**

X. Li  
*KAUST, Saudi Arabia*

**Th-3** 9:40-10:00

**Improved performance of AlGaIn-based deep ultraviolet light-emitting diodes with nano-patterned AlN/sapphire substrates**

D. Lee<sup>1</sup>, J. W. Lee<sup>2</sup>, J. Jang<sup>1</sup>, I.-S. Shin<sup>1</sup>, L. Jin<sup>1</sup>, J. H. Park<sup>2</sup>, J. Oh<sup>1</sup>, J. Kim<sup>3</sup>, J. Lee<sup>3</sup>, H.-S. Noh<sup>3</sup>, Y.-I. Kim<sup>3</sup>, Y. Park<sup>3</sup>, G.-D. Lee<sup>1</sup>, Y. Park<sup>1,4</sup>, J. K. Kim<sup>2</sup>, and E. Yoon<sup>1,4</sup>  
<sup>1</sup>Seoul National University, <sup>2</sup>Pohang University of Science and Technology, <sup>3</sup>Samsung Electronics, <sup>4</sup>Advanced Institute of Convergence Technology, Republic of Korea

**Th-4** 10:00-10:15

**The growth of vertically conducting AlGaIn heterostructures on patterned GaN substrates**

A. A. Allerman, M. H. Crawford, G. W. Pickrell, A. M. Armstrong, V. M. Abate, M. L. Smith, and K. C. Cross  
*Sandia National Laboratories, USA*

**Th-5** 10:15-10:30

**High Al-content Mg-doped AlN/AlGaIn superlattices for deep ultraviolet light-emitting diodes**

K. Ebata, J. Nishinaka, Y. Taniyasu, and K. Kumakura  
*NTT Corporation, Japan*

**Th-6** 10:30-10:45

**Semipolar deep-UV light emitting diodes using monolayer thin binary GaN/AlN quantum heterostructures grown on AlGaIn pyramids**

T. Wei<sup>1</sup>, S. M. Islam<sup>2</sup>, J. Yan<sup>1</sup>, K. Lee<sup>2</sup>, S. Bharadwaj<sup>2</sup>, J. Wang<sup>1</sup>, J. Li<sup>1</sup>, V. Protasenko<sup>2</sup>, H. Xing<sup>2</sup>, and D. Jena<sup>2</sup>  
<sup>1</sup>Chinese Academy of Sciences, China, <sup>2</sup>Cornell University, USA

*Coffee break* 10:45-11:15

**Characterization 2** (Chairs: C. T.-Cowan and F. Bertram)

**Th-7** 11:15-11:35

**First-principles modeling of ultra-wide-band-gap nitrides**

C. G. Van de Walle

*University of California, Santa Barbara, USA*

**Th-8** 11:35-11:55

**Growth related methods for point defect control in AlGaN**

R. Collazo<sup>1</sup>, P. Reddy<sup>1,2</sup>, S. Washiyama<sup>1</sup>, F. Kaess<sup>1</sup>, J. Harris<sup>1</sup>, R. Kirste<sup>2</sup>, S. Mita<sup>2</sup>, J. Tweedie<sup>2</sup>, D. Irving<sup>1</sup>, and Z. Sitar<sup>1</sup>

<sup>1</sup>North Carolina State University, <sup>2</sup>Adroit Materials, Inc., USA.

**Th-9** 11:55-12:15

**Clarifying carrier recombination processes in AlGaN-based materials towards efficient DUV emitters**

Y. Kawakami and M. Funato

*Kyoto University, Japan*

**Th-10** 12:15-12:30

**Direct nano-scale correlation of structural and optical properties of a 75-fold AlGaN/AlGaIn MQW stack using helium temperature scanning transmission electron microscopy cathodoluminescence**

G. Schmidt<sup>1</sup>, F. Bertram<sup>1</sup>, P. Veit<sup>1</sup>, J. Christen<sup>1</sup>, H. Miyake<sup>2</sup>, and K. Hiramatsu<sup>2</sup>

<sup>1</sup>Otto-von-Guericke-University Magdeburg, Germany, <sup>2</sup>Mie University, Japan

**Th-11** 12:30-12:45

**Tunable Plasmonics towards Efficient LEDs in Ultra-Deep UV Region**

K. Okamoto, K. Okura, H. Nishida, K. Tateishi, P. Wang, S. Ryuzaki, and K. Tamada

*Kyushu University, Japan*

**Poster 2 with lunch** 12:45-14:45

**Th-P1**

**Characteristics of gallium oxide films grown by oxygen plasma assisted pulsed laser deposition**

C. Hu, K. Saito, T. Tanaka, and Q. Guo

*Saga University, Japan*

**Th-P2**

**Phonon symmetries in hexagonal Boron Nitride and overtones of shear modes in the phonon-assisted emission spectrum**

T. Q. P. Vuong<sup>1</sup>, G. Cassabois<sup>1</sup>, P. Valvin<sup>1</sup>, K. Watanabe<sup>2</sup>, T. Taniguchi<sup>2</sup>, and B. Gil<sup>1</sup>

<sup>1</sup>CNRS-Université de Montpellier, France, <sup>2</sup>Nat. Inst. for Materials Science, Japan

### **Th-P3**

#### **Investigation on structural properties of rare earth doped gallium oxide films**

K. Nishihagi, K. Saito, T. Tanaka, and Q. X. Guo

*Saga University, Japan*

### **Th-P4**

#### **Adsorption of ammonia in III-nitrides vapor phase epitaxy: theoretical approach based on steepest-entropy-ascent quantum thermodynamics**

A. Kusaba<sup>1</sup>, G. Li<sup>2</sup>, M. R. von Spakovsky<sup>3</sup>, and Y. Kangawa<sup>1,4</sup>

<sup>1</sup>*Kyushu University, Japan*, <sup>2</sup>*Oxford University, UK*, <sup>3</sup>*Virginia Tech, USA*, <sup>4</sup>*Nagoya University, Japan*

### **Th-P5**

#### **Interaction of H<sub>2</sub> with Metal Atoms on Graphene Surface: Density Functional Theory (DFT) Study**

H. Tachikawa and T. Iyama

*Hokkaido University, Japan*

### **Th-P6**

#### **Interaction of Hydrogen Atom with Carbon Materials: Density Functional Theory (DFT) Study**

T. Iyama, T. Fukuzumi, and H. Tachikawa

*Hokkaido University, Japan*

### **Th-P7**

#### **Molecular Dynamics Simulation of Strain relaxation of AlN buffer layer**

Y. Morimoto<sup>1</sup>, T. Kawamura<sup>1</sup>, Y. Suzuki<sup>1</sup>, Y. Kangawa<sup>2</sup>, and K. Kakimoto<sup>2</sup>

<sup>1</sup>*Mie University*, <sup>2</sup>*Kyushu University, Japan*

### **Th-P8**

#### **Theoretical study of composition pulling effect in AlGaN and AlInN MOVPE**

Y. Inatomi<sup>1</sup>, Y. Kangawa<sup>1,3</sup>, S. F. Chichibu<sup>2,3</sup>, and K. Kakimoto<sup>1</sup>

<sup>1</sup>*Kyushu University*, <sup>2</sup>*Nagoya University*, <sup>3</sup>*Tohoku University, Japan*

### **Th-P9**

#### **Interplay of thermodynamics and kinetics in PA MBE of AlGaN alloys**

S. V. Ivanov, D. V. Nechaev, and V. N. Jmerik

*Ioffe Institute, Russia*

### **Th-P10**

#### **Introduction of Biexciton Processes into Exciton Dynamics Simulation for GaN on the Basis of Phononic-Excitonic-Radiative Model**

K. Nomachi, K. Oki, B. Ma, K. Morita, and Y. Ishitani

*Chiba University, Japan*

### **Th-P11**

#### **In situ X-ray diffraction during epitaxial growth of AlN on SiC(0001)**

M. Takahashi<sup>1</sup>, T. Sasaki<sup>1</sup>, F. Ishikawa<sup>2</sup>, and H. Suzuki<sup>3</sup>

<sup>1</sup>*QST*, <sup>2</sup>*Ehime University*, <sup>3</sup>*University of Miyazaki, Japan*

#### **Th-P12**

##### **Investigation of Phase Separation and 3D-Growth of Boron Containing AlGa<sub>N</sub>-Alloys Grown by MOVPE**

O. Rettig<sup>1</sup>, J.-P. Scholz<sup>1</sup>, N. Steiger<sup>1</sup>, S. Bauer<sup>1</sup>, T. Hubacek<sup>1,2</sup>, M. Zikova<sup>1,2</sup>, Y. Li<sup>1</sup>, H. Qi<sup>1</sup>, J. Biskupek<sup>1</sup>, U. Kaiser<sup>1</sup>, K. Thonke<sup>1</sup>, and F. Scholz<sup>1</sup>

<sup>1</sup>Ulm University, Germany, <sup>2</sup>Institute of Physics CAS, Czech Republic

#### **Th-P13**

##### **Abnormal radiative interband transitions in Al-rich AlGa<sub>N</sub> quantum wells induced by polarized orbitals**

L. Chen, W. Lin, J. Li, S. Li, D. Cai, and J. Kang

<sup>1</sup>Xiamen University, China

#### **Th-P14**

##### **Optical and structural properties of c-AlN films on MgO (001) substrates grown by MBE with an intermediated c-GaN layer**

N. Discharoen<sup>1</sup>, S. Sanorpim<sup>1</sup>, N. Nuntawong<sup>2</sup>, S. Kijamnajsuk<sup>3</sup>, M. Kakuda<sup>4</sup>, S. Kuboya<sup>4</sup>, and K. Onabe<sup>4</sup>

<sup>1</sup>Chulalongkorn University, Thailand, <sup>2</sup>National Electronics and Computer Technology Center (NECTEC), Thailand, <sup>3</sup>National Metal and Materials Technology Center (MTEC), Thailand, <sup>4</sup>The University of Tokyo, Japan

#### **Th-P15**

##### **Study of Boron metal organic sources for B<sub>GaN</sub> growth using MOVPE**

T. Nakano<sup>1</sup>, K. Mochizuki<sup>1</sup>, T. Nakamura<sup>1</sup>, T. Aoki<sup>1</sup>, Y. Inoue<sup>1</sup>, K. Kojima<sup>2</sup>, and S. F. Chichibu<sup>2,3</sup>

<sup>1</sup>Shizuoka University, <sup>2</sup>Tohoku University, <sup>3</sup>Nagoya University, Japan

#### **Th-P16**

##### **Raman spectroscopy study of homoepitaxially grown hexagonal boron nitride**

K. Watanabe and T. Taniguchi

National Institute for Materials Science (NIMS), Japan

#### **Th-P17**

##### **Temperature dependence of excitonic transitions in deep ultraviolet emitting AlGa<sub>N</sub> multiple quantum wells**

H. Murotani<sup>1,2</sup>, Y. Hayakawa<sup>2</sup>, H. Miyake<sup>3</sup>, K. Hiramatsu<sup>3</sup>, and Y. Yamada<sup>2</sup>

<sup>1</sup>Tokuyama College, <sup>2</sup>Yamaguchi University, <sup>3</sup>Mie University

#### **Th-P18**

##### **Threshold power density reduction of 272-nm lasing from AlGa<sub>N</sub>/AlN multiple-quantum-wells on the nano-grating AlN/sapphire template**

R. Ni<sup>1,2</sup>, Y. Zhang<sup>1,2</sup>, J. Yan<sup>1,2</sup>, X. Chen<sup>1,2</sup>, J. Wang<sup>1,2</sup>, and J. Li<sup>1,2</sup>

<sup>1</sup>Chinese Academy of Sciences, <sup>2</sup>University of Chinese Academy of Sciences

**Th-P19****Optical properties of semi-polar (11-22) AlGaIn on GaN microrod templates**

J. Bruckbauer<sup>1</sup>, P. R. Edwards<sup>1</sup>, G. N.-Kumar<sup>1</sup>, C. T.-Cowan<sup>1</sup>, Z. Li<sup>2</sup>, L. Jiu<sup>2</sup>, J. Bai<sup>2</sup>, T. Wang<sup>2</sup>, and R. W. Martin<sup>1</sup>

<sup>1</sup>University of Strathclyde, <sup>2</sup>University of Sheffield, UK

**Th-P20****Improved performance of molecularly modified Gallium Nitride based MSM UV-Photodetectors**

R. Singh<sup>1</sup>, M. Garg<sup>1</sup>, T. R. Naik<sup>2</sup>, and V. R. Rao<sup>1,2</sup>

<sup>1</sup>Indian Institute of Technology Delhi, <sup>2</sup>Indian Institute of Technology Bombay, India

**Th-P21****Vacuum-Ultra-Violet Diamond-based Photodetector for high-power excimer lamp**

M. Imura, M. Liao, and Y. Koide

NIMS, Japan

**Th-P22****Plasmon Resonance in UV Wavelength Region by Mode Coupling in Nanoparticles-on-Mirror Structures**

K. Okura, K. Tateishi, P. Wang, S. Ryuzaki, K. Okamoto, and K. Tamada

Kyushu University, Japan

**Th-P23****Spatio-time-resolved cathodoluminescence studies of hexagonal BN microcrystals**

S. F. Chichibu<sup>1</sup>, Y. Ishikawa<sup>1</sup>, Y. Kominami<sup>2</sup>, and K. Hara<sup>2</sup>

<sup>1</sup>Tohoku University, <sup>2</sup>Shizuoka University, Japan

**Th-P24****Ultra-High Temperature MBE Growth of Hexagonal Boron Nitride with Nitrogen Isotope Control**

R. Page, Y. Cho, J. Wright, B. Calderon, G. Xing, and D. Jena

Cornell University, USA

**Th-P25****Low-temperature epitaxial growth of AlGaIn/GaN hetero-junctions**

D. Alexandrov, J. Tot, and R. Dubreuil

Lakehead University, Canada

**Th-P27****Selective area growth of GaN/AlGaIn nanopillar arrays on graphene by metal-organic chemical vapor deposition**

A. M. Munshi<sup>1</sup>, D.-C. Kim<sup>1</sup>, C. P. Heimdal<sup>1</sup>, D. L. Dheeraj<sup>1</sup>, M. Heilmann<sup>2</sup>, S. H. Christiansen<sup>2,3</sup>, P. E. Vullum<sup>4</sup>, A. T. J. van Helvoort<sup>5</sup>, B.-O. Fimland<sup>1,5</sup>, and H. Weman<sup>1,5</sup>

<sup>1</sup>CrayoNano AS, Norway, <sup>2</sup>Max Planck Institute for the Science of Light, Germany, <sup>3</sup>Helmholtz Centre Berlin for Materials and Energy, Germany, <sup>4</sup>SINTEF Materials and Chemistry, Norway, <sup>5</sup>Norwegian University of Science and Technology, Norway

#### **Th-P28**

##### **Growth and Structural Characterization of Hexagonal Boron Nitride on Sapphire**

X. Yang<sup>1</sup>, S. Nitta<sup>1</sup>, K. Nagamatsu<sup>1</sup>, M. Pristovsek<sup>1</sup>, Y. Liu<sup>1,2</sup>, Y. Honda<sup>1</sup>, and H. Amano<sup>1</sup>

<sup>1</sup>Nagoya University, Japan, <sup>2</sup>Zhengzhou University, China

#### **Th-P29**

##### **Development of Surface-Activated Wafer Bonding Method of AlN, GaN and LiNbO<sub>3</sub>**

T. Onodera<sup>1</sup>, M. Uemukai<sup>1</sup>, K. Takahashi<sup>2</sup>, M. Iwaya<sup>2</sup>, I. Akasaki<sup>2</sup>, Y. Hayashi<sup>3</sup>, H. Miyake<sup>3</sup>, and R. Katayama<sup>1</sup>

<sup>1</sup>Osaka University, <sup>2</sup>Meijo University, <sup>3</sup>Mie University, Japan

#### **Th-P30**

##### **Influence of growth parameters on the nucleation and film formation of hexagonal boron nitride during low pressure chemical vapor deposition**

N. Umehara, T. Kouno, H. Kominami, and K. Hara

Shizuoka University, Japan

#### **Th-P31**

##### **Cathodoluminescence characterization of the hexagonal boron nitride thin films grown on c-plane sapphire substrates**

N. Umehara<sup>1</sup>, T. Kouno<sup>1</sup>, H. Kominami<sup>1</sup>, K. Kojima<sup>2</sup>, S. F. Chichibu<sup>2</sup>, and K. Hara<sup>1</sup>

<sup>1</sup>Shizuoka University, <sup>2</sup>Tohoku University, Japan

#### **Th-P32**

##### **Solar-blind AlGa<sub>N</sub> Avalanche Photodiodes with Multi-Heterojunction Multiplication Region**

M. Chen, H. Yan, C. Liu, H. Wang, X. Qiu, Y. Ou, Z. Zhang, and H. Jiang

Sun Yat-sen University, China

#### **Th-P33**

##### **Microscopic structural and optical properties of GaN/AlN quantum disks embedded in nanowires correlated by cathodoluminescence**

B. Sheng<sup>1,2</sup>, F. Bertram<sup>2</sup>, P. Wang<sup>1</sup>, X. Sun<sup>1</sup>, M. Müller<sup>2</sup>, P. Veit<sup>2</sup>, T. Hempel<sup>2</sup>, J. Christen<sup>2</sup>, X. Wang<sup>1</sup>, and B. Shen<sup>1</sup>

<sup>1</sup>Peking University, China, <sup>2</sup>Otto-von-Guericke-University Magdeburg, Japan

#### **Th-P34**

##### **Investigation of ideal Schottky electrodes for MSM-type AlGa<sub>N</sub>/AlGa<sub>N</sub> based solar-blind photodetector**

S. Ushida<sup>1</sup>, A. Yoshikawa<sup>1,2</sup>, M. Iwaya<sup>1</sup>, T. Takeuchi<sup>1</sup>, S. Kamiyama<sup>1</sup>, and I. Akasaki<sup>1,3</sup>

<sup>1</sup>Meijo University, <sup>2</sup>Asahi-Kasei Corporation, <sup>3</sup>Nagoya University, Japan

#### **Th-P35**

##### **Deep UV-LEDs with two-step p-AlGa<sub>N</sub> graded layers**

H. Kojima<sup>1</sup>, T. Yasuda<sup>1</sup>, D. Kanbayashi<sup>1</sup>, K. Iida<sup>1</sup>, N. Koide<sup>1</sup>, T. Takeuchi<sup>1</sup>, M. Iwaya<sup>1</sup>, S. Kamiyama<sup>1</sup>, and I. Akasaki<sup>1,2</sup>

<sup>1</sup>Meijo University, <sup>2</sup>Nagoya University, Japan



**Th-P36****Performance improvement of GaN ultraviolet photodiodes with Indium-surfactant-assisted Mg-delta-doped p-type GaN**

B. Li<sup>1,2</sup>, H. Wang<sup>1</sup>, H. Wu<sup>1</sup>, Y. Chen<sup>1</sup>, and H. Jiang<sup>1</sup>

<sup>1</sup>Sun Yat-Sen University of China, <sup>3</sup>The Open University of Guangdong & Guangdong Polytechnic Institute of China, China

**Th-P37****AlGaIn-based UV-photodetector heterostructure on Si (111) substrate grown by PA-MBE**

Y. Zheng<sup>1</sup>, M. Agrawal<sup>1</sup>, K. Radhakrishnan<sup>1</sup>, N. Dharmarasu<sup>1</sup>, G. S. Karthikeyan<sup>1</sup>, A. G. Unil Perera<sup>2</sup>, A. Bruno<sup>3</sup>, and C. Soci<sup>1</sup>

<sup>1</sup>Nanyang Technological University, Singapore, <sup>2</sup>Georgia State University, USA, <sup>3</sup>Energy Research Institute @ NTU, Singapore

**Th-P38****AlN/GaN MQWs with ultra-thin-wells towards deep UV light source**

X. Wang<sup>1</sup>, X. Rong<sup>1</sup>, Y. Wang<sup>1</sup>, P. Wang<sup>1</sup>, Z. Chen<sup>1</sup>, T. Wang<sup>1,2</sup>, B. Sheng<sup>1</sup>, X. Zhang<sup>2</sup>, F. Xu<sup>1</sup>, Z. Qin<sup>1</sup>, S.V. Ivanov<sup>3</sup>, and B. Shen<sup>1</sup>

<sup>1</sup>Peking University, China, <sup>2</sup>King Abdullah University of Science and Technology (KAUST), Saudi Arabia, <sup>3</sup>Ioffe Institute, Russia

**Th-P39****280nm-range laser oscillation of AlGaIn-based MQW on sputtered and annealed AlN/sapphire template**

J. Hakamata<sup>1</sup>, Y. Kawase<sup>1</sup>, L. Dong<sup>1</sup>, S. Iwayama<sup>1</sup>, M. Iwaya<sup>1</sup>, T. Takeuchi<sup>1</sup>, S. Kamiyama<sup>1</sup>, I. Akasaki<sup>1,2</sup>, and H. Miyake<sup>3</sup>

<sup>1</sup>Meijo University, <sup>2</sup>Nagoya University, <sup>3</sup>Mie University, Japna

**Th-P40****Investigation of high-temperature annealing process of sputtered AlN films**

S. Xiao<sup>1</sup>, R. Suzuki<sup>1</sup>, H. Miyake<sup>1</sup>, K. Hiramatsu<sup>1</sup>, S. Harada<sup>2</sup>, and T. Ujihara<sup>2</sup>

<sup>1</sup>Mie University, <sup>2</sup>Nagoya University, Japan

**Th-P41****Contactless Electreflectance and Photoluminescence Characterization of AlGaIn/GaN Quantum Wells and LEDs Grown by MOVPE on Sapphire and AlN Substrates**

L. Janicki<sup>1</sup>, J. Misiewicz<sup>1</sup>, M. Rudziński<sup>2</sup>, and R. Kudrawiec<sup>1</sup>

<sup>1</sup>Wroclaw University of Science and Technology, Poland, <sup>2</sup>Institute of Electronic Materials Technology, Russia

**Th-P42****Luminescence characteristics of Si-doped high Al composition AlGaIn Multi-quantum-well grown by metal organic chemical vapor deposition**

A. Mishima, Y. Tomita, Y. Yano, T. Tabuchi, and K. Matsumoto

<sup>1</sup>Taiyo Nippon Sanso corporation

**Th-P43****A DFT Study on oligosilane-functionalized nanocarbon materials**

Y. Era<sup>1</sup>, S. Abe<sup>1</sup>, M. Nakamura<sup>2</sup>, Y. Yoshida<sup>1</sup>, and H. Tachikawa

<sup>1</sup>Hokkaido University, <sup>2</sup>Kyushu University of Health and Welfare, Japan

**Th-P44****Wavelength Specific Ultraviolet Photodetection based on Lateral Transport in MBE-grown AlGaIn Quantum Wells**

A. Bhattacharyya

University of Calcutta, India

**Th-P45****Influence of sputter-deposited AlN buffer thickness on crystalline quality of MOVPE AlN templates for deep ultra-violet light-emitting diodes**

W. Zhang<sup>1</sup>, Y. Li<sup>1</sup>, R. Zhang<sup>2</sup>, and F. Yun<sup>1</sup>

<sup>1</sup>Xi'an Jiaotong University, <sup>2</sup>Guangdong RealFaith Semiconductor Equipment Manufacturing Co., Ltd, China

**Th-P46****Characterization of the deep centers responsible for intensive defect-related broadband luminescence of heavily doped Al<sub>x</sub>Ga<sub>1-x</sub>N:Si layers with high Al content**

I.V Osinnykh, T. V. Malin, and K. S. Zhuravlev

Rzhanov Institute of Semiconductor Physics of the Siberian Branch of the Russian Academy of Sciences, Russia

**Th-P47****Deep ultraviolet laser fabricated using a photo-pumped AlGaIn-based heterostructure with a polarization-doped compositionally graded cladding layer on an AlN/sapphire template**

Y. Kawase<sup>1</sup>, J. Hakamata<sup>1</sup>, T. Hayashi<sup>1</sup>, S. Ikeda<sup>1</sup>, S. Iwayama<sup>1</sup>, L. Dong<sup>1</sup>, M. Iwaya<sup>1</sup>, T. Takeuchi<sup>1</sup>, S. Kamiyama<sup>1</sup>, I. Akasaki<sup>1,2</sup>, and H. Miyake<sup>3</sup>

<sup>1</sup>Meijo University, <sup>2</sup>Nagoya University, <sup>3</sup>Mie University, Japan

**Th-P48****Structural stability and electronic structure of BAlN and BGaIn alloy semiconductors: a first-principles study**

T. Akiyama, K. Nakamura, and T. Ito

Mie University, Japan

**Th-P49****Deep ultraviolet light emitting diodes using polarization doped p-Al<sub>x</sub>Ga<sub>1-x</sub>N/Al<sub>y</sub>Ga<sub>1-y</sub>N superlattice structures**

B. So, J. Kim, T. Kwak, E. Shin, T. Kim, and O. Nam

Korea Polytechnic University, Republic of Korea

**Th-P50****UV Excited Novel Red Phosphors for Lighting Applications**

S. M. Babu and K. K. Rasu

Anna University, India

**Th-P51****Defect selective etching of MOVPE grown AlN and HVPE grown bulk AlN substrates in a molten KOH/NaOH eutectic**

M. Higuchi<sup>1</sup>, T. Mitsui<sup>1</sup>, T. Nagashima<sup>2</sup>, R. Yamamoto<sup>1,2</sup>, K. Konishi<sup>1</sup>, G. Pozina<sup>3</sup>, R. Dalmau<sup>4</sup>, R. Schlessler<sup>4</sup>, R. Collazo<sup>5</sup>, B. Monemar<sup>1,3</sup>, Z. Sitar<sup>5</sup>, and Y. Kumagai<sup>1</sup>

<sup>1</sup>Tokyo University of Agri. and Tech., Japan, <sup>2</sup>Tokuyama Corporation, Japan, <sup>3</sup>Linkoping University, Sweden,

<sup>4</sup>HexaTech, Inc., USA, <sup>5</sup>North Carolina State University, USA

**Th-P52****Localized Surface Plasmon Field Enhancement of Ag nanoparticles on GaN detectors**

X. Sun, Y. Jia, and D. Li

*Chinese Academy of Sciences, China*

**Th-P53****Degradation studies on AlGaIn-based metal-semiconductor-metal photodetectors**

M. Brendel, S. Walde, J. Oeff, E. Muhra, S. Hagedorn, F. Brunner, M. Reiner, U. Zeimer, and M. Weyers

*Leibniz-Institut fuer Hoechstfrequenztechnik, Germany*

**BN and Oxides** (Chairs: T. Taniguchi and S. Chen)

**Th-12** 14:45-15:05

**Optical properties of h-BN: demonstration of the indirect nature of the bandgap**

B. Gil

*Université de Montpellier, France*

**Th-13** 15:05-15:25

**Optical properties of isotopically-purified hexagonal boron nitride**

G. Cassabois

*University Montpellier, CNRS, France*

**Th-14** 15:25-15:45

**Hexagonal boron nitride epilayers for UV photonics**

H. Jiang and J. Lin

*Texas Tech University, USA*

**Th-15** 15:45-16:05

**Properties of Hexagonal BN Grown by High Temperature Metal-Organic Vapor Phase Epitaxy**

M. Crawford, A. Rice, A. Allerman, T. Beechem, T. Ohta, D. Medlin, C. Spataru, J. Figiel, and M. Smith

*Sandia National Laboratories, USA*

**Th-16** 16:05-16:20

**Theoretical Calculation of Positron Annihilation Parameters for Defects in UV Materials (AlN, ZnO, Ga<sub>2</sub>O<sub>3</sub>)**

S. Ishibashi<sup>1</sup> and A. Uedono<sup>2</sup>

<sup>1</sup>AIST, <sup>2</sup>University of Tsukuba, Japan

**Th-17** 16:20-16:35

**Thermodynamic analysis on molecular beam epitaxy of Ga<sub>2</sub>O<sub>3</sub>**

Y. Sawada, N. Ueda, K. Konishi, and Y. Kumagai

*Tokyo University of Agri. & Tech, Japan*

**Th-18** 16:35-16:50

**High-temperature molecular beam epitaxy of hexagonal boron nitride layers for 2D and DUV applications**

T. S. Cheng, A. Summerfield, J. D. Albar, A. Davies, C. J. Mellor, A.N. Khlobystov, L. Eaves, C. T. Foxon, P. H. Beton, and S.V. Novikov

*University of Nottingham, UK*

*Coffee break* 16:50-17:20

**Devices 1** (Chairs: L. Schowalter and M. Funato)

**Th-19** 17:20-17:40

**From step flow to quantum dots: Morphology of AlN, AlGa<sub>N</sub> and GaN on AlN and its effect on device properties**

T. Wernicke<sup>1</sup>, K. Bellmann<sup>1</sup>, C. Kuhn<sup>1</sup>, and M. Kneissl<sup>1,2</sup>

<sup>1</sup>Technische Universität Berlin, <sup>2</sup>Ferdinand-Braun-Institut, Germany

**Th-20** 17:40-18:00

**AlGa<sub>N</sub>-based deep-ultraviolet LED with high wall-plug efficiency incorporating uneven quantum well and future prospects**

A. Hirano<sup>1</sup>, Y. Nagasawa<sup>1</sup>, M. Ippommatsu<sup>1</sup>, Y. Honda<sup>2</sup>, H. Amano<sup>2</sup>, and I. Akasaki<sup>2,3</sup>

<sup>1</sup>UV Craftory Co., Ltd., <sup>2</sup>Nagoya University, <sup>3</sup>Meijo University, Japan

**Th-21** 18:00-18:20

**MOCVD Growth and Characterization of III-N Ultraviolet Vertical-Cavity Surface Emitting Lasers and Avalanche Photodiodes**

R. Dupuis<sup>1</sup>, Y.-S. Liu<sup>1</sup>, M.-H. Ji<sup>1</sup>, Y. J. Park<sup>1</sup>, J. Kim<sup>1,5</sup>, T. Detchprohm<sup>1</sup>, O. Moreno<sup>1</sup>, S.-C. Shen<sup>1</sup>, K. Mehta<sup>1</sup>, P. D. Yoder<sup>1</sup>, S. Wang<sup>2</sup>, S. Alugubelli<sup>2</sup>, F. Ponce<sup>2</sup>, A. Sood<sup>3</sup>, and N. Dhar<sup>4</sup>

<sup>1</sup>Georgia Institute of Technology, USA, <sup>2</sup>Arizona State University, USA, <sup>3</sup>Magnolia Optical Technologies, USA, <sup>4</sup>Night Vision Sensors and Electronic Division, USA, <sup>5</sup>Now with LG Electronics, Republic of Korea

**Th-22** 18:20-18:35

**Improving EQE (10%) of AlGa<sub>N</sub> deep-UV LED using highly-reflective photonic crystal (HR-PhC) on p-contact layer**

Y. Kasima<sup>1,2</sup>, N. Maeda<sup>1</sup>, E. Matsuura<sup>1,2</sup>, M. Jo<sup>1</sup>, T. Iwai<sup>3</sup>, T. Morita<sup>3</sup>, M. Kokubo<sup>4</sup>, T. Tashiro<sup>4</sup>, R. Kamimura<sup>5</sup>, Y. Osada<sup>5</sup>, H. Takagi<sup>6</sup>, and H. Hirayama<sup>1</sup>

<sup>1</sup>RIKEN, <sup>2</sup>Marubun Corporation, <sup>3</sup>Tokyo Ohka Kogyo Co.,Ltd, <sup>4</sup>Toshiba Machine Co.,Ltd, <sup>5</sup>ULVAC,Inc, <sup>6</sup>AIST, Japan

**Th-23** 18:35-18:50

**Impact of Electron Blocking Layer Design on the Degradation Behavior of UVB Light Emitting Diodes**

J. Glaab<sup>1</sup>, J. Ruschel<sup>1</sup>, M. Gesche<sup>1</sup>, A. Andrie<sup>1</sup>, T. Kolbe<sup>1,2</sup>, A. Knauer<sup>1</sup>, J. Rass<sup>1,2</sup>, N. L. Ploch<sup>1,2</sup>, M. Weyers<sup>1</sup>, M. Kneissl<sup>3</sup>, and S. Einfeldt<sup>1</sup>

<sup>1</sup>Ferdinand-Braun-Institut, <sup>2</sup>UVphotonics NT GmbH, <sup>3</sup>Technische Universität Berlin, Germany

**Th-24** 18:50-19:05

**AlGa<sub>N</sub>-based UVA LED and laser diode grown on Si**

Q. Sun<sup>1,2,3</sup>, Z. Li<sup>1,2</sup>, M. Feng<sup>1</sup>, L. Liu<sup>2,3</sup>, Y. Zhou<sup>1</sup>, and H. Yang<sup>1</sup>

<sup>1</sup>Chinese Academy of Sciences (CAS), <sup>2</sup>Lattice Power (Changzhou) Corporation, <sup>3</sup>Lattice Power (Jiangxi) Corporation, China

**Th-25** 19:05-19:20

**Transport in High Al-content AlGa<sub>N</sub> Hole Injection Layers for Deep UV LEDs**

K. Lee, S. M. Islam, S. Bharadwaj, V. Muthuraj, A. Hickman, H. G. Xing, and D. Jena

Cornell University, USA

## **Nov 17, Friday**

**Devices 2** (Chairs: T. Wernicke and T. Detchprohm)

**Fr-1** 9:00-9:20

**Electron beam excitation of UV laser using a GaN/AlGa<sub>N</sub> multi quantum well active layer**

M. Iwaya<sup>1</sup>, T. Hayashi<sup>1</sup>, L. Dong<sup>1</sup>, Y. Kawase<sup>1</sup>, N. Nagata<sup>1</sup>, T. Senga<sup>1</sup>, S. Iwayama<sup>1</sup>, T. Takeuchi<sup>1</sup>, S. Kamiyama<sup>1</sup>, I. Akasaki<sup>1,2</sup>, and T. Matsumoto<sup>3</sup>

<sup>1</sup>Meijo University, <sup>2</sup>Nagoya University, <sup>3</sup>Nagoya City University, Japan

**Fr-2** 9:20-9:40

**High performance UV photodetectors based on wide bandgap semiconductors**

H. Lu

Nanjing University, China

**Fr-3** 9:40-10:00

**Fabrication of high-quality AlN template by high-temperature annealing for deep-ultraviolet optical devices**

H. Miyake, S. Xiao, Y. Hayashi, and K. Hiramatsu

Mie University, Japan

**Fr-4** 10:00-10:15

**High-efficiency e-beam-pumped spontaneous sub-250nm UV emitters based on monolayer-thick binary GaN/AlN MQW grown by PA MBE on c-Al<sub>2</sub>O<sub>3</sub>**

V. N. Jmerik<sup>1</sup>, D. V. Nechaev<sup>1</sup>, A. A. Toropov<sup>1</sup>, E. A. Evropeitsev<sup>1</sup>, V. I. Kozlovsky<sup>2</sup>, V. P. Martovitsky<sup>2</sup>, S. Rouvimov<sup>3</sup>, and S. V. Ivanov<sup>1</sup>

<sup>1</sup>Ioffe Institute, Russia, <sup>2</sup>Lebedev Physical Institute, Russia, <sup>3</sup>University of Notre Dame, USA

**Fr-5** 10:15-10:30

**High-performance solar-blind AlGa<sub>N</sub>/AlGa<sub>N</sub> MSM type photodetector**

A. Yoshikawa<sup>1,2</sup>, S. Ushida<sup>1</sup>, M. Iwaya<sup>1</sup>, T. Takeuchi<sup>1</sup>, S. Kamiyama<sup>1</sup>, and I. Akasaki<sup>1,3</sup>

<sup>1</sup>Meijo University, <sup>2</sup>Asahi-Kasei corporation, <sup>3</sup>Nagoya University, Japan

*Coffee break* 10:30-11:00

**Keynote 2** (Chair: S. Ivanov)

**Fr-6** 11:00-11:30

**Tunnel Junctions in Nitride Semiconductors and their Heterostructures**

D. Jena

*Cornell University, USA*

**Fr-7** 11:30-12:00

**AlGaN Nanowire LEDs and Laser Diodes Operating in the UV-C Band**

Z. Mi<sup>1,2</sup>, S. Zhao<sup>2</sup>, X. Liu<sup>1,2</sup>, B. H. Le<sup>2</sup>, and N. H. Tran<sup>2</sup>

<sup>1</sup>University of Michigan, <sup>2</sup>McGill University, USA

**Plenary 2** (Chair: H. Miyake)

**Fr-8** 12:00-12:40

**Prospects and challenges for AlGaN-based deep UV LED technologies**

M. Kneissl<sup>1,2</sup>, J. Enslin<sup>1</sup>, M. Guttmann<sup>1</sup>, C. Kuhn<sup>1</sup>, F. Mehnke<sup>1</sup>, C. Reich<sup>1</sup>, L. Sulmoni<sup>1</sup>, T. Wernicke<sup>1</sup>, J. Jeschke<sup>2</sup>, J. Glaab<sup>2</sup>, S. Hagedorn<sup>2</sup>, A. Knauer<sup>2</sup>, T. Kolbe<sup>2</sup>, M. Lapeyrade<sup>2</sup>, N. L.-Ploch<sup>2</sup>, C. Netzel<sup>2</sup>, J. Rass<sup>2</sup>, C. Stölmacker<sup>2</sup>, U. Zeimer<sup>2</sup>, S. Einfeldt<sup>2</sup>, and M. Weyers<sup>2</sup>

<sup>1</sup>Technische Universität Berlin, <sup>2</sup>Ferdinand-Braun-Institut, Germany

**Closing** 12:40-13:00

H. Fujioka

*The University of Tokyo, Japan*

S. F. Chichibu

*Tohoku University, Japan*

H. Miyake

*Mie University, Japan*

Y. Kangawa

*Kyushu University, Japan*