

# WODIM 2018 Conference program

Park Inn hotel at Alexander Platz - Berlin

## Sunday 10<sup>th</sup> June 2018

18h30-21h30: Registration and Welcome Party - **Venue:** House of Weekend, Alexanderstr. 7, 10178 Berlin  
**Note:** Location is different from the Conference Venue

## Monday 11<sup>th</sup> June 2018

08h00 - 08h45: Registration

08h45 - 09h00: **Conference opening** - Catherine Dubourdieu, Helmholtz-Zentrum Berlin

### Session 1; III/V and FINFET – Chair: Paul Hurley

09h00: **Invited - Impact of high-k dielectric defects on the mobility and reliability of InGaAs channel MOSFETS**

**E. Cartier**, A. Majumdar, K. A. Jenkins, J.-B. Yau, M. M. Frank, T. Ando, J. Rozen, J. Bruley, P. Kerber, M. Hopstaken, E. Levrau, W-E Wang, K.-T. Lee, C. Liang, C.-W. Cheng, X. Sun, R. T. Mo, C.-C. Yeh, E. Leobandung and V. Narayanan  
*IBM, T. J. Watson Research Center, Yorktown Heights, NY 10598, USA*

09h40: **Physics-based TCAD analysis of border and interface traps in Al<sub>2</sub>O<sub>3</sub>/InGaAs stacks using multifrequency CV-curves**

E. Caruso<sup>1</sup>, J. Lin<sup>1</sup>, K. F. Burke<sup>1</sup>, K. Cherkaoui<sup>1</sup>, D. Esseni<sup>2</sup>, F. Gity<sup>1</sup>, S. Monaghan<sup>1</sup>, P. Palestri<sup>2</sup>, P. Hurley<sup>1</sup>, L. Selmi<sup>3</sup>  
*<sup>1</sup>Tyndall National Institute University College Cork, Cork, Ireland; <sup>2</sup>DPIA, University of Udine, Via delle Scienze 206, 33100, Udine, Italy; <sup>3</sup>DIEF, University of Modena and Reggio Emilia, Via P. Vivarelli 10/1, 41125, Modena, Italy*

10h00: **Interface and border traps density extraction in Al<sub>2</sub>O<sub>3</sub>/ In<sub>0.53</sub>Ga<sub>0.47</sub>As MOS capacitors**

M. Cassé<sup>1</sup>, H. Boutry<sup>1</sup>, M. Billaud<sup>1</sup>, J. Duvernay<sup>1</sup>, B. Sheehan<sup>2</sup>, P. Hurley<sup>2</sup>, S. Monaghan<sup>2</sup>, K. Cherkaoui<sup>2</sup>, T. Chiarella<sup>3</sup>, D. Claes<sup>3,4</sup>, S. Sioncke<sup>3</sup>, J. Mitard<sup>3</sup>, G. Reimbold<sup>1</sup>, O. Faynot<sup>1</sup>  
*<sup>1</sup>CEA-Leti, MINATEC Campus, 17 rue des martyrs, F-38054 Grenoble, France; <sup>2</sup>Tyndall National Institute, University College Cork, Cork, Ireland; <sup>3</sup>IMEC, 75 Kapeldreef, 3001 Leuven, Belgium; <sup>4</sup>KU Leuven, 44 Kasteelpark Arenberg, 3001 Leuven, Belgium*

10h20: **Invited - Reliability of gate oxides in 3D-architectures (FinFETs, Nanowires)**

**X. Garros**, A. Laurent, S. Barraud, M. Casse, F. Gaillard  
*CEA-LETI, Grenoble Alpes University, Grenoble, France*

11h00: COFFEE BREAK

### Session 2; SiC / Power MOSFETs – Chair: Mikaël Cassé

11h30: **Forming advanced gate oxides on 4H-SiC by increasing oxidation temperature and concurrent oxygen partial pressure reduction**

A.J. Bauer, A. Meixner, T. Sledziewski  
*Fraunhofer IISB, Schottkystrasse 10, 91058 Erlangen, Germany*

11h50: **Origin of the positive oxide charge at the SiO<sub>2</sub>/3C-SiC interface**

K. Cherkaoui<sup>1</sup>, A. Blake<sup>1</sup>, Y. Y. Gomeniuk<sup>1,3</sup>, J. Lin<sup>1</sup>, B. Sheehan<sup>1</sup>, M. White<sup>1</sup>, P. K. Hurley<sup>1</sup> and P. J. Ward<sup>2</sup>

<sup>1</sup>Tyndall National Institute, University College Cork, Cork, Ireland; <sup>2</sup>ANVIL Semiconductors Ltd. Coventry, UK; <sup>3</sup>V. Lashkaryov Institute of Semiconductor Physics, NAS of Ukraine, Ukraine

12h10: **Multi-stage deposition of trench gate oxides for power MOSFETs**

Markus Neuber<sup>1</sup>, Olaf Storbeck<sup>1</sup>, Maik Langner<sup>1</sup>, Knut Stahrenberg<sup>1</sup>, Thomas Mikolajick<sup>2,3</sup>

<sup>1</sup>Infineon Technologies Dresden, Königsbrücker Str. 180, 01099 Dresden, Germany; <sup>2</sup>NaMLab GmbH, Nöthnitzer Str. 64, 01187 Dresden, Germany; <sup>3</sup>Institute of Semiconductors and Microsystems, Nöthnitzer Str. 64, 01187 Dresden, Germany

12h30 - 14h00: LUNCH

**Session 3; Resistive switching materials and devices – Chair: Karol Fröhlich**

14h00: **Invited - Nanoguided filament approaches for reliable RRAM**

**G. Niu**<sup>1</sup>, P. Calka<sup>2</sup>, M. Auf der Maur<sup>3</sup>, F. Santoni<sup>3</sup>, M. Fraschke<sup>2</sup>, P. Hamoumou<sup>4</sup>, B. Gautier<sup>4</sup>, E. Perez<sup>2</sup>, C. Wenger<sup>2</sup>, A. Di Carlo<sup>3</sup>, T. Schroeder<sup>2,5</sup>

<sup>1</sup>Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China; <sup>2</sup>IHP, Im Technologiepark 25, 15236 Frankfurt (Oder), Germany; <sup>3</sup>Dept. Electronics Engineering, University of Rome, 00133 Roma, Italy; <sup>4</sup>INL, UMR CNRS 5270, INSA de Lyon, 69621 Villeurbanne, France; <sup>5</sup>Brandenburgische Technische Universität, 03046 Cottbus, Germany

14h40: **Switching mechanism in HfO<sub>2</sub>-based oxide resistive memories by in-situ TEM and EELS**

T. Dewolf<sup>1</sup>, D. Cooper<sup>1</sup>, N. Bernier<sup>1</sup>, E. Jalaguier<sup>1</sup>, G. Audoit<sup>1</sup>, S. Schamm-Chardon<sup>2</sup>

<sup>1</sup>CEA, LETI, DTISI, SCMC, Univ. Grenoble Alpes, Grenoble, France, <sup>2</sup>CEMES-CNRS, Université de Toulouse, Toulouse, France

15h00: **Analysis of conductive filament density in resistive RAMs, a 3D Kinetic Monte Carlo approach**

S. Aldana<sup>1</sup>, P. García-Fernández<sup>1</sup>, R. Romero-Zaliz<sup>2</sup>, F. Jiménez-Molinos<sup>1</sup>, F. Gómez-Campos<sup>1</sup>, J.B. Roldán<sup>1</sup>

<sup>1</sup>Departamento de Electrónica y Tecnología de Computadores, Universidad de Granada, Spain; <sup>2</sup>Departamento de Ciencias de la Computación e Inteligencia Artificial, Universidad de Granada, Spain

15h20: **Data retention investigation in HfO<sub>2</sub>-based RRAM arrays by using accelerated tests**

E. Perez<sup>1</sup>, M.K. Mahadevaiah<sup>1</sup>, C. Zambelli<sup>2</sup>, P. Olivo<sup>2</sup>, Ch. Wenger<sup>1,3</sup>

<sup>1</sup>IHP, Frankfurt (Oder), Germany, <sup>2</sup>Università degli Studi di Ferrara, Ferrara, Italy, <sup>3</sup>MHB Theodor Fontane, Neuruppin, Germany

15h40: COFFEE BREAK

**Session 4; 2D Materials - Chair: Clemens Ostermaier**

16h10: **Invited - MoS<sub>2</sub> transistors with ohmic or Schottky contacts**

**A. Di Bartolomeo**<sup>1,2</sup>, F. Giubileo<sup>2</sup>, A. Grillo<sup>1,2</sup>, L. Iemmo<sup>1,2</sup>, G. Luongo<sup>1,2</sup>, F. Urban<sup>1,2</sup>

<sup>1</sup>Physics Department, University of Salerno, Salerno, Italy; <sup>2</sup>CNR-SPIN, CNR, Salerno, Italy

16h50: **Invited - Two dimensional hexagonal boron nitride thin film for flexible resistive switching memory**

Qian Kai, Pooi See Lee

*School of Materials Science and Engineering, Nanyang Technological University, Singapore*

17h30: **Investigating contact resistance to PtSe<sub>2</sub> using forming gas annealing**

Lee A. Walsh<sup>1</sup>, Gioele Mirabelli<sup>1</sup>, Conor P. Cullen<sup>2</sup>, Farzan Gity<sup>1</sup>, Cormac Ó'Coileain<sup>2</sup>, Scott Monaghan<sup>1</sup>, Michael Schmidt<sup>1</sup>, Roger Nagle<sup>1</sup>, Niall McEvoy<sup>2</sup>, Ray Duffy<sup>1</sup>, Georg Duesberg<sup>2</sup>, Paul K. Hurley<sup>1</sup>

<sup>1</sup>*Tyndall National Institute, University College Cork, Cork, Ireland;* <sup>2</sup>*School of Chemistry and CRANN, Trinity College Dublin, Dublin 2, Ireland*

17h50: **Study of the annealing effect on interface traps in Cr/HfO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub>/MoS<sub>2</sub> top-gate stacks**

P. Zhao<sup>1</sup>, A. Padovani<sup>2</sup>, P. Bolshakov<sup>1</sup>, A. Khosravi<sup>1</sup>, L. Larcher<sup>3</sup>, P.K. Hurley<sup>4</sup>, C.L. Hinkle<sup>1</sup>, R.M. Wallace<sup>1</sup>, and C.D. Young<sup>1</sup>

<sup>1</sup>*University of Texas at Dallas, Richardson, TX, USA;* <sup>2</sup>*MDLSoft Inc., Santa Clara, CA, USA;* <sup>3</sup>*Università di Modena e Reggio Emilia, Italy;* <sup>4</sup>*Tyndall National Institut, University of College Cork, Cork, Ireland*

18h15 - 19h30: **POSTER SESSION**

**Tuesday 12<sup>th</sup> June 2018**

**Session 5 - Ferroelectrics - Chair: Catherine Dubourdieu**

08h15: **Invited - From FRAM to FeFET: Ferroelectric HfO<sub>2</sub>-based devices and their reliability**

U. Schroeder<sup>1</sup>, M. Pešić<sup>1</sup>, H. Mulaosmanovic<sup>1</sup>, S. Slesazek<sup>1</sup>, T. Mikolajick<sup>1,2</sup>

<sup>1</sup>*NaMLab gGmbH, Noethnitzer Strasse 64, 01187 Dresden, Germany;* <sup>2</sup>*Chair of Nanoelectronic Materials, TU Dresden, 01062 Dresden, Germany*

08h55: **Invited - Ferroionic states: coupling between surface electrochemical and bulk ferroelectric functionalities on the nanoscale**

Stephen Jesse, Anton Ievlev, Nina Balke, and Sergei V. Kalinin

*Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN, 37831*

09h35: **Tuning lattice strain of epitaxial ferroelectric BaTiO<sub>3</sub> thin films on Si(001) by growth kinetics**

J. Lyu, I. Fina, R. Solanas, J. Fontcuberta, and F. Sánchez

*Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), Campus UAB, Bellaterra 08193, Barcelona, Spain*

09h55: **Infrared and ab initio studies of ferroelectric strained SrTiO<sub>3</sub> thin films**

Wei-Wei Peng<sup>1</sup>, Robert Tétot<sup>2</sup>, Gang Niu<sup>3</sup>, Emilie Amzallag<sup>2</sup>, Bertrand Vilquin<sup>4</sup>, Jean-Blaise Brubach<sup>1</sup> and Pascale Roy<sup>1</sup>

<sup>1</sup>*Synchrotron SOLEIL, L'Orme des Merisiers, Saint-Aubin, F-91192 Gif-sur-Yvette, France;*

<sup>2</sup>*CNRS-Université Paris-Sud, ICMMO (SP2M) UMR 8182, Bât 410, F-91405 Orsay cedex, France;*

<sup>3</sup>*Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China;*

<sup>4</sup>*Ecole Centrale de Lyon, Université de Lyon, Institut des Nanotechnologies de Lyon (INL), CNRS-UMR 5270, F-69134 Ecully, France*

10h15: COFFEE BREAK

## Session 6; Solar and electrochemical – Chair: Pooi See Lee

- 10h45: **Invited - Electrochemical water splitting on Ir and Ru oxides: an insight from *operando* photoemission spectroscopy**  
V. A. Saveleva<sup>1</sup>, L. Wang<sup>2</sup>, D. Teschner<sup>3,4</sup>, J.-J. Gallet<sup>5,6</sup>, F. Bournel<sup>5,6</sup>, A. S. Gago<sup>2</sup>, K. A. Friedrich<sup>2</sup>, S. Zafeiratos<sup>1</sup>, **E. R. Savinova**<sup>1</sup>  
<sup>1</sup>ICPEES CNRS-University of Strasbourg, Strasbourg, France; <sup>2</sup>Institute of Engineering Thermodynamics, German Aerospace Center (DLR), Stuttgart, Germany; <sup>3</sup>Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, Germany; <sup>4</sup>Max-Planck-Institut für Chemische Energiekonversion, Mülheim a. d. Ruhr, Germany; <sup>5</sup>Sorbonne Université, CNRS, Laboratoire de Chimie-Physique Matière et Rayonnement, Paris, France; <sup>6</sup>Synchrotron-Soleil, Gif-sur-Yvette, France
- 11h25: **RuO<sub>2</sub>-based photoanodes for water splitting**  
K. Fröhlich<sup>1</sup>, M. Mikolášek<sup>2</sup>, K. Hušeková<sup>1</sup>, I. Kunderata<sup>1</sup>, E. Dobročka<sup>1</sup>, V. Řeháček<sup>2</sup>, L. Harmatha<sup>2</sup>  
<sup>1</sup>Institute of Electrical Engineering SAS, Dúbravská cesta 9, 841 04, Bratislava, Slovakia; <sup>2</sup>Faculty of Electrical Engineering and Information Technology, STU in Bratislava, Bratislava, Slovakia
- 11h45: **Si photovoltaic contacts – passivation or Fermi level unpinning**  
J. Robertson, H Li, H Lu  
Engineering Dept, Cambridge University, Cambridge CB2 1PZ, UK
- 12h05: **IrO<sub>x</sub> functionalized nickel foam electrodes for efficient energy conversion devices**  
R. G. Milazzo, M. S. Privitera, S. Scalese, S. Lombardo  
CNR-IMM Istituto per la Microelettronica e Microsistemi, Catania, Italy

12h25 - 14h00: LUNCH

## Session 7, Joint session with GraFOx; Sesquioxides – Chairs: Martin Albrecht & Oliver Bierwagen

The Leibniz ScienceCampus GraFOx (<http://grafox.pdi-berlin.de/>) joins activities in crystal growth, epitaxy, theory, and fundamental physical investigations. It brings together the passion, expertise and research facilities of all members to create and explore oxide systems for new generations of electronic devices.

- 14h00: **Invited - Ga<sub>2</sub>O<sub>3</sub> from materials to devices**  
**M. Albrecht**, R. Schewski, C. Wouters, A. Fielder, K. Irmscher, Z. Galazka, A. Popp, S. Bin Anooz, M. Baldini, G. Wagner  
Leibniz-Institut für Kristallzüchtung, Berlin, Germany
- 14h40: **Invited GraFOx - Molecular beam epitaxy of sesquioxides**  
**Oliver Bierwagen**, Patrick Vogt and Piero Mazzolini  
Paul Drude Institute, Berlin, Germany
- 15h10: **Invited GraFOx - Reflections on the state of ultra- wide-bandgap Ga<sub>2</sub>O<sub>3</sub> MOSFETs**  
**M. H. Wong**<sup>1</sup>, Y. Nakata<sup>1</sup>, C.-H. Lin<sup>1</sup>, K. Sasaki<sup>2</sup>, Y. Morikawa<sup>3</sup>, K. Goto<sup>2,4</sup>, A. Takeyama<sup>5</sup>, T. Makino<sup>5</sup>, T. Ohshima<sup>5</sup>, A. Kuramata<sup>2</sup>, S. Yamakoshi<sup>2</sup>, H. Murakami<sup>4</sup>, Y. Kumagai<sup>4</sup>, and M. Higashiwaki<sup>1</sup>  
<sup>1</sup>National Institute of Information and Communications Technology, Koganei, Tokyo, Japan; <sup>2</sup>Tamura Corporation, Sayama, Saitama, Japan; <sup>3</sup>Silvaco Japan Co., Ltd., Yokohama, Kanagawa, Japan; <sup>4</sup>Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan; <sup>5</sup>National Institutes for Quantum and Radiological Science and Technology, Takasaki, Gunma, Japan

15h40: COFFEE BREAK

- 16h10: **Invited GraFOx - Emergent property sets & applications of  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> hetero-epilayers grown by pulsed laser deposition**  
**D. J. Rogers**, V. E. Sandana, P. Bove and F. H. Teherani  
*Nanovation, 8 route de Chevreuse, 78117 Châteaufort, France*
- 16h40: **Invited GraFOx - A dilemma: Dielectrics for wide-bandgap gallium oxide high-voltage transistors**  
**Debdeep Jena**, N. Tanen, W. Li, K. Nomoto, Z. Hu, G. Xing  
*Cornell University, Ithaca, NY, USA*
- 17h10: **Invited GraFOx - Electrical and physical characterization investigation of potential high-k dielectrics on  $\beta$ -Ga<sub>2</sub>O<sub>3</sub>**  
**C.D. Young**<sup>1</sup>, M.S.L. Narayanan<sup>1</sup>, X. Qin<sup>1</sup>, P. Zhao<sup>1</sup>, A. Padovani<sup>2</sup>, P. Bolshakov<sup>1</sup>, Jesus J. Alcantar Peña<sup>1</sup>, L. Larcher<sup>2</sup>, O. Auciello<sup>1</sup>, R.M. Wallace<sup>1</sup>  
<sup>1</sup>*University of Texas at Dallas, 800 W. Campbell Rd., Richardson, TX 75080, USA;* <sup>2</sup>*University of Modena and Reggio Emilia, Modena, Italy*
- 17h40 **Invited GraFOx - Ga<sub>2</sub>O<sub>3</sub>: a model system to describe p-type and n-type behavior**  
**Dieter Schmeißer**<sup>1</sup>, Klaus Müller<sup>1</sup>, Karsten Henkel<sup>1</sup>, and Christoph Janowitz<sup>2</sup>  
<sup>1</sup>*Angewandte Physik-Sensorik, BTU Cottbus-Senftenberg, 03046 Cottbus, Germany;* <sup>2</sup>*Institut für Physik, Humboldt-Universität zu Berlin, 12489 Berlin, Germany*

18h15 - 19h30: **POSTER SESSION**

**Wednesday 13<sup>th</sup> June 2018**

**Session 8; Wide band-gap semiconductors – Chair: Antonio Di Bartolomeo**

- 08h30: **Invited - Dielectrics for GaN and GaN as dielectric: The role of interface and bulk defects**  
**C. Ostermaier**<sup>1</sup>, P. Lagger<sup>1</sup>, M. Reiner<sup>1</sup>, C. Koller<sup>2</sup>, G. Pobegen<sup>2</sup>, and D. Pogany<sup>3</sup>  
<sup>1</sup>*Infineon Technologies Austria AG, Villach, Austria;* <sup>2</sup>*KAI, Villach, Austria;* <sup>3</sup>*TU Wien, Vienna, Austria*
- 09h10: **Aluminium doped Ga<sub>2</sub>O<sub>3</sub> for GaN MIS-HEMTs**  
Leanne Jones<sup>1</sup>, James T. Gibbon<sup>2</sup>, Joseph W. Roberts<sup>3</sup>, Sung-Jin Cho<sup>4</sup>, Iain G. Thayne<sup>4</sup>, Paul R. Chalker<sup>3</sup>, Vinod R. Dhanak<sup>2</sup>, Ivona Z. Mitrovic<sup>1</sup>  
<sup>1</sup>*Department of Electrical Engineering & Electronics, University of Liverpool, UK;* <sup>2</sup>*Department of Physics & Stephenson Institute for Renewable Energy, University of Liverpool, UK;* <sup>3</sup>*Department of Engineering, University of Liverpool, UK;* <sup>4</sup>*School of Engineering, University of Glasgow, Glasgow, UK*
- 09h30: **Invited - Zinc oxide based transparent electronics**  
**I.Z. Mitrovic**<sup>1</sup>, J. Jin<sup>1</sup>, A. Shaw<sup>1</sup>, J.S. Wrench<sup>2</sup>, P.R. Chalker<sup>2</sup> and S. Hall<sup>1</sup>  
<sup>1</sup>*Department of Electrical Engineering & Electronics, University of Liverpool, UK;* <sup>2</sup>*Department of Engineering, University of Liverpool, UK*
- 10h10: COFFEE BREAK

**Session 9; Materials - Chair: Karim Cherkaoui**

**10h40: Impact of annealing on the current conduction and trap properties of CeO<sub>2</sub>/La<sub>2</sub>O<sub>3</sub> Metal-Insulator-Metal capacitors**

I. Rossetto<sup>1</sup>, R. Piagge<sup>1</sup>, F. Toia<sup>1</sup>, S. Spiga<sup>2</sup>, A. Lamperti<sup>2</sup>, S. Vangelista<sup>1,2</sup>, R. Ritasalo<sup>3</sup>, P. Järvinen<sup>3</sup> and G. Ghidini<sup>1</sup>

<sup>1</sup>STMicroelectronics, SMART POWER Technology R&D, Via C.Olivetti 2,20864 Agrate Brianza (MB), Italy; <sup>2</sup>CNR-IMM, Unit of Agrate Brianza, via C. Olivetti 2, 20864 Agrate Brianza (MB), Italy; <sup>3</sup>Picosun Oy, Tietotie 3, Espoo FI-02150, Finland

**11h00: Network reinforcement of amorphous GeO<sub>2</sub> by Y doping for highly reliable Ge gate stacks**

T. Nishimura, X. Tang, C. Lu, T. Yajima, and A. Toriumi

*The University of Tokyo, Tokyo, Japan*

**11h20: Light-emission mechanism and influence factors of HfO<sub>2</sub>-based solid state incandescent device**

Yiwei Liu<sup>1</sup>, Can Yang<sup>1</sup>, Shengli Wu<sup>1</sup>, Jintao Zhang<sup>1</sup>, Liyan Dai<sup>2</sup>, Gang Niu<sup>2</sup>

<sup>1</sup>Key Laboratory for Physical Electronics and Devices of the Ministry of Education, Xi'an Jiaotong University, Xi'an, 710049, China; <sup>2</sup>Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China.

**11h40: Reliable high-density energy storage in Si-doped HfO<sub>2</sub> thin films on 3D-structures**

K. Kühnel, W. Weinreich, S. Riedel, C. Mart

*Fraunhofer IPMS, Dresden, Germany*

**12h00: Atomic layer deposition of oxide films as solid sources for doping of high aspect ratio semiconductor structures**

Bodo Kalkofen<sup>1</sup>, Mindaugas Šilinskas<sup>1</sup>, Marco Lisker<sup>2</sup>, and Edmund P. Burte<sup>1</sup>

<sup>1</sup>IMOS, Otto von Guericke University, Magdeburg, Germany; <sup>2</sup>IHP, Im Technologiepark 25, Frankfurt (Oder), Germany

12h20 - 14h00: LUNCH

**Session 10; Advanced characterization - Chair: Stephen Jesse**

**14h00: Operando Electron Paramagnetic Resonance (EPR) with EPR-on-a-chip (EPRoC)**

K. Lips<sup>1,2</sup>, S. Küstner<sup>1</sup>, A. Blank<sup>3</sup>, J. Anders<sup>4</sup>

<sup>1</sup>HZB, Institute for Nanospectroscopy, Berlin, Germany; <sup>2</sup>Berlin Joint EPR Lab (BeJEL), Free University Berlin, Germany; <sup>3</sup>Technion, Haifa, Israel; <sup>4</sup>University of Stuttgart, Germany

**14h20: Amorphous copper capping layer dielectric thin films studied with electron paramagnetic resonance and multiple frequency electrically detected magnetic resonance**

R.J. Waskiewicz<sup>1</sup>, P.M. Lenahan<sup>1</sup>, S.W. King<sup>2</sup>

<sup>1</sup>Engineering Science and Mechanics, Pennsylvania State University, State College, PA, USA; <sup>2</sup>Logic Technology Development, Intel Corporation, Hillsboro, OR, USA

15h00 – 18h00: Local excursion

19h00 - 23h00: Conference dinner

## Thursday 14<sup>th</sup> June 2018

### Session 11; Resistive switching materials and devices – Chair: Gang Niu

09h00: **Invited - Engineering nanoscale devices for brain-inspired computing**

**Bipin Rajendran**

*Dept of Electrical & Computer Engineering, New Jersey Institute of Technology, Newark, NJ, USA*

09h40: **Variability analysis of ReRAM devices with ultra-fast measurements: Controlling the filament switching**

A. Crespo-Yepes, G. Clotet, R. Rodríguez, J. Martín-Martínez, M. Nafria, X. Aymerich

*Universitat Autònoma de Barcelona UAB, Bellaterra, Spain*

10h00: **Accurate control of intermediate states on bipolar resistive memories by several routes**

S. Dueñas<sup>1</sup>, H. Castán<sup>1</sup>, H. García<sup>1</sup>, E. Miranda<sup>2</sup>, M. B. González<sup>3</sup>, and F. Campabadal<sup>3</sup>

*<sup>1</sup>Dept. of Electronics, University of Valladolid. Paseo de Belén 15. 47011 Valladolid, Spain; <sup>2</sup>Dept. d'Enginyeria Electrònica, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain; <sup>3</sup>Institut de Microelectrònica de Barcelona, IMB-CNM (CSIC), Campus UAB, 08193 Bellaterra, Spain*

10h20: **Conductance modulation of TiN/Ti/HfO<sub>2</sub>/W memristor devices through ultrafast pulsed characterization**

M.B. González<sup>1</sup>, S. Poblador<sup>1</sup>, M. Maestro<sup>1</sup>, F. Jiménez-Molinós<sup>2</sup>, J.B. Roldán<sup>2</sup>, F. Campabadal<sup>1</sup>

*<sup>1</sup>Institut de Microelectrònica de Barcelona, IMB-CNM (CSIC), Campus UAB, 08193 Bellaterra, Spain; <sup>2</sup>Dept. de Electrònica y Tecnologia de Computadores, Universidad de Granada, Spain*

10h40: COFFEE BREAK

### Session 12; Theory and Modelling – Chair: John Robertson

11h00: **Invited - Introduction to topological insulators and their connection to ferromagnetism, ferroelectricity and strong electron correlation**

**Oliver Rader**

*Helmholtz Zentrum Berlin für Materialien und Energie, Berlin, Germany*

11h40: **Intrinsic trapping of electrons in amorphous HfO<sub>2</sub>**

J. Strand<sup>1</sup>, M. Kaviani<sup>2</sup>, A. Shluger<sup>1,2</sup>

*<sup>1</sup>Department of Physics and Astronomy, University College London, Gower Street, London WC1E 6BT; <sup>2</sup>WPI-Advanced Institute for Materials Research, Tohoku University, Senai 980-8577, Japan*

12h00: **Modeling of cycle-to-cycle variability in ReRAM devices using a first order autoregressive process with trend**

E. Miranda<sup>1</sup>, A. Mehonic<sup>2</sup>, W.H. Ng<sup>2</sup>, J. Suñé<sup>1</sup>, A.J. Kenyon<sup>2</sup>

*<sup>1</sup>Dept. d'Enginyeria Electrònica, Universitat Autònoma de Barcelona, Cerdanyola del Valles, Spain; <sup>2</sup>Dept. of Electronic & Electrical Engineering, University College London, London, UK*

### Closing presentation

12h20: **Invited – Approaches to memory integration in large high performance systems**

**Subramanian Iyer**

*Electrical and Computer Engineering, University of California Los Angeles, CA, USA*

13h00: **CLOSING REMARKS**

13h10: LUNCH

## POSTER SESSION PROGRAM

- P1. **Electrical characterization of 3-nm-thin Al<sub>2</sub>O<sub>3</sub> films grown by atomic layer deposition for graphene base transistors**  
M. Albert<sup>1</sup>, M. Junige<sup>1</sup>, J.W. Bartha<sup>1</sup>, C. Wenger<sup>2</sup>,  
<sup>1</sup>*Institut für Halbleiter- und Mikroelektronik, Technische Universität Dresden, Dresden, Germany;*  
<sup>2</sup>*IHP, Frankfurt/Oder, Germany*
- P2. **He/Ne-Ion milling of β-Ga<sub>2</sub>O<sub>3</sub> nanostructures**  
J. Barrat<sup>1</sup>, J. Albert<sup>1</sup>, H. Kropf<sup>1</sup>, K. Schwarzburg<sup>1</sup>, Z. Galazka<sup>2</sup>, S. Schmitt<sup>1</sup>, C. Dubourdieu<sup>1,3</sup>  
<sup>1</sup>*Helmholtz-Zentrum Berlin für Materialien und Energie (HZB), 14109 Berlin, Germany;* <sup>2</sup>*Leibniz Institute for Crystal Growth, 12489 Berlin, Germany;* <sup>3</sup>*Freie Universität Berlin, Institut für Chemie und Biochemie, 14195 Berlin, Germany*
- P3. **Annealing effect on hafnium/zirconium oxides solid solution deposited by reactive magnetron sputtering on silicon**  
Jordan Bouaziz<sup>1,2</sup>, Pedro Rojo Romeo<sup>1</sup>, Nicolas Baboux<sup>2</sup>, Bruno Masenelli<sup>2</sup>, Bertrand Vilquin<sup>1</sup>  
<sup>1</sup>*Université de Lyon, Ecole Centrale de Lyon, Institut des Nanotechnologies de Lyon, CNRS UMR5270, 69134 Ecully, France;* <sup>2</sup>*Université de Lyon, INSA de Lyon, Institut des Nanotechnologies de Lyon, CNRS UMR5270, 69621 Villeurbanne, France*
- P4. **Analysis of ZrO<sub>2</sub>-based RRAM devices**  
H. Castán<sup>1</sup>, S. Dueñas<sup>1</sup>, K. Kukli<sup>2,3</sup>, M. Kemell<sup>2</sup>, M. Ritala<sup>3</sup>, and M. Leskelä<sup>3</sup>  
<sup>1</sup>*Department of Electronics, University of Valladolid. Paseo de Belén 15. 47011 Valladolid (Spain);*  
<sup>2</sup>*Department of Chemistry, University of Helsinki. P.O. Box 55 FI-00014 Helsinki (Finland);*  
<sup>3</sup>*Institute of Physics, University of Tartu, 50411 Tartu (Estonia)*
- P5. **Combination of ultra-low energy ion beam synthesis and block-copolymer lithography for 3D-organization of embedded Si nanocrystals in SiO<sub>2</sub>**  
C. Castro<sup>1</sup>, G. BenAssayag<sup>1</sup>, A. Andreozzi<sup>2</sup>, G. Seguini<sup>2</sup>, M. Perego<sup>2</sup>, S. Schamm-Chardon<sup>1</sup>  
<sup>1</sup>*CEMES-CNRS, Université de Toulouse, Toulouse, France;* <sup>2</sup>*Laboratorio MDM, IMM-CNR, Agrate Brianza (MB), Italy*
- P6. **A thermal study of multilayer RRAMs based on HfO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> oxides**  
M. Cazorla<sup>1</sup>, S. Aldana<sup>1</sup>, M. Maestro<sup>2</sup>, M.B. González<sup>2</sup>, F. Jiménez-Molinos<sup>1</sup>, F. Campabadal<sup>2</sup>, J.B. Roldán<sup>1</sup>  
<sup>1</sup>*Departamento de Electrónica y Tecnología de Computadores Universidad de Granada, Spain;*  
<sup>2</sup>*Institut de Microelectrònica de Barcelona, IMB-CNM (CSIC), Campus UAB, 08193 Bellaterra, Spain*
- P7. **Toward van der Waals epitaxy of releasable ferroelectric films on graphene**  
Liyan Dai, Jinyan Zhao, Wei Bai, Yankun Wang, Heping Wu, Wei Ren, Zuo-Guang Ye, Gang Niu  
*Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Centre for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China*
- P8. **Resistive switching structures for Min and Max functions implementation**  
Karol Fröhlich<sup>1</sup>, Ivan Kundrata<sup>1</sup>, Michal Blaho<sup>1</sup>, Marian Precner<sup>1</sup>, Milan Ťapajna<sup>1</sup>, Martin Klimo<sup>2</sup>, Ondrej Šuch<sup>2</sup>, Ondrej Škvarek<sup>2</sup>  
<sup>1</sup>*Institute of Electrical Engineering, SAS, Dúbravská cesta 9, 84104 Bratislava, Slovakia ;*  
<sup>2</sup>*University of Žilina, Department of InfoCom Networks, 01026 Žilina, Slovakia*



- P9. **Electrical characterization of MIS structures based on HfO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> multilayers**  
H. García, H. Castán, and S. Dueñas  
*Dpto. Electricidad y Electrónica. E.T.S.I. Telecomunicación. Universidad de Valladolid. Paseo de Belén 15. 47011 Valladolid (Spain)*
- P10. **A new method to analyze random telegraph signals in the high-resistance state of Ni/HfO<sub>2</sub>/Si-n+ RRAMs**  
G. González-Cordero<sup>1</sup>, M.B. González<sup>2</sup>, F. Jiménez-Molinos<sup>1</sup>, F. Campabadal<sup>2</sup>, J.B. Roldán<sup>1</sup>  
<sup>1</sup>*Departamento de Electrónica y Tecnología de Computadores Universidad de Granada, Spain;*  
<sup>2</sup>*Institut de Microelectrònica de Barcelona, IMB-CNM(CSIC), Campus UAB,08193 Bellaterra, Spain*
- P11. **Recent progress in perovskite-type substrate crystal growth at the Leibniz Institute for Crystal Growth**  
C. Gugushev<sup>1</sup>, J. Hidde<sup>1</sup>, T. M. Gesing<sup>2,3</sup>, M. Gogolin<sup>2</sup>, D. Klimm<sup>1</sup>  
<sup>1</sup>*Leibniz Institute for Crystal Growth, 12489 Berlin, Germany;* <sup>2</sup>*University of Bremen, Solid State Chemical Crystallography, Institute of Inorganic Chemistry and Crystallography, 28359 Bremen, Germany;* <sup>3</sup>*University of Bremen, MAPEX Center for Materials and Processes, 28359 Bremen, Germany*
- P12. **Interaction of hydrogen with hafnium oxide grown on silicon dioxide by the atomic layer deposition technique**  
Vl. Kolkovsky<sup>1</sup>, S. Scholz<sup>1</sup>, V. Kolkovsky<sup>2</sup>, J.-U. Schmidt<sup>1</sup>  
<sup>1</sup>*Fraunhofer IPMS Dresden, 01109 Dresden, Germany;* <sup>2</sup>*Technische Universität Dresden, 01062 Dresden, Germany*
- P13. **Gallium oxide deposition by atomic layer deposition on 200mm (100) silicon**  
H. Kröncke<sup>1</sup>, M. Rusu<sup>1</sup>, N. Maticiu<sup>1</sup>, I. Lauer<sup>1</sup>, S. Wiesner<sup>1</sup>, J. Albert<sup>1</sup>, C. Dubourdieu<sup>1,2</sup>  
<sup>1</sup>*Helmholtz-Zentrum Berlin für Materialien und Energie, 14109 Berlin, Germany;* <sup>2</sup>*Freie Universität Berlin, 14195 Berlin, Germany*
- P14. **Stabilization of orthorhombic (Zr,Ta)O<sub>2</sub> in thin Zr-Ta-O films**  
D. Lehninger<sup>1,2</sup>, D. Rafaja<sup>3</sup>, J. Wünsche<sup>1</sup>, F. Schneider<sup>1</sup>, J. von Borany<sup>4</sup>, and J. Heitmann<sup>1,2</sup>  
<sup>1</sup>*TU Bergakademie Freiberg, Institute of Applied Physics, 09599 Freiberg, Germany;* <sup>2</sup>*Fraunhofer Technology Center for Semiconductor Materials, 09599 Freiberg, Germany;* <sup>3</sup>*TU Bergakademie Freiberg, Institute of Materials Science, 09599 Freiberg, Germany;* <sup>4</sup>*Helmholtz-Zentrum Dresden Rossendorf, Institute of Ion Beam Physics and Materials Research, 01314 Dresden, Germany*
- P15. **Assessment of resistive switching characteristics on different HfO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> dielectric stacks**  
M. Maestro, S. Poblador, M. Zabala, M. C. Acero, M. B. Gonzalez, and F. Campabadal  
*Institut de Microelectrònica de Barcelona, IMB-CNM (CSIC), Campus UAB, 08193 Bellaterra, Spain*
- P16. **Determination of border/bulk traps parameters based on (C-G-V) admittance measurements**  
A. Mazurak, J. Jasiński, B. Majkusiak  
*Institute of Microelectronics and Optoelectronics, Warsaw University of Technology, Poland*
- P17. **Cu/SiO<sub>2</sub>/W memristive devices with half-integer quantized conductance**  
S. R. Nandakumar<sup>1</sup>, S. Nagar<sup>2</sup>, C. Dubourdieu<sup>2,3</sup> and B. Rajendran<sup>1</sup>  
<sup>1</sup>*Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Newark, NJ 07102, USA;* <sup>2</sup>*Helmholtz-Zentrum Berlin für Materialien und Energie, 14109 Berlin, Germany;* <sup>3</sup>*Freie Universität Berlin, 14195 Berlin, Germany*

- P18. **Toward the realization of low-cost integrated devices for fast silicon photonics, using functional oxides and low index CMOS compatible materials**  
P. Rojo Romeo<sup>1</sup>, B. Vilquin<sup>1</sup>, J. Bouaziz<sup>1</sup>, R. Orobtcouk<sup>2</sup>  
<sup>1</sup>University of Lyon, Ecole Centrale de Lyon, Institut des Nanotechnologies de Lyon, CNRS UMR5270, 69134 Ecully Cedex, France; <sup>2</sup>University of Lyon, INSA, Institut des Nanotechnologies de Lyon, CNRS UMR5270, 69100 Villeurbanne, France
- P19. **Towards tunable silicon-oxide core-shell nano-photonics resonators**  
Sebastian W. Schmitt<sup>1</sup>, Christian Appelt<sup>1</sup>, Sven Wiesner<sup>1</sup>, Hanno Kröncke<sup>1</sup>, Klaus Schwarzburg<sup>1</sup>, Catherine Dubourdieu<sup>1,2</sup>  
<sup>1</sup>Helmholtz-Zentrum Berlin für Materialien und Energie, 14109 Berlin, Germany; <sup>2</sup>Freie Universität Berlin, 14195 Berlin, Germany
- P20. **Temperature dependence of the permittivity of SrTiO<sub>3</sub> in high electric fields**  
J. Stoeber, L. Bogula, J.E. Boschker, T. Markurt, J. Schwarzkopf, M. Albrecht, K. Irmscher  
Leibniz Institut für Kristallzucht im Forschungsverbund Berlin e.V., Max Born Strasse 2, 12489 Berlin, Germany
- P21. **Sputtered ZrO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and MgO on GaN: band alignment and interface study**  
S.N. Supardan<sup>1</sup>, P. Das<sup>2</sup>, A.P. Shaw<sup>1</sup>, J.D. Major<sup>3</sup>, R. Valizadeh<sup>4</sup>, A. Hannah<sup>4</sup>, A.K. Chakraborty<sup>5</sup>, R. Mahapatra<sup>2</sup>, S. Hall<sup>1</sup>, V.R. Dhanak<sup>3</sup>, I.Z. Mitrovic<sup>1</sup>  
<sup>1</sup>Dept. of Electrical Engineering & Electronics, University of Liverpool, UK; <sup>2</sup>Dept. of Electronics & Communication Eng., National Institute of Technology Durgapur, India; <sup>3</sup>Dept. of Physics and Stephenson Institute for Renewable Energy, University of Liverpool, UK; <sup>4</sup>ASTeC Vacuum Science Group, STFC Daresbury Laboratory, Cheshire, UK; <sup>5</sup>Dept. of Physics, National Institute of Technology Durgapur, India
- P22. **Infrared absorption studies on tetragonal barium titanate (BaTiO<sub>3</sub>) thin film**  
B. Wague<sup>1</sup>, J-B. Brubach<sup>2</sup>, G. Niu<sup>3</sup>, G. Dong<sup>3</sup>, L. Dai<sup>3</sup>, P. Roy<sup>2</sup>, G. Saint-Girons<sup>1</sup>, P. Rojo-Romeo<sup>1</sup>, Y. Robach<sup>1</sup>, B. Vilquin<sup>1</sup>  
<sup>1</sup>Université de Lyon, Ecole Centrale de Lyon, Institut des Nanotechnologies de Lyon, CNRS UMR5270, 69134 Ecully Cedex, France; <sup>2</sup>Synchrotron SOLEIL, 91190 Saint Aubin, France; <sup>3</sup>Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China
- P23. **Varicap HfO<sub>2</sub> memory-impedance**  
T. Wakrim<sup>1</sup>, P. Gonon<sup>1</sup>, C. Vallée<sup>1</sup>, A. Sylvestre<sup>2</sup>  
<sup>1</sup>Univ. Grenoble Alpes, LTM (CEA-LETI/Minatoc), 38000 Grenoble, France; <sup>2</sup>Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, 38000 Grenoble, France
- P24. **Plasma-enhanced atomic layer deposition of TiO<sub>2</sub> for thin-film transistors**  
L. Zheng<sup>1,2</sup>, D. Wu<sup>1,2</sup>, X. Cheng<sup>1,2\*</sup>, W. Zhou<sup>1,2</sup>, L. Shen<sup>1,2</sup>, Q. Wang<sup>1,2</sup>, D. Zhang<sup>1,2</sup>, Z. Gu<sup>1,2</sup>, R. Qian<sup>1,2</sup> and Y. Yu<sup>1,2</sup>  
<sup>1</sup>State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai 200050, P. R. China; <sup>2</sup>University of Chinese Academy of Sciences, Beijing 100049, P. R. China
- P25. **Plasma-enhanced atomic layer deposition of SiO<sub>2</sub> for channel regulation of colloidal quantum dots phototransistors**  
W. Zhou<sup>1,2</sup>, L. Zheng<sup>1,2</sup>, X. Cheng<sup>1,2</sup>, L. Shen<sup>1,2</sup>, Q. Wang<sup>1,2</sup>, D. Zhang<sup>1,2</sup>, Z. Gu<sup>1,2</sup>, R. Qian<sup>1,2</sup>, D. Wu<sup>1,2</sup> and Y. Yu<sup>1,2</sup>  
<sup>1</sup>State Key Laboratory of Functional Materials for Informatics, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai 200050, P. R. China; <sup>2</sup>University of Chinese Academy of Sciences, Beijing 100049, P. R. China