

**SISC 2012**

**43<sup>rd</sup> IEEE  
Semiconductor Interface  
Specialists Conference**

December 6-8, 2012 (Tutorial: December 5)  
The Catamaran Hotel, San Diego, CA  
[www.ieeesisc.org](http://www.ieeesisc.org)



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## **CONFERENCE PROGRAM**

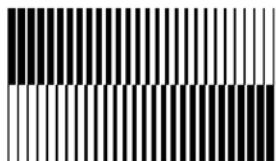
General Chair: Michel Houssa

Program Chair: Chadwin Young

Arrangements Chair: Alex Demkov

Ex-Officio: John Robertson

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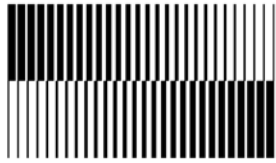
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<b>T. Nabatame</b> , NIMS <i>Tsukuba, JAPAN</i>	<b>Y. C. Yeo</b> , National U. Singapore <i>SINGAPORE</i>

*This meeting is sponsored by the IEEE Electron Devices Society*



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## **SISC Ed Nicollian Award for Best Student Paper**

In 1995, the SISC began presenting an award for the best student presentation, in honor of Professor E.H. Nicollian, University of North Carolina at Charlotte. Professor Nicollian was a pioneer in the exploration of the metal-oxide-semiconductor system, particularly in the area of electrical measurements. His efforts were fundamental in establishing the SISC in its early years, and he served as its technical program chair in 1982. With John Brews, he wrote the definitive book, “MOS Physics and Technology,” published by Wiley Interscience.

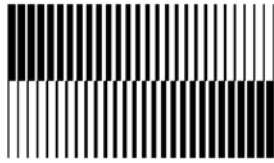
The *SISC Ed Nicollian Award for Best Student Paper* is presented to the lead student author for either an oral or a poster presentation. The winner is chosen by members of the technical program committee at the end of the SISC. The award consists of a plaque, an honorarium, and a permanent mention on the conference web site.

### **Winner of the 2011 SISC Ed Nicollian Award for Best Student Paper:**

**Suyog Gupta, *Stanford University***

“Atomic Layer Deposition of Al<sub>2</sub>O<sub>3</sub> on GeSn and Impact of Wet Chemical Surface  
Pre-Treatment”

with R. Chen, J. Harris, and K.C. Saraswat



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## **Wednesday Evening Tutorial**

**Wednesday, December 5, 2012, 8:00 PM**

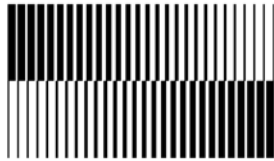
First introduced at SISC 2008, the Wednesday evening Tutorial aims to provide a good foundation in a topic frequently covered at the conference, particularly benefiting students and newcomers to the field. The Tutorial is free to all registered SISC attendees.

### **Dr. Dirk Wouters**

imec  
Kapeldreef 75  
3001 Leuven, Belgium

### **Resistive Switching Devices and Materials for Future Memory Applications**

The ever growing need for fast and power-efficient data handling and storage make memories an increasingly important part of semiconductor technology. The success of Moore's scaling resulted in dramatic cost reductions allowing fast penetration of solid-state memories in both new and replacement markets. However, current major memory technologies (DRAM, Flash) are facing severe limitations for further scaling, essentially limited by the fact that they are charge based. This has driven the research of new memory concepts that would allow for better scalability. An important class of these is based on devices that change their resistivity by applying an electrical signal (voltage/current). This is a broad class that in principle comprises phase-change memories (PCM), the so-called resistive RAM (RRAM) memories, and even magnetic memories as STT-RAM. This tutorial will largely focus on the RRAM memories, and the different materials and device structures investigated. The progress in understanding different switching phenomena as well as scaling results and prospects will be discussed.



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## Conference Agenda Overview

### Wednesday, December 5, 2012

<b>Registration</b> .....	6:00 PM – 8:00 PM
<b>Evening Tutorial</b> .....	8:00 PM – 9:30 PM
<b>Hospitality Room</b> .....	8:00 PM – Midnight

### Thursday, December 6, 2012

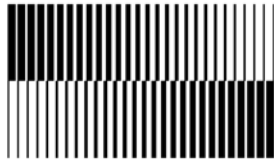
<b>Registration</b> .....	8:00 AM – 5:00 PM
<b>Session 1 – High-k Dielectrics</b> .....	8:00 AM – 9:30 AM
<b>Poster Preview Session 1 – Dielectrics / Memory</b> .....	9:30 AM – 9:55 AM
<b>Session 2 – III-V</b> .....	10:25 AM – 11:40 AM
<b>Poster Preview Session 2 – III-V</b> .....	11:40 AM – Noon
<b>Session 3 – Graphene and Related 2D Materials</b> .....	1:30 PM – 2:50 PM
<b>Poster Preview Session 3 – Ge / III-V / Characterization</b> .....	2:50 PM – 3:10 PM
<b>Session 4 – III-V</b> .....	3:40 PM – 5:20 PM
<b>Poster Preview Session 4 – Beyond Si / Power Devices</b> .....	5:20 PM – 5:40 PM
<b>Poster Reception</b> .....	7:00 PM – 10:00 PM
<b>Hospitality Room</b> .....	9:30 PM – Midnight

### Friday, December 7, 2012

<b>Registration</b> .....	8:00 AM – Noon
<b>Session 5 – Memory</b> .....	8:00 AM – 10:00 AM
<b>Session 6 – Characterization and Reliability</b> .....	10:30 AM – 12:30 PM
<b>Technical Committee / Invited Speaker Luncheon</b> .....	12:30 PM – 2:00 PM
<b>Rump Session</b> .....	3:00 PM – 5:30 PM
<b>Conference Banquet and Limerick Contest</b> .....	7:00 PM – 10:00 PM
<b>Hospitality Room</b> .....	10:00 PM – Midnight

### Saturday, December 8, 2012

<b>Session 7 – Ge and III-V</b> .....	8:00 AM – 9:40 AM
<b>Session 7 (continued) – Ge and III-V</b> .....	10:10 AM – 11:10 AM
<b>Session 8 – Devices</b> .....	11:10 AM – 12:30 PM



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## Conference Program

### Session 1 - High-k Dielectrics

Thursday, December 6, 2012

Session Chair: M. Houssa

- 8:00 AM Welcome and opening remarks
- 8:15 AM 1.1 **Invited - Physics and Chemistry of the High k/InGaAs Interface for High Mobility Channel MOSFET**, J. Kwo<sup>1</sup>, M. Hong<sup>2</sup>, T.-W. Pi<sup>3</sup>, W. W. Pai<sup>2</sup>, Y. M. Chang<sup>2</sup>, M. L. Huang<sup>1</sup>, Y. C. Liu<sup>1</sup>, C. A. Lin<sup>1</sup>, T. D. Lin<sup>2</sup>, Y. H. Chang<sup>1</sup>, and W. C. Lee<sup>1</sup>, <sup>1</sup>National Tsing Hua U., Taiwan, <sup>2</sup>National Taiwan U., Taiwan, <sup>3</sup>National Synchrotron Radiation Research Center, Taiwan
- 8:50 AM 1.2 - **Characterization of Thulium Silicate as an Interfacial Layer for High-k/Metal Gate Stacks**, E. Dentoni Litta, P.-E. Hellström, C. Henkel, and M. Östling, *KTH, Sweden*
- 9:10 AM 1.3 - **Thermal and Plasma Treatments for Improved (Sub-)1nm EOT RMG High-k Last Devices**, A. Veloso<sup>1</sup>, H. Arimura<sup>1,2</sup>, E. Simoen<sup>1</sup>, V. Paraschiv<sup>1</sup>, X. Shi<sup>1</sup>, M. J. Cho<sup>1</sup>, L.-Å. Ragnarsson<sup>1</sup>, S. A. Chew<sup>1</sup>, E. Vecchio<sup>1</sup>, F. Sebaai<sup>1</sup>, Ph. J. Roussel<sup>1</sup>, S. D. Santos<sup>1,2,3</sup>, T. Schram<sup>1</sup>, Y. Higuchi<sup>1,4</sup>, A. Thean<sup>1</sup>, and N. Horiguchi<sup>1</sup>, <sup>1</sup>imec, Belgium, <sup>2</sup>U. Leuven, Belgium, <sup>3</sup>U. Sao Paulo, Brazil, <sup>4</sup>Panasonic, Belgium

### Poster Preview Session 1 - Dielectrics / Memory

Thursday, December 6, 2012

Session Chair: R. Wallace

- 9:30 AM Poster Intro
- 9:35 AM P.1 - **Control of Schottky Barrier Heights by Inserting Thin Dielectric Layers**, L. Lin, H. Li, and J. Robertson, *U. Cambridge, UK*
- P.2 - **Electron Spin Resonance Signature of the Oxygen Vacancy in HfO<sub>2</sub>**, R. Gillen<sup>1</sup>, J. Robertson<sup>1</sup>, and S. J. Clark<sup>2</sup>, <sup>1</sup>U. Cambridge, UK, <sup>2</sup>Durham U., UK
- P.3 - **High-k Dielectric Integration on Semiconducting Transition Metal Dichalcogenides**, H. Liu, K. Xu, A. T. Neal, and P. D. Ye, *Purdue U.*

**P.4 - Internal Photoemission and I-V Investigation of Interface Composition Control for Schottky Barrier Height Lowering of NiPtSi on n-Si through Incorporation of Yb**, C. Buie<sup>1</sup>, B. Quigley<sup>1</sup>, J. Chan<sup>1</sup>, R. A. Chapman<sup>1</sup>, E. M. Vogel<sup>1</sup>, D. Riley<sup>2</sup>, A. Jain<sup>2</sup>, S. C. Song<sup>2</sup>, K. Y. Lim<sup>2</sup>, J. Blatchford<sup>2</sup>, J. B. Shaw<sup>2</sup>, and C. L. Hinkle<sup>1</sup>, <sup>1</sup>*UT Dallas*, <sup>2</sup>*Texas Instruments*

**P.5 - Cerium-Doped Hafnium Oxide on Silicon**, N. Sedghi<sup>1</sup>, M. Werner<sup>1</sup>, P. J. King<sup>1</sup>, S. Hindley<sup>2</sup>, W. M. Davey<sup>1</sup>, I. Z. Mitrovic<sup>1</sup>, P. Chalker<sup>1</sup>, and S. Hall<sup>1</sup>, <sup>1</sup>*U. Liverpool, UK*, <sup>2</sup>*SAFC Hitech, UK*

**P.6 - Improvement of the Leakage Current Density of ZrO<sub>2</sub>-based Alternative High-k Dielectrics**, M. Grube<sup>1</sup>, D. Martin<sup>1</sup>, W. M. Weber<sup>1</sup>, Th. Mikolajick<sup>1,2</sup>, and H. Riechert<sup>3</sup>, <sup>1</sup>*Namlab, Germany*, <sup>2</sup>*U. Technology Dresden, Germany*, <sup>3</sup>*Paul-Drude-Institut für Festkörperelektronik, Germany*

**P.7 - Band Alignment of Metal/HfO<sub>2</sub>/SiO<sub>2</sub>/Si Stacks Based on Charge Neutrality Level**, X. L. Wang<sup>1</sup>, W. W. Wang<sup>1</sup>, K. Han<sup>1</sup>, J. J. Xiang<sup>1</sup>, J. Zhang<sup>2</sup>, H. Yang<sup>1</sup>, C. Zhao<sup>1</sup>, D. P. Chen<sup>1</sup>, and T. C. Ye<sup>1</sup>, <sup>1</sup>*Chinese Academy of Sciences, China*, <sup>2</sup>*North China U. Technology, China*

**P.8 - Influence of the Different Interfaces on the Electrical Properties of MgO and Al<sub>2</sub>O<sub>3</sub> Gate Stacks Grown by MBE**, C. Y. Su, M. Menghini, T. Smets, L. Dillemans, R. R. Lieten, and J.-P. Locquet, *U. Leuven, Belgium*

**P.9 - TiO<sub>x</sub> Layer Engineering for Producing Non-Linear Characteristic in HfO<sub>x</sub>-based Resistive Random Access Memory**, G. Choi, D. Lee, J. Woo, and H. Hwang, *POSTECH, South Korea*

**P.10 - Study of Device Architecture and Multilevel Characteristics in SiO<sub>x</sub>-based Resistive Switching Memory**, Y. F. Chang<sup>1</sup>, Y. T. Chen<sup>1</sup>, F. Xue<sup>1</sup>, Y. Wang<sup>1</sup>, F. Zhou<sup>1</sup>, P. Y. Chen<sup>1</sup>, B. Fowler<sup>2</sup>, and J. C. Lee<sup>1</sup>, <sup>1</sup>*UT Austin*, <sup>2</sup>*PrivaTran*

**P.11 - Guideline of MONOS Type Memory for Using Long Lifespan Archive Memories**, H. Shirakawa, K. Yamaguchi, K. Kamiya, and K. Shiraishi, *U. Tsukuba, Japan*

**P.12 - Inter-Gate Dielectric Engineering in Hybrid Floating Gate Stacks for NAND Flash**, L. Breuil, J. Lisoni, P. Blomme, G.S. Kar, G. Van den bosch, and J. Van Houdt, *imec, Belgium*

9:55 AM Break

## Session 2 - III-V

Thursday, December 6, 2012

Session Chair: A. Demkov

10:25 AM Opening remarks

10:30 AM 2.1 *Invited* - **XPS Studies of Oxides on III-V**, R. M. Wallace, *UT Dallas*

11:05 AM 2.2 *Invited* - **Weakly Interacting Epitaxial Systems: the Semiconductor/SrTiO<sub>3</sub> Case**, G. Saint-Girons<sup>1</sup>, A. Danescu<sup>1</sup>, B. Gobaut<sup>1</sup>, J. Penuelas<sup>1</sup>, G. Grenet<sup>1</sup>, G. Renaud<sup>2</sup>, N. Blanc<sup>2</sup>, V. Favre-Nicollin<sup>2</sup>, M. El Kazzi<sup>3</sup>, F. Sirotti<sup>3</sup>, and M. Silly<sup>3</sup>, <sup>1</sup>*Ecole Centrale de Lyon, France*, <sup>2</sup>*CEA, France*, <sup>3</sup>*Synchrotron SOLEIL, France*

## Poster Preview Session 2 - III-V

Thursday, December 6, 2012

Session Chair: V. V. Afanas'ev

11:40 AM P.13 - **Investigation of Electron Mobility Degradation in Al<sub>2</sub>O<sub>3</sub>/In<sub>0.53</sub>Ga<sub>0.47</sub>As MOSFETs**, T. P. O'Regan<sup>1</sup>, M. A. Negara<sup>2</sup>, V. Djara<sup>2</sup>, K. Cherkaoui<sup>2</sup>, M. Burke<sup>2</sup>, Y. Y. Gomeniuk<sup>3</sup>, M. Schmidt<sup>2</sup>, E. O'Connor<sup>2</sup>, I. M. Povey<sup>2</sup>, A. J. Quinn<sup>2</sup>, and P. K. Hurley<sup>2</sup>, <sup>1</sup>*U.S. Army Research Laboratory*, <sup>2</sup>*Tyndall National Institute, Ireland*, <sup>3</sup>*National Academy of Sciences of Ukraine, Ukraine*

P.14 - **Inversion Response of n-type and p-type In<sub>0.53</sub>Ga<sub>0.47</sub>As MOS Capacitors with Varying Al<sub>2</sub>O<sub>3</sub> Thickness and In<sub>0.53</sub>Ga<sub>0.47</sub>As Doping Concentration**, E. O'Connor, S. Monaghan, K. Cherkaoui, I. M. Povey, B. Sheehan, and P. K. Hurley, *Tyndall National Institute, Ireland*

P.15 - **Investigation of MBE-grown In<sub>0.53</sub>Ga<sub>0.47</sub>As (001) 4x2 Surface and in-situ ALD TEMA-Hf-dosed Surface by STM**, Y. C. Liu<sup>1</sup>, M. L. Huang<sup>1</sup>, T. D. Lin<sup>2</sup>, Y. T. Liu<sup>1</sup>, W. C. Lee<sup>1</sup>, W. W. Pai<sup>2</sup>, M. Hong<sup>2</sup>, and J. Kwo<sup>1</sup>, <sup>1</sup>*National Tsing Hua U., Taiwan*, <sup>2</sup>*National Taiwan U., Taiwan*

P.16 - **High-k/InAs and -GaSb Interfaces for Future CMOS**, C. H. Wang<sup>1</sup>, S. W. Wang<sup>1</sup>, R. Contreras-Guerrero<sup>2</sup>, O. C. Noriega<sup>2</sup>, G. Doornbos<sup>1</sup>, W. Priyantha<sup>2</sup>, M. Edirisooriya<sup>2</sup>, G. Astromskas<sup>1</sup>, G. Vellianitis<sup>1</sup>, R. Oxland<sup>1</sup>, C. H. Hsieh<sup>4</sup>, M. C. Holland<sup>1</sup>, K. Bhuwalka<sup>1</sup>, M. J. H. van Dal<sup>1</sup>, B. Duriez<sup>1</sup>, P. Ramvall<sup>3</sup>, E. Lind<sup>3</sup>, L.-E. Wernersson<sup>3</sup>, R. Droopad<sup>2</sup>, M. Passlack<sup>1</sup>, and C. H. Diaz<sup>4</sup>, <sup>1</sup>*TSMC, Belgium*, <sup>2</sup>*Texas State U.*, <sup>3</sup>*Lund U., Sweden*, <sup>4</sup>*TSMC, Taiwan*

P.17 - **Electronic Structure of (In)GaAs(001) Surfaces and Native Oxide Free High k Interfaces**, T.-W. Pi<sup>1</sup>, T. D. Lin<sup>2</sup>, H. Y. Lin<sup>3</sup>, Y. T. Liu<sup>3</sup>, Y. C. Chang<sup>2</sup>, M. L. Huang<sup>3</sup>, Y. H. Chang<sup>3</sup>, G. K. Wertheim<sup>4</sup>, J. Kwo<sup>3</sup>, and M. Hong<sup>2</sup>, <sup>1</sup>*National Synchrotron Radiation Research Center, Taiwan*, <sup>2</sup>*National Taiwan U., Taiwan*, <sup>3</sup>*National Tsing Hua U., Taiwan*, <sup>4</sup>*Woodland Consulting*

P.18 - **Band Offsets of Al<sub>2</sub>O<sub>3</sub> on an InAs/AlGaSb Heterojunction Measured by Internal Photoemission**, Q. Zhang<sup>1,2</sup>, R. Li<sup>2</sup>, T. Kosel<sup>2</sup>, H. G. Xing<sup>2</sup>, A. Seabaugh<sup>2</sup>, K. Xu<sup>1</sup>, O. A. Kirillov<sup>1</sup>, C. A. Richter<sup>1</sup>, D. J. Gundlach<sup>1</sup>, and N. V. Nguyen<sup>1</sup>, <sup>1</sup>*NIST*, <sup>2</sup>*U. Notre Dame*

P.19 - **In-situ Sulfur Passivation of In<sub>0.53</sub>Ga<sub>0.47</sub>As at Elevated Temperature by (NH<sub>4</sub>)<sub>2</sub>S Solution Vapor Treatment in an ALD Reactor**, F. Tang<sup>1</sup>, Q. Xie<sup>2</sup>, S.-H. Jung<sup>1</sup>, M. Givens<sup>1</sup>, J. W. Maes<sup>2</sup>, and V. Machkaoutsan<sup>2</sup>, <sup>1</sup>*ASM*, <sup>2</sup>*ASM, Belgium*

P.20 - **Electron Spin Resonance Study of Point Defects in Thermal GaAs/GaAs-Oxide Structures**, A. Stesmans, S. Nguyen, and V. V. Afanas'ev, *U. Leuven, Belgium*

P.21 - **The Atomic and Electronic Structure of Trimethylaluminum on GaAs/InGaAs (110) Surfaces**, T. Kent<sup>1</sup>, M. Edmonds<sup>1</sup>, A. C. Kummel<sup>1</sup>, and R. Droopad<sup>2</sup>, <sup>1</sup>*UC San Diego*, <sup>2</sup>*Texas State U.*

P.22 - **Subcutaneous Oxidation of InGaAs Through Atomic Layer Deposited Al<sub>2</sub>O<sub>3</sub>**, J. Ahn and P. C. McIntyre, *Stanford U.*

12:00 PM Adjourn for lunch



## Session 3 - Graphene and Related 2D Materials

Thursday, December 6, 2012

Session Chair: J. Robertson

- 1:30 PM Opening remarks
- 1:35 PM 3.1 *Invited - Graphene Bilayer Pseudospin FETs and 2D-2D Tunnel FETs*, C. Corbet, D.Reddy, S. Kang, D. Basu, S. Kim, L. F. Register, E. Tutuc, and S. K. Banerjee, *UT Austin*
- 2:10 PM 3.2 - *Theory of Remote-Phonon and Charged-Impurity Scattering in Top-Gated Graphene*, Z.-Y. Ong and M. V. Fischetti, *UT Dallas*
- 2:30 PM 3.3 - *Graphene-like Si and Ge on Silver Substrates*, A. Dimoulas, E. Xenogiannopoulou, V. Golias, D. Tsoutsou, and P. Tsipas, *NCSR DEMOKRITOS, Greece*

## Poster Preview Session 3 - Ge / III-V / Characterization

Thursday, December 6, 2012

Session Chair: Y. C. Yeo

- 2:50 PM P.23 - **Total Ionizing Dose (TID) Effects on Al<sub>2</sub>O<sub>3</sub>-Gated Ultra-thin Body In<sub>0.7</sub>Ga<sub>0.3</sub>As MOSFETs**, X. Sun<sup>1</sup>, S. Cui<sup>1</sup>, F. Xue<sup>2</sup>, J. Chen<sup>3</sup>, E. X. Zhang<sup>3</sup>, and T. P. Ma<sup>1</sup>, <sup>1</sup>*Yale U.*, <sup>2</sup>*UT Austin*, <sup>3</sup>*Vanderbilt U.*
- P.24 - **Insights into Interface Trap Behavior in LDMOSFETs Observed from MR-DCIV Method**, Y. He, G. Zhang, L. Han, and X. Zhang, *Peking U., China*
- P.25 - **Novel Gate-Bias-Induced Instability Phenomenon Causing Anomalous Behavior in Random Telegraph Noise**, T. Tsuchiya<sup>1</sup>, N. Tamura<sup>2</sup>, A. Sakakidani<sup>2</sup>, K. Sonoda<sup>2</sup>, M. Kamei<sup>2</sup>, S. Yamakawa<sup>2</sup>, and S. Kuwabara<sup>2</sup>, <sup>1</sup>*Shimane U., Japan*, <sup>2</sup>*Semiconductor Technology Academic Research Center, Japan*
- P.26 - **A Charge Trapping Model for 3-Pulse CV: the Origin of Logarithmic and Power Law Regimes in High  $\kappa$  Dielectrics**, N. Sedghi, T. Dowrick, I. Z. Mitrovic, and S. Hall, *U. Liverpool, UK*
- P.27 - **Characterizing Oxide Traps in the InGaAs/Al<sub>2</sub>O<sub>3</sub> System with Sulfur Passivation**, A. Alian<sup>1,2</sup>, G. Brammertz<sup>1</sup>, R. Degraeve<sup>1</sup>, M. J. Cho<sup>1</sup>, M. Caymax<sup>1</sup>, K. De Meyer<sup>1,2</sup>, M. Heyns<sup>1,2</sup>, <sup>1</sup>*imec, Belgium*, <sup>2</sup>*U. Leuven, Belgium*
- P.28 - **Optical Characterization of the Injection Properties of Tunnel-thin Calcium Fluoride Films**, Y. Y. Illarionov<sup>1,2,3</sup>, M. I. Vexler<sup>3</sup>, D. Isakov<sup>2</sup>, S. M. Sutorin<sup>3</sup>, N. S. Sokolov<sup>3</sup>, and V. V. Fedorov<sup>3</sup>, <sup>1</sup>*Augsburg U., Germany*, <sup>2</sup>*Singapore Institute of Manufacturing Technology, Singapore*, <sup>3</sup>*Ioffe Physical Technical Institute, Russia*
- P.29 - **Ultralow EOT and High Mobility Ge pMOSFETs with In-situ H<sub>2</sub>O Plasma Grown GeO<sub>2</sub> and HfON Gate Dielectric**, L. J. Liu, K. S. Chang-Liao, C. H. Fu, T. C. Chen, C. C. Li, J. W. Cheng, C. C. Lu, and T. K. Wang, *National Tsing Hua U., Taiwan*

P.30 - **Impact of HCl and (NH<sub>4</sub>)<sub>2</sub>S Surface Treatment in Ge MOSFETs**, B. Q. Xue, S. K. Wang, H. D. Chang, B. Sun, W. Zhao, and H. G. Liu, *Chinese Academy of Sciences, China*

P.31 - **Abrupt Ge-Si and GeSn-Si Interfaces by Solid Phase Crystallization**, R. R. Lieten<sup>1,2</sup> and J.-P. Locquet<sup>1</sup>, <sup>1</sup>*U. Leuven, Belgium*, <sup>2</sup>*imec, Belgium*

P.32 - **High Quality Germanium Gate Stack by Sulfur Passivation and Novel Ozone Oxidation**, B. Yang<sup>1</sup>, S. Gupta<sup>2</sup>, J. P. McVittie<sup>2</sup>, Y. Nishi<sup>2</sup>, S. R. Liang<sup>1</sup>, W. P. Mazra<sup>1</sup>, and K. C. Saraswat<sup>2</sup>, <sup>1</sup>*GLOBALFOUNDRIES*, <sup>2</sup>*Stanford U.*

P.33 - **Bound States and Their Charge Occupancy within the 'Notch' of HfO<sub>2</sub>/GeO<sub>2</sub>/Ge Stacks**, N. Sedghi, J. F. Ralph, I. Z. Mitrovic, and S. Hall, *U. Liverpool, UK*

P.34 - **Low Defect Densities at Ge/Hi-K Transition Metal Oxide Interfaces: Spectroscopic Studies of Interfacial Bonding**, J. Kim<sup>1</sup>, D. J. Zeller<sup>1</sup>, C. Cheng<sup>1</sup>, G. Lucovsky<sup>1</sup>, and D. Nordstrum<sup>2</sup>, <sup>1</sup>*NC State U.*, <sup>2</sup>*Stanford Synchrotron Research Lightsource*

3:10 PM Break

## Session 4 - III-V

Thursday, December 6, 2012

Session Chair: M. Hong

3:40 PM Opening remarks

3:45 PM 4.1 **Invited - Strained InGaSb Metamorphic Growth and High-k Oxides Interfaces for P-Channel MOSFETs**, S. Oktyabrsky, A. Greene, S. Madisetti, M. Yakimov, R. Moore, and V. Tokranov, *SUNY Albany*

4:20 PM 4.2 - **Understanding Scaling Limits in a-Si Passivated In<sub>0.53</sub>Ga<sub>0.47</sub>As Gate Stacks for Gate First Implant-free MOSFETs**, M. El Kazzi<sup>1</sup>, L. Czornomaz<sup>1</sup>, D. Caimi<sup>1</sup>, E. Uccelli<sup>1</sup>, N. Daix<sup>1</sup>, M. Sousa<sup>1</sup>, M. Silly<sup>2</sup>, F. Sirotti<sup>2</sup>, C. Rossel<sup>1</sup>, H. Siegwart<sup>1</sup>, M. Richter<sup>1</sup>, J. Fompeyrine<sup>1</sup>, and C. Marchiori<sup>1</sup>, <sup>1</sup>*IBM, Switzerland*, <sup>2</sup>*Synchrotron SOLEIL, France*

4:40 PM 4.3 - **Performance and Variability Breakthrough for LaAlO<sub>3</sub>/InGaAs Gate-all-around Nanowire MOSFETs with Ultra-thin Al<sub>2</sub>O<sub>3</sub> Passivation**, J. Gu and P. D. Ye, *Purdue U.*

5:00 PM 4.4 - **GaAs pMOSFETs with Atomic Layer Epitaxial La<sub>1.7</sub>Y<sub>0.3</sub>O<sub>3</sub> Gate Dielectric**, L. Dong, J. Y. Zhang, X. F. Li, and P. D. Ye, *Purdue U.*

## Poster Preview Session 4 - Beyond Si / Power Devices

Thursday, December 6, 2012

Session Chair: S. Banerjee

- 5:20 PM P.35 - **In-depth Electrical and Physical Characterization of ITO Electrodes for Photovoltaic and Display Applications**, R. Lachaume, X. Garros, P. Scheiblin, G. Rodriguez, D. Blachier, S. Favier, J. Coignus, C. Leroux, W. Favre, Y. Gobil, P. Mur, D. Muñoz, and G. Reimbold, *CEA, France*
- P.36 - **Graphene as an Electrode for Directly Observing Hole Injection from Silicon to Oxide**, R. Yan<sup>1,2</sup>, Q. Zhang<sup>1,2</sup>, O. A. Kirillov<sup>1</sup>, W. Li<sup>1,3</sup>, J. Basham<sup>1</sup>, X. Liang<sup>3</sup>, D. Jena<sup>2</sup>, C. A. Richter<sup>1</sup>, A. Seabaugh<sup>2</sup>, D. J. Gundlach<sup>1</sup>, H. G. Xing<sup>2</sup>, and N. V. Nguyen<sup>1</sup>, <sup>1</sup>NIST, <sup>2</sup>U. Notre Dame, <sup>3</sup>Peking U., China
- P.37 - **Engineering Asymmetry in Metal-Insulator-Insulator-Metal (MIIM) Tunnel Diodes**, N. Alimardani and J. F. Conley, Jr., *Oregon State U.*
- P.38 - **(111)-Oriented Strained GeSn Channel pMOSFET with Low Temperature Si<sub>2</sub>H<sub>6</sub> Surface Passivation**, G. Han<sup>1</sup>, X. Gong<sup>1</sup>, F. Bai<sup>1</sup>, R. Cheng<sup>1</sup>, P. Guo<sup>1</sup>, K. H. Goh<sup>1</sup>, S. Su<sup>2</sup>, G. Zhang<sup>2</sup>, C. Xue<sup>2</sup>, B. Cheng<sup>2</sup>, and Y.-C. Yeo<sup>1</sup>, <sup>1</sup>National U. Singapore, Singapore, <sup>2</sup>Chinese Academy of Sciences, China
- P.39 - **Top-Down GeSn Nanowire Formation using F-based Dry Etch and H<sub>2</sub>O<sub>2</sub>-based Wet Etch**, R. Cheng<sup>1</sup>, X. Gong<sup>1</sup>, P. Guo<sup>1</sup>, F. Bai<sup>1</sup>, Y. Yang<sup>1</sup>, B. Liu<sup>1</sup>, K. H. Goh<sup>1</sup>, S. Su<sup>2</sup>, G. Zhang<sup>2</sup>, J. Pan<sup>3</sup>, T. H. Li<sup>3</sup>, C. Xue<sup>2</sup>, B. Cheng<sup>2</sup>, G. Han<sup>1</sup>, and Y.-C. Yeo<sup>1</sup>, <sup>1</sup>National U. Singapore, Singapore, <sup>2</sup>Chinese Academy of Sciences, China, <sup>3</sup>A\*STAR, Singapore
- P.40 - **Impacts of Surface Treatment of SiO<sub>2</sub>/Si Substrate on the Electrical Property of Polycrystalline Germanium Thin Film Transistor**, S. Kabuyanagi<sup>1,2</sup>, T. Nishimura<sup>1,2</sup>, K. Nagashio<sup>1,2</sup>, and A. Toriumi<sup>1,2</sup>, <sup>1</sup>U. Tokyo, Japan, <sup>2</sup>JST-CREST, Japan
- P.41 - **Study of Dielectric Traps in HfO<sub>2</sub>-Gated AlGaIn/GaN MOSHEMTs**, X. Sun<sup>1</sup>, O. I. Saadat<sup>2</sup>, K. S. Chang-Liao<sup>3</sup>, T. Palacios<sup>2</sup>, S. Cui<sup>1</sup>, and T. P. Ma<sup>1</sup>, <sup>1</sup>Yale U., <sup>2</sup>MIT, <sup>3</sup>National Tsing Hua U., Taiwan
- P.42 - **Mobile Ions Generated in Thermal SiO<sub>2</sub> on SiC by Hydrogen Passivation and Its Impact on Interface Property**, T. Hosoi<sup>1</sup>, A. Chanthaphan<sup>1</sup>, S. Mitani<sup>2</sup>, Y. Nakano<sup>2</sup>, T. Nakamura<sup>2</sup>, T. Shimura<sup>1</sup>, and H. Watanabe<sup>1</sup>, <sup>1</sup>Osaka U., Japan, <sup>2</sup>ROHM Co., Japan
- P.43 - **Structural and Electrical Properties of Epitaxially Grown GdScO<sub>3</sub> on GaN**, A. Schaefer<sup>1,2</sup>, A. Winden<sup>1,2</sup>, W. Zander<sup>1,2</sup>, H. Hardtgen<sup>1,2</sup>, and J. Schubert<sup>1,2</sup>, <sup>1</sup>Forschungszentrum Juelich, Germany, <sup>2</sup>JARA, Germany
- P.44 - **Interface Electronic State Characterization of Remote PEALD High- and Low-k Dielectrics on GaN**, J. Yang, B. S. Eller, and R. J. Nemanich, *Arizona State U.*
- P.45 - **Origin of the Time Constant Dispersion at the SiO<sub>2</sub>/4H-SiC MOS Interface**, J. A. Cooper, S. Swandono, and A. Penumatcha, *Purdue U.*

5:40 PM Adjourn

7:00 PM – 10:00 PM Poster Reception

**Session 5 - Memory**  
**Friday, December 7, 2012**  
**Session Chair: J. Van Houdt**

- 8:00 AM Morning announcements
- 8:05 AM 5.1 *Invited* - **Mechanism of RRAM Operations in HfO<sub>2</sub>-based Devices**, G. Bersuker, *SEMATECH*
- 8:40 AM 5.2 - **VO<sub>2</sub> Metal-Insulator Transition Devices and Voltage-based Switching**, K. Martens<sup>1,2,3</sup>, J. Verbruggen<sup>4</sup>, I. P. Radu<sup>1,4</sup>, S. Mertens<sup>1</sup>, X. Shi<sup>1</sup>, G. Rampelberg<sup>4</sup>, T. Conard<sup>1</sup>, P. Favia<sup>1</sup>, H. Bender<sup>1</sup>, M. Schaekers<sup>1</sup>, C. Huyghebaert<sup>1</sup>, C. Detavernier<sup>4</sup>, J. A. Kittl<sup>1</sup>, M. Heyns<sup>1,2</sup>, and M. Jurczak<sup>1</sup>, <sup>1</sup>*imec, Belgium*, <sup>2</sup>*U. Leuven, Belgium*, <sup>3</sup>*FWO, Belgium*, <sup>4</sup>*U. Gent, Belgium*
- 9:00 AM 5.3 - **Atomistic Investigation of Oxygen Vacancy Conducting Filaments in TiO<sub>2</sub>-based ReRAMs**, K. Kamiya<sup>1</sup>, M. Y. Yang<sup>1</sup>, B. Magyari-Köpe<sup>2</sup>, M. Niwa<sup>1</sup>, Y. Nishi<sup>2</sup>, and K. Shiraishi<sup>1</sup>, <sup>1</sup>*U. Tsukuba, Japan*, <sup>2</sup>*Stanford U.*
- 9:20 AM 5.4 - **Role of Al<sub>2</sub>O<sub>3</sub> O Vacancy Barrier Layer in High Quality ReRAM Operation**, M. Y. Yang<sup>1</sup>, K. Kamiya<sup>1</sup>, B. Magyari-Köpe<sup>2</sup>, M. Niwa<sup>1</sup>, Y. Nishi<sup>2</sup>, and K. Shiraishi<sup>1</sup>, <sup>1</sup>*U. Tsukuba, Japan*, <sup>2</sup>*Stanford U.*
- 9:40 AM 5.5 - **Programmable Analog Circuits with Multi-Level Memristive Device**, S. Park<sup>1</sup>, J. Park<sup>1</sup>, S. Kim<sup>1</sup>, W. Lee<sup>1</sup>, J. Shin<sup>1</sup>, D. Lee<sup>2</sup>, G. Choi<sup>2</sup>, J. Woo<sup>2</sup>, E. Cha<sup>1</sup>, B. H. Lee<sup>1</sup>, and H. Hwang<sup>2</sup>, <sup>1</sup>*GIST, South Korea*, <sup>2</sup>*POSTECH, South Korea*
- 10:00 AM Break

**Session 6 - Characterization and Reliability**  
**Friday, December 7, 2012**  
**Session Chair: T. Nabatame**

- 10:30 AM Opening remarks
- 10:35 AM 6.1 *Invited* - **Fundamental Aspects of HfO<sub>2</sub>-based High-k Metal Gate Stack Reliability and  $t_{inv}$ -Scaling for MGHK CMOS Technologies**, E. Cartier, *IBM*
- 11:10 AM 6.2 - **Reliability in Gate First and Gate Last Ultra-Thin-EOT Gate Stacks Assessed with CV-eMSM BTI Characterization**, E. Bury<sup>1,2</sup>, B. Kaczer<sup>1</sup>, M. Toledano-Luque<sup>1</sup>, H. Arimura<sup>1,2</sup>, L.-Å. Ragnarsson<sup>1</sup>, A. Veloso<sup>1</sup>, S. A. Chew<sup>1</sup>, M. Togo<sup>1</sup>, T. Schram<sup>1</sup>, and G. Groeseneken<sup>1,2</sup>, <sup>1</sup>*imec, Belgium*, <sup>2</sup>*U. Leuven, Belgium*
- 11:30 AM 6.3 - **Probing Electrically Active Traps in AlGaIn/GaN HEMT by Inelastic Electron Tunneling Spectroscopy**, J. Yang<sup>1</sup>, S. Cui<sup>1</sup>, X. Sun<sup>1</sup>, Z. Liu<sup>1</sup>, T. P. Ma<sup>1</sup>, T. H. Hung<sup>2</sup>, D. Nath<sup>2</sup>, S. Krishnamoorthy<sup>2</sup>, and S. Rajan<sup>2</sup>, <sup>1</sup>*Yale U.*, <sup>2</sup>*OSU*
- 11:50 AM 6.4 - **1/f Noise and Charge-Pumping Investigation of D<sub>it</sub> Formation During Gate-Last HfO<sub>2</sub>/TiN Band Edge Effective Work Function Tuning**, J. Mendez<sup>1</sup>, J. Chan<sup>1</sup>, R. A. Chapman<sup>1</sup>, E. M. Vogel<sup>1</sup>, H. Niimi<sup>2</sup>, J. J. Chambers<sup>3</sup>, P. Srinivasan<sup>2</sup>, J. B. Shaw<sup>2</sup>, and C. L. Hinkle<sup>1</sup>, <sup>1</sup>*UT Dallas*, <sup>2</sup>*Texas Instruments*, <sup>3</sup>*Advanced Micro Devices, Germany*

- 12:10 PM 6.5 - **Inversion Charge Pumping Method for Mobility Extraction in Surface-Channel  $\text{Al}_2\text{O}_3/\text{In}_{0.53}\text{Ga}_{0.47}\text{As}$  MOSFETs**, V. Djara, K. Cherkaoui, M. A. Negara, J. MacHale, and P. K. Hurley, *Tyndall National Institute, Ireland*
- 12:30 PM Adjourn for lunch ; Technical Committee / Invited Speaker Luncheon
- 3:00 PM – 5:00 PM Optional Rump Sessions – Topics TBD
- 7:00 PM – 10:00 PM Conference Banquet and Limerick Contest

## Session 7 - Ge and III-V

Saturday, December 8, 2012

Session Chair: A. Kummel / P. Ye

- 8:00 AM Morning Announcements
- 8:05 AM 7.1 *Invited* - **Internal Photoemission at Ge/Oxide and  $\text{A}_{\text{III}}\text{-B}_{\text{V}}$ /Oxide Interfaces**, V. V. Afanas'ev, H.-Y. Chou, M. Houssa, and A. Stesmans, *U. Leuven, Belgium*
- 8:40 AM 7.2 - **Chemical Trends and Nitrogen Passivation of Defects at  $\text{Al}_2\text{O}_3:\text{GaAs}/\text{InAs}/\text{InP}/\text{GaSb}$  Interfaces**, Y. Guo, L. Lin, and J. Robertson, *U. Cambridge, UK*
- 9:00 AM 7.3 - **Improvement of  $\text{Al}_2\text{O}_3/\text{Si}_{0.75}\text{Ge}_{0.25}$  MOS Interface by Plasma Post-Nitridation**, J. H. Han<sup>1</sup>, R. Zhang<sup>1</sup>, T. Osada<sup>2</sup>, M. Hata<sup>2</sup>, M. Takenaka<sup>1</sup>, and S. Takagi<sup>1</sup>, <sup>1</sup>*U. Tokyo, Japan*, <sup>2</sup>*Sumitomo Chemical, Japan*
- 9:20 AM 7.4 - **Self-limiting Growth of Ultrathin Ga Oxide Layer for Passivating  $\text{Al}_2\text{O}_3/\text{InGaAs}$  Interfaces**, W. Jevasuwan, T. Maeda, N. Miyata, M. Oda, T. Irisawa, T. Tezuka, and T. Yasuda, *AIST, Japan*
- 9:40 AM Break

## Session 7 (continued) - Ge and III-V

Saturday, December 8, 2012

Session Chair: A. Kummel / P. Ye

- 10:10 AM 7.5 - **Identifying a Suitable Passivation Route for Ge Interfaces**, H. Li, L. Lin, and J. Robertson, *U. Cambridge, UK*
- 10:30 AM 7.6 - **Roles of Interfacial Ga and Sb Oxides on GaSb MOS Interface Properties**, M. Yokoyama<sup>1</sup>, Y. Asakura<sup>1</sup>, H. Yokoyama<sup>2</sup>, M. Takenaka<sup>1</sup>, and S. Takagi<sup>1</sup>, <sup>1</sup>*U. Tokyo, Japan*, <sup>2</sup>*NTT Corporation, Japan*
- 10:50 AM 7.7 - **Implementation of GeON Gate Dielectrics for Dual-Channel Ge CMOS Technology**, Y. Minoura, A. Kasuya, T. Hosoi, T. Shimura, and H. Watanabe, *Osaka U., Japan*

## Session 8 - Devices

Saturday, December 8, 2012

Session Chair: E. Cartier

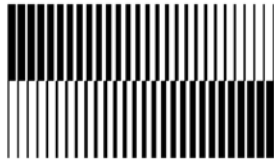
11:10 AM Opening remarks

11:15 AM 8.1 - **Al-inserted TiN Gate Electrodes with Low-Pressure Oxidation for Effective Work Function Control of Gate-First Poly-Si/TiN/HfSiO Stacks**, K. Chikaraishi<sup>1</sup>, T. Minami<sup>2</sup>, N. Kitano<sup>1,2</sup>, T. Seino<sup>2</sup>, N. Yamaguchi<sup>2</sup>, T. Nakagawa<sup>2</sup>, T. Hosoi<sup>1</sup>, T. Shimura<sup>1</sup>, and H. Watanabe<sup>1</sup>, <sup>1</sup>*Osaka U., Japan*, <sup>2</sup>*Canon ANELVA, Japan*

11:35 AM 8.2 - **Al-induced Defect Generation in Cubic Phase HfO<sub>2</sub>/SiO<sub>2</sub>/Si Gate Stacks**, H. Arimura<sup>1,2</sup>, L.-Å. Ragnarsson<sup>1</sup>, A. Veloso<sup>1</sup>, C. Adelman<sup>1</sup>, R. Degraeve<sup>1</sup>, T. Schram<sup>1</sup>, S. A. Chew<sup>1</sup>, M. J. Cho<sup>1</sup>, B. Kaczer<sup>1</sup>, G. Groeseneken<sup>1,2</sup>, N. Horiguchi<sup>1</sup>, and A. Thean<sup>1</sup>, <sup>1</sup>*imec, Belgium*, <sup>2</sup>*U. Leuven, Belgium*

11:55 AM 8.3 - **Comparison of Plasma and Thermal Nitridation of GeO<sub>2</sub> Interfacial Layer for Ge CMOS**, K. Chaudhuri<sup>1</sup>, P. Bhatt<sup>1</sup>, A. Nainani<sup>2</sup>, M. Abraham<sup>2</sup>, M. Subramaniam<sup>2</sup>, S. Kapadia<sup>2</sup>, K. Schuegraf<sup>2</sup>, U. Ganguly<sup>1</sup>, and S. Lodha<sup>1</sup>, <sup>1</sup>*IIT Bombay, India*, <sup>2</sup>*Applied Materials*

12:15 PM Closing Remarks



**SISC 2012**

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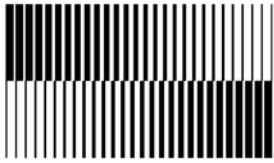
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