Semiconductor Technology for Ultra-Large Scale Integrated Circuits and Thin Film Transistors VII

An ECI Conference Series Volume 19AP

Kyoto, Japan
19 – 23 May 2019

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ISBN: 978-1-5108-9164-7
Monday, May 20, 2019

07:00 - 08:00  Breakfast

08:00 - 08:10  Introductions
   Yue Kuo, Conference Chair
   Norman Li, ECI Liaison

Overviews
   Session Chair: Yue Kuo, Texas A&M University

08:10 - 08:50  (Plenary) Transparent oxide semiconductors: Materials design, electronic structure, and device applications
   Hideo Hosono, Tokyo Institute of Technology

08:50 - 09:20  (Invited) ULSI and TFT technologies in industry, research and higher education in France: An evolution towards innovation resulting from close and sustainable interaction
   Olivier Bonnaud, University of Rennes 1, GIP-CNFM

Device Physics I
   Session Chair:  Hideo Hosono, Tokyo Institute of Technology

09:20 - 09:50  (Invited) Terahertz testing of very large scale integrated circuits
   Michael Shur, RPI, Troy and Electronics of the Future, Vienna; J. Suarez, University of Delaware, Newark

09:50 - 10:20  (Invited) Photoemission characterization of interface dipoles and electronic defect states for gate dielectrics
   Seiichi Miyazaki, Akio Ohta, Nagoya University

10:20 - 10:50  Coffee Break

Device Physics II
   Session Chair: Akira Toriumi, University of Tokyo

10:50 - 11:20  (Invited) What will come after V-NAND – Vertical resistive switching memory?
   Cheol Seong Hwang, Seoul National University

11:20 - 11:50  (Invited) Operation analysis of resistive switching of CBRAM using in-situ TEM
   Yasuo Takahashi, Atsushi Tsurumaki-Fukuchi, Masashi Arita, Hokkaido University, Sapporo

11:50 - 12:20  (Invited) Strain engineering for GeSn/SiGeSn multiple quantum well laser structures

12:20 - 13:30  Lunch
Monday, May 20, 2019 (continued)

**Device Reliability**

*Session Chair: Niko Münzenrieder, University of Sussex*
*Cheol Seong Hwang, Seoul National University*

**13:30 - 14:00**
*(Invited) Reliability degradation phenomena in metal oxide thin film transistors*

Yukiharu Uraoka, Juan Paolo Bermundo, Mami Fujii, Mutsunori Uenuma, Yasuaki Ishikawa, Nara Institute of Science and Technology

**14:00 - 14:30**
*(Invited) Carrier transport and bias stress stability of IGZO TFT with heterojunction channel*

Mamoru Furuta, Daichi Koretomo, Ryunosuke Higashi, Syuhei Hamada, Kochi University of Technology

**14:30 - 15:00**
*(Invited) Relatively low-temperature processing and its impact on device performance and reliability*

Chadwin D. Young, Pavel Bolshakov and Rodolfo A. Rodriguez Davila (equal contributors), Peng Zhao and Christopher Smyth, Manuel Quevedo-Lopez and Robert M. Wallace, University of Texas at Dallas

**15:00 – 15:20**
*Reliability of flexible low temperature poly-silicon thin film transistor*

Ting-Chang Chang, Bo-Wei Chen, Shin-Ping Huang, Yu-Ching Tsao, Chih-Yang Lin, Yi-Ting Tseng, Cheng-Hsien Wu, Mao-Chou Tai, National Sun Yat-Sen University, Kaoshiung; Po-Wen Chang, National United University, Miaoli; Po-Hsun Chen, Chinese Naval Academy, Kaohsiung

**15:30 - 18:30**
*ad hoc sessions / Free discussions*

(Optional) Tour of Sake microbrewer (led by Prof. Fukunaka)
Meet at lobby reception at 15:30

**18:30 - 20:00**
*Dinner*

**20:00 - 21:00**
*Poster Session*

*Session Chair: Mutsumi Kimura, Ryukoku University*

**21:00 - 22:00**
*Panel Discussion: Challenges in speed and power*

*Panel Leaders: Akira Toriumi, University of Tokyo*
*Kyung Min Kim, KAIST*
Tuesday, May 21, 2019

07:00 - 08:00 Breakfast

Materials I
Session Chair: Oussama Moutanabbir, École Polytechnique de Montréal

08:00 - 08:30 (Invited) Challenge of crystalline IGZO ceramics to silicon LSI - Its application to AI and displays
Shunpei Yamazaki, Semiconductor Energy Laboratory, Atsugi

08:30 - 09:00 (Invited) Introducing novel functional materials and liquids for breaking the limit of memory devices
Kentaro Kinoshita, Tokyo University of Science, Tokyo

09:00 - 09:30 (Invited) Flexible organic thin film transistors for high-performance biosensors
Feng Yan, Hong Kong Polytechnic University

09:30 - 10:00 (Invited) Mechanical ball shear, electromigration, and thermal cycling reliability testing on novel solder interconnects of highly integrated chips for advanced applications
Tzu-Ting Chou, Collin Fleshman, Rui-Wen Song, Hao Chen, Jenq-Gong Duh, National Tsing Hua University, Hsinchu

10:00 - 10:30 Coffee Break

Materials II
Session Chairs: Yukiharu Uraoka, Nara Institute of Science and Technology

10:30 - 11:00 (Invited) Non-volatile n-TiO₂ channel FETs with ferroelectric HfO₂
Akira Toriumi, University of Tokyo

11:00 - 11:30 (Invited) Langmuir-type mechanism for in-situ doping in CVD Silicon and Germanium Epitaxial Growth
Junichi Murota, Tohoku University, Sendai

11:30 - 12:00 (Invited) Germanium-tin semiconductors: A versatile silicon-compatible platform
Oussama Moutanabbir, Simon Assali, Anis Attiaoui, Étienne Bouthillier, Patrick Del Vecchio, Aashish Kumar, Samik Mukherjee, Jérome Nicolas, École Polytechnique de Montréal

12:00 - 13:00 Boxed Lunch (pick up in reception lobby)

13:00 - 18:00 Excursion to Kyoto / ad hoc sessions

18:00 - 19:30 Dinner
Materials, Devices, and Designs

19:30 - 20:00 (Invited) High performance gas sensor platform based on integrated sensing mechanisms
Jong-Ho Lee, Yujeong Jeong, Yoonki Hong, Meile Wu, Seongbin Hong, Gyuweon Jung, Wonjun Shin, Seoul National University, Seoul

20:00 - 20:20 Embedded DRAM using c-axis-aligned crystalline In-Ga-Zn oxide FET with 1.8V-power-supply voltage

20:20 – 20:50 (Invited) A new design methodology of highly reliable TFT based integrated circuits in display applications
Di Geng, Yue Su, Ling Li, Ming Liu, Chinese Academy of Sciences, Beijing, Kai Wang, Sun Yat-sen University, Guanzhou

21:00 - 22:00 Panel Discussion: Challenges in new materials and processes
Panel Leaders: Junichi Murota, Tohoku University
Jin Jang, Kyung Hee University
Wednesday, May 22, 2019

07:00 - 08:00  Breakfast

Processes I
Session Chairs: Karl D. Hirschman, Rochester Institute of Technology

08:00 - 08:30  (Invited) Dual Gate LTPS TFT versus Oxide TFT
Jin Jang, Kyung Hee University, Seoul

08:30 - 09:00  (Invited) Fabrication and AC performance of flexible Indium-Gallium-Zinc-Oxide thin-film transistors
Niko Münzenrieder, University of Sussex; Giuseppe Cantarella, Luisa Petti, Free University of Bolzano-Bozen, Italy

09:00 - 09:30  (Invited) Observation of the behavior of additives in copper electroplating using a microfluidic device
Masanori Hayase, Takanori Akita, Mineyoshi Tomie, Ryo Ikuta, Haruki Egoshi, Tokyo University of Science

09:30 - 9:50  Thermal oxidation kinetics of germanium
Akira Toriumi, University of Tokyo

09:50 - 10:20  Coffee Break

Processes II
Session Chairs: Shunpei Yamazaki, Semiconductor Energy Laboratory
Jin Jang, Kyung Hee University

10:20 - 10:50  (Invited) Development of high performance metal oxide thin-film transistor for OLED and flexible display
Jae Kyeong Jeong, Hanyang University, Seoul

10:50 - 11:20  (Invited) Introduction on atomic layer deposition for high-k dielectric & high mobility oxide semiconductor thin film transistors
Jin-Seong Park, Wan-Ho Choi, Jiazhen Sheng, Tae-Hyun Hong, Hanyang University, Seoul

11:20 - 11:50  (Invited) Flash lamp annealed polycrystalline silicon as a potential candidate for large panel manufacturing
Karl D. Hirschman, Glenn Packard, Adam Rosenfeld, Viraj Garg, Rochester Institute of Technology; Robert Manley, Coming Inc.

11:50 – 12:20  (Invited) Homo-junction bottom-gate amorphous In-Ga-Zn-O TFTs with metal induced source/drain regions
Shengdong Zhang, Yang Shao, Xiaoliang Zhou, Peking University

12:20 - 13:30  Lunch
Processes III
Session Chair: Jae Kyeong Jeong, Hanyang University

13:30 - 14:00 (Invited) Back-end of line compatible transistors for hybrid CMOS applications
          Po-Tsun Liu, Po-Yi Kuo, Chien-Min Chang, Hsiu-Hsuan Wei, National Chiao Tung University, Hsinchu

14:00 - 14:30 (Invited) Adhesion lithography for large-area patterning of asymmetric nanogap electrodes
                      Gwenhivir Wyatt-Moon, Andrew Flewitt, University of Cambridge, Cambridge

14:30 - 15:00 (Invited) Directed self-assembly of block copolymers for sub-10nm fabrication
                        Shisheng Xiong, Fudan University, Shanghai

15:00 - 17:30 Free time for discussions

17:30 - 18:00 Transfer to banquet restaurant

18:00 - 20:00 Reception & Banquet at Toukansou Restaurant
**Thursday, May 23, 2019**

07:00 - 08:00 Breakfast

**New Applications I**
**Session Chairs:** Michael Shur, Rensselaer Polytechnic Institute

08:00 - 08:30 *(Invited) Neuromorphic system using thin-film devices*  
*Mutsumi Kimura, Ryukoku University and Nara Institute of Science and Technology*

08:30 - 09:00 *(Invited) Stateful in-memory computing in emerging crossbar memories*  
*Kyung Min Kim, KAIST, Daejeon*

09:00 - 09:30 *(Invited) Memristive crossbar arrays for brain-inspired computing*  
*Qiangfei Xia, University of Massachusetts, Amherst*

09:30 - 10:00 *(Invited) Emerging applications of TFTs enabled by novel device architectures*  
*Kai Wang, Sun Yat-sen University, Guangzhou*

10:00 - 10:30 Coffee Break

**New Applications II**
**Session Chairs:** Olivier Bonnaud, University of Rennes 1, GIP-CNFM  
*Mamoru Furuta, Kochi University of Technology*

10:30 - 11:00 *(Invited) Nano-resistors based devices - effects of size and structure on performance*  
*Yue Kuo, Texas A&M University, College Station*

11:00 - 11:30 *(Invited) Performance enhancement of SSI-LEDs and geometrically confinement of lighting dots by using patterned wafer approaches*  
*Shengli Wu, Yiwei Liu, Xiaoning Zhang, Can Yang, Lingguang Liu, Yaogong Wang, Gang Niu, Xi'an Jiaotong University, Xi'an*

11:30 - 12:00 *(Invited) Microsystems for thermal energy powering*  
*Takahito Ono, Tohoku University, Sendai*

12:00 - 12:30 *(Invited) Chemiresistive and resistive switching semiconductor based sensor for biomolecule detection*  
*Hyun Ho Lee, Myongji University, Cheoin*

12:30 - 12:40 Conclusions / Next Conference

12:40 - 13:40 Lunch and Departures
Poster Presentations (Monday, May 20; 20:00 - 21:00)

Chairs: Mutsumi Kimura, Ryukoku University
         Feng Yan, Hong Kong Polytechnic University

1. Set voltage distribution stabilized by constructing an oxygen reservoir in resistive random access memory
   Chih-Yang Lin, National Sun Yat-sen University; Chih-Hung Pan, National Sun Yat-sen University; Po-Hsun Chen, Chinese Naval Academy; Ting-Chang Chang, National Sun Yat-sen University

2. Investigation of degradation caused by charge trapping at etching-stop layer under AC gate-bias stress for InGaZnO thin film transistors
   Ting-Chang Chang, Mao-Chou Tai, Yu-Ching Tsao, National Sun Yat-sen University; Po-Wen Chang, National United University

3. Effect of different a-InGaZnO TFTs channel thickness upon self-heating stress
   Ting-Chang Chang, National Sun Yat-sen University; Po-Wen Chang, National United University; Yu-Ching Tsao, National Sun Yat-sen University; Mao-Chou Tai, National Sun Yat-sen University

4. Mechanism of thermal field and electric field in resistive random access memory using the high/low-k side wall structure
   Yi-Ting Tseng, National Sun Yat-sen University; Ting-Chang Chang, National Sun Yat-sen University; Po-Hsun Chen, Chinese Naval Academy; Chih-Cheng Shih, National Sun Yat-sen University

5. Influence of electrode thermal conductivity on resistive switching behavior during reset process
   Cheng-Hsien Wu, National Sun Yat-Sen University; You-Lin Xu, National Sun Yat-Sen University; Shih-Kai Lin, National Tsing Hua University; Tsung-Ming Tsai, National Sun Yat-Sen University; Ting-Chang Chang, National Sun Yat-Sen University

6. The reliability of amorphous-InGaZnO₄ thin film transistor influence by self-heating stress at high temperature under compressive strain
   Yu-Ching Tsao, Ting-Chang Chang, Yu-Lin Tsai, Hong-Yi Tu, National Sun Yat-Sen University

7. Analysis of IGZO crystalline structure and its stability by first-principles calculations
   Tomonori Nakayama, Masahiro Takahashi, Tomosato Kanagawa, Toshimitsu Obonai, Kenichi Okazaki, and Shunpei Yamazaki, Semiconductor Energy Laboratory

8. Bi-direction transmissible gate driver on array
   Po-Tsun Liu, Guang-Ting Zheng, Chia-Heng Tu, Jin-Hao Huang, National Chiao Tung University

9. A TCAD calibrated approach for on-state modeling of amorphous oxide semiconductor TFTs
   Karl Hirschman, Glenn Packard, Rochester Institute of Technology; Robert Manley, Corning Inc.

10. Effects of X-ray irradiation on the noise behavior of low-temperature polycrystalline silicon TFTs
    Shan Yeh, Ya-Hsiang Tai, National Chiao Tung University, Hsinchu
11. **Reliability of plasma-etched copper lines on a glass substrate**
   
   Yue Kuo, Jia Quan Su, Mingqian Liu, Texas A&M University

12. **Gravitational level effects on optical properties of electrodeposited ZnO nanowire arrays**
   
   Y. Fukunaka, Waseda University; H. Osaki, Kyoto University; Y. Kanemitsu, Kyoto University; T. Homma, Waseda University

13. **A piecewise linear approximation for output characteristic for short-channel “extrinsic” mosfet with accounting of nonzero differential conductance in saturation regime and source parasitic resistance effect at high drain biases**
   
   Valentin Turin, Roman Shkarlat, Badriddin Rakhmatov, Orel State University after Ivan Turgenev, Russia; Gennady Zebrev, National Research Nuclear University “MEPHI”, Russia; Chang-Hyun Kim, Gachon University, Republic of Korea; Benjamin Iñiguez, Rovira i Virgili University, Spain; Michael Shur, Rensselaer Polytechnic Institute, USA