

Program

ULSIC vs TFT: 7th International Conference on Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors

**May 19-23, 2019
Palace Side Hotel
Kyoto, Japan**

Conference Chair

**Prof. Yue Kuo
Texas A&M University, USA**

Local Chair

**Prof. Yasuhiro Fukunaka
Kyoto University and Waseda
University**

Conference Co-Chairs

**Prof. Junichi Murota
Tohoku University, Japan**

**Prof. Yukiharu Uraoka,
Nara Advanced Institute of Science
and Technology**



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Previous conferences in this series

Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors
July 29-Aug 3, 2007

Barga, Italy

Conference Chairs:

Yue Kuo, Texas A&M University, USA
Michael Shur, Rensselaer Polytechnic Institute, USA
Dieter Ast, Cornell University, USA

Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors II
July 5-10, 2009

Xi'an, China

Conference Chairs:

Yue Kuo, Texas A&M University, USA
Michael Shur, Rensselaer Polytechnic Institute, USA
Dieter Ast, Cornell University, USA
William Milne, Cambridge University, UK
Shaozhen Xiong, Nankai University, China

Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors III
June 26-July 1, 2011

Hong Kong, China

Conference Chairs:

Yue Kuo, Texas A&M University, USA
Gennadi Bersuker, Sematech, USA

Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors IV
July 8-11, 2013

Grenoble, France

Conference Chairs:

Yue Kuo, Texas A&M University, USA
Gennadi Bersuker, Sematech, USA
C. Claeys, IMEC, Belgium

Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors V
June 14-18, 2015

Lake Tahoe, California, USA

Conference Chairs:

Yue Kuo, Texas A&M University, USA
Gennadi Bersuker, Sematech, USA
Olivier Bonnaud, University of Rennes, France

Semiconductor Technology for Ultra Large Scale Integrated Circuits and Thin Film Transistors VI
May 21-25, 2017

Hernstein, Austria

Conference Chairs:

Yue Kuo, Texas A&M University, USA
Olivier Bonnaud, University of Rennes, France

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The Semiconductor Division of the Korean Physical Society

Sunday, May 19, 2019

17:30 - 19:00	Conference Check-in
19:00 - 20:30	Welcome Reception and Dinner
20:30 - 21:30	Free communication

Locations and Notes

- *Technical sessions will be in the Grande and Moderato rooms.*
- *The poster session will be in the Legato and Piccolo rooms.*
- *Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, PDAs, watches) is strictly prohibited during the technical sessions, unless the author and ECI have granted prior permission.*
- *Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).*
- *Speakers – Please leave at least 3-5 minutes for questions and discussion.*
- *Please do not smoke at any conference functions.*
- *Turn your mobile telephones to vibrate or off during technical sessions.*
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- *Emergency Contact Information: Because of privacy concerns, ECI does not collect or maintain emergency contact information for conference participants. If you would like to have this information available in case of emergency, please use the reverse side of your name badge.*

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**
D. Grützmacher, D. Buca, Nils von den Driesch, Daniela Stange, Dennis Rainko, Inst. Semicond. Nanoelectron., Jülich; *Z. Ikonik*, University of Leeds, Leeds; *J.M. Hartmann*, Univ. Grenoble Alpes, Grenoble

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, Kaohsiung; 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, Jeng-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, Jérôme 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

Tuesday, May 21, 2019 (continued)

Materials, Devices, and Designs

Session Chairs: *D. Grützmacher, Inst. Semicond. Nanoelectron.*

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

Eri Yamamoto, Seiya Saito, Keita Sato, Kazuma Furutani, Yuto Yakubo, Tatsuya Onuki, Takanori Matsuzaki, Tomoaki Atsumi, Yoshinori Ando, Tsutomu Murakawa, Kiyoshi Kato, Shunpei Yamazaki, Semiconductor Energy Laboratory

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, Chinses 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, Corning 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

Wednesday, May 22, 2019 (continued)

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, Guanzhou

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 o 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