**SYMPOSIUM ED7**

**Materials and Device Engineering for Beyond the Roadmap**
**Devices in Logic, Memory and Power**
**April 18 - April 21, 2017**

**Symposium Organizers**
Alexander Demkov, University of Texas, Austin
Andrew Kummel, University of California, San Diego
John Robertson, University of Cambridge
Shinichi Takagi, University of Tokyo

**Proceedings Statement**
All authors are invited to submit articles based on their 2017 MRS Spring Meeting presentations to the journals in the MRS portfolio (www.mrs.org/publications-news). Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as symposium collections. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more, including MRS Advances print options available at special rates during the meeting week only.

* Invited Paper

**SESSION ED7.1: Memory I**
**Tuesday Morning, April 18, 2017**
PCC North, 100 Level, Room 131 A

**10:30 AM **ED7.1.01
**Computing with Coupled Dynamical Systems**
Suman Datta; University of Notre Dame, United States.

**11:00 AM ED7.1.02**
**Growth of NbO2 by Molecular-Beam Epitaxy and Characterization of its Metal-Insulator Transition**
Lindsey Noskin; Cornell University, United States.

**11:15 AM ED7.1.03**
**Infrared Near-Field Spectroscopy of Free Charge Carriers at Grain Boundaries in Sr-La2TiO5 Ceramics on the nm-Scale**
Martin Lewin; RWTH Aachen University, Germany; Fraunhofer Institute for Laser Technology (ILT), Germany.

**11:30 AM ED7.1.04**
**Molecular Beam Epitaxy Grown NbO2 Thin Films for Selector Devices**
Alex Demkov; University of Texas, United States.

**11:45 AM ED7.1.05**
**A Novel Forming-Free Bipolar Resistive Memory Based On ITO/V2O5/ITO Structure**
Zhenni Wan; University of Washington, United States.

**SESSION ED7.2: Memory II**
**Tuesday Afternoon, April 18, 2017**
PCC North, 100 Level, Room 131 A

**1:30 PM **ED7.2.01
**ReRAM Devices—From New Memory to beyond von Neumann**
Computing Applications
Dirk J. Wouters; RWTH Aachen University, Germany.

**2:00 PM ED7.2.02**
**Oxygen Stoichiometry Controlled Resistive Switching Modes in HfO2 and TaOx Based RRAM Devices**
Sankaramangalam U. Sharath; TU Darmstadt, Germany.

**SESSION ED7.3: CMOS**
**Wednesday Morning, April 19, 2017**
PCC North, 100 Level, Room 131 A

**8:00 AM ED7.3.01**
**Selective Isotopic Etching of Silicon in Preference to Germanium and SiGe**
Christopher Ahles; University of California, San Diego, United States.

**8:15 AM ED7.3.02**
**Reducing Fermi Level Pinning at Contacts on Ge by Germanides**
Hongfei Li; University of Cambridge, United Kingdom.

**8:30 AM ED7.3.03**
**Trap Characterization and Capacitance-Voltage Hysteresis of Al2O3/InGaAs Gate Stacks**
Kechao Tang; Stanford University, United States.

**8:45 AM ED7.3.04**
**Temperature Dependent Border Trap Response Produced by a Defective Interfacial Oxide Layer in Al2O3/InGaAs Gate Stacks**
Kechao Tang; Stanford University, United States.

**9:00 AM **ED7.3.05
**Bringing III-Vs into CMOS—From Epitaxy to Circuits**
Lukas Czornomaz; IBM Research GmbH, Switzerland.

**9:30 AM BREAK**

**10:00 AM **ED7.3.06
**Reliability of Metal Gate/High-K Devices and Its Impact on CMOS Technology Scaling**
Andreas Kerber; GLOBALFOUNDRIES, United States.

**10:30 AM ED7.3.07**
**Al2O3-HfO2 Nanolaminate Gate Oxides with Organic Precursor on Silicon Germanium**
Mahmut Sami Kavrik; University of California San Diego, United States.

**10:45 AM ED7.3.08**
**Yttrium Passivation of Defects in GeO2 and GeO2/Ge Interfaces**
Hongfei Li; University of Cambridge, United Kingdom.
ED7.4.01
Ferroelectric HfO2 or ZrO2 for Non-Volatile Memory Devices Uwe Schroeder; Namlab, Germany.

ED7.4.02
Structural Study of Ferroelectric HfO2 in Metal-Insulator-Metal Stack—Lateral Grain Growth and Transition to Non-Centrosymmetric Phase Takashi Ando; IBM T.J. Watson Research Center, United States.

ED7.4.03
Ferroelectric Capacitors with Quasi-Amorphous BaTiO3 Integrated on Silicon Catherine Dubourdieu1, 2; 1Institut des Nanotechnologies de Lyon, France; 2Helmholtz Zentrum Berlin für Materialien und Energie, Germany.

ED7.4.04
Ferroelectricity in Hf-Based Oxide—Negative Capacitance FETs for Steep Subthreshold Swing Min-Hung Lee; National Taiwan Normal University, Taiwan.

ED7.4.05
Recent Advances in Negative Capacitance for Ultra-Low Power Computing Asif Khan; Georgia Institute Technology, United States.

ED7.4.06
Flexible Ferroelectric Hafnia Films and Devices Hyeonggeun Yu; North Carolina State University, United States.

ED7.4.07
Rapid Imaging of Polarization Switching in Ferroelectrics Using the Complete Information Stream from Scanning Probe Microscopes Subhas Somnath; Oak Ridge National Laboratory, United States.

ED7.5.01
Hydrogen Silsesquioxane (HSQ) Resistance Switching Nanopillar Arrays Wing H. Ng; University College London, United Kingdom.

ED7.5.02
Investigation of Ferroelectric Behavior in Doped Hafnium Oxide Irving Cashwell; Norfolk State University, United States.

ED7.5.03
Dependences of Memory Characteristics on Schottky Parameters in Pt/Nb/SrTiO3 Schottky Junction Type Resistive Memory Kentaro Kinoshita1, 2; 1Tottori University, Japan; 2Tottori Integrated Frontier Research Center, Japan.

ED7.5.04
Beyond the Nanoparticle—Memory Devices Using Near Atomic Structures Febin Paul; De Montfort University, United Kingdom.

ED7.5.05
Analog Memcapacitance in Pt/HfOx/n+IGZO Structure through Redistribution of Oxygen Paul Yang; Myongji University, Korea (the Republic of).

ED7.5.06
Strain-Induced Shift of the Electrical Properties in AlGaN/GaN Heterostructures WuLin Tong; University of Electronic Science and Technology of China, China.

ED7.5.07
Directly Observation of the Switching Behaviors in VCM-Based TaOx Memristor Jui-Yuan Chen; National Chiao Tung University, Taiwan.

ED7.5.08
Radiation Effects on Talutans Oxide Resistive Memory under Applied Bias Joshua Holt; State University of New York Polytechnic Institute, United States.

ED7.5.09
Resistive Memory Structures of Nano-Layered Al2O3 Sita Dude; University of Puerto Rico, United States.

ED7.5.10
Switching Characteristic Improvement of TaOx-Based ReRAM Stack by Magnetron Sputtering Method Yusuke Miyaguchi; Institute of Semiconductor and Electronics Technologies, ULVAC, Inc., Japan.

ED7.5.11
Taguchi Design of Experiment Enabling the Reduction of Spikes on the Sides of Patterned Thin Films for Tunnel Junction Fabrication Pawan Tyagi; University of the District of Columbia, United States.

ED7.5.12
Polarity-Dependent Resistive Switching Characteristics in Ta2O5/Ag,Se and Ag,Se/Ta2O5 Bilayer Structures Jae Sung Lee; Myoung Ji University, Korea (the Republic of).

ED7.5.13
Oxygen Vacancy Electromigration versus Joule Heating in Local Programming of TiO2 RRAM Conductivity Kechao Tang; Stanford University, United States.

ED7.5.14
Multi-Level Organolead Halide Perovskite Resistive Random Access Memories Feichi Zhou; HK Polytechnic University, Hong Kong.

ED7.5.15
Amorphous In-Ga-ZnO Thin-Film Transistors with Embedded Reduced-Graphene Oxide for Mobility Enhancement Myung Ju Kim; Korea University, Korea (the Republic of).

ED7.5.16
Subsurface Engineering of Silicon for 3D Devices Onur Tokel; Bilkent University, Turkey.

ED7.5.17
The Influence of Local Defects on the Magnetic Properties of NiCo2O4 Sibylle Gemming1, 2; 1Helmholtz-Zentrum Dresden-Rossendorf, Germany; 2Technische Universität Chemnitz, Germany.

ED7.5.18
Reliable Resistive Switching Memory with Self-Compliance Based on Electrodeposited CuOx Multilayer Min-Kyu Kim; Pohang University of Science and Technology (POSTECH), Korea (the Republic of).

ED7.5.19
Flexible Threshold Switching Device Based on Electrochemical Deposition Youngjun Park; POSTECH, Korea (the Republic of).

ED7.5.20
First-Principles Study on Charge Trap States in Amorphous Si3N4-x Grine Kang; Seoul National University, Korea (the Republic of).
ED7.5.21
Resistive Switching Characteristics of All-Solution-Processed Ag/TiOx/Mo-Doped InxOy Nanovolatile Memory Device Sujayakumar Vishwanath; Kongju National University, Korea (the Republic of).

ED7.5.22
Effect of Off-Center Ion Substitution in Morphotropic Composition Lead Zirconate Titaneate Mohan K. Bhattarmi; Department of Physics and Institute for Functional Nanomaterials, University of Puerto Rico, United States.

ED7.5.23
Forming-Free Resistive Switching Characteristics of Ag/CeOx/Pt Structure Hong Zhang; Myongji University, Korea (the Republic of).

ED7.5.24
Two Dimensional Materials for Electronic Devices Ali Javey; University of California, Berkeley, United States.

ED7.5.25
University, Taiwan.

ED7.5.26
Direct Observation of Resistive Switching Behavior in Core-shell Ni/NiO HfOx Nanowire ReRAM Device Ting Kai Huang; National Chiao Tung University, Taiwan.

ED7.5.27
Performance of Hydrogenated Diamond MISFET Using Zr-Si-N as the Dielectric Layer Pengfei Zhang1, 2; Inner Mongolia University of Technology, China; Xi’an Jiaotong University, China.

ED7.5.28
Organic Non-Volatile Memory Using Nickel Oxide Nano-Floating-Gate and Polymer Electrets Yoon Ju Kim; GIST, Korea (the Republic of).

ED7.5.29
Detection and Mapping of Static Charges in Nanometer Scale Memory Devices Rudra S. Dhar; National Institute of Technology Mizoram, India.

SESSION ED7.6: 2D and Others
Session Chair: John Conley
Thursday Morning, April 20, 2017
PCC North, 100 Level, Room 131 A

8:00 AM ED7.6.01
Cause of RRAM Device Switching Variability and its Impact on Memristive Dynamic Adaptive Neural Network Arrays Nathaniel Cadiz, SUNY Polytechnic Institute, United States.

8:15 AM ED7.6.02
The Analog Information Limit of Magnetic Domain Wall Positions in Nanowires Sumit Dutta; Massachusetts Institute of Technology, United States.

8:30 AM *ED7.6.03
Tunnel FETs—Vertical or Lateral? Huili G. Xing; Cornell University, United States.

9:00 AM *ED7.6.04
2D Semiconductor Electronics—Advances, Challenges and Opportunities Ali Javey; University of California, Berkeley, United States.

9:30 AM BREAK

10:00 AM ED7.6.05
Graphene and Beyond—Creating and Exploring Atomically Thin Materials Joshua A. Robinson; The Pennsylvania State University, United States.

10:30 AM ED7.6.06
Quasi-2D β-Ga2O3 Field-Effect Transistors with Hexagonal Boron Nitride Gate Dielectric Jianqiang Kim; Korea University, Korea (the Republic of).

10:45 AM ED7.6.07
Approaching the Quantum Conductance Limit in Carbon Nanotube Array Transistors Gerald J. Brady; University of Wisconsin–Madison, United States.

11:00 AM *ED7.6.08
Two Dimensional Materials for Electronic Devices Seonjun Park; Samsung Advanced Institute of Technology, Korea (the Republic of).

11:30 AM ED7.6.09
Internal Photocemission Spectroscopy Measurement of Energy Barriers between Amorphous Metals and High-K Dielectrics John F. Conley; Oregon State University, United States.

11:45 AM ED7.6.10
All-Transparenet and Flexible Schottky Barrier Transistors and Logics Based on Ion Gel-Gated Graphene/Metal Oxide Heterostructure Seong Chan Kim; Sungkyunkwan University, Korea (the Republic of).

SESSION ED7.7: TFET
Session Chairs: Lukas Czmornoz and Huili Xing
Thursday Afternoon, April 20, 2017
PCC North, 100 Level, Room 131 A

1:30 PM *ED7.7.01
The Impact of Contact Deposition Ambient on the Interfacial Chemistry of 2D Materials Robert M. Wallace; University of Texas at Dallas, United States.

2:00 PM ED7.7.02
Vertical InxAs/GaAs/GaSb Tunneling Field-Effect Transistors on Si with Sub 50 mV/dec. Operation Lars-Erik M. Wernersson; Lund University, Sweden.

2:15 PM ED7.7.03
Band Engineering, Doping and Tunnel FETs with InSe Yuzheng Guo; University of Swansea, United Kingdom.

3:30 PM *ED7.7.05
Exploiting Interfacial Properties of Pristine MoSx, MOS Interface Mitsuru Takenaka1, 2; The University of Tokyo, Japan; JST-CREST, Japan.

4:00 PM *ED7.7.06
ON Current Boosting Technology for Si-Based Tunnel Field-Effect Transistors Utilizing Isoelectronic Trap Takahiro Mori; National Institute of Advanced Industrial Science and Technology (AIST), Japan.

4:30 PM ED7.7.07
Probing the Nanostructure in State-of-the-Art FinFET Devices Pritesh Parikh; University of California, San Diego, United States.

4:45 PM ED7.7.08
Charge Transfer Levels in ZrOx and Si:ZrOx Interfacial Layer Probed by DLTS Sandip Mondal; Indian Institute of Science, India.

SESSION ED7.8: Processing and Others
Session Chairs: Alex Demkov and John Robertson
Friday Morning, April 21, 2017
PCC North, 100 Level, Room 131 A

8:30 AM ED7.8.01
Heat-Induced Bipolar to Unipolar Resistive Switching Transition Simone Cortese; University of Southampton, United Kingdom.

8:45 AM ED7.8.02
How Do the Electrodes Affect the Electrical Response of a M/La/NiOx/M’ Memristive Device? Klasiassian Mans; Univ Grenoble Alpes, CNRS, LMGPP, France.

9:00 AM ED7.8.03
Structural Properties of Cerium Dioxide Film Prepared by Atomic Layer Deposition on TiN and Si Substrates Silvia Vangelista; IMM-CNR, MDM, Unit, Italy.

9:15 AM ED7.8.04
Characterization of Low Temperature Thermal ALD BN on Si1-xGex (001) Steven Wolf; University of California, San Diego, United States.
9:30 AM ED7.8.05
Uniform Atomic Layer Deposition of Al₂O₃ on Graphene by Reversible Hydrogen Plasma Functionalization Rene Vervuurt; Eindhoven University of Technology, Netherlands.

9:45 AM ED7.8.06
Inkjet-Printed Four-Terminal Microelectromechanical Relays for 3-Dimensional Logic Applications Seunghun Chung¹,²; ¹Seoul National University, Korea (the Republic of); ²University of California, Berkeley, United States.

10:00 AM BREAK

10:30 AM ED7.8.07
Chemical Vapor Deposition of Stoichiometric TaSi₂ on Si(001) Jong Youn Choi; University of California, San Diego, United States.

10:45 AM ED7.8.08
Antiferromagnetic Ordering in 25% Ca Doped Antisite-Disordered Ferromagnetic La₃CoMnO₇ Double Perovskite Ramechandra Sahoo; IIT Kharagpur, India.

11:00 AM ED7.8.09
Flexible Memristive Memory Arrays Based on Vapor-Phase Deposited Polymer Thin Film Byung Chul Jang; KAIST, Korea (the Republic of).

11:15 AM ED7.8.10
Resistive Switching of Nanoengineered LaMnO₃±δ Thin Films for ReRAM Applications Dolores D. Pla Asensio; Laboratoire des Matériaux et du Génie Physique (LMGP), France.

11:30 AM ED7.8.11
Interface-Type Resistive Switching in Epitaxial GdBaCO₃O₆±δ Thin Film Heterostructures Sarunas Bagdzvečius; Univ Grenoble Alpes, CNRS, LMGP, France.