High Current Temperature Sensitive RolltoRoll Printed Transistor

Pastorelli, Francesco

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Symposium PM4 : Novel Materials, Fabrication Routes and Devices for Environmental Monitoring

Nov 28 Nov 29 Nov 30

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Symposium Organizers

Albert Romano-Rodriguez, Universitat de Barcelona (UB)
Ruby Ghosh, Michigan State Univ
Meyya Meyyappan, NASA Ames Research Ctr
Michele Penza, ENEA, Italian National Agency for New Technologies, Energy and Sustainable Economic Development

PM4.1: Metal Oxide Materials I

Session Chairs

Andrei Kolmakov
J. Daniel Prades
Albert Romano-Rodriguez
David Schwartz

Monday AM, November 28, 2016
Hynes, Level 1, Room 110

8:45 AM - *PM4.1.01
Material Design of Semiconductor Gas Sensors for Practical Use

Kengo Shimanoe [1], N. Ma [1] , T. Oyama [1] , H. Uchino [1] , M. Nishibori [1] , K. Watanabe [1]

[1] Kyushu University Kasuga Japan

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9:15 AM - PM4.1.02
Engineering Surface of Titanium Oxide Sensors for Toxic H2S Monitoring

Tushar Jagadale [1], Champalal Prajapat [1] , Kunal Muthe [1] , S. Gadkari [1] , S. Gupta [1]

[1] Technical Physics Division Bhabha Atomic Research Centre Mumbai India

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9:30 AM - PM4.1.03
SnO_2 Functionalized Gas Sensors for Selective Detection of NO_2.

Cristian Fabrega [1], Alexandra Rodrigues [1], Olga Casals Guillen [1], Nicolai Markiewicz [1 2 3], Alaaeldin Gad [2 3], Hutomo Wasisto [2 3], Andreas Waag [2 3], J. Daniel Prades [1]

[1] Department of Engineering University of Barcelona Barcelona Spain, [2] Institute of Semiconductor Technology Braunschweig University of Technology Braunschweig Germany, [3] Laboratory for Emerging Nanometrology Braunschweig Germany

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9:45 AM - PM4.1.04
A Gas Sensor for the Trace Detection of Explosives

Nathaniel Gomes [1], Zachary Caron [1], Andrew Rossi [1], Spencer Fusco [1], Jonny Cummings [1], Otto Gregory [1]

[1] University of Rhode Island Kingston United States

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10:00 AM - *
Break

10:30 AM - PM4.1.05
Enhanced Gas Sensing Properties of Chemiresitors Based on ZnO Nanorods Electrodecorated with Au and Pd Nanoparticles

Elena Dilonardo [1 2], Marco Alvisi [4], Gennaro Cassano [4], Cinzia Di Franco [5], Nicola Cioffi [2], Michele Penza [4]

[1] Politecnico di Bari Bari Italy, [2] Università Degli Studi di Bari Bari Italy, [4] ENEA Brindisi Italy, [5] CNR IFN Bari Italy

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10:45 AM - PM4.1.06
Ultra Low Energy Consumption of SnO_2 Nanowire Sensor by Nanoscale Thermal Management

Kazuki Nagashima [1], Gang Meng [1], Fuwei Zhuge [1], Atsuo Nakao [2], Masaki Kanai [1], Yong He [1], Mickael Boudot [1], Tsunaki Takahashi [3], Ken Uchida [3], Takeshi Yanagida [1]

[1] Institute for Materials Chemistry and Engineering Kyusyu University Kasuga Japan, [2] Panasonic Corporation Kadoma Japan, [3] Keio University Yokohama Japan

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11:00 AM - *PM4.1.07
Seamless Environmental Indoor and Outdoor Monitoring Strategies Enabled by Emerging Low Cost Detection Technologies

Maximilian Fleischer [1], Roland Pohle [1]

[1] Corporate Technology Siemens AG Munich Germany

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11:30 AM - PM4.1.08
Monitoring a p-Type Gas Sensor at Work—An Advanced *In Situ* X-Ray Absorption Spectroscopy Study

Anderson Felix [1], Diogo Volanti [2], Pedro Suman [1], Elson Longo [1], Jose Varela [1], Marcelo Orlandi [1]

[1] Instituto de Química-UNESP Araraquara Brazil, [2] Instituto de Biociências, Letras e Ciências Exatas-UNESP São José do Rio Preto Brazil

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11:45 AM - PM4.1.09
Synergy Effects in Hybrid Au/SPION Nanoparticles on the Gas Detection Performance of Zinc Oxide Nanowires Array Based Sensor

Bo Zhang [1], Rodrigo Vinluan [2], Sibo Wang [1], Jie Zheng [2], Pu-Xian Gao [1]

[1] University of Connecticut Storrs United States, [2] University of Texas at Dallas Richardson United States

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PM4.2: Metal Oxide Materials II

Session Chairs
Sven Barth

Monday PM, November 28, 2016
Hynes, Level 1, Room 110

1:30 PM - PM4.2.01
Gas Nanosensors Based on Individual $(In_{1-x}Ga_x)_2O_3$ Nanowires

Guillem Domenech-Gil [1], Elena Lopez-Aymerich [1], Jordi Sama [1], Paolo Pelegrino [1], Sven Barth [2], Albert Romano-Rodriguez [1]

[1] Engineering, Electronics Universitat de Barcelona Barcelona Spain, [2] Institut für Materialchemie Vienna University of Technology Vienna Austria

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1:45 PM - PM4.2.02
Flexible TiO_2 Platforms for UV Sensing

Daniela Nunes [1], Ana Pimentel [1], Tomas Calmeiro [1], Andreia Araujo [1], Lidia Santos [1], Suman Nandy [1], Joana Pinto [1], Pedro Barquinha [1], Elvira Fortunato [1], Rodrigo Martins [1]

[1] Department of Materials Science Universidade Nova de Lisboa Caparica Portugal

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2:00 PM - *PM4.2.03
Applications of Metal Oxide Nano-Materials for Manufacturing Environmental Sensors on CMOS Silicon Process

M. F. Chowdhury [1]

[1] ams, Deanland House Cambridge United Kingdom

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2:30 PM - *
Break

PM4.3: Carbon-Based Materials

Session Chairs
Donatella Puglisi
Albert Romano-Rodriguez

Monday PM, November 28, 2016
Hynes, Level 1, Room 110

3:00 PM - *PM4.3.01
Suspended SWNT FETs for Ultra Low Power NO_2 Sensors

C. Hierold [1], M. Haluska [1], C. Roman [1]

[1] Department of Mechanical and Process Engineering ETH Zurich Zurich Switzerland

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3:30 PM - PM4.3.02
Novel Carbon Nanotube Fibers for Sensing Water and Moisture

Sisi He [1], Peining Chen [1], Longbin Qiu [1], Huisheng Peng [1]

[1] Fudan University Shanghai China

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3:45 PM - PM4.3.03
Towards Chemical Sensing and Self-Healing Materials—Synthesis and Fabrication of Multi-Stimuli Responsive Self-Immolative Polymers

Xiaocun Lu [1], Chengtian Shen [1], Jeffrey Moore [1 2]

[1] Department of Chemistry University of Illinois at Urbana-Champaign Urbana United States, [2] Beckman Institute for Advanced Science and Technology Urbana United States

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4:00 PM - PM4.3.04
Sensing Properties of MWCNTs Layers Electrodecorated with Metal Nanoparticles for Detection of Aromatic Hydrocarbon Compounds

Elena Dilonardo [1], Marco Alvisi [2], Riccardo Rossi [2], Gennaro Cassano [2], Gerardo Palazzo [3], Michele Penza [2]

[1] Università del Salento Lecce Italy, [2] ENEA Brindisi Italy, [3] Università Degli Studi di Bari Bari Italy

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4:15 PM - PM4.3.05
Sensors from Nanocomposite Foams Containing Conductive Sheet Material at the Interface

Harish Kumar [1], Douglas Adamson [1]

[1] University of Connecticut Storrs United States

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4:30 PM - *PM4.3.06
Printed Carbon Nanotube Gas Sensor Arrays for Natural Gas Leak Detection

David Schwartz [1], Meyya Meyyappan [2], C. Smith [1], Y. Zhang [1], G. Iftime [1], B. Saha [1], E. Cocker [1], C. Paulson [1], J. Lee [1], G. Daniel [1], V. Beck [1], B. Kim [2]

[1] PARC Palo Alto United States, [2] NASA Ames Research Laboratory Moffet Field United States

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PM4.4: Poster Session

Session Chairs

Monday PM, November 28, 2016
Hynes, Level 1, Hall B

8:00 PM - PM4.4.01
Carcinogenic Isoprene Detection at low-ppb Level with Nanostructured Ti-Doped ZnO Sensors

Andreas Guentner [1], Sebastian Abegg [1], Nicolay Pineau [1], Donovan Chie [1], Frank Krumeich [1], Sotiris Pratsinis [1]

[1] ETH Zurich Zurich Switzerland

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8:00 PM - PM4.4.02
Template-Free Electrogeneration of Polypyrrole Oriented Nanowires or Interconnected Nanofibers

Ahmed Fakhry [1], Hubert Cachet [1], Francoise Pillier [1], Catherine Debiemme-Chouvy [1]

[1] Laboratory of Interfaces and Electrochemical Systems Pierre-and-Marie-Curie University Paris France

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8:00 PM - PM4.4.03
High-Performance Flexible ZnO Nanorod UV Sensors with Network-Structured Cu Nanowire Electrode

Do-Kyun Kwon [1], Su Jeong Lee [1], Jae-Min Myoung [1]

[1] Yonsei University Seoul Korea (the Republic of)

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8:00 PM - PM4.4.04
Synthesis of Density Controlled Gold Nanostructures via Limited Exposure to Hydrofluoric Acid for Sensing Applications

Minh Tran [1], Sonal Padalkar [1]

[1] Iowa State University Ames United States

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8:00 PM - PM4.4.05
Nanostructured Oxide Thin-Film-Based Chemiresistive Sensors for Detection of Chemical Warfare Agents and Their Simulants

Pavel Hozak [1], David Tomecek [1], Eva Maresova [1 2], Premysl Fitl [1 2], Ladislav Fiser [1], Tomas Rozsypal [3], Monika Hoskovcova [3], Zbynek Kobliha [3], Zdenek Skalican [3], Jan Lancok [2], Ladislav Fekete [2], Martin Vrnata [1], Jan Vlcek [1 2]

[1] Physics and Measurements University of Chemistry and Technology Prague Czech Republic, [2] Institute of Physics Prague Czech Republic, [3] NBC Defence Institute University of Defense Vyskov Czech Republic

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8:00 PM - PM4.4.06
Femtosecond Laser Fabricated Protein Nanowires for Biosensing

Xuan-Yu Zhang [1], Yun-Lu Sun [1], Chao Lv [1], Yong-Sen Yu [1], Hong-Bo Sun [1]

[1] College of Electronic Science and Engineering Jilin University Changchun China

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8:00 PM - PM4.4.07
Development of Metal-Ion Sensing Membrane by Thermo-Reversible Assembly of Phthalocyanine

Seung-Hwan Byun [1], Seung-Yeop Kwak [1]

[1] Seoul National University Seoul Korea (the Republic of)

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8:00 PM - PM4.4.08
The Role of Device Geometry in the Gas Sensing Performance of Metal Oxide Nanowires

Francisco Hernandez [1 2] , J. Daniel Prades [2] , Cristian Fabrega [2] , Albert Romano-Rodriguez [2]

[1] Institut de Recerca en Energia de Catalunya Barcelona Spain, [2] University of Barcelona Barcelona Spain

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8:00 PM - PM4.4.09
Novel CeO2-Based Screen-Printed Potentiometric Electrodes for pH Monitoring in the Nuclear Waste Storage Sites

Stephanie Betelu [2] , Kyriaki Polychronopoulou [1], Claus Rebholz [3] , Mark Baker [4] , Ayesha AlKhoori [1] , Maitha AlKetbi [1] , Ioannis Ignatiadis [2] , Ohood Alnuaimi [1 5]

[2] Environment and Processes Division Bureau de Recherches Géologiques et Minières Orléans France, [1] Mechanical Engineering Khalifa University Abu Dhabi United Arab Emirates, [3] Mechanical Engineering University of Cyprus Nicosia Cyprus, [4] MicroStructural Studies Unit University of Surrey Guildford United Kingdom, [5] Emirates Technology and Innovation Center Abu Dhabi United Arab Emirates

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8:00 PM - PM4.4.10
Adsorption and Electrical Behavior of Room Temperature Ionic Liquids as a Function of CO_2 Gas Concentration

Edward Graef [1], Rujuta Munje [1] , Shalini Prasad [1]

[1] University of Texas at Dallas Richardson United States

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8:00 PM - PM4.4.11
Enhanced Photocatalytic Activity of Composite Semiconducting/Plasmonic Materials—Towards Withholding of Heavy Metal Ions from Aqueous Solutions

Nikolaos Pliatsikas [2] , Konstantinos Symeonidis [2] , George Vourlias [2] , Manasis Mitrakas [3] , D. Koutsogeorgis [1] , Panos Patsalas [2] , Nikolaos Kalfagiannis [1]

[2] Physics Aristotle University of Thessaloniki Thessaloniki Greece, [3] Chemical Engineering Aristotle University of Thessaloniki Thessaloniki Greece, [1] Nottingham Trent University Nottingham United Kingdom

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8:00 PM - PM4.4.12
High Current Temperature Sensitive Roll-to-Roll Printed Transistor

Francesco Pastorelli [1]

[1] Technical University of Denmark Roskilde Denmark

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Organic thin film transistors (OTFT) offer great potential for use in flexible electronics. Much of this potential lies in the solution processability of the organic polymers enabling both roll coating and printing on flexible substrates and thus greatly reducing the material and fabrication costs. We have fabricated an OTFT in ambient air, on a PET flexible substrate. The printing technique is very similar to the one used for printing newspapers and has low environmental impact in comparison with traditional electronics. This is because is made at lower temperature than you would normally use for baking a cake. After implementing the transistor we build a small demonstrator circuit to operate a printed electrochromic surface powered by an organic solar cell all realized with the same technique. The devices have top gate architecture and were completed by slot-die coating of the organic semiconductor poly-3-hexylthiophene and the dielectric material polyvinylphenol before the gate was applied by screen printing. We explore the footprint and the practically accessible geometry of such devices with a special view toward being able to drive large currents while handling the thermal aspects. We find especially that an elevated operational temperature is beneficial with respect to both transconductance and on/off ratio. We achieve high currents of up to 45 mA at a temperature of 80 °C with an on/off ratio of 100. We observe a significant temperature dependence of the performance which can be explored further in sensing applications.

[1] Francesco Pastorelli, Thomas M. Schmidt, Markus Hösel, Roar R. Søndergaard, Mikkel Jørgensen and Frederik C. Krebs, " The Organic Power Transistor: Roll-to-Roll Manufacture, Thermal Behavior, and Power Handling When Driving Printed Electronics", Volume 18, Issue 1, pages 51–55, January 2016, doi: 10.1002/adem.201500348

8:00 PM - PM4.4.13
Tunable UV Response and High Performance of Zinc Stannate Nanoparticle Film Photodetectors

Caihong Liu [2] , Adimali Piyadasa [1 2], Marcin Piech [3] , Sameh Dardona [3] , Zheng Ren [2] , Pu-Xian Gao [1 2]

[2] Department of Materials Science and Engineering and Institute of Materials Science University of Connecticut Storrs United States, [1] Department of Physics University of Connecticut Storrs United States, [3] Department of Physical Sciences United Technologies Research Center East Hartford United States

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