Program - Symposium D: Nanocontacts–Emerging Materials and Processing for Ohmicity and Rectification

2012 MRS Spring Meeting & Exhibit
April 9-13, 2012
San Francisco, California

2012-04-10
Symposium D
Show All Abstracts

Symposium Organizers
- A. Alec Talin, CNST/NIST
- M. Saif Islam, University of California, Davis
- Christian Lavoie, IBM T. J. Watson Research Center
- King-Ning Tu, University of California, Los Angeles

Support
- IBM T.J. Watson Research Center
- NIST

D1: Nano and Molecular Contacts
- Chair: A. Alec Talin
- Chair: Richard Martel
8:30 AM - *D1.1
Electrical Contacts to Nanostructures: Lessons, Opportunities, and Challenges
Francois Leonard1.
Show Abstract

9:00 AM - *D1.2
Scanning Probe Microscopy of In-based Nanocontacts and Nanorings on CdZnTe(110)
Gili Cohen-Tagur1, Ori Sinkevich1, Mario Levinshtein1, Arie Ruzin1, Ilan Goldfarb1.
Show Abstract

9:30 AM - D1.3
Correlation between Quantum Conductance and Atomic Arrangement of Silver Atomic-Size Nanocontacts
Pedro A Autreto1, Maureen J Lagos1 2, Daniel Ugarte1, Douglas S Galvao1.
Hide Abstract

The intense work of the nanotechnology community has increased the capabilities of researchers to produce new materials at the nanometric scale. As a result, novel physical and chemical behaviors are frequently reported opening opportunities for creating new kind of devices. These new devices will require a precise knowledge of the physical properties of atomic-size contacts and nanowires (NW)/interconnects. The generation of these atomic-size metal wires by the mechanical stretching has allowed the study of a wide range of metals at nanoscale. Due to the dominant role of surface energy in this size regime, several anomalous wire structures have already been reported to form during the stretching of very tiny wires, as hollow tubular metals and the size-limit to the existence of defects in NWs [1-3]. In this work we have studied the relevance of thermal effects on the structural and transport response of Ag atomic-size nanowires generated by mechanical elongation. Our study involve time-resolved atomic resolution transmission electron microscopy imaging and quantum conductance measurement using a ultra-high-vacuum mechanically he controllable break junction in association with quantum transport calculations. We have observed drastic changes in conductance and structural properties of Ag nanowires generated at different temperatures (150 and 300 K). By combining electron microscopy images, electronic transport measurements and theoretical modeling we have been able to establish a consistent correlation between the conductance and structural properties of Ag NWs. In particular, our study has revealed the formation of metastable rectangular rod-like Ag wire (3/3) along [001] direction. [1] M. J. Lagos, F. Sato, J. Bettini, V. Rodrigues, D. S. Galvao and D. Ugarte, Nature Nanotechnology v4, 149 (2009) [2] P. A. S. Autreto, M. J. Lagos, F. Sato, J. Bettini, V. Rodrigues, D. Ugarte, and D. S. Galvao, Phys. Rev. Lett. v106, 065501 (2011). [3] M. J. Lagos, F. Sato, D. S. GalvÃ£o, and D. Ugarte, Phys. Rev. Lett. v106, 055501 (2011).

9:45 AM - D1.4
Conductance Statistics from a Large Array of sub-10 nm Single Grain Au Nanodot Electrodes
Kacem Smaali1, Nicolas Clement1, Gilles Patriarche2, Dominique Vuillaume1.
Show Abstract

10:00 AM - BREAK
Show Abstract
10:30 AM - D1.5
Room-temperature Spin Injection into Si in a Metal-oxide-semiconductor Field Effect Transistor Structure with a High-quality Schottky-tunnel Contact
Yuichiro Ando1,2, Kohei Masaki2, Kenji Kasahara2, Shinya Yamada2, Yusuke Hoshi3, Kentarou Sawano3, Masanobu Miyao1, Kohei Hamaya1,4.

Show Abstract

10:45 AM - D1.6
High Performance Switchable Thermal Diode Based on Metal-insulator Interface
Jia Zhu1, Sheng Shen1, Kedar Hippalgaonkar1, Kevin Huang1, Arun Majumdar1, Junqiao Wu1, Xiang Zhang1.

Show Abstract

11:00 AM - D1.7
Molecule/Electrode Interface Energetics in Nanocontact Molecular Junction: A "Transition Voltage Spectroscopy" Study
Stephane Lenfant1, Guillaume Ricoeur1, David Guerin1, Dominique Vuillaume1.

Show Abstract

11:15 AM - D1.8
Nanocontact Reliability for Nanomechanical Logic Switches: Lifetime Performance of Platinum and Conducting Diamond Contacts under Extreme Conditions
Graham E. Wabiszewski1, Andrew R Konicek2, Anirudha V Sumant3, Augusto Tazzoli4, Gianluca Piazza4, Robert W Carpick1.

Show Abstract

D2: Contacts to Nanotubes, Graphene and Beyond

- Chair: M. Saif Islam
- Chair: Yu Huang
- Tuesday PM, April 10, 2012
- Moscone West, Level 2, Room 2002

1:30 PM - *D2.1
Carbon Nanotube Array Electrodes for Carrier Injection
Richard Martel1.

Show Abstract

2:00 PM - D2.2
Charge Injection at Carbon Nanotube-metal Contacts
Aron Cummings1, Francois Leonard1.

Show Abstract

2:15 PM - D2.3
Negative Contact Resistances Apparently-appeared at Graphene/Metal Contacts

http://www.mrs.org/s12-program-d/
Ryo Nouchi, Tatsuya Saito2, Nobuhiko Mitoma2, Katsumi Tanigaki1 2.

Show Abstract

2:30 PM - D2.4
Graphene for Metal-semiconductor Ohmic Contact
Heejun Yang1, Seongjun Park1, Jinseong Heo1, Hyun Jae Song1, David H Seo1, Kyung-Eun Byun1, Hyun-Jong Chung1.

Show Abstract

2:45 PM -
BREAK

Show Abstract

3:15 PM - *D2.5
Mechanical Annealing and Robust Conductance of Metallic and Semimetallic Nanocontacts
Juan Jose Palacios1, Carlos Sabater2, Daniel Gosálbez2, María J Caturla2, Carlos Untiedt2.

Show Abstract

3:45 PM - D2.6
Nanostructure Characterization of Carbon Nanotube/Metal Interfaces
Patrick Wilhite1, Anshul Vyas1, Jason Tan1, Phillip Wang2, Jeongwon Park2, Michael Jackson2, Cary Y Yang1.

Show Abstract

4:00 PM - D2.7
Quantum Confinement Effects on Charge Injection and Transport in InAs Membranes
Rehan Kapadia1, Kuniharu Takei1, Hui Fang1, S. Bala Kumar2, Qun Gao2, Yu-Lun Chueh4, Sanjay Krishna3, Jing Guo2, Ali Javey1.

Show Abstract

4:15 PM - D2.8
Theory of the Schottky Barrier at the Metal/AlN Interface
Alex Slepko1, Alex Demkov1.

Show Abstract

D3: Poster Session: Nanocontacts - Emerging Materials and Processing for Ohmicity and Rectification

- Chair: A. Alec Talin
- Chair: Christian Lavoie
- Chair: King-Ning Tu
- Chair: M. Saif Islam
- Tuesday PM, April 10, 2012
- Moscone West, Level 1, Exhibit Hall

5:00 PM - D3.2
A Numerical Simulation Study of Inverse Doped Surface Layer in Schottky Barrier Modification

Subhash Chand1, Priyanka Kaushal1.

Show Abstract

5:00 PM - D3.3
Low-frequency Noise in Schottky Barriers Based Nanoscale Field-effect Transistors

Nicolas Clement1, Guilhem Larrieu2, Emmanuel Dubois1.

Show Abstract

5:00 PM - D3.4
Nano Devices for Spintronics with Organic Materials

Marta Galbiati1, Sergio Tatay Aguilar1, Clement Barraud1, Richard Mattana1, Pierre Seneor1, Karim Bouzehouane1, Cyril Deranlot1, Eric Jacquet1, Albert Fert1, Frederic Petroff1.

Show Abstract

5:00 PM - D3.5
Electronic Properties of Sandwiched Metal-Graphene-Metal Structures: An Experimental and Theoretical Study

Cheng Gong1, David Hinojos1, Weichao Wang1, Nour Nijem1, Bin Shan2, Robert Wallace1, Kyeongjae Cho1, Yves J Chabal1.

Show Abstract

5:00 PM - D3.6
Ultra-thin and Discontinuous Metal Films for Solar Cell Electric Nanocontacts

Abdennaceur Karoui1, Faouzia K Sahtout2.

Show Abstract

5:00 PM - D3.7
Nanometer Thickness Planar Schottky Contacts for Ultra-fast Sensing and Energy Conversion Applications

Mohammad Hashemian1, Suhas K Dasari1, Eduard Karpov1.

Show Abstract

5:00 PM - D3.8
Marked Suppression of the Fermi-level Pinning at Metal/Ge(111) Junctions with Atomically Matched Interfaces

Kenji Kasahara1, Shinya Yamada1, Masanobu Miyao1, Kohei Hamaya1 2.

Show Abstract

5:00 PM - D3.9
Laser Zone Annealing of Electrodeposited Gold Nanowires to Bamboo Grain Structures

Jungyun Kim1 2, Mercedes Lin2, Eric Potma2, Reginald Penner2.

Show Abstract

5:00 PM - D3.10
Novel Method for Robust Bonding and Alignment of Nanowires on Electrodes

Won Seok Lee1, Inkyu Park1, Jihye Lee2.
### 5:00 PM - D3.11
The Role of the Organic Layer Functionalization in the Formation of Silicon/Organic Layer/Metal Junctions with Coinage Metals

**Eduardo Martín Patrito**, Federico Soria, Maria Fernanda Juarez, Patricia Paredes-Olivera.

**Show Abstract**

### 5:00 PM - D3.12
Nanoscale Schottky Contact and Light-induced Charge Separation on 1D TiO₂ Nanostructures

Myungjun Kim, Yunjeong Yang, Hyunchul Kim, Hyunjun Yoo, Sovan K Panda, Jang-Sik Lee, Hyunjung Shin.

**Show Abstract**

### 5:00 PM - D3.13
Development and Characterization of Platinum Silicide as a Tunable Contact Material for NEMS Switches

Frank Streller, Graham E Wabiszewski, Gianluca Piazza, Robert W Carpick.

**Show Abstract**

### 5:00 PM - D3.14
Compositional Analysis of E-beam-induced Deposited Tungsten Contacts for Nanocarbon Interconnects

Nobuhiko Kanzaki, Patrick Wilhite, Shusaku Maeda, Cary Y Yang.

**Show Abstract**

### 5:00 PM - D3.15
Magnetoresistance of Ni/Benzenedithiol/Ni Single Molecular Junctions at Room Temperature

Ryo Yamada, Motoki Noguchi, Hirokazu Tada.

**Show Abstract**

### 5:00 PM - D3.16
Formation of Cobalt Disilicide on 3D Structures from Highly Conformal Cobalt Nitride Thin Films by Low-temperature Chemical Vapor Deposition from a Liquid Cobalt Amidinate Precursor

Jing Yang, Harish B Bhandari, Roy Gordon, Qing Min, Wang, Jean-Sebastien Lehn, Deo Shenai.

**Show Abstract**

### 5:00 PM - D3.18
Systematic Study of the Contact Resistance of InAs Nanowires between Wet Etching Process and In situ Argon Milling

Marion J. L. Sourribes, Ivan Isakov, Marina Panfilova, Paul A Warburton.

**Show Abstract**

### 5:00 PM - D3.19
Ohmic Contacts to n-type Germanium Using a Thin ZnO Interfacial Layer

Prashanth Manik Paramahans, Prasenjit Ray, Sandeep Mane, Pradeep Nyaupane, Udayan Ganguly, Saurabh Lodha.

**Show Abstract**
5:00 PM - D3.20
Interfacing Ag Nanoparticles with 1D Semiconductor Micro/Nanostructures via Joule Heating for Transfer Printing Nanodevices at Room Ambient
Logeeswaran Vij1, Aaron M Katzenmeyer2, Matthew Ombaba1, M. Saif Islam1.
Show Abstract

2012-04-11

Symposium D
Show All Abstracts

Symposium Organizers
- A. Alec Talin, CNST/NIST
- M. Saif Islam, University of California, Davis
- Christian Lavoie, IBM T. J. Watson Research Center
- King-Ning Tu, University of California, Los Angeles

Support
- IBM T.J. Watson Research Center
- NIST

D4: Contacts to Nanowires
- Chair: King-Ning Tu
- Chair: Francois Leonard
- Wednesday AM, April 11, 2012
- Moscone West, Level 2, Room 2002

8:30 AM - *D4.1
Influence of Doping Profiles on Schottky Barrier and Resistance of Contacts to Si Nanowires: Scanning Photocurrent Microscopy and Atom Probe Tomography Studies
Jerome K Hyun1, KunHo Yoon1, Jonathan P Pelz2, Yossi Rosenwaks3, Lincoln J Lauhon1.
Show Abstract

9:00 AM - *D4.2
Fabrication and Characterization of Contacts to Semiconductor Nanowires: Systematic Trends, Anomalies, and Remaining Challenges
Suzanne E. Mohney1.
Show Abstract

9:30 AM - D4.3
Investigation of Silicide / Silicon Interfaces in Nanowire Based-nanocontacts
Guilhem Larrieu, Xiang-Lei Han, Gilles Patriarche, Fuccio Cristiano, Maeva Collet, Youssouf Guerfi.

Show Abstract

9:45 AM - D4.4
A Novel Design of Metal Contacts for Radial p-n Junction Si Wire Solar Cells Prepared without Transparent Conducting Oxide

Sun-Mi Shin, Jin-Young Jung, Kwang-Tae Park, Han-don Um, Sang-Won Jee, Yoon-Ho Nam, Jung-Ho Lee.

Show Abstract

10:00 AM - BREAK

Show Abstract

10:30 AM - *D4.5
Kinetic Competition Model and Phase Control in 1-D Nanostructures

Yu Huang.

Show Abstract

11:00 AM - D4.6
Void Evolution and Microstructure of Annealed Ni/Au Contacts to GaN Nanowires

Andrew M. Herrero, Paul Blanchard, Devin Rourke, Aric Sanders, Matthew Brubaker, Chris Dodson, Norman A Sanford, Alexana Roshko, Kris A Bertness.

Show Abstract

11:15 AM - D4.7
Effect of GaN Nanowire Morphology on Current-voltage Characteristics

Paul Blanchard, Kris A Bertness, Todd E Harvey, Aric W Sanders, Norman A Sanford, John B Schlager.

Show Abstract

11:30 AM - D4.8
Electrical Contact Characteristics between Silicon Micropillars and Ag Nanoparticles with Controlled Mechanical Load

Logeeswaran V, Daniel Lam, Emre Yengel, Heim K Grewal, Matthew Ombada, M. Saif Islam.

Show Abstract

11:45 AM - D4.9
Local Electronic Properties of Micro/Nanocontact CdTe Solar Cells

Heayoung P. Yoon, Dmitry Ruzmetov, Marina S Leite, A. A Talin, Nikolai B Zhitenev.

Show Abstract

D5: Silicides

- Chair: Christian Lavoie
- Chair: Suzanne Mohney
- Wednesday PM, April 11, 2012
Moscone West, Level 2, Room 2002

1:30 PM - *D5.1
Nucleation and Growth of Nanoscale Epitaxial Silicides by Point Contact Reactions
Yi-Chia Chou1

Show Abstract

2:00 PM - D5.2
Level Set Modeling of Nickel Silicide Growth
Ashish Kumar1, Mark E Law1.

Show Abstract

2:15 PM - D5.3
Nanoindentation-induced Rectifying-to-Ohmic Phase-transformation in Nickel-rich Silicon
David John Sprouster1, Simon Ruffell1, Jodie Bradby1, Ryan C Major2, Oden L Warren2, James S Williams1.

Show Abstract

2:30 PM - D5.4
Influence of Impurities on Ni Silicide Formation for Ultra Thin Films of Ni Deposited on Si (100)
Andrew Thron1, Peter Greene2, Jack Chan3, Timothy J Pennycook4, Kai Liu2, Stephen J Pennycook4, Amitabh Jain5, Chris L Hinkle3, Klaus van Benthem1.

Show Abstract

2:45 PM - D5.5
Theoretical Investigation of TixPt1-xSi Contacts to Si
Alex Slepko1, Alex Demkov1.

Show Abstract

3:00 PM -
BREAK

Show Abstract

3:30 PM - *D5.6
Silicide Contact Resistivity and Phase Formation for Extremely Scaled CMOS Device Applications
Mark Raymond1, Bin Yang1, Zhen Zhang2, Ahmet Ozcan3, Christian Lavoie2.

Show Abstract

4:00 PM - *D5.7
Understanding Solid-state Interactions: Ultrathin Ni1-xPt x Silicide Films Formed on Si(100)
Shili Zhang1

Show Abstract

4:30 PM - D5.8
What Makes a Good Contact? Insights from Atomistic Simulation
Keith Tobias Butler1, Enrique Cabrera2, Sara Olibet2, John H Harding1.

Show Abstract

4:45 PM - D5.9
Contact Resistance Reduction on Germanium through Metal Work Function Engineering
Pavan Kishore Vuddantii, Prashanth Manik Paramahans1, Sunny Sadana1, Udayan Ganguly1, Saurabh Lodha1.

Show Abstract