

SYMPOSIUM NM7

Semiconductor Nanowires for Energy Applications
April 18 - April 21, 2017

Symposium Organizers

Esther Alarcon-Llado, AMOLF
Anna Fontcuberta i Morral, EPFL
Sudha Mokkalapati, Australian National University
Carl Thompson, Massachusetts Institute of Technology

Symposium Support

Journal of Physics D | IOP Publishing

Proceedings Statement

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* Invited Paper

SESSION NM7.1: Piezoelectronic Nanowire Devices

Session Chairs: Esther Alarcon-Llado and Anna Fontcuberta i Morral
Tuesday Morning, April 18, 2017
PCC West, 100 Level, Room 105 A

10:30 AM *NM7.1.01

Metal Oxide Nanosurfaces and Hetero-Interfaces for Energy Harvesting and Sensing Applications [Sanjay Mathur](#); University of Cologne, Germany.

11:00 AM NM7.1.02

Voltage-Current Characteristics of a Piezoelectric Semiconducting Nanowire under Dynamic Axial Tension Deformations [Shuaiqi Fan](#); Huazhong University of Science and Technology, China.

11:15 AM NM7.1.03

All Oxide VO₂ Nanowire Bimorph Actuators [Helmut Karl](#); University of Augsburg, Germany.

11:30 AM *NM7.1.04

Piezotronics and Piezo-Phototronics of Nanowires [Zhong Lin Wang](#)^{1,2}; ¹Georgia Institute of Technology, United States; ²Beijing Institute of Nanoenergy and Nanosystems, CAS, China.

SESSION NM7.2: Pushing the Frontier of Efficient Light Emitting Devices with Nanowire Structures

Session Chairs: Sudha Mokkalapati and Carl Thompson
Tuesday Afternoon, April 18, 2017
PCC West, 100 Level, Room 105 A

1:45 PM *NM7.2.01

Flexible Optoelectronic Devices Based on Nitride Nanowires Embedded in Polymer Films [Maria Tcherycheva](#); University of Paris-Sud, France.

2:15 PM NM7.2.02

Simultaneously Enhancing Light Emission and Suppressing Efficiency Droop in GaN Microwire-Based UV LED by Piezo-Phototronic Effect [Xingfu Wang](#); Georgia Institute of Technology, United States.

2:30 PM *NM7.2.03

3D Nano-Architectures on Si Platforms for Opto-Electronic Device Concepts such as Solarcells, Light Emitting Devices and Sensors [S.H. Christiansen](#); Helmholtz Zentrum Berlin, Germany.

3:00 PM BREAK

SESSION NM7.3: Nanowire Architectures for Light Management in Photovoltaics

Session Chairs: Sudha Mokkalapati and Carl Thompson
Tuesday Afternoon, April 18, 2017
PCC West, 100 Level, Room 105 A

3:30 PM *NM7.3.01

Resonantly Excited Semiconductor Wire Motifs in Photovoltaic, Photoelectrochemical and Thermoelectric Devices [Kelly W. Mauer](#); California Institute of Technology, United States.

4:00 PM NM7.3.02

Broadband and Omnidirectional Anti-Reflectivity of Hierarchically Structured Silicon [Anna M. Hiszpanski](#); Lawrence Livermore National Laboratory, United States.

4:15 PM NM7.3.03

Metamaterial Absorber for Efficient Perovskite Solar Cell [Omar A. Abdelraouf](#); The American University in Cairo, Egypt.

4:30 PM *NM7.3.04

Calculating and Measuring the Thermodynamic Limits and Losses in Nanophotonic Solar Cells [Erik Garnett](#); FOM Institute AMOLF, Netherlands.

SESSION NM7.4: Electrical Properties in Nano-Photovoltaics

Session Chairs: Esther Alarcon-Llado and Anna Fontcuberta i Morral
Wednesday Morning, April 19, 2017
PCC West, 100 Level, Room 105 A

8:00 AM *NM7.4.01

Exploring Electromechanical Properties of III-V Nanowires for Energy Applications [Sohini Kar-Narayan](#); University of Cambridge, United Kingdom.

8:30 AM NM7.4.02

Surface Passivation and Quantum Efficiency Enhancement of InP Nanowires by ALD Al₂O₃ with PO₂ Interlayer [Lachlan Black](#); Eindhoven University of Technology, Netherlands.

8:45 AM NM7.4.03

Hybrid Free-Standing Metal-Semiconductor Nanowire Arrays for Semi-Transparent Organic Solar Cells [Yuyi Feng](#); University of Konstanz, Germany.

9:00 AM *NM7.4.04

Semiconductor Nanowires for Nanostructured Photovoltaic Devices [Silvija Gradecak](#); Massachusetts Institute of Technology, United States.

9:30 AM NM7.4.05

Characterization of Silicon Nanowires with Infrared Near-Field Optical Microscopy [Earl T. Ritchie](#); University of North Carolina at Chapel Hill, United States.

9:45 AM BREAK

SESSION NM7.5: Nanowires for Next Generation Batteries

Session Chairs: Esther Alarcon-Llado and Anna Fontcuberta i Morral
Wednesday Morning, April 19, 2017
PCC West, 100 Level, Room 105 A

10:15 AM *NM7.5.01

Synthesis and *In Situ* Scanning Electron Microscopy Investigations of Semiconductor Nanowires for Smart Material and Energy Storage Applications [Steven T. Boles](#); Hong Kong Polytech University, Hong Kong.

10:45 AM NM7.5.02

Silicon-Germanium Alloy Nanowires as Potential High Capacity Lithium-Ion Battery Anodes [Killian Stokes](#)¹; ¹University of Limerick, Ireland; ²Bernal Institute, Ireland.

11:00 AM NM7.5.03

Optimizing Performance of Ge Nanowire Based Li-Ion Full-Cells [Hugh Geaney](#); University of Limerick, Ireland.

11:15 AM NM7.5.04

Low Temperature of Growth Silicon Nano-Structures of for Li-Ion Batteries [Shashi Paul](#); Emerging Technologies Research Centre, De Montfort University, United Kingdom.

11:30 AM *NM7.5.05

Nanowires for Enabling Fundamental *In Situ* Investigations and New Materials Architectures in Electrochemical Energy Systems [Matthew T. McDowell](#)^{1,2}; ¹Georgia Institute of Technology, United States; ²Georgia Institute of Technology, United States.

SESSION NM7.6: Pushing the Frontiers of Thermoelectric Energy Conversion
Session Chairs: Sudha Mokkalapati and Carl Thompson
Wednesday Afternoon, April 19, 2017
PCC West, 100 Level, Room 105 A

1:45 PM *NM7.6.01

Investigating the Thermoelectric Properties of Semiconductor Nanowires [Ilaria Zardo](#); Universitat Basel, Switzerland.

2:15 PM NM7.6.02

Enhanced Thermoelectric Properties of PEDOT Nanowires for Printed Devices [Verena K. Schendel](#); Karlsruhe Institute of Technology, Germany.

2:30 PM BREAK

SESSION NM7.7: Thermoelectric Nanowires and Devices
Session Chairs: Sudha Mokkalapati and Carl Thompson
Wednesday Afternoon, April 19, 2017
PCC West, 100 Level, Room 105 A

3:30 PM *NM7.7.01

Photothermoelectric Energy Harvesting and Light Detection in Heterostructure Nanowires [Heiner Linke](#)^{1,2}; ¹Lund University, Sweden; ²University of New South Wales, Australia.

4:00 PM NM7.7.02

Remote Doping-Based Approach to Thermoelectric Performance Enhancement in N-Type Flexible Nanocomposites [Hyeunhwan An](#); University of Nevada, Las Vegas, United States.

4:15 PM NM7.7.03

Manipulating Electrical and Thermal Transport in Nanowire Based Nanocomposite through Doping for Thermoelectric Applications [Yue Wu](#); Iowa State University, United States.

4:30 PM *NM7.7.04

Silicon-Based Nanowires for Fully Integrated Micro Thermo-Electric Generators [Albert Tarancon](#); Institut de Recerca en Energia de Catalunya (IREC), Spain.

SESSION NM7.8: Poster Session
Wednesday Afternoon, April 19, 2017
8:00 PM - 10:00 PM
Sheraton, Third Level, Phoenix Ballroom

NM7.8.01

Switching from Negative to Positive Photoconductivity in the Same InAs Nanowire Field Effect Transistors [Qing Chen](#); Peking University, China.

NM7.8.02

Surface Effects in Polytypic Gallium Arsenide Nanowires [Natasa Vulic](#)^{1,2}; ¹Arizona State University, United States; ²Ecole Polytechnique Fédérale de Lausanne, Switzerland.

NM7.8.03

Gas Depletion Effects on Preferential Growth Directions of Aluminum-Catalyzed Silicon Nanowires [Mel F. Hainey](#); The Pennsylvania State University, United States.

NM7.8.04

Morphology Dependent Optical Properties of ZnO/SiNWs Nanocomposites [Vitaly Bondarenko](#); Belarusian State University of Informatics and Radioelectronics, Belarus.

NM7.8.05

Synthesis and Characterization of Colloidal CsPbX₃ (X = Cl, Br, I) Nanowires [Dandan Zhang](#); University of California Berkeley, United States.

NM7.8.06

On the Physical Properties of Radial ZnO-Core/ZnS-Shell Nanostructures Deposited at Atmospheric Pressure Using DEZn, N₂O and DTBS [Ho-Ching Ni](#); National Chung Hsiang University, Taiwan.

NM7.8.07

Solution Synthesis of Colloidal RbPbI₃ Orthorhombic Perovskite Nanowires [Da-Hye Lim](#); DGIST, Korea (the Republic of).

NM7.8.08

Indium Selenide (In₂Se₃) Nanowires Synthesis and Characterization [Ya Chu Hsu](#); National Taiwan University of Science and Technology, Taiwan.

NM7.8.09

Vapor Phase Synthesis and Optoelectrical Properties of Structurally Tailored Organic-Inorganic Perovskites for Nanowires Transistors [Dong Ruoting](#); City University of Hong Kong, Hong Kong.

NM7.8.10

Spectroscopic Characterization by Super Resolution Transient Absorption Microscopy [Eric Massaro](#); Montana State University, United States.

NM7.8.11

Epitaxy of GaN Nanowires on Versatile Substrates [Ludovic Largeau](#)^{1,3}; ¹CNRS, France; ³University Paris Saclay, France.

NM7.8.12

New Insight into the Effect of Annealing on the Photoelectrochemical Performance of Rutile Single-Crystalline TiO₂ Nanorods Arrays [Chao Huang](#); City University of Hong Kong, Hong Kong.

NM7.8.13

Three-Dimensional Cobalt Phosphide Nanowire Arrays for Flexible Solid-State Asymmetric Supercapacitors [Zhi Zheng](#); University of New Orleans, United States.

NM7.8.14

Electron Beam at Low Acceleration Voltage does not Damage Carbon Nanotube and Graphene [Jae Hong Choi](#); Ulsan National Institute of Science and Technology (UNIST), Korea (the Republic of).

NM7.8.15

Preferential Transport of Cations Along the Exterior of Single Walled Carbon Nanotubes Assisted by Cation- π Interaction [Yun-Tae Kim](#); Ulsan National Institute of Science and Technology, Korea (the Republic of).

NM7.8.16
Temperature-Dependent Charge-Carrier Dynamics of Modulation-Doped Core-Shell GaAs/AlGaAs Nanowires Probed Via Terahertz Spectroscopy [Jessica L. Boland](#); University of Oxford, United Kingdom.

NM7.8.17
Characterization of GaAsP NWs and GaSb TPV Solar Cells Grown on Si Substrate [Sarfray Ali](#); University of Hull, United Kingdom.

NM7.8.18
Structural and Optical Studies of Doped GaAsP Nanowires Grown by Aerotaxy [Sudhakar Sivakumar](#)^{1,2}; ¹Lund University, Sweden; ² Lund University, Sweden.

NM7.8.19
Novel Morphologies of Bi₂S₃ Synthesized by Microwave Heating without Complexing Agents [Evelyn B. Diaz-Cruz](#); UNAM, Mexico.

NM7.8.20
Growth of Nanostructured CdS on a CdS Film by Microwave Assisted Heating for Hybrid Solar Cells Applications [Alejandro Baray](#); UNAM, Mexico.

NM7.8.21
Optical and Electrical Properties of Random Ag NW@ ZnO Core-Shell Structure Based Transparent and Conductive Thin Film [Fen Qin](#); University of Pittsburgh, United States.

NM7.8.22
Passivation of Silicon Nanopillar fabricated by Each Different Metal Adhesion Layer of Metal Assisted Chemical Etching [Sangpyeong Kim](#); Arizona State University, United States.

NM7.8.23
Experimental and Theoretical Detection of Axial Strain in InAs/InSb Heterostructured Nanowires [Atanu Patra](#); Indian Institute of Technology Kharagpur, India.

SESSION NM7.9: New Fabrication Methods of Nano-PV Devices
Session Chairs: Esther Alarcon-Llado and Anna Fontcuberta i Morral
Thursday Morning, April 20, 2017
PCC West, 100 Level, Room 105 A

8:15 AM NM7.9.01
Novel Growth of Silicon Nanowires for Photovoltaic Applications [Shashi Paul](#); Emerging Technologies Research Centre, De Montfort University, United Kingdom.

8:30 AM *NM7.9.02
Single and Tandem Radial Junction Solar Cells Built on Silicon Nanowires Produced by Plasma-Assisted VLS [Pere Roca i Cabarrocas](#); LPICM, CNRS, Ecole Polytechnique, France.

9:00 AM NM7.9.03
Growth of Silicon Nanowires Coated with Dielectric Layer by Simultaneous Precipitation at Low Temperatures (<300°C) [Krishna Nama Manjunatha](#); De Montfort University, United Kingdom.

9:15 AM NM7.9.04
Templated Synthesis of Uniform Perovskite Nanowire Arrays [Michael Ashley](#); Northwestern University, United States.

9:30 AM NM7.9.05
From Single NW to Large Scale NW Array Solar Cell Development through Conductive AFM Analysis [Dmitry Mikulik](#); Ecole Polytechnique Fédérale de Lausanne, Switzerland.

9:45 AM NM7.9.06
Fabrication of CIGS Nanowire-Based Solar Cell by Electrodeposition [Daniel Choi](#); Masdar Institute of Science and Technology, United Arab Emirates.

10:00 AM BREAK

SESSION NM7.10: Nanowire Strategies for Efficient Photodetection
Session Chairs: Esther Alarcon-Llado and Anna Fontcuberta i Morral
Thursday Morning, April 20, 2017
PCC West, 100 Level, Room 105 A

10:30 AM NM7.10.01
Performance Boosting of Flexible ZnO UV Sensors with Rational Designed Absorbing Antireflection Layer and Humectant Encapsulation [Heng Zhang](#); Peking University, China.

10:45 AM *NM7.10.02
Silicon-Germanium-Tin Nanowires—Growth, Structure and Device Properties [Oussama Moutanabbir](#); Ecole Polytechnique de Montreal, Canada.

11:15 AM NM7.10.03
Extreme IR Light Absorption in Group IV-SiGeSn Core-Shell Nanowires [Anis Attiaoui](#); Ecole Polytechnique Montreal, Canada.

11:30 AM *NM7.10.04
Design of Nanowire Quantum-Well Infrared Photodetectors for Intersubband Absorption [Dingkun Ren](#); University of California, Los Angeles, United States.

SESSION NM7.11: Nanowire Strategies for Efficient Solar to Fuel Conversion
Session Chairs: Sudha Mokkapatil and Carl Thompson
Thursday Afternoon, April 20, 2017
PCC West, 100 Level, Room 105 A

1:30 PM *NM7.11.01
CO₂ + H₂O + Sunlight = Chemical Fuels + O₂ [Peidong Yang](#); University of California, Berkeley, United States.

2:00 PM NM7.11.02
Mixing Cu Nanowires with ZnO Nanowires as Highly Stable Catalysts for Methanol Synthesis and Steam Reforming [Jia Xu](#); Arizona State University, United States.

2:15 PM NM7.11.03
Three-Dimensional Array of Highly Conductive SnO₂ Nanowires Arrays as a Current Collector of CdSe/CdS/TiO₂ Cascade Heterojunction Photoelectrochemical Cells [Salim Caliskan](#); University of Pittsburgh, United States.

2:30 PM BREAK

3:00 PM *NM7.11.04
Nanowires, Nanoplates and Nanofilms of Two-Dimensional Layered Materials [Hongtao Yuan](#)^{1,2}; ¹Stanford University, United States; ²SLAC National Accelerator Laboratory, United States.

3:30 PM NM7.11.05
Silicon Nanowires for Solar-to-Fuel Conversion [Yude Su](#); University of California, Berkeley, United States.

3:45 PM NM7.11.06
Growth and Optical Properties of Self-Assembled Gallium Nitride Nanowires for Photocatalytic Water Splitting [Bijun Zhao](#); Research School of Physics and Engineering, The Australian National University, Australia.

4:00 PM *NM7.11.07
Efficient Solar Cells and Water Reduction with Nanowires [Erik Bakkers](#)^{1,6}; ¹Eindhoven University of Technology, Netherlands; ⁶Delft University of Technology, Netherlands.

4:30 PM NM7.11.08
High Efficiency and Highly Stable Photocatalytic Overall Water Splitting on III-Nitride Nanowire Arrays [Mohammad F. Chowdhury](#); McGill University, Canada.

4:45 PM NM7.11.09
An InGaN Nanowire/Si Tandem Photoanode for High-Efficiency Photoelectrochemical Water Splitting [Srinivas Vanka](#); McGill, Canada.

SESSION NM7.12: III-V Nanowires for Solar Energy Conversion
Session Chairs: Sudha Mokkalapati and Carl Thompson
Friday Morning, April 21, 2017
PCC West, 100 Level, Room 105 A

8:30 AM NM7.12.01

Self-Guided Growth of Millimeter-Long Vanadium Dioxide Nanowires Lee Hye Jin^{1,2}; ¹Ulsan National Institute of Science and Technology (UNIST), Korea (the Republic of); ²Korea Institute of Science and Technology (KIST), Korea (the Republic of).

8:45 AM *NM7.12.02

III-V Semiconductor Nanowires for Energy Applications Chennupati Jagadish; Australian National University, Australia.

9:15 AM NM7.12.03

Zn and Sn Doped GaAs Nanowires Grown by Aerotaxy Wondwosen Metaferia^{1,2}; ¹Lund University, Sweden; ²Lund University, Sweden.

9:30 AM NM7.12.04

Growth of Self-Catalyzed InGaP Alloy Nanowires via CVD Method Praneeth Ranga; Arizona State University, United States.

9:45 AM NM7.12.05

Vapor-Liquid-Solid Growth of High Quality InP Thin Film and Nano-Networks for Photovoltaic Applications Seyed Ebrahim Hashemi Amin^{1,2}; ¹Arizona State University, United States; ²Arizona State University, United States.