# 2019 SPRING MEETING SYMPOSIA

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The views, opinions, findings or conclusions expressed in the papers presented during the 2019 MRS Spring Meeting are strictly those of the author(s), and do not constitute endorsement by the Materials Research Society or the organizations sponsoring these symposia.
SYMPOSIUM GI01
Advancing Materials Discovery with Data-Driven Science
April 23 - April 24, 2019

Symposium Organizers
Muratahan Aykol, Toyota Research Institute
Jason Hattrick-Simpers, National Institute of Standards and Technology
Elsa Olivetti, Massachusetts Institute of Technology
Logan Ward, University of Chicago

* Invited Paper

SESSION GI01.01: Knowledge Discovery in Materials Science—Methods and Applications I
Session Chairs: Logan Ward and Olga Wodo
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 102 C

10:30 AM *GI01.01.01
Data-Driven Molecular Engineering of Functional Materials Jacqueline M. Cole1, 2, 3; 1University of Cambridge, United Kingdom; 2STFC Rutherford Appleton Laboratory, United Kingdom; 3Argonne National Laboratory, United States.

11:00 AM GI01.01.02
Inorganic Materials Synthesis Planning with Literature-Trained Neural Networks Edward Kim; Massachusetts Institute of Technology, United States.

11:15 AM GI01.01.03
Teaching a Computer Synthesis—Obtaining “Codified Synthesis Recipes” by Machine Reading Millions of Papers Olga Kononova; University of California, Berkeley, United States.

11:30 AM GI01.01.04
Materials Property Datasets with Minimal Effort Using Hybrid Human-Machine Text Extraction Roselyne B. Tchoua; The University of Chicago, United States.

11:45 AM GI01.01.05
A Classifier for Identifying Materials with Metal-Insulator Transitions Nicholas Wagner; Northwestern University, United States.

SESSION GI01.02: Knowledge Discovery in Materials Science—Getting More Out of Characterization
Session Chairs: Jason Hattrick-Simpers and Elsa Olivetti
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 C

1:30 PM *GI01.02.01
Knowledge from Atomically Resolved Images—Deep Learning Meets Statistical Physics Sergei V. Kalinin; Oak Ridge National Laboratory, United States.

2:00 PM *GI01.02.02
Artificial Intelligence for Knowledge Generation in Materials Science Elizabeth A. Holm; Carnegie Mellon University, United States.

2:30 PM GI01.02.03
Metric Learning of Composition-Maping from High-Throughput Experiments to Accelerate Catalyst Discovery for Fuel Cells and Metal-Air Batteries Olga Wodq; University at Buffalo, The State University of New York, United States.

2:45 PM GI01.02.04
Performance Assessments from Low-Cost Surrogate Measurements Helge S. Stem; California Institute of Technology, United States.

3:00 PM BREAK

SESSION GI01.03: Automation of Materials Research—From Robots to Software
Session Chairs: Muratahan Aykol and Helge Stein
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 C

3:30 PM *GI01.03.01
A Self-Driving Laboratory for Accelerating Materials Discovery Curtis Berlinguer1, 2, 3; 1The University of British Columbia, Canada; 2The University of British Columbia, Canada; 3The University of British Columbia, Canada.

4:00 PM *GI01.03.02
Robot-Enabled Halide Perovskite Discovery—A Case Study in Autonomous Materials Exploration Joshua Schriner; Fordham University, United States.

4:30 PM GI01.03.03
ChemOS—Orchestrate Self-Driving Laboratories for Next-Generation Experimentation Loic M. Roch1, 2; 1Vector Institute for Artificial Intelligence, Canada; 2University of Toronto, Canada.

4:45 PM GI01.03.04
Data Services to Increase Data Accessibility and Adoption of Data-Driven Materials Science Research Marcus Schwarting; Argonne National Laboratory, United States.

SESSION GI01.04: Poster Session: Advancing Materials Discovery with Data-Driven Science
Session Chairs: Muratahan Aykol, Elsa Olivetti and Logan Ward
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

GI01.04.01
Program for Three-Dimensional Quantification of Elemental Segregation to Surfaces in Large APT Datasets Lingqing Peng; Grinnell College, United States.

GI01.04.02
Natural Language Processing for Materials Discovery and Design John Dagedeleg; University of California, Berkeley, United States.

GI01.04.03
Augmenting Machine Learning of Energy Landscapes with Local Structural Information Shrevas Honrao; Cornell University, United States.

GI01.04.04
Predicting Material Properties Using a Novel Descriptor “Elemental Fingerprints” with Neural Networks Jaekyun Hwang; The University of Tokyo, Japan.

GI01.04.05
Machine Learning Accelerates the Characterization of Functional Materials Tonio Buonassisi; Massachusetts Institute of Technology, United States.

GI01.04.06
Optimization of Transparent Hole-Conducting Materials Via Machine Learning Lingshui Wei1, 2; 1Lawrence Berkeley National Laboratory, United States; 2Southeast University, China.

GI01.04.07
Structural Evaluation of Ca1-xBi2xMnO3-δ Using Combination of Newly High-Throughput Data Collection Tool for Synchrotron Powder X-Ray Diffraction and Automatic Structural Refinement Software Kenjiro Fujimoto; Tokyo University of Science, Japan.

GI01.04.08
Distribution of Zr Atoms in Σ3(1-12)/[100] Ce1-xZrxO2 Grain Boundary Using Genetic Algorithm and Substitution Region Restriction Method Yeong-Chool Kim; KoreaTech, Korea (the Republic of).
SESSION GI01.05: Accelerating Materials Research with Machine Learning I
Session Chairs: Muratahan Aykol and Anubhav Jain
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 C

8:00 AM GI01.05.01
Inverse Design of Thermoelectric Materials—Results and the Case for a Database of Charge Scattering Times Kedar Hippalgaonkar; Institute of Materials Research and Engineering, Singapore; Nanyang Technological University, Singapore.

8:15 AM GI01.05.02
Pursuing the Next-Generation of High-Efficiency Phosphors with Machine Learning Jakoah Brocch; University of Houston, United States.

8:30 AM GI01.05.03
Graph Networks as a Universal Machine Learning Framework for Molecules and Crystals Chi Chen; University of California, San Diego, United States.

8:45 AM GI01.05.04
Automated Machine Learning Applied to Diverse Materials Design Problems Anubhav Jain; Lawrence Berkeley National Laboratory, United States.

9:15 AM GI01.05.05
JARVIS-ML—Physics Inspired AI for Fast and Accurate Screening of Materials Francesca Tavazza; National Institute of Standards and Technology, United States.

9:45 AM BREAK

SESSION GI01.06: Automation of Materials Research—Synthesis and Characterization
Session Chairs: Jason Hattrick-Simpers and Santosh Suram
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 C

10:15 AM GI01.06.01
Active Learning Driven Mapping of Combinatorial Libraries of Functional Materials Ichiro Takeuchi; University of Maryland, United States.

10:45 AM GI01.06.02
Exploring the Materials Genome Through Nanomaterial Megalibraries Chad A. Mirkin; Northwestern University, United States.

11:15 AM GI01.06.03
Generating the Largest Experimental Materials Database and Initial Findings on the Science It Enables John M. Gregoire; Joint Center for Artificial Photosynthesis, California Institute of Technology, United States.

11:30 AM GI01.06.04
Reversible Perovskite Electrocatalysts for Oxygen Reduction / Oxygen Evolution for Fuel Cells and Metal-Air Batteries Brian E. Hayden; University of Southampton, United Kingdom.

SESSION GI01.07: Accelerating Materials Research with Machine Learning II
Session Chairs: Muratahan Aykol, Elsa Olivetti and Logan Ward
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 C

1:30 PM GI01.07.01
Predicting Properties is not Enough—Realizing the Full Potential of Machine Learning in Materials Discovery Bryce Meredig; Citrine Informatics, United States.

2:00 PM GI01.07.02
Design of Molecules with High Hole Mobility by Applying Machine-Learning Technologies Nobuyuki N. Matsuura; Panasonic Corporation, Japan.
SYMPOSIUM BI01

High Impact Practice—Increasing Ethnic and Gender Diversification in Engineering Education
April 25 - April 29, 2019

Symposium Organizers
Olivia Graeve, University of California, San Diego
Leslie Momoda, HRL Laboratories LLC
Makita Phillips, Carbice Corporation
Beylee Watford, Virginia Tech

* Invited Paper

SESSION BI01.01: Broader Impacts I
Session Chairs: Makita Phillips and Beylee Watford
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 C

8:30 AM *BI01.01.01
Advancing Gender Equity in Education for the Future Engineering Workforce
Justin Schwartz; The Pennsylvania State University, United States.

9:00 AM BI01.01.02
Writing Personal Stories About Thermodynamics Improves Professional Identity
Eric Jankowski; Boise State University, United States.

9:15 AM BI01.01.03
Princeton University Materials Academy for Minority High School Students, a MRSEC Education and Outreach Program
Daniel J. Steinberg; Princeton University, United States.

9:30 AM BI01.01.04
Bystander Intervention as a Component of Developing an Inclusive Culture in STEM
Stephen D. Albright; Yale University, United States.

9:45 AM BREAK

10:15 AM BI01.01.05
Priming the Materials Science Pipeline—Research Opportunities for Community College Students
Scott A. Sinex; Prince George's Community College, United States.

10:30 AM BI01.01.06
Science is Too Important to Be Left Just to Men
Debra R. Rolison; Consultant, United States.

SESSION BI01.02: Broader Impacts II
Session Chairs: Makita Phillips and Beylee Watford
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 102 C

1:30 PM *BI01.02.01
Holistic Retention Strategies for Underrepresented Minority Students
Whitney Gaskins; University of Cincinnati, United States.

2:00 PM BI01.02.02
Professional Societies and African American Engineering Leaders—Paving Pathways and Empowering Legacies
Christine S. Grant; North Carolina State University, United States.

2:30 PM BI01.02.03
Implementable Group-Based Undergraduate Research Programs for First-Year STEM Students
Matthew Hauwiller; University of California, Berkeley, United States.

2:45 PM BI01.02.04
Understanding the Impact of Design in High School Outreach Camps
Jessica A. Kroastad; University of Illinois at Urbana-Champaign, United States.

3:00 PM BREAK

3:30 PM BI01.02.05
Engineering Change—Strategic Action to Achieve Diversity in Engineering
Stephanie Law; University of Delaware, United States.

SYMPOSIUM CP01

Advances in In Situ Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design
April 23 - April 29, 2019

Symposium Organizers
Arief Budiman, Singapore University of Technology and Design
Jessica Krogstad, University of Illinois at Urbana-Champaign
Nan Li, Los Alamos National Laboratory
Nobumichi Tamura, Lawrence Berkeley National Laboratory

* Invited Paper

SESSION CP01.01: Xtreme Materials Design
Session Chairs: Arief Budiman and Jessica Krogstad
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 101 A

10:30 AM *CP01.01.01
Nanomaterials Design and Properties at the Extreme Limits of Molecular-Scale Confinement
Reinhold H. Dauskardt; Stanford University, United States.

11:00 AM *CP01.01.02
Role of Graphene in Reducing Fatigue Induced Damage in Cu-Graphene Nanolayered Composite
Seung Min Han; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

11:30 AM *CP01.01.03
From Nano to Macro
Ju Li; Massachusetts Institute of Technology, United States.

SESSION CP01.02: Xtreme Materials Design Applications—Wearables and Microrobotics
Session Chairs: Arief Budiman and Young-Chang Joo
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 A

1:30 PM *CP01.02.01
Development of Reliable Wearable Electronic Devices Through In Situ Monitoring
Young-Chang Joo; Seoul National University, Korea (the Republic of).

2:00 PM *CP01.02.02
Nano-Chemomechanics at Play—Novel Nickel-Hydroxide Thin-Film Actuating Materials for Micro-Robotics Applications
Alfonso H. Ngan; University of Hong Kong, Hong Kong.

2:30 PM CP01.02.03
A Highly Sensitive and Selective Relative Humidity Sensor Based on Mn Loaded Cubic Mesoporous SBA-16
Jasbir Sangwan; Tau Devi Lal Govt. College for Women, India.

2:45 PM CP01.02.04
Nanoscale Dielectric Charging and Breakdown Mapping
Bryan D. Huey; University of Connecticut, United States.

3:00 PM BREAK

3:30 PM CP01.02.05
In Situ Raman Spectroscopy to Study Plastic Deformation in Silicate Glasses
Sherford P. Baker; Cornell University, United States.

3:45 PM CP01.02.06
Direct Observation of Conducting Channels in SrCoOx Based RRAM Device
Hung-Yang Lo; National Chiao Tung University, Taiwan.
**SESSION CP01.04: Poster Session: Advances in In Situ Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design**

Session Chairs: Arief Budiman, Jessica Kroghstad, Nan Li, Nobumichi Tamura and Nobumichi Tamura

Tuesday Afternoon, April 23, 2019

5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

**CP01.04.01**
**Synthesis and Interfacial Analysis of Carboxyl Functionalized Carbon Nanotube - MOF-808 Composite Using Scanning Transmission Electron Microscopy (STEM)**

Justin W. Hendrix; Naval Surface Warfare Center, Dahlgren Division, United States.

**CP01.04.02**
**Development of Compound Melt Extruded Nanocomposite FDM Filament by Continuous Syringe Pumping of Dispersed Graphenes During the Extrusion Process**

Joshua D. Brooks; University of Wollongong, Australia.

**CP01.04.03**
**Efficient Synthesis of Defect-Rich and N-Doped Nanocarbon Shells via Localized Micro-Deflagration for Oxygen Reduction Reaction**

Jian Tang; University of Electronic Science and Technology of China, China.

**CP01.04.04**
**In Situ Implantation of Ti<sup>0</sup> in TiO<sub>2</sub>/GQDs Nanohybrids via Carbothermal Reduction for Enhanced Photocatalytic Performance**

Jian Tang; University of Electronic Science and Technology of China, China.

**CP01.04.05**
**Effect of Aspect Ratio and Bulk Density of Carbon Nanotube on the Electrical Conductivity of Polypropylene/ Multi-Walled Carbon Nanotube Nanocomposites**

Dae Bui; Kongju National University, Korea (the Republic of).

**CP01.04.06**
**Cyclic Deformation of Nanostructured Multiphase Ductile Cast Iron**

Wentao Zhou; Yangzhou University, China.

**CP01.04.07**
**Photocatalytic Disinfection Using GO/TiO<sub>2</sub> Nanocomposite Against *Escherichia coli* and Study on Effect of Reactive Oxygen Species (ROS)**

Christeena T. Thomas; Centro de Investigación y de Estudios Avanzados, México.

**CP01.04.08**
**Graphene Reinforced Metallic Foam Through Electrochemical Co-Deposition**

Rui Dai; Arizona State University, United States.

**CP01.04.09**
**Sintering Behavior in Thin Film of Ni Nanoparticle through In Situ Stress Analysis for MLCC Internal Electrode**

Miajeong Choi; Seoul National University, Korea (the Republic of).

**CP01.04.11**
**In Situ Mechanical and Electromechanical Testing of Piezoresistive Nanowires During Scanning Electron Microscopy**

Sijin Ran; The Hong Kong Polytechnic University, Hong Kong.

**CP01.04.12**
**Piezoelectric Response of Sn-Doped BaTiO<sub>3</sub> Epitaxial Thin Film**

Tae Yoon Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

**CP01.04.13**
**Mesoscale Phase Field Simulations of Composites**

Anant Raj; North Carolina State University, United States.

**CP01.04.14**
**In Situ Growth of Nanodefects in Si**

Andreas Mageed; University of Erlangen-Nürnberg, Germany.
SESSION CP01.07: Xtreme Materials Design—Nanolayers II
Session Chairs: Irene Beyerlein, Arief Budiman, Michael Demkowicz
and Jessica Krostad
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 A

1:30 PM *CP01.07.01
Strength, Plasticity and Irradiation Properties of Amorphous Ceramics Containing Nano-Sized Metal Additions Jian Wang; University of Nebraska–Lincoln, United States.

2:00 PM *CP01.07.02
The Influence of 3D Interfacial Structure and Morphology on the Mechanical Behavior of Nanocomposites Nathan Mara; University of Minnesota, Twin Cities, United States.

2:30 PM BREAK

3:30 PM *CP01.07.03
Cyclic Plasticity and Damage Behavior of Metals at the Nanoscales Guang-Ping Zhang; Institute of Metal Research, Chinese Academy of Sciences, China.

4:00 PM *CP01.07.04
Advances in In Situ Microfracture Experimentation Techniques—Enabling Enhanced Fracture Properties of Cu/Nb Nanolayers via Interface Interaction Engineering Arief S. Budiman; Singapore University of Technology and Design (SUTD), Singapore.

SESSION CP01.08: Advances in Xtreme Experimentation—Synchrotron Micro XRD I
Session Chairs: Arief Budiman and Olivier Thomas
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 A

8:00 AM *CP01.08.01
Advanced In Situ X-Ray Diffraction Strategies for the Evaluation of Structure, Strains and Defects in Functional Materials Olivier Thomas1, 2, 3; 1Aix Marseille Université, France; 2Université de Toulon, France; 3CNRS, France.

8:30 AM CP01.08.02
In Situ Study on the Strain Partitioning in a Duplex Stainless Steel by Synchrotron X-Ray Diffraction, SEM, p-DIC and EBSD Xin Zhai; Chalmers University of Technology, Sweden.

9:00 AM *CP01.08.04
In Situ Nano X-Ray Tomography for High-Resolution Imaging of Cracks in Composites and Integrated Circuits During Mechanical Loading Ehrenfried Zecher; Fraunhofer Institute for Ceramic Technologies and Systems, Germany.

9:30 AM BREAK

SESSION CP01.09: Advances in Xtreme Experimentation II
Session Chairs: Arief Budiman and Andrew Minor
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 A

10:00 AM *CP01.09.01
Understanding the Role of Local Order in Plasticity Through In Situ Nanomechanical Testing with 4DSTEM Andrew Minor1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

10:30 AM *CP01.09.02
Advances in Nanomechanical Throughput for Extreme Materials Design Douglas D. Stauffer; Bruker Nano Surfaces, United States.

11:00 AM CP01.09.03
Annealing of Metal Films at Room Temperature Using Electron Wind Force and Elastic Strain Energy—An In Situ TEM Study Aman Hauze; The Pennsylvania State University, United States.

11:15 AM CP01.09.04
In Situ Nanoindentation Tests to Investigate Plastic Deformation and Recovery of Thin 3C-SiC and Change of Mechanical Properties Due to Ion Irradiation Xuying Liu; University of Wisconsin-Madison, United States.

11:30 AM CP01.09.05
In Situ TEM Study of Mechanical and Electromechanical Properties of Individual InAs Nanowires Lunjie Zeng; Chalmers University of Technology, Sweden.

11:45 AM CP01.09.06
In Situ TEM MEMS-Based Tensile Nanomechanical Testing of Ultrathin Films Sandra Stangebye; Georgia Institute of Technology, United States.

SESSION CP01.10: Materials in Extreme Design
Session Chair: Sasi Kumar Tippabhotla
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 A

1:45 PM *CP01.10.01
High-Velocity Impact Ignition of Pre-Stressed Micron-Scale Aluminum Powder Compacts Michelle Pantoya; Texas Tech University, United States.

2:15 PM CP01.10.02
Mechanical Characterization of Quartz Tuning Fork Coupled Oscillator for Quantitative Measurement of Nanoscale Forces at sub-10 nm Gap Separations Cedric Shaskey; University of Utah, United States.

2:30 PM CP01.10.03
Crack Nucleation in a 3C-SiC Nanowire and Its Atomic Origin Fazle Elahi; University of Delaware, United States.

2:45 PM BREAK

SESSION CP01.11: Advances in Xtreme Experimentation—Synchrotron Micro XRD II
Session Chairs: Arief Budiman and Bin Chen
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 A

3:15 PM *CP01.11.01
Coherent Diffraction for a Look Inside Nanostructures—Catalysis and Defects Marie-Ingrid Richard1, 2, 3; 1IM2NP, France; 2Aix-Marseille University, France; 3ESRF, France.

3:45 PM *CP01.11.02
Mechanical Strengthening of Nickel Continues Down to 3 nm Bin Chen; Center for High Pressure Science and Technology Advance Research, China.

4:15 PM CP01.11.03
In Situ and Operando Studies Using Bragg Coherent X-Ray Diffraction Imaging Wonsuk Cha; Argonne National Laboratory, United States.

4:30 PM CP01.11.04
Novel Functional Nanocomposites of 2D MXenes and Light-Weight Metals Vladislav Kamyshayev; The University of Chicago, United States.

4:45 PM CP01.11.05
High-Strength 3D Printed Chemically Linked Graphene Networks Composites Gabriel Ilting; PARC a Xerox Company, United States.

SESSION CP01.12: Advances in In Situ Experimentation Techniques—Electron Microscopy
Session Chairs: Arief Budiman and Marie-Ingrid Richard
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 121 A
8:30 AM CP01.12.02

In Situ Observation of Grain Rotation and the Bauschinger Effect in Nanocrystalline Palladium Thin Films Using ACOM-STEM Ankush Kashiwar; 1, 2 Karlsruhe Institute of Technology, Germany; 3Technische Universität Darmstadt, Germany.

8:45 AM CP01.12.03

Imaging Reversible Topotactic Phase Transitions in Strontium Ferrite Thin Films by In Situ TEM Zhenzhong Yang; Pacific Northwest National Laboratory, United States.

9:00 AM CP01.12.04

Studies of MOFs and Their Complexes by High Resolution “Conventional” and Novel Solid-State Synchronous Fluorescence Spectroscopy Alexander Samokhvalov; Morgan State University, United States.

9:15 AM CP01.12.05

Synthesis and Mechanical Behavior of Freestanding, Nanocrystalline NiTi Films Under Cyclic Tensile Deformation Paul Rasmussen; Arizona State University, United States.

9:30 AM BREAK

SESSION CP01.13: Xtreme Materials Design—Application: Solar PV and Battery

Session Chairs: Arief Budiman and Sasi Kumar Tippabhotla

Friday Morning, April 26, 2019

PCC North, 100 Level, Room 121 A

10:00 AM CP01.13.01

Characterization of Adhesion of Dust Particles on Photovoltaic Panels on the Nanoscopic Level Joerg Baagahn; Anhalt University of Applied Sciences, Germany.

10:30 AM CP01.13.02


11:00 AM CP01.13.03

Advances in X-Ray Microscopy for the Study of Battery Reactions in Single Particles Jordi Cabana; University of Illinois at Chicago, United States.

11:30 AM CP01.13.04

Creep Behavior of Nanocrystalline Al Alloys Sung Eun Kim; University of Illinois at Urbana-Champaign, United States.

SESSION CP01.14: Advances in Materials Design

Session Chairs: Paulo Branicio and Arief Budiman

Friday Afternoon, April 26, 2019

PCC North, 100 Level, Room 121 A

1:45 PM CP01.14.01

In Situ Studies of Surface Effects on the Mechanics of Metal Network Structures Joerg Weissmueller1, 2; 1Hamburg University of Technology, Germany; 2Helmholtz-Center Geesthacht, Germany.

2:15 PM CP01.14.02

Deformation and Failure of CuZr Gradient Nanoglasses Paulo Branicio; University of Southern California, United States.

2:45 PM CP01.14.03

Electrical and Mechanical Tuning of 3D Printed Photopolymer-CNT Nanocomposites Through In Situ Dispersion Jaime E. Regis1, 2; 1University of Texas at El Paso, United States; 2The University of Texas at El Paso, United States.

3:00 PM BREAK

SESSION CP01.15: Advances in Novel and Extreme Materials Design—Polymer/Fibre-Based Nanocomposites

Session Chairs: Paulo Branicio and Arief Budiman

Friday Afternoon, April 26, 2019

PCC North, 100 Level, Room 121 A
SYMPOSIUM CP02

Design and In Situ TEM Characterization of Self-Assembling Colloidal Nanosystems
April 23 - April 25, 2019

Symposium Organizers
Qian Chen, University of Illinois at Urbana-Champaign
Liang Hong, The Dow Chemical Company
Jianbo Wu, Shanghai Jiaotong University
Xingchen Ye, Indiana University

Symposium Support
Direct Electron
Gatan, Inc.
The Southern Indiana Section of the American Chemical Society (SISACS)
Protechips
Xiamen Xinji Technology Ltd

* Invited Paper

SESSION CP02.01: Crystal Nucleation and Growth, Nanoparticle Superlattice I
Session Chair: Jianbo Wu
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 101 B

10:30 AM *CP02.01.01
Understanding the Relationship Between Interfacial Structure, Interparticle Forces and Assembly Dynamics During Oriented Attachment of Colloidal Crystals James J. De Yoreo1,2, 1Pacific Northwest National Laboratory, United States; 2University of Washington, United States.

11:00 AM CP02.01.02
Direct Imaging of Strain Propagation and Oriented Attachment in Nanoparticle Superlattices by Liquid-Phase TEM Binbin Luo; University of Illinois at Urbana-Champaign, United States.

11:15 AM *CP02.01.03
Insights into the Formation of Epitaxially Connected Quantum Dot Solids Tobias Hanrath; Cornell University, United States.

11:45 AM CP02.01.04
In Situ Cooling TEM Study on Structure Phase Transition in LaNiO3δ Xue Ran; University of Illinois at Chicago, United States.

SESSION CP02.02: Crystal Nucleation and Growth, Nanoparticle Superlattice II
Session Chair: Xingchen Ye
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 B

1:30 PM *CP02.02.01
Self-Assembly of Electrostatically and Sterically Stabilized Colloidal Nanocrystals—The Roles of Topology, Image Charges and Non-Classical Nucleation Dmitri Talapin; University of Chicago, United States.

2:00 PM *CP02.02.02
Multicomponent Nanocrystal Self-Assembly for the Creation of Multifunctional Materials and Devices Christopher Murray1, 2, 1University of Pennsylvania, United States; 2University of Pennsylvania, United States.

2:30 PM *CP02.02.03
Prescribing Self-Assembly of Nanoscale Architectures Through Valence Control Oleg Gap1, 2, 1Columbia University, United States; 2Brookhaven National Laboratory, United States.

3:00 PM BREAK

3:30 PM *CP02.02.04
Polymer Nanoreactors—Vehicles to Control and Observe Nanoparticle Formation Chad A. Mirkin; Northwestern University, United States.

4:00 PM *CP02.02.05
Peering into the Self- and Directed-Assembly of Nanoparticles Hongyou Fan; University of New Mexico/Sandia National Laboratories, United States.

SESSION CP02.03: Poster Session: Liquid-Phase TEM and Assembly
Session Chairs: Qian Chen, Liang Hong, Jianbo Wu and Xingchen Ye
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP02.03.01
Synthesis of Cs-Pb-Br Colloidal Crystals Liang Zhou; Peking University, China.

CP02.03.02
Observation of Carbon Nanotube Diameter via Metal Catalysts and Precursor Ratios on Carbon Foam Substrates Nicholas Roskopf; University of California, Riverside, United States.

CP02.03.03
Solution Phase Behavior of Polymer-Grafted Nanoparticles—Improving Assembly and Processability Sarah N. Izor1, 4, 1UES, Inc., United States; 4Air Force Research Laboratory, United States.

SESSION CP02.04: Self-Assembly, Shape Anisotropy and Multifunction I
Session Chair: Xingchen Ye
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 B

8:00 AM CP02.04.01

8:15 AM CP02.04.02
Watching Nanoparticle Growth with Tandem In Situ SAXS-XAS Tao Li1, 2, 1Northern Illinois University, United States; 2Argonne National Laboratory, United States.

8:30 AM *CP02.04.03
Real Time Analysis and Interpretation of Au Nanoparticle Self-Assembly and Its Driving Sources Dongsheng Li; Pacific Northwest National Laboratory, United States.

9:00 AM CP02.04.04
Probing Crystallization of Gibbsite Nanocrystals Using In Situ High-Field 27Al NMR Spectroscopy Xin Zhang; Pacific Northwest National Laboratory, United States.

9:15 AM *CP02.04.05
Self-Assembly of Nanocrystals in Solution—Insights from In Situ Electron Microscopy Eli Sutter; University of Nebraska–Lincoln, United States.

9:45 AM CP02.04.06
Interfacially-Driven Nanoparticle Nucleation Biases Hematite Crystallization Towards Oriented Attachment Guomin Zhu1, 2; 1University of Washington, United States; 2Pacific Northwest National Laboratory, United States.

10:00 AM BREAK

10:30 AM *CP02.04.07
Stimuli-Responsive Polymer Hairs Enable Reversible Self-Assembly and Tunable Optical and Catalytic Properties of Stable Nanoparticles Zhiqun Lin; Georgia Institute of Technology, United States.

11:00 AM CP02.04.08
Electron Microscopy of Thermal Capillary Waves in a Nanoparticle Superlattice Zihao Ou; University of Illinois at Urbana-Champaign, United States.

11:15 AM *CP02.04.09
In Situ Visualization of Rapid Assembly of Platinum Nanocrystals into Supraparticles Taylor J. Woehl; University of Maryland, United States.
Electrocatalysis
Zachary Farrell1, 2; 1AFRL, United States.

Temperature Liquid Metal Colloids
Design and Characterization of Chemically and Mechanically Tunable Room-
Temperature Liquid Metal Colloids
8:15 AM
BaTiO3 Locally Investigated by HRTEM and PFM
Haimei Zheng1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

Size Dependency of the Ferroelectric Properties in Single Nanocrystals of
BaTiO3
8:00 AM
Viorel Popa; The Pennsylvania State University, United States.

9:00 AM BREAK

9:15 AM CP02.05.01
Revealing of Intermediate States During Nanocrystal Superlattice
Transformations Using In Situ Liquid Phase TEM
Haimer Zheng1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

9:30 AM CP02.05.02
Self-Assembly of Nanoparticle Superlattices and Their Post-Assembly
Transformations
Rafael Klein; Weizmann Institute of Science, Israel.

9:45 AM CP02.05.03
Visualizing Self-Assembly—From Atoms to Nanostructures
Utkur Mirsaidov; National University of Singapore, Singapore.

10:00 AM BREAK

10:15 AM CP02.05.04
Transmission Electron Microscopy Investigation on Pt-Based Nanocrystals for
Electrocatalysis
Dong Su; Brookhaven National Laboratory, United States.

10:30 AM CP02.05.05
Polymorphic Self-Assembly of Nanoarrows
Chang Liu; University of Illinois at Urbana-Champaign, United States.

10:45 AM CP02.05.06
Time-Resolved Observations of Liquid-Liquid Phase Separation at the
Nanoscale Using In Situ Liquid Transmission Electron Microscopy
Hortense Le Ferrand; Nanyang Technological University, Singapore.

11:00 AM CP02.05.07
Other Colloidal Assembly
Session Chair: Qian Chen
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 101 B

11:15 AM CP02.06.09
Probing Synthesis, Bandgaps and Stability of a Family of Cs2AgMX6 Lead-
Free Double Perovskite Nanocrystals (M = Sb, Bi, In; X = Cl, Br)
Jakob Dahl1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

11:30 AM CP02.06.10
Visualizing Electrochemical Reactions at the Nanoscale by In Situ TEM
HuoLin L. Xin; University of California, Irvine, United States.

11:45 AM CP02.06.11
9:00 AM BREAK

9:15 AM CP02.06.01
Direct Observation of Chemical and Mechanically Tunable Room-
Temperature Liquid Metal Colloids
Zachary Farrell1, 2; 1AFRL, United States.

9:30 AM CP02.06.02
Design and Characterization of Chemically and Mechanically Tunable Room-
Temperature Liquid Metal Colloids
Zachary Farrell1, 2; 1AFRL, United States; 2UES, Inc., United States.

9:45 AM CP02.06.03
Liquid Phase Imaging of Dynamic Biological Systems—A Multifaceted
Approach
Madeline J. Dukes; Protochips, Inc., United States.

10:00 AM CP02.06.04
Mechanistic Study of Galvanic Replacement of Chemically Heterogeneous
Templates
Alexander Chen; Indiana University, United States.

10:15 AM CP02.06.05
Synthesis and Characterisation of Calcium Carbonate-Based Nano- and
Micro- Structural Materials
Fearghal C. Donnelly; Trinity College Dublin, Ireland.

10:30 AM CP02.06.07
Poly(N-vinylpyrrolidone) Influences Shape-Control of Ag Nanocubes Through
Reduction Kinetics Instead of Preferential Binding to Specific Facets
Supriya Sriram; The Pennsylvania State University, United States.

10:45 AM CP02.06.08
Study of Charge Effect on Nanoparticle Self-Assembly by Liquid
Transmission Electron Microscopy
Yuet Li; Argonne National Laboratory, United States.

11:00 AM CP02.06.09
Direct-Write Freeform Colloidal Assembly
Alvin Tan; Massachusetts Institute of Technology, United States.

11:15 AM CP02.06.10
Colloidal Crystals Engineered from Anisotropic Nanoparticles and
DNA
Haixin Lin; Northwestern University, United States.

11:30 AM CP02.06.11
3:00 PM BREAK

3:15 PM CP02.07.01
Self-Assembly of Anisotropic Nanocrystals
On Chen; Brown University, United States.

3:30 PM CP02.07.02
Assembly and Rheology of 2D Colloids and Their Role in 3D Printing
Andrew Corker1, 2; 1University of Liverpool, United Kingdom; 2University of Liverpool, United Kingdom.

3:45 PM CP02.07.03
Self-Assembly of Non-Spherical Nanoparticles into Functional
Supercrystals
Zawei Quan; Southern University of Science and Technology, China.

4:00 PM CP02.07.04
Visualizing Self-Assembly—From Atoms to Nanostructures
Utkur Mirsaidov; National University of Singapore, Singapore.

4:15 PM CP02.07.05
Colloidal Crystals Engineered from Anisotropic Nanoparticles and
DNA
Haixin Lin; Northwestern University, United States.

4:30 PM CP02.07.06
7:30 PM BREAK

7:45 PM CP02.08.01
Superhydrophilic Wrinkle-Free Cotton Fabrics via Plasma and Nanofluid
Treatment
Lihong Lao; Cornell University, United States.

8:00 PM CP02.08.02
High Performance Unpoled Piezoelectric Device Comprised of Surface
Modified 3D Li-ZnO into PVDF Polymer Incorporated with MWCNT
Jasim M. Uddin; The University of Texas at Rio Grande Valley, United States.

8:15 PM CP02.08.03
Chirality Inversion on the Carbon Dot Surface via Covalent Surface
Conjugation of Cyclic α-Amino Acid Capping Agents
Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

8:30 PM CP02.08.04
Colloidal Cs0.1-FAPbI3 Perovskite Nanocrystals with Full Range of A-Site
Composition Tuning for High Voc Solar Cells
Abhijit Hazarika; National Renewable Energy Laboratory, United States.
**SYMPOSIUM CP03**

TUTORIAL: Mini X-Ray and Neutron School on In-Situ Materials Research  
April 22 - April 22, 2019

Symposium Organizers

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**4:30 PM CP02.08.05**

**Tuning the Optical Properties of Pulsed Laser Synthesized Nitrogen Doped Graphene Quantum Dots**  
Muhammad Shehzad Sultan; University of Puerto Rico, United States.

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**4:45 PM CP02.08.06**

**Colloidal CuFeS2 Nanocrystals—Intermediate Band Composed of Fe D-Orbitals Leading to Unique Optical Properties**  
Sandeep Ghosh; The University of Texas at Austin, United States.

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**SYMPOSIUM CP03**

TUTORIAL: Mini X-Ray and Neutron School on In-Situ Materials Research  
April 22 - April 22, 2019

Symposium Organizers

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The application of X-ray and neutron facilities are useful and powerful analysis routes for characterizing materials from a broad range of research communities. With the development of new generations of synchrotron X-ray and neutron facilities across the world, there is increasing demand on how to take full advantage of these state of art techniques and tailor them for individual research areas. The main purpose of the X-ray and neutron technique tutorial session is to educate conference attendees on the utilization of major neutron and x-ray facilities for in-situ characterization of materials synthesis and function under operating conditions. The leading researchers from US DOE national laboratories will present the lectures, including basic tutorials of the neutron and x-ray facilities, the characteristics of the sources and related beamlines, the principles of scattering and spectroscopy, data processing and modeling, as well as topics on applications to a variety of scientific subjects. The latest progress and ideas will also be discussed, both on experimental and analytical methods for in-situ materials research using X-ray and neutron sources.

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**8:30 AM**

**Introduction to X-Ray Absorption Spectroscopy**  
Steve M. Heald; Argonne National Laboratory

The x-ray absorption fine structure (XAFS) that is present near x-ray absorption edges contains detailed information about the local structure and bonding of the absorbing atoms. With the advent of intense tunable sources of x-rays using synchrotron radiation facilities, the application of x-ray absorption spectroscopy has become widespread and routine. The XAFS is a local probe sensitive to the location and type of atoms surrounding the absorbing atom. As a local probe, it can be applied to many materials where diffraction-based techniques would be impractical such as resolving the structure near highly dilute components and determining the local structure of atoms in nanoparticles, liquids, metalloproteins in solution, amorphous solids, and poorly crystalline materials. In addition to the direct structural information, the absorption edge position and shape can be used to determine the site symmetry and valence of the absorbing atoms. In this tutorial, an introduction to XAFS will be given, and the basic steps for data analysis including examples will be demonstrated.

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**10:00 AM BREAK**

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**10:30 AM**

**Material Insights from Total Scattering Data: A Tour of Small Box Modeling and More**  
Katharine L. Page; Oak Ridge National Laboratory

Total scattering (and the associated pair distribution function technique), an extension of diffraction methods, is increasingly prevalent in modern materials studies. The unique combination of Bragg and diffuse scattering has related vacancies in high temperature ceramics to both their superionic conductivity and phase stability, nanometer-sized polar domains or nanoregions in relaxor ferroelectrics to their enhanced dielectric and piezoelectric properties, and vacancy/disorder arrays and other subtle local correlations to the mechanisms of high-Tc superconductivity. These methods have further proven critical in understanding guest-host interactions, amorphous to crystalline transitions, local spin correlations, and other disordered crystalline materials phenomena. This lecture and tutorial is aimed at introducing neutron total scattering, community software, and refinement methods to new and beginning users. The lecture will focus in providing a technical foundation and highlighting exemplary work in the community, while the tutorial will include both demonstration and hands-on training with community software. We will also introduce available instruments (including our mail-in programs), sample environments, and resources for first time and beginning practitioners. A special emphasis will be placed on the growing number of in situ and in operando capabilities at the neutron total scattering beamlines at the Spallation Neutron Source at Oak Ridge National Laboratory.
SYMPOSIUM CP03

Advances in In Situ Techniques for Diagnostics and Synthetic Design of Energy Materials
April 23 - April 25, 2019

Symposium Organizers
- Jenny Lockard, Rutgers, The State University of New Jersey
- Chengjun Sun, Argonne National Laboratory
- Feng Wang, Brookhaven National Laboratory
- Markus Winterer, University of Duisburg-Essen

Symposium Support
- Rutgers University - Newark Chancellor's Office
- Rutgers University - Newark Department of Chemistry
- The Advanced Photon Source (APS) at Argonne National Laboratory

* Invited Paper

SESSION CP03.01: Fast Transmission Electron Microscopy
Session Chair: Chengjun Sun
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 101 C

10:30 AM *CP03.01.01
Development of a Dynamic Environment Transmission Electron Microscope for the Study of Ultrafast Light-Induced Phenomena in Nanoscale Materials
Renske M. van der Veen1,2; 1University of Illinois at Urbana-Champaign, United States; 2University of Illinois at Urbana-Champaign, United States.

11:00 AM CP03.01.02
An Open Cell System for Probing Nanoparticles Under Illumination in Aqueous Solutions in an Environmental Transmission Electron Microscope
Barnaby D. Levin; Arizona State University, United States.

11:15 AM CP03.01.03
Composition Analysis by EDS at Elevated Temperatures in STEM and SEM
Meiken Falke; Bruker Nano GmbH, Germany.

11:30 AM CP03.01.04
In Situ Atomic-Scale Observation of Intermediate Pathways of Melting and Crystallization of Supported Bi-Nanoparticles in the TEM
Leonard D. Francis; International Iberian Nanotechnology Laboratory, Portugal.

11:45 AM CP03.01.05
Effects of Pulsed Electron-Beam Characteristics on Radiation-Sensitive Materials for Energy Applications
Elisah VandenBussche; University of Minnesota, United States.

SESSION CP03.02: X-Ray Photoelectron and Electron Energy-Loss Spectroscopy
Session Chairs: Beatriz Roldan Cuenya and Markus Winterer
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 C

1:30 PM *CP03.02.01
Investigation of Aqueous Interfaces Using Ambient Pressure XPS
Hendrik Bluhm1,2; 1Lawrence Berkeley National Laboratory, United States; 2Fritz Haber Institute of the MPG, Germany.

2:00 PM CP03.02.02
Observing Reactions at Surfaces with Fast and Dynamic XPS
Christian Kaiser; Sigma Surface Science GmbH, Germany.

2:15 PM CP03.02.03
The Role of First Principles Calculations in Interpreting Core Level X-Ray Photoelectron Spectra of Complex Heterogeneous Systems
Juhan Matthias Kahk; Imperial College London, United Kingdom.

2:30 PM *CP03.02.04
Electron Energy-Loss Spectroscopy for Designing Plasmonic Catalysts
Renu Sharma1,2; 1National Institute of Standards and Technology, United States; 2University of Maryland, United States.

SESSION CP03.03: In Situ/In Operando Observation of Catalysis and Catalysts
Session Chairs: Zhenxing Feng and Jenny Lockard
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 C

3:00 PM BREAK

SESSION CP03.03: In Situ/In Operando Observation of Catalysis and Catalysts
Session Chairs: Zhenxing Feng and Jenny Lockard
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 101 C

3:30 PM *CP03.03.01
In Situ and Operando Insight into Electrocatalytic and Thermal Conversion of CO2 to Valuable Chemicals and Fuels
Beatriz Roldan Cuenya; Fritz-Haber Institute of the Max Planck Society, Germany.

4:00 PM CP03.03.02
Elucidating the Effects of Chemical Potential and Ligands on Nonequilibrium Etching of Nanocrystals Using Graphene Liquid Cell TEM
Matthew Hauwiller; University of California, Berkeley, United States.

4:15 PM CP03.03.03
In Situ Diagnostics of 2D Materials Synthesis and Heterogeneity—Closing the Loop for Functional Optoelectronic Materials
David B. Geohegan; Oak Ridge National Laboratory, United States.

4:30 PM *CP03.03.04
About Using In Situ and Operando Characterization to Characterize Catalysts
Jeroen A. van Bokhoven; ETH Zurich-PSI, Switzerland.
SESSION CP03.04: Poster Session: Advances in In Situ Techniques for Diagnostics and Synthetic Design of Energy Materials
Session Chairs: Jenny Lockard, Chengjun Sun, Markus Winterer and Markus Winterer
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP03.04.01

CP03.04.03
Probing Semiconductor Photocatalyst Surface Intermediates and Band Edge Energies via Ambient Pressure XPS on CO2, Photoreduction Hsung-Ting Lien1, 2; 1National Taiwan University, Taiwan; 2National Taiwan University, Taiwan.

CP03.04.04
In Situ Analysis and Simulation of Heat Generation During Charging and Discharging of Ni-Rich Layered Oxide Cathode Gabe Kim; SAIT, Korea (the Republic of).

CP03.04.05
Compositional and Structural Evolution of Ultra-Thin Nickel Silicide Films as Studied by In Situ Low- and Medium-Energy-Ion-Scattering Tuan T. Tran; Uppsala University, Sweden.

CP03.04.06
Rapid High Shear Viscosity Measurements Using a Microfluidic Rheometer Matt Vanden Eynden; Formulaction, Inc., United States.

CP03.04.07
Dopant Profiling Using Low-Voltage SEM for GaN Power Electronics Shanthan Reddy Alegubelli; Arizona State University, United States.

CP03.04.08
Non-Uniform Mg Doping in GaN Epilayers on Mesa Structures Hanxiao Liu; Arizona State University, United States.

CP03.04.09

CP03.04.11
In Situ Electron Beam Induced Current STEM Measurements of the Minority Carrier Diffusion Length in n-GaN Zoe Warecki; University of Maryland, United States.

CP03.04.13
In Situ TEM Biasing Experiments with Easy-to-Move Mobile Probes Julio A. Rodriguez Manzo; Hummingbird Scientific, United States.

CP03.04.14
Exploring the Interfacial Structure in Aqueous Colloidal Tin Dioxide Dispersions Viktor Mackert; Universität Duisburg-Essen, Germany.

CP03.04.15
Designing Perovskite Nanoparticles to Probe Structural Changes During Catalytic Activity by In Situ X-Ray Absorption Spectroscopy Jeremias Geiss; University of Duisburg-Essen, Germany.

CP03.04.16
Coupling Operando Electrochemical Mass Spectrometry with Post-Mortem Analysis of Electrodes for Revealing the Degradation Mechanisms of Electrochemical Capacitors During High Voltage Operation Francois Beguin; Poznan University of Technology, Poland.

CP03.04.17
Colossal Transformations in Metal-Organic Frameworks with Ultrahigh Porosity Stefan Kaskel1, 2; 1Fraunhofer IWS, Germany; 2TU Dresden, Germany.

CP03.04.18
Fundamental Understanding of the Effects of Molten Salts on MgO for the Intermediate—CO2 Adsorption via In Situ DRIFTS Techniques Wanlin Gao; Beijing Forestry University, China.

CP03.04.19
In Situ Measurements of Plasma-Surface Interactions via Time Domain Thermoreflectance—Electron Heating, Surface Cooling and Chemical Reactions in Materials Patrick Hopkins; University of Virginia, United States.

CP03.04.20
Molecular Beam Epitaxy Grown Core-Shell Gallium Arsenide Nanowire Solar Cells on Silicon Substrate M. Hadi Tavakoli Dastjerdi; Massachusetts Institute of Technology, United States.

CP03.04.21

CP03.04.22
In Situ Transient Absorption Spectroscopy During Materials Formation Cathy Y. Wong; University of Oregon, United States.

CP03.04.23
In Situ Studies of Ion Transport in Electrolyte and Electrolyte/Lithium Interfacial Reactions Yuan Yang; Columbia University, United States.

CP03.04.25
Tracking the Underlying Redox Mechanism in Na2FeP2O7 Pyrophosphate Cathode for Sodium-Ion Batteries Ritambhara Gond; Indian Institute of Science, India.

CP03.04.26
In Situ and Operando Soft X-Ray Spectroscopy of Energy-Relevant Materials Lutheran Weinhardt1, 2, 3; 1Karlsruhe Institute of Technology (KIT), Germany; 2University of Nevada, Las Vegas, United States; 3Karlsruhe Institute of Technology (KIT), Germany.

CP03.04.27
Systematic Design of High Performance Lithium-Sulfur Battery Using Efficient Polysulfide Adsorbent Porous Host Materials Tilahun A. Zegeye; National Taiwan University of Science and Technology, Taiwan.

SESSION CP03.05: X-Ray Diffraction and Batteries
Session Chairs: Steve Heald and Feng Wang
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 C

8:30 AM *CP03.05.01
In Situ Synchrotron X-Rays Studies on the Synthesis of Energy Materials for Li-Ion Battery Jianming Bai; Brookhaven National Laboratory, United States.

9:00 AM CP03.05.02
Large Area and Multimodal Study of Li-Ion Batteries with New In Situ Technologies Stefanie Freitag; Zeiss, Germany.

9:15 AM CP03.05.03
In Situ Probing of Anionic Redox in Li-Rich Layered Cathodes Chong Yim1, 2; 1Brookhaven National Laboratory, United States; 2Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China.

9:30 AM CP03.05.04
Bismuth as Rechargeable Lithium-Ion Battery Anode—A Fundamental Study Using In Situ Synchrotron XRD and In Situ TEM Yifei Yuan; University of Illinois at Chicago, United States.

9:45 AM CP03.05.05
Cationic Ordering Coupled to Reconstruction of Basic Building Units During Synthesis of High-Ni Layered Oxide Cathodes Mingjian Zhang1, 2; 1Brookhaven National Lab, United States; 2Peking University, China.

10:00 AM BREAK

SESSION CP03.06: Neutron Scattering and Battery Related Materials
Session Chairs: Steve Heald and Feng Wang
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 101 C

10:30 AM *CP03.06.01
Neutron and Synchrotron X-Ray Study of Battery Materials Ren Yang; Argonne National Laboratory, United States.
SESSION CP03.07: X-Ray Spectroscopy and Battery Related Materials
Session Chairs: Anatoly Frenkel and Jenny Lockard
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 C

1:30 PM *CP03.07.01
X-Ray Spectroscopic Studies of Energy Storage Systems Mahalingam Balasubramanian; Argonne National Laboratory, United States.

2:00 PM CP03.07.02
In Situ XAS Studies of Layered Double Hydroxide Catalysts for Electrochemical Oxygen Evolution Reaction Maoyu Wang; Oregon State University, United States.

2:15 PM CP03.07.03
Laboratory-Based Hard X-Ray Photoelectron Spectrometer for the Study of Advanced and Complex Materials Susanna Eriksson; Scienta Omicron, Sweden.

2:30 PM BREAK

SESSION CP03.08: X-Ray Spectroscopy and Catalysis
Session Chairs: Mahalingam Balasubramanian and Markus Winterer
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 101 C

3:30 PM *CP03.08.01
In Situ Determination of Active Species and Active Sites in Water Gas Shift Reaction Over Pu/CeO2 Catalysts Anatoly Frenkel1, 2; Stony Brook University, The State University of New York, United States; 3Brookhaven National Laboratory, United States.

4:00 PM CP03.08.02
Unveiling Site-Selective CO Disproportionation Mediated by Electron Beam Excited Localized Surface Plasmon Resonance Wei-Chang D. Yang1, 2; 1National Institute of Standards and Technology, United States; 2University of Maryland, United States.

4:15 PM CP03.08.03
X-Ray Absorption Study on Iron(III)Acetylacetonate Vapor and Nanoparticles Produced from It Oleksandr Levisch; Universität Duisburg-Essen, Germany.

4:30 PM *CP03.08.04
In Situ X-Ray Absorption Spectroscopy Studies of Catalysts in Electrochemical Reactions Zhenxing Feng; Oregon State University, United States.

SESSION CP03.09: Small Angle Scattering, Ion Scattering and Related Methods
Session Chairs: Jianming Bai and Feng Wang
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 101 C

8:30 AM *CP03.09.01
Exploring Pore Formation of Atomic Layer-Deposited Overlayers by In Situ Small Angle X-Ray Scattering Tao Li1, 2; 1Argonne National Laboratory, United States; 2Northern Illinois University, United States.

9:00 AM CP03.09.02
In Situ Small-Angle X-Ray Scattering Observation of Electrophoretic Deposition at the Nanoscale Viktor Mackert; Universität Duisburg-Essen, Germany.

9:15 AM CP03.09.03
Advanced Setups for In Situ Growth and Characterization of Materials by Ion Beams Tuan T. Tran; Uppsala University, Sweden.

9:30 AM CP03.09.04

9:45 AM CP03.09.05
Probing Prospective Electrode Materials for Next Generation High-Energy Density Batteries by Advanced Focused Electron Beam and Ion Beam Techniques Vladimir P. Oleshko; National Institute of Standards and Technology, United States.

10:00 AM BREAK
SYMPOSIUM CP04

Interfacial Science and Engineering—Mechanics, Thermodynamics, Kinetics and Chemistry
April 22 - April 26, 2019

Symposium Organizers
Fadi Abdeljawad, Clemson University
Julie Carmey, The University of Sydney
Timothy Rupert, University of California, Irvine
Jason Trelewicz, Stony Brook University

* Invited Paper

SESSION CP04.00: Late News in Interfacial Science and Engineering
Session Chairs: Jessica Krogstad and Timothy Rupert
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 124 A

1:30 PM CP04.00.01

Solute Segregation and Grain Boundary Transport in Nanocrystalline Alloys—Insight from Diffusion Triples Jessica A. Krogstad1, 2; 1University of Illinois, Urbana-Champaign, United States; 2University of Illinois at Urbana-Champaign, United States.

1:45 PM CP04.00.02

Surface Energy Interactions in Crystalline Coffee Rings Samantha McBride; Massachusetts Institute of Technology, United States.

2:00 PM CP04.00.03

Evolution of Persistent Metastable Phases During Mg Metal Corrosion Suntharampillai Thevuthasan; Pacific Northwest National Laboratory, United States.

2:15 PM CP04.00.04

Kinetics and Mechanism of Surface-Guided Nanowire Growth Amnon Rothman; Weizmann Institute of Science, Israel.

2:30 PM CP04.00.05

Understanding Surface Degradation and Ligand Passivation-Assisted Stability of Hybrid Perovskites in Water Using Molecular Dynamics Simulations Huanhuan Zhou; Florida State University, United States.

2:45 PM CP04.00.06

Waterbowls—Reducing Impacting Droplet Interactions by Momentum Direction Henri-Louis Girard; Massachusetts Institute of Technology, United States.

3:30 PM CP04.00.07

Defect Induced Surface Reactivity and Ion Transfer Process in TiO2 Polymorphs Vijayakumar Murugesan; Pacific Northwest National Laboratory, United States.

3:45 PM CP04.00.08

Bulk-Like Ferromagnetism in Manganese Ultrathin Layers Sanaz Koohfar; North Carolina State University, United States.

4:00 PM CP04.00.09

Atomic Structure During Interface Formation, De-Cohesion and Migration Under In Situ High Resolution TEM Scott N. Mao; University of Pittsburgh, United States.

SESSION CP04.01: Interface Structure
Session Chairs: Fadi Abdeljawad and Eric Horner
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 102 A

10:30 AM *CP04.01.01

Connecting Atomic and Crystallographic Structure-Property Relationships of Grain Boundaries Eric R. Horner; Brigham Young University, United States.

3:30 PM CP04.01.01

11:00 AM *CP04.01.02

Processing Routes for Controlling Disorder-Property Relationships in Metallic Alloys Daniel S. Gianola; University of California, Santa Barbara, United States.

11:30 AM CP04.01.03


11:45 AM CP04.01.04

Surface Atomic and Electronic Structure of Ultrathin BaTiO3 Films Kyle P. Kelley; Oak Ridge National Laboratory, United States.

SESSION CP04.02: Mechanically-Driven Transformations and Diffusion
Session Chairs: Eugen Rabkin and Jason Trelewicz
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 A

1:30 PM *CP04.02.01

Interface Diffusion-Controlled Pseudoelasticity of Metal Nanoparticles Eugen Rabkin; Department of Materials Science and Engineering, Technion-Israel Institute of Technology, Israel.

2:00 PM CP04.02.02

Strain Relaxation in Low-Mismatched GaAs/GaAs0.85Sb0.15/GaAs(001) Heterostructures Abhinandan Gangopadhyay; Arizona State University, United States.

2:15 PM CP04.02.03

Exploring the Impact of Strain and Droplet Formation on Phase Separation and Atomic Ordering in GaAsBi John McElearney; Tufts University, United States.

2:30 PM CP04.02.04

Dynamic Investigation of Titanium Disilicide Formation by In Situ TEM Hsin Mei Lu; National Chiao Tung University, Taiwan.

2:45 PM CP04.02.05

Design and Control of Crystalline Phase Interfaces in Doubly-Epitaxial FeSe Thin Films Sumner B. Harris; University of Alabama at Birmingham, United States.

3:00 PM BREAK

SESSION CP04.03: Tailoring Properties by Controlling Interfacial Structure
Session Chairs: Martin Harmer and Jason Trelewicz
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 A

3:30 PM CP04.03.01

Grain Boundary Complexion Engineering—A Case Study of Silica and Rare-Earth Doped Boron Suboxide Armor Ceramics Martin Harmer; Lehigh University, United States.

4:00 PM CP04.03.02

Grain Size Effects on Ni/Al Nanolaminate Combustion Douglas E. Spearot; University of Florida, United States.

4:15 PM CP04.03.03

In Situ TEM Investigation of Low Resistivity NiSi Formation on Silicon Layer An-Yuan Hou; National Chiao Tung University, Taiwan.

4:30 PM CP04.03.04

Study on the Atomic Interaction of Si and Mn During the Eutectoid Transformation in High-Carbon Steel Linghui Huang; Southeast University, China.

4:45 PM CP04.03.05

Interatomic Bonds and Elastic Properties of Σ5(210) Grain Boundaries in NiSi Compound Martin Želenský1, 2; 1Faculty of Mathematics and Physics, Charles University, Czechia; 2Faculty of Mechanical Engineering, Brno University of Technology, Czechia.
SESSION CP04.04: Poster Session: Interfacial Science and Engineering—Mechanics, Thermodynamics, Kinetics and Chemistry

Session Chairs: Fadi Abdeljawad, Julie Cairney, Timothy Rupert and Jason Trelewicz
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP04.04.01 Mesoscale Interface and Surface Characterization by µ-XRD Mapping on Mosaic and Lateral Grown Single Crystal Diamond Shengyuan Bai; Michigan State University, United States.

CP04.04.02 Analytical Diffuse Layer Models in Electronic Structure Simulations Matthew Truscott; University of North Texas, United States.

CP04.04.03 Computational Investigations of Surface Adsorption of Ethane on M1 Catalyst (Mo-V-Nb-Te-O) Breton H. Anderson; Boise State University, United States.

CP04.04.04 Surface Characteristics of Accident Tolerant Fuels Cladding and their Potential Impact in Critical Heat Flux Rainikant Unretiya; Virginia Commonwealth University, United States.

CP04.04.05 Perovskite Alloys and Metal Halides at the Interface—Crystallographic Orientation and Environmental Degradation Timothy Siegler; University of Texas-Austin, United States.

CP04.04.06 Membrane Characterization Through Electrocompression Joyce E. Bevrnody; The University of Georgia, United States.

CP04.04.07 Generation of Shape-Tuned, Monodisperse Block Copolymer Particles Through Particle Restructuring by Solvent Engineering Jae Min Shin; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

CP04.04.08 Surface Energy Measurements by Three Liquid Contact Angle Analysis Correlated with Ion Beam Analysis of Thin Silicon Oxides as a Function of Dopant Species and Concentration Saaketh R. Narayan; 1, 2, 3, 1Arizona State University, United States; 2SiO2 Innovates, LLC, United States; 3AccuAngle Analytics LLC, United States.

CP04.04.09 Fabrication of High-Pressure-Phase α-PbO2-Type TiO2 Epitaxial Thin Films via Ultrahigh Pressure Treatment Yuki Sasahara; Tokyo Institute of Technology, Japan.

CP04.04.10 Transfer Printing of Colloidal Crystals Based on UVO Mediated Polymer Degradation Rabibrata Mukherjee; Indian Institute of Technology Kharagpur, India.

CP04.04.11 Pyrolytic Carbon Films with Tunable Electronic Structure and Surface Functionality—A Planar Stand-in for Electroanalysis of Energy-Relevant Reactions Jeffrey W. Long; Naval Research Laboratory, United States.


CP04.04.13 Ordering and Miniaturization in Dewetting of Pre-Patterned Thin Polymer Films and Bilayers with Patterned Interface Nandini Bhandari; Birla Institute of Technology and Science Pilani, Hyderabad Campus, India.

CP04.04.14 Analysis of Deep Level and Oxide Interface Defects Using 100V HF Schottky Diodes and MOS CV’s for Silicon and 4H SiC HV MOSFETS, Advanced Power Electronics and RF ASIC James Pan; Northrop Grumman Electronic Systems, United States.
CP04.04.31 Molecular Dynamics Simulation and Disconnection Model for Faceting of Migrating Grain Boundaries Larissa Woryk; University of Pennsylvania, United States.

CP04.04.32 Thermotropic Polymers with Robust Interfaces for Transparency-Tunable and Impact-Resistant Windows Cheng Zhang; The University of Missouri, United States.

CP04.04.33 Multimodal Chemical and Functional Imaging of Functional Materials via Combined AFM/ToF-SIMS Platform Anton V. Ievlev; Oak Ridge National Laboratory, United States.

CP04.04.37 Using Light to Regulate Adhesion of Polymers to Substrate Hossein Mostafavi; University of California, Riverside, United States.

CP04.04.38 Shedding Light onto the Controversy Around Graphene Wettability Opacity by Locally Probing Surface Free Energy Matteo Chiesa; Khalifa University of Science and Technology, United Arab Emirates.

SESSION CP04.05: Interface Motion
Session Chairs: Srikanth Patala and Timothy Rupert
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 A

8:00 AM *CP04.05.01
Triple-Junction Dynamics During Grain Boundary Migration David J. Srolovitz1, 4; 1City University of Hong Kong, Hong Kong; 4University of Pennsylvania, United States; 4City University of Hong Kong, Hong Kong.

8:30 AM *CP04.05.02
Shear Induced Motion of Twin Boundaries in Mg via Disconnection Terrace Nucleation, Growth and Coalescence Douglas E. Spearot; Univ of Florida, United States.

9:00 AM *CP04.05.03
A Machine Learning Exploration of Grain Boundary Mobility Mechanisms Srikanth Patala; North Carolina State University, United States.

9:30 AM BREAK

SESSION CP04.06: Surface-Driven Phenomena
Session Chairs: Wendy Gu and Timothy Rupert
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 102 A

10:00 AM CP04.06.01
First Principle Study of the Protonation Effect and Active Sites Towards Oxygen Reduction Reaction on α-MnO2(211) Plane Xuan Shi; Arizona State University, United States.

10:15 AM CP04.06.02
"Good" and "Bad" Defects at Interfaces and Surfaces of Water Splitting Photoelectrodes Artur Braun; Empa, Switzerland.

10:30 AM CP04.06.03
Time Resolved Ambient Pressure X-Ray Study of LiCoO2 Formation on Garnet Electrolyte in CO2 Meiling Sun1, 2; 1Lawrence Berkeley Laboratory, United States; 2Lawrence Berkeley National Laboratory, United States.

10:45 AM CP04.06.04
Coupling Chemistry and Mechanics in Nanomaterials Joerg Weissmueller1, 2; 1Hamburg University of Technology, Germany; 2Helmholtz-Center Geesthacht, Germany.

11:15 AM CP04.06.05
Surface Dominated Deformation in Sub-10 nm Au Nanocrystals at High Pressure Wendy Gu; Stanford University, United States.

11:30 AM CP04.06.06
Multi-Resolution Characterization of Surface Topography for Improved Prediction of Surface Properties Tevis D. Jacobs; University of Pittsburgh, United States.

SESSION CP04.07: Radiation and Interfaces
Session Chairs: Julie Cairney and Mitra Taheri
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 A

1:30 PM *CP04.07.01
Grain Boundary Metastability Under Irradiation—Toward Tunable Sink Efficiency Mitra Taheri; Drexel University, United States.

2:00 PM CP04.07.02
Atomistic Multiscale Modeling of Compositional and Defect Dynamics for Ion Irradiation Synthesis of III-V Semiconductor Quantum Dots Michael Lively; University of Illinois at Urbana-Champaign, United States.

2:15 PM CP04.07.03
Atomic-Scale Mechanisms for Interfacial Radiation Damage Resistance of Oxide Heterostructures Steven R. Spurgeon; Pacific Northwest National Laboratory, United States.

2:30 PM BREAK

SESSION CP04.08: Characterizing Interfacial Chemistry
Session Chairs: Julie Cairney and Ann Chiaramonti-deBay
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 102 A

3:30 PM *CP04.08.01
Extreme Ultraviolet-Assisted Atom Probe Tomography Ann Chiaramonti-deBay; National Institute of Standards and Technology, United States.

4:00 PM CP04.08.02
Sub-Nanoscale Chemistry Across an Abrupt SiO2/Si Interface Using Vibrational Electron Energy-Loss Spectroscopy Kartik Venkatraman; Arizona State University, United States.

4:15 PM CP04.08.03

4:30 PM *CP04.08.04
Atomic-Scale Chemical Analysis at Ceramic Interfaces by Advanced Scanning Transmission Electron Microscopy Naoya Shibata; The University of Tokyo, Japan.

SESSION CP04.09: Solid-Liquid Interfaces
Session Chairs: Fadi Abdeljawad and Jeffrey Hoyt
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 102 A

8:15 AM CP04.09.01
The Temperature Dependence of the Solid-Liquid Interfacial Free Energy in Cu-Zr and Al-Sn Jeffrey Hoyt1; 1McMaster University, Canada; 3University of California, Berkeley, United States.

8:45 AM CP04.09.02
Gallium-Based Liquid Metal Wetting Behavior of Tungsten Powder Facilitated via Electrolec Silver Coatings Wilson Kong; Arizona State University, United States.

9:00 AM *CP04.09.03
Characterization of Chemically Heterogeneous Metal-Metal Solid-Liquid Interfaces Using Atomistic Simulation Brian Laird; University of Kansas, United States.
1:30 PM *CP04.15.01
Twinning in Multiple Principal Element Alloys—Atomistic Simulation
Studies Mark Asta1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

2:00 PM CP04.15.02
Atomistic Level Mechanism for the Formation of Long Period Stacking Order (LPSO) in Magnesium Alloys Yiqiang Chen; Max-Planck-Institut für Eisenforschung, Germany.

2:15 PM CP04.15.03
On the Different Relaxation Schemes During Generalized Stacking Fault Energy Analysis in Hexagonal Close-Packed Metals—A Case Study of Magnesium Reza Namakian; Louisiana State University, United States.

2:30 PM CP04.15.04
The Role of Twin Boundaries on Failure Mechanisms in Nickel-Based Superalloys Zhenbo Zhang; University of Manchester, United Kingdom.

2:45 PM CP04.15.05
Preferential Intergranular Corrosion Along Coherent Twin Boundaries in Pure Ni Mengying Liu; Texas A&M University, United States.

3:00 PM BREAK

SESSION CP04.16: Property Control Through Grain Boundary Segregation
Session Chairs: William Bowman and Julie Cairney
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 121 B

3:30 PM *CP04.16.01
Nano-Scale Effects on Grain Growth—Grain Boundary Energy and Velocity in Magnesium Aluminate Ricardo H. Castro; University of California, Davis, United States.

4:00 PM CP04.16.02
Enhancing Grain Boundary Ionic Conductivity in Ceramics via Local Solute Enrichment and a New Data-Driven Interacting-Defect Model Describing Nanoscopic Interface Compositions William J. Bowman; Massachusetts Institute of Technology, United States.

4:15 PM CP04.16.03
Atomistic Studies of Effects of Alloyning Element Segregation on Grain Boundary Cohesive Strength in Fe-Based Alloys Axel E. Alocer Seoane; Department of Materials Science and Engineering, Virginia Polytechnic Institute and State University, United States.

4:30 PM CP04.16.04
First-Principles Studies of Effects of Oxygen Impurity on Grain Boundary Strength in Nickel Qizi Xiao; Virginia Polytechnic Institute and State University, United States.

4:45 PM CP04.16.05
Understanding the Role of High-Solute Grain Boundary Composition and Local Atomic Structure for Improved Ionic Conductivity in CeO2 Ceramic Oxides Tara M. Boland; Arizona State University, United States.

3:00 PM BREAK

SYMPOSIUM CP05
Materials Evolution in Dry Friction—Microstructural, Chemical and Environmental Effects
April 23 - April 25, 2019

Session Chairs: William Bowman and Julie Cairney
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 102 B

10:30 AM *CP05.01.01
In Situ Observations of Nanotribology Evolution Laurence Marks; Northwestern University, United States.

11:00 AM *CP05.01.02
Atomic-Scale Insights into Contacts Between Nanoscale Bodies—In Situ Experiments and Matched Atomistic Simulations Tevis D. Jacobs; University of Pittsburgh, United States.

11:30 AM CP05.01.03
Micro-Mechanical Investigation of Microstructure Effects on Dry Friction Gianluca Roscioli; Massachusetts Institute of Technology, United States.

11:45 AM CP05.01.04
In Situ Atomic-Scale Observation on Friction Between Metallic Contacts Scott X. Mao; University of Pittsburgh, United States.

SESSION CP05.02: Tribology of 2D Materials
Session Chairs: Martin Dienwiebel and Laurence Marks
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 102 B

1:30 PM *CP05.02.01
Fundamental Insights into Dry Friction, Adhesion and Wear via Nanoscale and In Situ Approaches Robert Carpick; University of Pennsylvania, United States.

2:00 PM CP05.02.02
Atomistic Origins of Temperature-Dependent Shear Strength in 2D Materials Adam R. Hinkle; Sandia National Laboratories, United States.

2:15 PM CP05.02.03
Temperature and Speed Dependence of Nanoscale Friction for Mono- and Multilayer MoS2—A Combined Atomic Force Microscopy and Molecular Dynamics Study Kathryn Hasz; University of Pennsylvania, United States.

2:30 PM CP05.02.04
Environmental Contamination Affecting Friction in Graphene Clara Almeida; Inmetro, Brazil.

2:45 PM CP05.02.05
Sliding Over 10,000 Times Faster—QCM Integrated Microtribometry to Probe Friction Fundamentals via Gold and Single-Crystal MoS2 Nikolay T. Garabedian; University of Delaware, United States.

3:00 PM BREAK
SYMPOSIUM CP06

Smart Materials for Multifunctional Devices and Interfaces
April 23 - April 25, 2019

Session Chairs: Harish Bhaskaran and Ying-Hao Chu
Tuesday Morning, April 23, 2019
PCC West, 100 Level, Room 105 C

10:30 AM *CP06.01.01
Metallic Muscles—Nanoporous Materials at Work  Jeff De Hosson; University of Groningen, Netherlands.

11:00 AM *CP06.01.02
Microstructural and Micromechanical Insights into Designing, Fabricating and Using Shape Memory Alloy Actuators Raj Vaidyanathan; University of Central Florida, United States.

11:30 AM CP06.01.03
A Surface Load Memory Effect—No Actuation Under Load in Nanoporous Gold? Lingxhi Liu1, 2; 1Helmholtz-Zentrum Geesthacht, Germany; 2Institute of Metal Research, China.

11:45 AM CP06.01.04
Li Alloy-Based Non-Volatile Actuators Myoung-Sub Noh1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2KU-KIST Graduate School of Converging Science and Technology, Korea University, Korea (the Republic of).

Session Chairs: Jeff De Hosson and Raj Vaidyanathan
Tuesday Afternoon, April 23, 2019
PCC West, 100 Level, Room 105 C

1:30 PM *CP06.02.01
Bistable Electroactive Polymers and Compliant Electrodes Qibing Pei; University of California, Los Angeles, United States.

2:00 PM CP06.02.02
Heavy Lifting with Soft Materials—Layered Liquid Crystal Elastomer Actuators Tyler Guin1, 2; 1Air Force Research Laboratory, United States; 2Oak Ridge National Laboratory, United States.

2:15 PM CP06.02.03
Mechanical Response and Deformation Behavior of NiTi-Based Low-, Medium- and High-Entropy Intermetallic Compounds Chi-Huan Tung; National Tsing Hua University, Taiwan.

2:30 PM CP06.02.04
Porous Composite Films through Phase Inversion for Tuning Mechanics and Composition Independently Andrew Fassler1, 2; 1Air Force Research Laboratory, United States; 2UES, Inc., United States.

2:45 PM CP06.02.05
Electroresponsive Homogeneous Polyelectrolyte Complex Hydrogels from Naturally Derived Polysaccharides Wei Li; Texas Tech University, United States.

3:00 PM BREAK
SESSION CP06.08: Smart Approaches to Modeling and Simulation
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 105 C

8:30 AM *CP06.08.01
A Multiscale Modelling Strategy to Predict Precipitate Stability, Nucleation and Growth in Metallic Alloys
Javier Llorca1, 2; 1Technical University of Madrid, Spain; 2IMDEA Materials Institute, Spain.

9:00 AM *CP06.08.02
Deyu Lu; Brookhaven National Laboratory, United States.

9:30 AM CP06.08.03
First-Principles Study of Doping Effects on Transformation Temperatures in Ni-Mn-Ga Magnetic Shape Memory Alloys
Martin Zelený1, 2; 1Faculty of Mathematics and Physics, Charles University, Czechia; 2Faculty of Mechanical Engineering, Brno University of Technology, Czechia.

9:45 AM CP06.08.04
Analysis of Conducting Filaments in HfO2 Memristors
Darshan G. Pahinkar; Georgia Institute of Technology, United States.

10:00 AM BREAK

SESSION CP06.09: Smart Materials for Functional Devices
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 105 C

10:30 AM CP06.09.01
Three-Dimensional Strain Engineering in Epitaxial Vertically Aligned Nanocomposite Thin Films with Tunable Magnetotransport Properties
Xing Sun; Purdue University, United States.

10:45 AM CP06.09.02
Single Nanoparticle Electrochromism Reveals Heterogeneous Coloration Rates and Ion Trapping Sites in Smart Windows
Justin Sambur; Colorado State University, United States.

11:00 AM CP06.09.03
Giant Magnetostriction and Low Loss in FeGa/NiFe Laminates for Strain-Mediated Multiferroic Micro-Antenna Applications
Kevin Fitzell; University of California, Los Angeles, United States.

11:15 AM CP06.09.04
Electric Field Control of Interfacial Magnetism Through Ionic Liquid Gating
Zhongqiang Hu; Xi’an Jiaotong University, China.

11:30 AM CP06.09.05
Smart Carbon Fiber Sheets for 2D Structural Health Monitoring of Composites
Mohammad K. Idris; York University, Canada.

SESSION CP06.10: Processing and 3D Printing of Smart Materials
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 105 C

1:45 PM CP06.10.02
Direct Writing of Amphiphilic Graphene Ink for Stretchable Tactile Sensors with Highly Sensitive and Ultra-Broadband Frequency Response
Xin Jiang; Tsinghua University, China.

2:00 PM CP06.10.03
Fabrication of High-Performance Nanocomposites by Site-Specific Nanoparticle Orientation Through Additive Manufacturing
Sayli Jambhulkar; Arizona State University, United States.

2:15 PM CP06.10.04
Effective Unidirectional Wetting of Liquids on Biomimetic Patterned Surfaces via 3D Printing-Assisted Replication and Surface Modification
Hsu Che-Ni; National Tsing Hua University, Taiwan.

2:30 PM CP06.10.05
Solution Deposited Columnar Thin Films and Their Potential Application as Absorber Layers for SWIR Active Up-Conversion Devices
Yuval Golan; Ben-Gurion University of the Negev, Israel.

2:45 PM BREAK

3:15 PM CP06.10.06
Characterization and Simulation of Elastocaloric Effects of Shape Memory Poly(Cyclooctene) and Its Composites
Woong-Ryeol Yu; Seoul National University, Korea (the Republic of).

3:30 PM CP06.10.07
Tough and Water-Insensitive Self-Healing Elastomer for Soft Electronics
Jheong Kang; Stanford University, United States.

3:45 PM CP06.10.08
Y2Hf2O7:Eu3+ Nanoparticles with High Concentration Quenching Towards Red Emitting Phosphor, X-Ray Scintillator and Luminescent Thin Film
Yuanbing Mao; The University of Texas at Rio Grande Valley, United States.

4:00 PM CP06.10.09
Localized Self-Growth of Reconfigurable Architectures Induced by a Femtosecond Laser on a Shape-Memory Polymer
Ya-chao Zhang; University of Science and Technology of China, China.

4:15 PM CP06.10.10
Magnetoelastic Coupling in 2D Multiferroics
Menghao Wu; Huazhong University of Science & Technology, China.

4:30 PM CP06.10.11
Roll-to-Roll Manufacturing of Flexible Sensors for Environmental and Food Pollutants
Lia Stanciu1, 2; 1Purdue University, United States; 2Purdue University, United States.

4:45 PM CP06.10.12
Electrospinning and Plasma Treatment of Polyamides for Mosquito-Repellant Fabrics
Nicholas R. Etrick1, 2; 1University of Florida, United States; 2Cornell University, United States.
SYMPOSIUM CP07

From Mechanical Metamaterials to Programmable Materials
April 25 - April 26, 2019

Symposium Organizers
Alexander Boeker, Universität Potsdam and Fraunhofer IAP
Christoph Eberl, Fraunhofer IWM
Silvia Titotto, Federal University of ABC
Xiaoyu Zheng, Virginia Tech

* Invited Paper

SESSION CP07.01: Folding Mechanisms
Session Chairs: Christoph Eberl and Shu Yang
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 106 A

8:00 AM CP07.01.01
Bidirectional Self-Folding with Atomic Layer Deposition Bimorphs for Autonomous Micro-Origami
Baris Bircan; Cornell University, United States.

8:15 AM *CP07.01.02
Foldable and Responsive Soft Metamaterials
Shu Yang; University of Pennsylvania, United States.

8:45 AM CP07.01.03
Hinges for Origami-Inspired Structures by Multi-Material Additive Manufacturing—Materials and Design
Marius Wagner; ETH Zürich, Switzerland.

SESSION CP07.02: Mechanical Properties and Programming Aspects
Session Chairs: Christoph Eberl and Shu Yang
Thursday Morning, April 25, 2019
PCC West, 100 Level, Room 106 A

9:00 AM CP07.02.01
Selecting Metamaterials for Maximizing the Specific Stiffness of a Beam Under Different Loading Conditions
Raghav Sharma; Arizona State University, United States.

9:15 AM *CP07.02.02
Buckling Dominated Behavior of Elastic Hierarchical Truss Structures
Matthew Begley; University of California, Santa Barbara, United States.

9:45 AM CP07.02.03
Auxetic Lattice Materials from Symmetry Breaking
Pu Zhang; SUNY Binghamton, United States.

10:00 AM BREAK

SESSION CP07.03: Programming Mechanical Properties
Session Chairs: Jens Bauer and Xiaoyu Zheng
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 106 A

1:30 PM *CP07.03.01
Programmable Properties of Two-Photon-Polymerized Materials and Metamaterials
Jens Bauer; University of California, Irvine, United States.

2:00 PM CP07.03.02
Meta-Crystals—A Fusion of Physical Metallurgy and Architected Materials
Son Pham; Imperial College London, United Kingdom.

2:15 PM CP07.03.03
Mechanical Meta-Materials Inspired by Crystal Microstructure—Size Effect and Anisotropy
Chen Liu; Imperial College London, United Kingdom.

2:30 PM BREAK

SESSION CP07.04: Manufacturing Architectured Materials
Session Chairs: Jens Bauer and Xiaoyu Zheng
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 106 A

3:00 PM *CP07.04.01
Three-Dimensional Photonic Manufacturing—From Catalytic Waste Gas Converters to Microvascular Tissue Scaffolding
Nicholas Fang; Massachusetts Institute of Technology, United States.

3:30 PM CP07.04.02
Site Selective Laser Shaping of Architected Mechanical Metamaterials
Letian Wang; University of California, Berkeley, United States.

3:45 PM CP07.04.03
3D Printing of Zinc Oxide via a Novel Photopolymer System
Daryl Yee; California Institute of Technology, United States.

4:00 PM CP07.04.04
Atomic Layer Deposition for Membranes, Metamaterials and Machines
Tanner Pearson; Cornell University, United States.

4:15 PM CP07.04.05
Controlling Magnetic Properties in Fused Deposition Modeling Parts via Shape, Infill Orientation and Infill Percentage
Thomas M. Calascione; University of St. Thomas, United States.

SESSION CP07.05: Acoustic Design by Periodic Topology
Session Chairs: Diden Ozevin and Silvia Titotto
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 B

8:30 AM CP07.05.01
Controllable Elastomer Shape Modulation with Solvent Droplet Sequences
Akshay Phadnis; Arizona State University, United States.

8:45 AM CP07.05.02
Block Copolymer-Templated Nanoceramics with Ductile-Like Compression Behavior
Matthew B. Dickerson; Air Force Research Laboratory, United States.

9:00 AM *CP07.05.03
The Implementation of Periodic Topologies and Acoustic Metamaterials to the Design of Infrastructure Systems
Didem Ozevin; University of Illinois at Chicago, United States.

9:30 AM BREAK

SESSION CP07.06: Interaction with Acoustic and Electromagnetic Waves
Session Chairs: Diden Ozevin and Silvia Titotto
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 B

10:30 AM CP07.06.01
Shape Morphing Mechanical Metamaterials
Michael D. Bartlett; Iowa State University, United States.

10:45 AM *CP07.06.02
Tailoring Materials Properties Outside Classical Bounds—Towards Mechanically Programmable Materials
Peter Gambisch1,2; 1Karlsruhe Institute of Technology KIT, Germany; 2Fraunhofer IWM, Germany.

11:00 AM CP07.06.03
The Use of Negative Space Around Metamaterials to Improve the Performance of Energy Absorption Structures
Irving Ramirez Chavez; Arizona State University, United States.

11:15 AM CP07.06.04
Programmable Mechanical Metamaterials—Material, Machine and Everything in Between
Christoph Eberl; Fraunhofer-Institut fuer Werkstoffmechanik IWM, Germany.
10:00 AM CP07.06.01
Electrochemically Reconfigurable Architected Materials through Cooperative Beam Buckling and Defect Engineering Xiaoxing Xia; California Institute of Technology, United States.

10:15 AM CP07.06.02
Strain Rate Dependence of Additively Manufactured Polymer, Composite and Metallic Honeycomb Structures Dhiraj Patil; Arizona State University, United States.

10:30 AM CP07.06.03
High Strain Hardening, Lightweight, Three-Dimensional Mechanical Metamaterials with Microlattices Inspired by Crystal Twinning Letian Wang; University of California, Berkeley, United States.

10:45 AM *CP07.06.04
Acoustic Metasurface Yun Jing; North Carolina State University, United States.

11:00 AM *CP07.06.05
Engineering the Shapes of Organic Molecular Crystals to Generate Different Photomechanical Responses Fei Tong; University of California, Riverside, United States.

11:30 AM *CP07.06.06
Towards Programmable Optical Metasurfaces Jürgen Sautter; Friedrich Schiller University Jena, Germany.

10:30 AM CP08.01.01
Effect of Nucleating Particles on the Microstructure of 7075 Al Alloy Manufactured by Selective Laser Melting Javier Llorca; IMDEA Materials Institute, Spain.

10:45 AM CP08.01.02
Microstructure and Mechanical Properties of 316L Stainless Steel Fabricated Using Selective Laser Melting Naveed Iqbal; University of Coventry, United Kingdom.

11:00 AM *CP08.01.03
Corrosion and Corrosion Fatigue of Additively Manufactured 316L, Inconel 625 and Titanium Alloys Compared to Wrought and Cast Equivalents in Naval Environments Scott Olig; U.S. Naval Research Laboratory, United States.

11:30 AM CP08.01.04
Laser Metal Additive Manufacturing onto Silicon Arad Azizi; Binghamton University, United States.

10:30 AM CP08.02.01
Spotlight Talk—Optimization of Process Parameters for Additive Manufacturing Using Recycled Metal Powder Susana J. Castillo; University of Arizona, United States.

10:50 AM CP08.02.02
Spotlight Talk—Effect of Process Parameters on Characteristics of 316 L Stainless Steel Deposited by DED Jose Mingaves; Insper, Brazil.

10:55 AM CP08.02.03
Spotlight Talk—Corrosive Microstructurization of Nickel-Copper Gas Atomized Powders Stanislau Niauzorau; Arizona State University, United States.

11:45 AM CP08.03.02
Spotlight Talk—Effect of Process Parameters on Characteristics of 316 L Stainless Steel Deposited by DED Jose Mingaves; Insper, Brazil.

11:55 AM CP08.03.03
Spotlight Talk—Corrosive Microstructurization of Nickel-Copper Gas Atomized Powders Stanislau Niauzorau; Arizona State University, United States.
2:15 PM CP08.03.03
Nanofunctionalization for Additive Manufacturing of Crack-Free High Strength Aluminum Alloys
John H. Martin; HRL Laboratories, United States.

2:45 PM BREAK

3:15 PM CP08.03.04
Developing Metal Matrix Composites via Selective Laser Melting to Optimize Manufacturability and Material Performance
Steven Storck; Johns Hopkins University Applied Physics Lab, United States.

3:30 PM CP08.03.05
Optimizing Process Parameters in Selective Laser Melting to Alter Thermal Conductivity
Scott N. Schiffres; Binghamton University, United States.

SESSION CP08.04: Poster Session: Characterization—Microstructure Analysis and Mechanical Behavior
Session Chairs: Dawnielle Farrar-Gaines and Jennifer Wolk
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP08.04.01
Spotlight Talk—Effect of Process Parameters on Characteristics of 316 L Stainless Steel Deposited by DED
Joice Miagava; Insper, Brazil.

CP08.04.02
Spotlight Talk—Corrosive Microstructurization of Nickel-Copper Gas Atomized Powders
Stanislau Niauzorau; Arizona State University, United States.

CP08.04.03
Spotlight Talk—Optimization of Process Parameters for Additive Manufacturing Using Recycled Metal Powder
Susana J. Castillo; University of Arizona, United States.

CP08.04.04
Study on Thermal Stability of Nanocrystallized Inconel 718 Induced by Electropulsing Assisted Ultrasonic Surface Rolling Process
Zhiyan Sun; Tsinghua University, China.

CP08.04.05
The Interplay of Metals with Carbon and Boron Nitride Nanotubes
Christoph Rohmann1, 2; 1University of Maryland, United States; 2National Institute of Standards and Technology, United States.

CP08.04.06
An Electrochemical 3D Printer for Room-Temperature Direct Additive Manufacturing of Multiple Metals
Harry Apostolidis; Khalifa University of Science and Technology, United Arab Emirates.

SESSION CP08.05: Process Optimization and Control II
Session Chair: Dawnielle Farrar-Gaines
Wednesday Morning, April 24, 2019
PCC West, 100 Level, Room 106 A

10:00 AM CP08.06.01
Improving Fatigue Resistance of Selective Laser Melted Aluminum Alloy AlSi10Mg
Aude Simar; iMMC, Université catholique de Louvain, Belgium.

10:30 AM CP08.06.02
Printability of CrMnFeCoNi High Entropy Alloy
Son Pham; Imperial College London, United Kingdom.

10:45 AM CP08.06.03
Transients in Plastic Instabilities During Thermo-Mechanical Reversals in Metal Additive Manufacturing
Sabina C. Kumar1, 2; 1University of Tennessee, United States; 2Oak Ridge National Laboratory, United States.

11:00 AM CP08.06.04
Laser Beam Melting of Large-Scale Ti-6Al-4V Parts—Increasing Productivity and Reducing Residual Stresses
Dirk Herzog1, 2; 1Hamburg University of Technology, Germany; 2Fraunhofer Research Institution for Additive Manufacturing Technologies IAPT, Germany.

SESSION CP08.07: Characterization—Microstructure Analysis and Mechanical Behavior II
Session Chair: Dawnielle Farrar-Gaines
Wednesday Afternoon, April 24, 2019
PCC West, 100 Level, Room 106 A

1:30 PM CP08.07.01
Qualification of Additive Manufactured Components—Integration of Modeling, Measurement and Manufacturing Processes
Sudarsanam S. Babu1, 2; 1University of Tennessee, Knoxville, United States; 2Oak Ridge National Laboratory, United States.

2:00 PM CP08.07.02
Rapid Development of Mechanical Models for Additively Manufactured Materials
Michael Presley; JHU/APL, United States.

2:30 PM BREAK

3:30 PM CP08.07.03
Microstructural Analysis and Mechanical Behavior of a High Entropy Alloy Produced with Selective Laser Melting (SLM)
Nikole Kucza; GE Global Research, United States.

3:45 PM CP08.07.04
Electrical Tuning of Additive Manufactured Metal Microstructures
Aman Haque; The Pennsylvania State University, United States.

4:00 PM CP08.07.05
Evaluation of a Learning Tool for In Situ Monitoring of Metal Additive Manufacturing
Jonas Van Vaerenbergh; 3D Systems, Belgium.

4:15 PM CP08.07.06
Nanoindentation Based Investigation of Additively Manufactured Inconel 718 at High Temperature
Tyler Palma; Lamar University, United States.
10:30 AM *CP09.01.01
Electricaly Driven Three-Dimensional Solitary Waves as Director Bullets in Nematic Liquid Crystals Oleg D. Lavrentovich; Kent State University, United States.

11:00 AM *CP09.01.02
Spherical Particle in Nematic Liquid Crystal Under an External Field—The Saturn Ring Regime Lia Bромшид; McMaster University, Canada.

11:30 AM *CP09.01.03
Chromonic Liquid Crystals and Bacteriophage Viruses Maria-Carme Calderer; University of Minnesota, United States.

1:30 PM *CP09.02.01
The Direct Conversion of Heat to Electricity Using Ferroelectric Oxides Richard D. James; University of Minnesota, United States.

2:00 PM *CP09.02.02
Design of Nematics Through Colloidal Homogenisation Arghir D. Zarnescu1, 2; 1Basque Center for Applied Mathematics, Spain; 2”Simion Stoilow” Institute of Mathematics, Romania.

2:30 PM *CP09.02.03
Hidden Variables and Internal Scales in Composite Materials Elena Cherkasova; University of Utah, United States.

3:00 PM BREAK

3:30 PM CP09.02.04
Flow Effects in High-Frequency Homogenization of Porous Media in Electromagnetic Heat Exchangers Burt Tilley; Worcester Polytechnic Institute, United States.

3:45 PM CP09.02.05
Predicting Dynamic Properties of Computer Designed Metal-Organic Frameworks by Deep Learning Weiwei Zhang; University of California, Riverside, United States.

4:00 PM CP09.02.06
Flexible Boundary Conditions for Random Alloys Using Machine Learning Hyojung Kim; University of Illinois at Urbana Champaign, United States.

4:15 PM CP09.02.07
Flow Instability Mechanism for Formation of Self-Ordered Porous Anodic Oxide Films Pratyush Mishra; Iowa State University, United States.

4:30 PM CP09.02.08
A Fully Coupled Diffusional-Mechanical Finite Element Modeling for Tin Dioxide-Coated Copper Anode System in Lithium-Ion Batteries Kyewong Jeong; Seoul National University, Korea (the Republic of).

8:30 AM CP09.03.01
Development of an Experimental Method to Define the Kinetic Parameters of a Phase Field Model—Application to Zirconium Hydride Precipitation Pierre-Clement A. Simon; The Pennsylvania State University, United States.

8:45 AM CP09.03.02
Multi-Phase Field Model of Localized Corrosion Kinetics with Corrosion Products Formation Talha Q. Ansari; The Hong Kong Polytechnic University, Hong Kong.

9:00 AM CP09.03.03
Precipitation and Strengthening Modeling for Disk-Shaped Particles in Aluminum Alloys—Size Distribution Considered Yue Li1, 2, 3; 1University of Science and Technology Beijing, China; 2SINTEF, Norway; 3Norwegian University of Science and Technology, Norway.

9:15 AM CP09.03.04
Refraction with Phase Discontinuities on Nonflat Metasurfaces Eric Stachura; Kennesaw State University, United States.

9:30 AM *CP09.03.05
On the Voronoi Implicit Interface Method Selim Esedoglu; University of Michigan, United States.

10:00 AM BREAK

10:30 AM *CP09.03.06
Theory and Modeling of Abnormal Grain Growth Elizabeth A. Holm; Carnegie Mellon University, United States.

11:00 AM *CP09.03.07
Shape and Composition Control in 2D-TMD Alloy Sheets—Benjamin "MoSeC" Franklin David J. Srolovitz1, 3, 2; 1City University of Hong Kong, Hong Kong; 2City University of Hong Kong, Hong Kong.

11:30 AM CP09.03.08
Γ-Convergence of Threshold Dynamics Algorithms Tiago Salvador; University of Michigan, United States.

11:45 AM CP09.03.09
Mathematical Modelling Beyond Computation—An Example on Epitaxial Growth of Magnetic Films for Tailoring of Magnetic Anisotropy Artur Braun; Empa, Switzerland.

1:30 PM CP09.04.01
Coarse-Graining Out of Equilibrium—From Particles to Dissipative PDEs Celia Reina; University of Pennsylvania, United States.

2:00 PM CP09.04.02
Limit Shapes for Gibbs Ensembles of Partitions Ibrahim Fatkullin; University of Arizona, United States.

2:30 PM BREAK
3:30 PM CP09.04.03
Motile Active Matter—Emergent Properties by Structure and Hydrodynamics Roland G. Winkler; Institute for Advanced Simulations, Germany.

3:45 PM CP09.04.04
A Variational Principle for Mass Transport Calculations Dallas R. Trinkle; University of Illinois at Urbana-Champaign, United States.

4:00 PM CP09.04.05
A Regularised Dean-Kawasaki Model for Weakly Interacting Particles Federico Combalba; University of Bath, UK, United Kingdom.

4:15 PM CP09.04.06
First-Principles Calculation of Third-Order Elastic Constants via Numerical Differentiation of the Second Piola-Kirchhoff Stress Tensor Angelo Bongiorno; College of Staten Island - CUNY, United States.

4:30 PM CP09.04.07
Multiscale Modeling—First-Principles Parameterization of Force Fields for Classical Atomistic Simulations Using Atomistic Descriptors Extracted from Quantum Chemistry Calculations Thomas A. Manz; New Mexico State Univ, United States.

SESSION CP09.05: Poster Session: Mathematical Aspects of Materials Science—Modeling, Analysis and Computations
Session Chairs: Patricia Bauman and Dmitry Golovaty
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

CP09.05.01
Computational Analysis of Structural Defects In Silica Aerogels Based on Experimental Data from Remote Temperature Sensing Firoozeh Sabri; University of Memphis, United States.

CP09.05.02
Automatic Mass Spectrum Peak Labeling by Maximal Likelihood Estimate in Atom Probe Tomography Alex Ulyanenkov; Atomicum GmbH, Germany.

CP09.05.03
Numerical Simulation of Faceted Surface Modification by Chemical Etching for Solar Energy Technology Zong-You Yang; National University of Taiwan, Taiwan.

CP09.05.04
Simulation of Microstructural Evolution of Thin Films During Chemical Bath Deposition Process with the Changing Precursor Concentration Han-Lin Hu; National University of Taiwan, Taiwan.

CP09.05.05
The Peculiarities of Mathematical Modeling of Electromagnetic Stirring of Silicon Melt Sergey M. Karabanov; Ryazan State Radio Engineering University, Russian Federation.

CP09.05.06
Theoretical Design and Characterization of Modified Graphene for Biomedical Applications Ernesto Lopez Chavez1, 2; 1Autonomous Univ-Mexico City, Mexico; 2CICATA-IUPN, Mexico.

CP09.05.07
Computational Techniques for Calculating Material Properties from Coarse-Grained Epoxy Curing Simulations Mike Henry; Boise State University, United States.

CP09.05.08
On the {10-12}<-1011> Twinning in Hexagonal Close-Packed Metals—A Crystallographic Model with the Emphasis on the Role of Partial Stacking Faults in {10-12} Twin Nucleation Reza Namakan; Louisiana State University, United States.

CP09.05.09
Predicting Phase-Dependent Anisotropic Ion Transport in Single-Ion Conducting Block Copolyelectrolytes Using Dissipative Particle Dynamics Simulations And Diffusivity Tensors Huanhuan Zhou; Florida State University, United States.

CP09.05.10
Computational Modeling of Surface Sputtering and Redeposition from Micro-Architected Surfaces Andrew Alvarado; University of California, Los Angeles, United States.

CP09.05.11
Computational Modeling of Secondary Electron Emission from Micro-Architected Surfaces Hsin-Yin Chang; University of California, Los Angeles, United States.

CP09.05.12
The Sensitivity of the Electron Transport Response within Zinc Oxide to Variations in the Crystal Temperature, the Doping Concentration, and the Non-Parabolicity Associated with the Lowest Energy Conduction Band Valley Stephen K. O'Leary; University of British Columbia, Canada.

CP09.05.13
Simple Models for Testing Self-Assembly Robustness Rachel Singleton; Boise State University, United States.

CP09.05.14
Dislocation Dynamics of Deformation and Creep in Alloys Ajay Annamreddy; North Carolina State University, United States.

CP09.05.15

CP09.05.16
Predicting Assemblies of Complex Macromolecules for Organic Photovoltaics Mia Klopfenstein; Boise State University, United States.

CP09.05.17
Coupled Ray Tracing and Lattice Boltzmann Model of TiO2 Micropillars Array for Water Purification Pegah Mirabedini; University of California, Riverside, United States.

CP09.05.18
Is Atomic Size-Mismatch a Sufficient Condition to Yield Fragility in Bulk Metallic Glass Forming Liquids? Tina Mizraei; University of California, Riverside, United States.

CP09.05.19
A Neural Networks Approach to Predicting the Orientations of Images Vincent Davis1, 2; 1North Carolina Central University, United States; 2North Carolina State University, United States.

CP09.05.20
Surface Coupling Synchronization by Nanostructure Manipulation in a SiO2 Thin Film Sunny Sui; Arizona State University, United States.

CP09.05.21
Atomic Scale Distribution of Oxygen Vacancies and Metal Atoms in BaCe1-x-YxO3+y/2 (y=0.15) Bulk and Grain-Boundary Using Genetic Algorithm and Lattice Statics Yeong-Cheol Kim; KoreaTech, Korea (the Republic of).

SESSION CP09.06: Analysis of Materials—Instability, Defects and Fracture
Session Chairs: Patricia Bauman, Maria Emelianenko and Dmitry Golovaty
Thursday Morning, April 25, 2019
8:30 AM CP09.06.01
Modeling Fracture Due to Thermal Expansion of Polycrystalline Alpha Uranium at Room Temperature Aashique A. Rezwan; The Pennsylvania State University, United States.

8:45 AM CP09.06.02
Continuum Stress Intensity Factors from Atomic Fracture Simulations Mark Wilson; Sandia National Laboratories, United States.

9:00 AM CP09.06.03
A Variational Perspective on Wrinkling Patterns in Thin Elastic Sheets Robert Kohn; New York University, United States.

9:30 AM CP09.06.04
Equilibria for Thin Grain Systems—Surface Diffusion and Grain Migration Amy Novick-Cohen; Technion–Israel Institute of Technology, Israel.
SESSION CP09.07: Mathematics of Nanoscale Structures and 2D Materials
Session Chairs: Patricia Bauman, Maria Emelianenko and Dmitry Golovaty
Thursday Afternoon, April 25, 2019
PCC West, 100 Level, Room 106 B

1:30 PM *CP09.07.01
Plasmonics on 2D Materials—A Flavor of Dispersion and Homogenization
Dionisos Margetis; University of Maryland, United States.

2:00 PM *CP09.07.02
Multiscale Modeling of van der Waals 2D Stacked Materials
John Lowengrub; University of California, Irvine, United States.

2:30 PM CP09.07.03
Multiscale Modeling of Weakly Interacting Incommensurate 2D Lattices
J. P. Wilber; University of Akron, United States.

2:45 PM BREAK

3:15 PM CP09.07.04
Hamiltonians and Order Parameters for Crystals Containing Orientable Molecules
John C. Thomas; University of California, Santa Barbara, United States.

3:30 PM CP09.07.05
A Practical Approach to Bypassing Kohn-Sham DFT Using Machine Learning Techniques
Amit Samanta; Lawrence Livermore National Laboratory, United States.

3:45 PM CP09.07.06
Thermal/Electrostatic Green’s Function for 2D Phosphorene/Metal Composite and Possibility of Its Measurement by Using SPM
Virend K. Tewary; National Institute of Standards and Technology, United States.

4:00 PM CP09.07.07
Role of Mesoscopic Friction and Network Morphology in Carbon Nanotube Yarn Formation—A Distinct Element Method Study
Yuezhou Wang1, 2; 1Minnesota State University, Mankato, United States; 2University of Minnesota Twin Cities, United States.

4:15 PM CP09.07.08
Towards Quantitative Modeling of Co-Based Superalloys
Wenkun Wu1, 2; 1Northwestern University, United States; 2Argonne National Laboratory, United States.

SESSION CP09.08: Dislocations and the First Principles Modeling
Session Chairs: Patricia Bauman, Maria Emelianenko and Dmitry Golovaty
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 C

8:30 AM CP09.08.01
Acousto-Plasmonic Coupling—The Raman Energy Density (RED)
Jose Luis Montaño-Priede; The University of Texas at San Antonio, United States.

8:45 AM CP09.08.02
Assessing the Size Effect on Frank-Read Source Operation in f.c.c Metallic Materials Through Concurrent Atomicistic-Continuum Simulations
Thanh Pham; Iowa State University, United States.
In organic electronics, it is critically important to understand how chemical structure influences molecular packing, carrier transport, and ultimately device performance. The self-assembly properties of liquid crystalline semiconductors offer many interesting advantages for fabricating highly ordered molecular films with interesting properties, including high carrier mobilities and good thermal stability.

This tutorial will provide a comprehensive overview of molecular self-assembly and liquid crystallinity in organic electronics. We aim to highlight the great potential for exploiting these effects in large-scale applications. We will begin by introducing the basics of liquid crystalline small molecules and polymers, liquid crystalline mesophases, film processing and characterization, and device physics. Relevant experimental and theoretical tools for studying this class of materials will be introduced. Finally, we will survey state-of-the-art results on the application of liquid crystalline semiconductors in high performance organic electronics.

This tutorial is aimed at experimentalists and theorists in physics, chemistry, and material science.

1:30 PM  
Basics of Liquid-Crystalline Small-Molecule Semiconductors—Liquid Crystals as an Organic Semiconductor from Materials to Devices  
Jun-ichi Hanna; Tokyo Institute of Technology

The basics of liquid crystalline small molecule semiconductors, with focus on controlling molecular order via liquid crystalline mesophases, electrical transport in liquid crystalline films, device physics and applications.

2:30 PM BREAK

3:00 PM  
Liquid Crystallinity in Conjugated Polymers  
Enrique Gomez; The Pennsylvania State University

The basics of polymeric liquid crystalline semiconductors, with focus on molecular design, controlling molecular order, film characterization, electrical and optical properties.

4:00 PM  
Investigating Transport in Liquid Crystalline Semiconductors  
Elizabeth von Hauff; Vrije Universiteit Amsterdam

Concepts of carrier transport in organic semiconductors with focus on how molecular ordering determines transport phenomena.
SESSION EP01.04: Material Design and Fabrication II
Session Chair: Enrique Gomez
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 A

8:45 AM *EP01.04.01
Liquid Crystalline Composites as an Organic Semiconductor Yo Shimizu; Nara Institute of Science and Technology, Japan.

9:15 AM EP01.04.03
Planerly-Oriented Polycrystalline Thin Films Fabricated with Smectic Liquid Crystalline Organic Semiconductors Jun-Ichi Hanna; Tokyo Institute of Technology, Japan.

9:30 AM EP01.04.04
Surface Crystallization Studies of 2-decyl-7-phenyl-[1]benzothieno[3,2-b][1]benzothiophene (Ph-BTBT-10) Wolfgang R. Bodlos; Graz University of Technology, Austria.

9:45 AM EP01.04.05
Accelerated Prediction of Self-Assembly and Charge Transport in P3HT and More Evan Miller; Boise State Univ, United States.

10:00 AM BREAK

SESSION EP01.05: Devices II
Session Chairs: Sabine Ludwigs and Iain McCulloch
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 A

10:30 AM *EP01.05.01
High-Performance Ternary Organic Solar Cell Enabled by a Thick Active Layer Containing a Liquid Crystalline Small Molecule Donor Fei Huang; South China Univ of Technology, China.

11:00 AM EP01.05.02
Exploring the Growth and Post-Deposition Dewetting of Dinaphthothienothiophene (DNTT) Films and Relating it to Organic Thin-Film Transistor Performance Rachana Acharya1, 2; 1Max Planck Institute for Solid State Research, Germany; 2Institute of Materials Science, University of Stuttgart, Germany.

11:15 AM EP01.05.03
Microstructural Origin of Temperature Independent Electron Mobility in a Polymer Field-Effect Transistor Mario Caironi; Istituto Italiano di Tecnologia, Italy.

11:30 AM EP01.05.04
Direct-Write Polarizers Built from Charge-Transfer Liquid Crystals Bryan Kahr; Sandia National Laboratories, United States.

11:45 AM EP01.05.05
Watching Ions Diffuse—Potential Modulated Spectroscopy for Structure-Property Relationships of Polymer Electrochemical Devices Judith L. Jenkins; Eastern Kentucky Univ, United States.

SESSION EP01.06: Transport II
Session Chairs: Jun-Ichi Hanna and Elizabeth von Hauff
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 A

1:30 PM *EP01.06.01
Polaron Delocalization and Mesoscale Effects in Charge Transport in Semicrystalline Conjugated Polymers Alberto Salleo; Stanford University, United States.

2:00 PM *EP01.06.02
Nematic Interactions, Ordering and Effects on Charge Mobility in Semiconducting Copolymers Scott T. Milner; The Pennsylvania State University, United States.

2:30 PM BREAK

SESSION EP01.07: Material Design and Fabrication III
Session Chairs: Jun-Ichi Hanna and Fei Huang
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 A

3:30 PM *EP01.07.01
Electronic Functions in Liquid-Crystalline Nanostructures with High Polarization Masahiro Funahashi1, 2; 1Kagawa University, Japan; 2National Institute of Advanced Industrial Science and Technology, Japan.

4:00 PM EP01.07.02
Phase Behavior of an Asymmetric Benzothienobenzo thiophene (BTBT) Derivative as a Function of Temperature Sebastian Hohler; Graz University of Technology, Austria.

4:15 PM EP01.07.03
Impact of Molecular Orientation on Electronic States at Interfaces Between Co and Highly Ordered Pentacene Toshio Nishi; Sony Corporation, Japan.

4:30 PM *EP01.07.04
Controlled Crystallization Strategies for Organic Electronic Applications Sabine Ludwigs; University of Stuttgart, Germany.
Remote-Controllable Actuating and Rewritable Films Fabricated by Self-Assembled Hierarchical Superstructure  
Dayoung Jung; Chonbuk National University, Korea (the Republic of).

Coatable E-Type Polarizer Fabricated by Perylenediimide-Based Reactive Mesogen  
Minwoo Rim; Chonbuk National University, Korea (the Republic of).

Uniaxial Orientation of Liquid Crystal Monomers for Directional Thermal Conductivity  
Hyeyeon Ko; Chonbuk National University, Korea (the Republic of).

Reversible Doping in Organic Electronics—A Strategy to Finely Tune Electrical Conductivity  
Jonathan Harris; University of Arizona, United States.

Controlling Solution Assembly Behaviors of P3HT-b-P2VP Block Copolymers via Tuning Regioregularity  
Younokwon Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

Discrete Monolayers of a Benzothieno-benzothiophene Derivative at Silicon Oxide Surfaces—Structures Formed by Liquid Crystalline States  
Poland Reisel; Graz University of Technology, Austria.

Optical and Structural Anisotropy in Pentacene Thin Films Revealed by pMAIRS  
Nobutaka Shioya; Institute for Chemical Research, Kyoto University, Japan.

Thin-Film Structure Analysis and Organic Field-Effect Transistor Performance of a Liquid Crystalline Material Ph-BTBT-10  
Yuji Yamaguchi; Tokyo Chemical Industry Co., Ltd., Japan.

Understanding Molecular Aggregation of Emissive Guests in Organic Light-Emitting Diods with Atom Probe Tomography  
Matthew Jaskot; Colorado School of Mines, United States.

Molecular Scale Patterning of Photonic Structures via Conformational Control  
Alice Smith; University of Oxford, United Kingdom.

Phase Diagrams of poly(3-alkylthiophene):N,N'-alkyl Substituted Naphthalene Diimides Blends  
Dorota Chlebosz1, 2; 1Wroclaw University of Science and Technology, Poland; 2Max Planck Institute for Polymer Research, Germany.

SESSION EP01.09: Material Design and Fabrication IV  
Session Chairs: Enrique Gomez and Elizabeth von Hauff  
Thursday Morning, April 25, 2019  
PCC North, 200 Level, Room 221 A

Solution-Processed Photovoltaics—Opportunities Provided By Use of Material Science Tools  
Natalie Stingelin; Georgia Institute of Technology, United States.

Nanostructured Liquid-Crystalline Assemblies for Ion and Electron Transport  
Takashi Katoh; The University of Tokyo, Japan.

Molecular Packing Dependent Photophysics and (Opto)electronic Properties of Functionalized Anthradithiophene Single Crystals  
Jonathan Van Schenck; University of Augsburg, Germany.

SESSION EP02: Joint Session: Soft, Biointegrated Electronics and Photonics  
Session Chairs: Hui Fang, Marc Ramuz, Xing Sheng and Cunjiang Yu  
Tuesday Morning, April 23, 2019  
PCC North, 200 Level, Room 222 A

Skin-Inspired Organic Electronics  
Zhenan Bao; Stanford University, United States.

Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices  
Joseph Wang; University of California, San Diego, United States.

Human Skin Interactive Bio-e-skin for Self-Powered Health Care Monitoring  
Dipankar Mandal1, 2; 1Institute of Nano Science and Technology, India; 2Jadavpur University, India.

Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation  
Philipp Gutruf; University of Arizona, United States.

3:00 PM BREAK

3:30 PM *EP02.02.05/EP02.03.02/EP04.02.05  
Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring  
Takao Someya1, 2; 1University of Tokyo, Japan; 2RIKEN Center for Emergent Matter Science, Japan.

4:00 PM *EP02.02.06/EP02.03.02/EP04.02.06  
Physical Biology and Material Dynamics at the Semiconductor-Based Biointerfaces  
Rozhi Tian; The University of Chicago, United States.
4:30 PM *EP02.02.07/EP03.02.07/EP04.02.07
Autonomic Self-Healing and Intrinsical Stretchability of PEDOT:PSS Films Fabio Ciccora; Polytechnique Montréal, Canada.

4:45 PM EP02.02.08/EP03.02.08/EP04.02.08
Implantable Neurotransmitter Monitoring Based on Luminescent MOFs and Flexible Electronics Hao Xu; Tianjin University, China.

SESSION EP02.03: Photonic Materials and Devices for Biointerfaces II
Session Chairs: Xiaoting Jia and Xing Sheng
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 223

8:30 AM *EP02.03.01
Laser-Emission Based Microscopy for Cell, Tissue and Neural Network Analysis Xudong S. Fan; University of Michigan, United States.

SESSION EP02.04: Photonic Materials and Devices for Biointerfaces III
Session Chairs: Wenlong Cheng and Xiaoting Jia
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 223

1:30 PM *EP02.04.01
Flexible and Stretchable Integrated Photonics Yuejian Hu; Massachusetts Institute of Technology, United States.

4:00 PM *EP02.04.05
Stretchable Microscale Surface-Emitting Lasers as a Patternable Coherent Light Source for Biointegrated Optoelectronics Jongseung Yoon; University of Southern California, United States.

4:00 PM EP02.04.06
Metal Oxide in Photovoltaic Biointerfaces Enables Capacitive Photostimulation of Neurons Shashi B. Srivastava; Koc University, Turkey.

4:45 PM EP02.04.07
Stain-Resistant Superomniphobic Flexible Optical Plastics Based on Nano-Enoki Mushrooms Sadig Haghaniifar; University of Pittsburgh, United States.
Graphene-Related Materials for Electronic Skins Guozhen Shen; Institute of Semiconductors, CAS, China.

Textured Si Nanowires for Highly Localized Optical Modulation of Cellular Dynamics Yin Fang1, 2; 1University of Chicago, United States; 2University of Chicago, United States.

Enabling Intracellular Recordings on Commercial High-Density Multi-Electrode Arrays by Optoacoustic Poration and Meta-Electrodes Francesco De Angelis; Istituto Italiano di Tecnologia, Italy.

SESSION EP02.07: Photonic Materials and Devices for Biointerfaces V

*EP02.07.01
Fully Rubbery Stretchable Electronics, Sensors and Integrated Devices Cunjiang Yu; University of Houston, United States.

Flexible microLED for Displays and Biomedical Applications Keon Jae Lee; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

Engineering Transparent Graphene Microelectrodes to Overcome Quantum Capacitance Limit Yuchen Lu; University of California, San Diego, United States.

Plasmonic Response of Light-Activated, Nano-Gold Doped Polymers Jessica M. Andriolo1, 2; 1Montana Technological University, United States; 2Montana Technological University, United States.

SESSION EP02.07 BREAK

EP02.07.05
Developing Clinical Grade Implantable Optoelectronics Patrick Degenaar; Newcastle University, United Kingdom.

Nanostructure-Enhanced Devices for Flexible and High-Performance Electronics and Optoelectronics Zhiyong Fan; Hong Kong University of Science and Technology, China.

Spatial Control over Bi10V2O33Eu3+ Core-Shell Nanoparticles and the Effects of Weak Electric Field on the Photoluminescence Behavior James A. Dorman; Louisiana State University, United States.

Dual Light-Emitting Iodide Nanoparticles—Up-Conversion Emission and Second Harmonic Generation Geraldine Datelle; Institut Néel, CNRS, France.

SESSION EP03.01: Biodegradable and Biocompatible Electronics

Biodegradable and Biocompatible Microelectromechanical Systems Mark G. Allen; University of Pennsylvania, United States.

Fully Biodegradable Batteries for Self-Powered Transient Implants Lan Yin; Tsinghua University, China.

Bioresorbable Electronics for Minimally Invasive Medical Sensing and Treatment of Nervous System Seung-Kyun Kang; Seoul National University, Korea (the Republic of).

Digitally Inkjet-Printed Electro(Fluoro)Chromic Devices Consisting of Biodegradable and Biocompatible Materials Manuel Pietsch1, 2; 1Karlsruhe Institute of Technology, Germany; 2InnovationLab, Germany.

Skin-Inspired Organic Electronics Zhenan Bao; Stanford University, United States.

Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices Joseph Wang; University of California, San Diego, United States.

Human Skin Interactive Bio-e-skin for Self-Powered Health Monitoring Dipankar Mandal1, 2; 1Institute of Nano Science and Technology, India; 2Jadavpur University, India.

Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation Philip Gutruf; University of Arizona, United States.

SESSION EP03.02/EP02.02/EP04.02: Joint Session: Soft, Biointegrated Electronics and Photonics

Soft, Biointegrated Electronics and Photonics Session Chairs: Hui Fang, Marc Ramuz, Xing Sheng and Cunjiang Yu Tuesday Afternoon, April 23, 2019 PCC North, 200 Level, Room 222 A

Skin-Inspired Organic Electronics Zhenan Bao; Stanford University, United States.

Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices Joseph Wang; University of California, San Diego, United States.

Human Skin Interactive Bio-e-skin for Self-Powered Health Monitoring Dipankar Mandal1, 2; 1Institute of Nano Science and Technology, India; 2Jadavpur University, India.

Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation Philip Gutruf; University of Arizona, United States.

SESSION EP03.03.01: Biodegradable and Biocompatible Electronics

Biodegradable and Biocompatible Microelectromechanical Systems Mark G. Allen; University of Pennsylvania, United States.

Fully Biodegradable Batteries for Self-Powered Transient Implants Lan Yin; Tsinghua University, China.

Bioresorbable Electronics for Minimally Invasive Medical Sensing and Treatment of Nervous System Seung-Kyun Kang; Seoul National University, Korea (the Republic of).

Digitally Inkjet-Printed Electro(Fluoro)Chromic Devices Consisting of Biodegradable and Biocompatible Materials Manuel Pietsch1, 2; 1Karlsruhe Institute of Technology, Germany; 2InnovationLab, Germany.

Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring Takao Someya1, 2; 1University of Tokyo, Japan; 2RIKEN Center for Emergent Matter Science, Japan.
4:00 PM *EP03.02.06/EP02.02.06/EP04.02.06
Physical Biology and Material Dynamics at the Semiconductor-Based
Biointerfaces Bozhi Tian; The University of Chicago, United States.

4:30 PM EP03.02.07/EP02.02.07/EP04.02.07
Autonomous Self-Healing and Intrinsical Stretchability of PEDOT:PSS
Films Fabio Ciccare; Polytechnique Montréal, Canada.

4:45 PM EP03.02.08/EP02.02.08/EP04.02.08
Implantable Neurotransmitter Monitoring Based on Luminescent MOFs and
Flexible Electronics Hang Xu; Tianjin University, China.

SESSION EP03.03: Poster Session: Materials Strategies and Device Fabrication for
Biofriendly Electronics
Session Chairs: Hui Fang and Lan Yin
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP03.03.01
Application of Active Transient Mechanism in Design of Biodegradable and
Environmentally Friendly Polymeric Electronics Reihanajamshadi; University of
Hartford, United States.

EP03.03.02
Vibrational Spectroscopy of Thiophene ElectrolypORIZATION Shrirang S.
Chhatre; University of Delaware, United States.

EP03.03.03
Honey as Gate Dielectric for Organic Thin-Film Transistor Feng Zhao;
Washington State University, United States.

EP03.03.04
Plasma Cleaning of Organics on Biominalized Nanopores Nishant Satapathy;
Arizona State University, United States.

8:00 AM *EP03.04.00
Biopolyimides for Transparent Insulators Tatsumo Kaneko; Japan Advanced
Institute of Science and Technology, Japan.

8:30 AM *EP03.04.01
Enroute Towards Biodegradable Organic Electronics Materials and
Devices Clara Santato; Polytechnique Montreal, Canada.

9:00 AM EP03.04.02
Fully Bioabsorbable Natural-Materials-Based Triboelectric
Electrogenerators Zhao Lu; Beihang University, China.

9:15 AM *EP03.04.03
High Performance Bioresorbable Electronics Based on Spontaneous Room-
Temperature Sintering Xian Huang; Tianjin University, China.

9:45 AM EP03.04.04
Biodegradable Elastomers for Stretchable Light-Emitting Electrochemical
Cells Martin Held; Karlsruhe Institute of Technology, Germany.

10:00 AM BREAK

10:30 AM EP03.04.05
Solvent Treatment Stabilizes the In Vitro Response of Enzymatic
Sensors Dongliang Wang; University of Connecticut, United States.

10:45 AM *EP03.04.07
Silicon Nanomembrane-Based Visible/Infrared Phototransistors and Their
Applications in Transparent Electronics Yang Feng Mei; Fudan University, China.

11:15 AM EP03.04.08
Transparent Single Electrode Silk Triboelectric Nanogenerators for
Biomechanical Energy Harvesting Narendra Gogurla; Ajou University, Korea
(the Republic of).

SESSION EP03.05: Bioelectronic Interface
Session Chairs: Hai Fang, Mihai Irimia-Vladu and Lan Yin
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 221 C

1:30 PM *EP03.05.01
Hydrogel-Based Electronics—Ultracompliant Electrodes for Neural Interfaces
and Beyond Christopher J. Bettinger; Carnegie Mellon University, United States.

2:00 PM EP03.05.02
Biologically Produced Fluorescent Proteins for Advanced Photonic
Devices Malte C. Gather; University of St Andrews, United Kingdom.

2:15 PM EP03.05.03
Photothermally Tunable Biodegradation of Implantable Triboelectric
Nanogenerators for Tissue Repairing Zhe Li; Beijing Institute of Nanoenergy
and Nanosystems, China.

2:30 PM BREAK

3:30 PM *EP03.05.04
Biomimetic and Bioactive Strategies Towards Seamless Neural
Implants/Tissue Integration Tracy Cui; University of Pittsburgh, United States.

4:00 PM EP03.05.05
All Organic Piezoelectric E-Skin Sensor for Self-Powered Wearable
Electronics and Human Physiological Signal Monitoring Kuntal Maity;
Jadavpur University, India.

4:15 PM *EP03.05.06
Tattoo Paper as a Platform for Bio-Friendly and Skin-Contact Conformable
Electronics Francesco Greco1, 2, 3; 1Graz University of Technology,
Austria; 2Istituto Italiano di Tecnologia, Italy; 3Waseda University, Japan.

4:45 PM EP03.05.07
Conductive Polyhydroxybutyrate/Reduced Graphene Oxide Biocomposite
Temperature Sensor Dan Li; University of Alberta, Canada.

SESSION EP03.06: Biofriendly Materials
Session Chairs: Gerardo Hernandez-Sosa and Mihai Irimia-Vladu
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 221 C

8:30 AM *EP03.06.01
Facile Non-Invasive Electrical Probe for Studying Photoinduced Events in
Primary Explants K.S. Narayan; Jawaharlal Nehru Center for Advanced Scientific
Research, India.

9:00 AM EP03.06.02
Organic Electrochemical Transistor Response to Liquid and Solid Bacteria
Growth Media Eric Frantz; University of Cincinnati, United States.

9:15 AM *EP03.06.03
Organic Electronic Devices as Multi-Modal Transducers of Cellular
Activity Charalampos Pitsalidis; 1Graz University of Technology,
Austria; 2Istituto Italiano di Tecnologia, Italy; 3Waseda University, Japan.

9:45 AM EP03.06.04
Electrolyte-Gated Carbon Nanotubes Transistors for Electrical Monitoring of
Cell Cultures Mario Caireni; Istituto Italiano di Tecnologia, Italy.

10:00 AM BREAK

10:30 AM *EP03.06.05
Light-Responsive Materials for Bioelectronics from Photosynthetic
Microorganisms Gianluca M. Farinola; University degli Studi-Bari Aldo Moro,
Italy.

11:00 AM EP03.06.06
Conductive Biopolymeric Proteins for Bio-Hybrid Devices Noemie-Manuelle
Dorval Courchesne; McGill University, Canada.

11:15 AM EP03.06.07
Perovskite Biointerface for Optical Stimulation of Neural Cells Shashi B.
Srivastava; Koc University, Turkey.
SYMPOSIUM EP04

Soft and Stretchable Electronics—From Fundamentals to Applications
April 23 - April 26, 2019

Session Chairs: Hui Fang, Marc Ramuz, Xing Sheng and Cunjiang Yu

Session Chairs: Roozbeh Ghaffari, Pooi See Lee, Marc Ramuz and Cunjiang Yu
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 A

10:30 AM *EP04.01.01
Liquid Metals Encased in Functional Elastomers for Soft and Stretchable Electronics Michael Dickey; North Carolina State University, United States.

11:00 AM EP04.01.02
Polymerized Liquid Metal Networks for Activatable Stretchable Conductors and Sensors Carl Traverski; Air Force Research Laboratory, United States.

11:15 AM EP04.01.03
Micro-Patterned Liquid Metal Based Conductors for Large-Area Stretchable Electronics Laurent Dejace; Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland.

11:30 AM EP04.01.04
Stretchable Elastic Shape Memory Fibers with Electrical Conductivity Sungjune Park; Chonbuk National University, Korea (the Republic of).

11:45 AM EP04.01.05
The Freeze/Thaw Properties of the Conformable Conductor Eutectic Gallium-Indium-Tin Amanda Koh1, 2; 1U.S. Army Research Laboratory, United States; 2University of Alabama, United States.

1:30 PM *EP04.02.01/EP02.02.01/EP03.02.01
Skin-Inspired Organic Electronics Zhengan Bao; Stanford University, United States.

2:00 PM *EP04.02.02/EP02.02.02/EP03.02.02
Flexible Bioelectronics—Enzyme-Based Body-Worn Electronic Devices Joseph Wang; University of California, San Diego, United States.

2:30 PM EP04.02.03/EP02.02.03/EP03.02.03
Human Skin Interactive Bio-e-skin for Self-Powered Health Care Monitoring Dipankar Mandal1, 2; 1Institute of Nano Science and Technology, India; 2Jadavpur University, India.

2:45 PM EP04.02.04/EP02.02.04/EP03.02.04
Fully Implantable Wireless Battery-Free Optoelectronic Systems for Multimodal Optogenetic Neuromodulation Philipp Gutruf; University of Arizona, United States.

3:00 PM BREAK

3:30 PM *EP04.02.05/EP02.02.05/EP03.02.05
Self-Powered Ultra-Flexible Organic Electronics for Health Monitoring Takao Someya1, 2; 1University of Tokyo, Japan; 2RIKEN Center for Emergent Matter Science, Japan.

4:00 PM *EP04.02.06/EP02.02.06/EP03.02.06
Physical Biology and Material Dynamics at the Semiconductor-Based Biointerfaces Bozhi Tian; The University of Chicago, United States.

4:30 PM EP04.02.07/EP02.02.07/EP03.02.07
Autonomic Self-Healing and Intrinsical Stretchability of PEDOT:PSS Films Fabio Cicoira; Polytechnique Montréal, Canada.

4:45 PM EP04.02.08/EP02.02.08/EP03.02.08
Implantable Neurotransmitter Monitoring Based on Luminescent MOFs and Flexible Electronics Hang Xu; Tianjin University, China.

SESSION EP04.03: Poster Session I: Soft and Stretchable Electronics—From Fundamentals to Applications
Session Chairs: Roozbeh Ghaffari, Pooi See Lee, Marc Ramuz and Cunjiang Yu
Tuesday afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP04.03.01
Vapor-Phase Synthesis of Organic-Inorganic Hybrid Gate Dielectric for Flexible Electronics Min Ju Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

EP04.03.02
Highly Conducting MXene Composite Fibers with Conductive Polymer Binder for Fiber-Shaped Supercapacitors Jizhen Zhang; Deakin University, Australia.

EP04.03.03
Wearable Organic Memory Fiber for Low Voltage Operation and Conformable Data Storage Minju Kang; Korea Institute of Science and Technology, Korea (the Republic of).

EP04.03.04
Stretchable Location Sensor Based on Transparent AgNWs Electrodes Hang Gu; Institute of Microelectronics, Peking University, China.

EP04.03.06
Soft Electronic and Optoelectronic Devices with Dynamic 3D Architectures Controlled by Heat-Responsive Polymers Cheng Zhang; The University of Missouri, United States.

EP04.03.07
A MXene-Based Wearable Biosensor System for High-Performance In Vitro Perspiration Analysis Yongjun Lei; King Abdullah University of Science and Technology, Saudi Arabia.

EP04.03.08
Electrochemically Stable and Adherent PEDOT Coatings for High Quality EMG Recording Nico Rossetti; Ecole Polytechnique de Montréal, Canada.

EP04.03.09
3D-Printed Hydrogel with Superior Stability for Energy Harvesting and Physiological Monitoring Min Wu; Purdue University, United States.

EP04.03.10
Extruded Liquid Metal Wires at Room Temperature via Electrochemical Oxidation Minyung Song; North Carolina State University, United States.

EP04.03.11
Electronic Skin with Autonomous Self-Healability Jiheong Kang; Stanford University, United States.

EP04.03.12
Fast Self-Healing and Conductive Hydrogels as Soft Strain Sensor Yujie Chen; Shanghai Jiao Tong University, China.

EP04.03.13
Planting Carbon Nanotubes onto Supramolecular Polymer Matrixes for Waterproof Non-Contact Self-Healing Bo Li; Harbin Engineering University, China.
EP04.03.14
Pressure-Sensitive Rectifier Array for High Resolution E-Skin Tactile Sensor Insang You; Pohang University of Science and Technology, Korea (the Republic of).

SESSION EP04.04: Implantable Electronics and Sensors
Session Chairs: Pooyee Lee and Marc Ramuz
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 222 A

8:00 AM *EP04.04.01
Soft Implantable Devices for Electrophoretic Drug Delivery George Malliaras; University of Cambridge, United Kingdom.

8:30 AM *EP04.04.02
Brain-Implanted Flexible and Stretchable Integrated Circuit System for Comprehensively Monitoring Brain Activities from Cerebral Cortex to Deep Brain Regions Tsuyoshi Sekitani; Osaka University, Japan.

9:00 AM EP04.04.03
Dense Conformal Electrode Array for Mormyrid Fish Electoreceptor Stimulation Caroline Yu; Columbia University, United States.

9:15 AM *EP04.04.04
Flexible and Stretchable Organic Artificial Synapses for Sensory and Motor Nervous Systems of Bio-Inspired Electronics Tae-Woo Lee; Seoul National University, Korea (the Republic of).

9:45 AM EP04.04.05
Temporary Tattoo Electrode Records Brain Activity Laura Martinengo Ferrari; Istituto Italiano di Tecnologia, Italy.

10:00 AM BREAK

SESSION EP04.05: Soft and Stretchable Systems and Applications I
Session Chairs: Pooyee Lee and Marc Ramuz
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 222 A

10:30 AM EP04.05.01
Hydrogels Sense and Heal Better with MXene Yizhou Zhang; King Abdullah University of Science and Technology, Saudi Arabia.

10:45 AM EP04.05.02
Bioimpedance Spectroscopy with Conformal Polymer Electrodes and Its Application in Long-Term Health Monitoring Jae Joon Kim; University of Massachusetts Amherst, United States.

11:00 AM EP04.05.03
3D Designed Ion Selective Sensors Chao Bao; Simon Fraser University, Canada.

11:15 AM *EP04.05.04
Stretchable Conductive Nanocomposite for Implantable and Wearable Bioelectronics Da-Hyung Kim1, 2; 1Seoul National University, Korea (the Republic of), 2Institute for Basic Science, Korea (the Republic of).

11:45 AM EP04.05.05
Ionic Liquid Doping Enables High Transconductance and High Ion Sensitivity in Flexible, Stretchable Organic Electrochemical Transistors Wei Lin Leong; Nanyang Technological University, Singapore.

SESSION EP04.06: Liquid-Material Embedded Soft Structures II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.06.01
From Particles to Parts—Multi-Phase Metallic Particle Additives for Sensing and Tunable Materials Rebecca Kramer-Bottiglio; Yale University, United States.

2:00 PM EP04.06.02
Electrical Control of Shape in Liquid Crystalline Elastomer Nanocomposites Tyler Guin1, 2; 1Air Force Research Laboratory, United States; 2Oak Ridge National Lab, United States.

2:15 PM EP04.06.03
Mechanical Tunability of Core-Shell Liquid Metal Nanoparticles for Self-Healing Electronics Nicholas J. Morris1, 2; 1Air Force Research Laboratory, United States; 2UES, Inc., United States.

2:30 PM BREAK

SESSION EP04.07: Robotics, Prosthetics and Eskin I
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 A

3:30 PM *EP04.07.01
Emerging Self-Healing Material and System Platforms for Electronic Skins in Wearables and Robotics Benjamin C. Tsay1, 2, 3; 1National University of Singapore, Singapore; 2Institute of Materials Research and Engineering, Singapore; 3Biomedical Institute for Global Health Research and Technology, Singapore.

4:00 PM EP04.07.02
Stretchable, Transparent and Breathable Epidermal Electrode for Health-Related Applications Guoan Zhu; Beijing Institute of Nanoenergy and Nanosystems, CAS, China.

4:15 PM EP04.07.03
Fully Wirelessly-Operated Soft Actuators with Environmental-Sensing Capability Byungkook Oh; Yonsei University, Korea (the Republic of).

4:30 PM EP04.07.04
Liquid Crystal Elastomers for Soft and Stretchable Bioelectronics Jimin Maeng; The University of Texas at Dallas, United States.

4:45 PM EP04.07.05
3D Printing Flexible Silicones, TPU’s and Nylon Materials for Actuating Devices and Motors Rigoberto C. Advincula; Case Western Reserve University, United States.

SESSION EP04.08: Poster Session II: Soft and Stretchable Electronics—From Fundamentals to Applications
Session Chairs: Roozbeh Ghaffari, Pooi See Lee, Marc Ramuz and Cunjiang Yu
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP04.08.01
NIR Absorbing Ionic Dyes for Transparent Photo-Actuators Minsu Han; Yonsei University, Korea (the Republic of).

EP04.08.02
Thermally Self-Healing Electrochromic Film and Devices Derived from Reversible Diels–Alder Polymer Yi Wang; Chengdu University, China.

EP04.08.03
Highly Robust, Transparent and Breathable Epidermal Electrode Youjun Fan; Chinese Academy of Sciences, China.

EP04.08.04
Patterned Transfer of Silver Nanowire Electrode by Using UV Curable Pressure Sensitive Adhesives KeunHwan Park; KETI, Korea (the Republic of).

EP04.08.05
A Hybrid PVD/PDMS Electronic Skin for Accurate Touch Localization Keith Behrman; Columbia University, United States.

EP04.08.06
Single-Crack-Activated Ultrasensitive Flexible Impedance Strain Sensor Jihong Ye; Tsinghua University, China.
Beyond Human
Xu Wang; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

Electronics
Synthesis and Control of Robots with Light

States.
Organic Haptics
Darren J. Lipomi; University of California, San Diego, United States.

10:15 AM 9:45 AM BREAK

Programmed Magnetically-Triggered Ultrafast Soft Robots for Implantations
Zhao; Fudan University, China.

9:30 AM
Austria.

Sensing Skins
Actively Perceiving and Responsive Soft Robots Enabled by Self-Powered, Water Permeable Sticky Patch with Serpentine Patterns for Detection of Electrophysiological Signals
Hyeokju Chae; Sungkyunkwan University, Korea (the Republic of).

EP04.08.10
Effective Processing Strategies to Integrate Ag NWs with Polymer Semiconductors for High Performance Stretchable Field Effect Transistors Runqiao Song; North Carolina State University, United States.

EP04.08.11
Flexible and Multi-Functional Energy Storage Devices with High Safety Yang Zhao; Fudan University, China.

EP04.08.12
Bioinspired Multi-Responsive Soft Actuators Controlled by Laser Induced Graphene Heng Deng; University of Missouri, United States.

EP04.08.13
Robust and Stretchable Polymer Semiconductor Networks—From Film Microstructure to Macroscopic Device Performance Guoyan Zhang; Georgia Institute of Technology, United States.

EP04.08.14
Stretchable/Flexible Transparent Conductors for Emerging Optoelectronic Devices and Epidermal Transducers Bin Hu; Huazhong Univ of Science and Technology, China.

EP04.08.16
Fully Printed Carbon Nanotube Network Thin-Film Transistor Based Gas Sensors on Flexible Substrates Satish Kumar; Georgia Institute of Technology, United States.

EP04.08.17
Water Permeable Sticky Patch with Serpentine Patterns for Detection of Electrophysiological Signals Hyeokju Chae; Sungkyunkwan University, Korea (the Republic of).

SESSION EP04.08: Robotics, Prosthetics and Eskin II
Session Chairs: Pool See Lee and Marc Ramuz
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 222 A

8:15 AM *EP04.09.01
Synthesis and Control of Robots with Light Robert Shepherd; Cornell University, United States.

8:45 AM EP04.09.02
Actively Perceiving and Responsive Soft Robots Enabled by Self-Powered, Highly Extensible and Highly Sensitive Triboelectric Proximity- and Pressure-Sensing Skins Ying-Chih Lai1,2; 1National Chung Hsing University, Taiwan; 2National Chung Hsing University, Taiwan.

9:00 AM *EP04.09.03
Soft Electronic and Robotic Systems From Resilient Yet Biocompatible and Degradable Materials Martin Kaltenbrunner; Johannes Kepler University, Austria.

9:30 AM EP04.09.04
Programmed Magnetically-Triggered Ultrafast Soft Robots for Implantations Beyond Human Xu Wang; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

9:45 AM BREAK

10:15 AM *EP04.09.05
Organic Haptics Darren J. Lipomi; University of California, San Diego, United States.

SESSION EP04.09: Robotics, Prosthetics and Eskin II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.10.01
Stretchable Electronics—Actives and Passives Beyond 40 GHz Zhenqiang Ma; University of Wisconsin-Madison, United States.

2:00 PM EP04.10.02
Soft and Ultra-Conformable Electronic Circuits on Thin Metallic Foil Séverine C. de Mulatier1, 2; 1Ecole Supérieure des Mines de Saint-Etienne, Centre Microélectronique de Provence, France; 2@-HEALTH, France.

2:15 PM *EP04.10.03
Climbing-Inspired Twining Electrodes Using Shape Memory for Peripheral Nerves Stimulation and Recording Yinji Ma; Tsinghua University, China.

2:45 PM BREAK
Session Chairs: Pooi See Lee and Marc Ramuz
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 222 A

8:00 AM *EP04.12.01
Emerging Designs for Polymer-Based Infrared Photodetectors Tse Nga Ng; University of California, San Diego, United States.

8:30 AM EP04.12.02
Mechanically Tunable Nonlinear Dielectrics Deng Li Ko; National Chiao Tung University, Taiwan.

8:45 AM *EP04.12.03
From Chemistry to Mechanically-Adaptive Assemblies—Designs for Soft Thin-Film Electronics Jennifer Macron; Ecole Polytechnique Federale de Lausanne, Switzerland.

9:15 AM EP04.12.04
Acoustic Assembly of Electrically Conductive Particle Structures in Flexible Printable Composites Drew S. Melchert; University of California, Santa Barbara, United States.

9:30 AM EP04.12.05
High-Performance Stretchable Conductive Adhesives for Bio-Compliant Stretchable Electronics Youngpyo Ko1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2Korea University, Korea (the Republic of).

9:45 AM EP04.12.06
Flexible Conjugation-Break Spacers for Intrinsically Stretchable Polymer Semiconductors Jaewan Mun; Stanford University, United States.

10:00 AM BREAK

SESSION EP04.13: Soft Electronics—Manufacturing and Design I
Session Chairs: Pooi See Lee and Marc Ramuz
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 222 A

10:30 AM *EP04.13.01
Controlled Component Positioning in 3D Thermoformed Electronics Jan Vanfleteren; imec Ghent University, Belgium.

11:00 AM EP04.13.02
Soft Electronic and Energy Devices Based-On Laser-Induced Porous Graphene Zheng Yan; University of Missouri, United States.

11:15 AM EP04.13.03
Driving Crystallization on the Way to Polymer-Based, Heterogeneous Semiconducting and Electroactive Materials Adam Kiersnowski1, 2; 1Wrocław University of Science and Technology, Poland; 2Leibniz Institute for Polymer Research, Germany.

11:30 AM EP04.13.04
Inkjet-Printed Iontronics Based Conformable Transparent Touch Sensors for Human Machine Interface Dace Gao; Nanyang Technological University, Singapore.

11:45 AM EP04.13.05
Determining the Thermomechanical Properties of Polymer Semiconductors Supported on Elastomers Runqiao Song; North Carolina State University, United States.

1:30 PM *EP04.14.01
Silver Nanowire Composite Electrode and Deformable Light Emitting Devices Qibing Pei; University of California, Los Angeles, United States.

2:00 PM EP04.14.02
Molecular Engineering of Stretchable Organic Electronics Using Block Copolymers Laure V. Kayser; University of California, San Diego, United States.

2:15 PM *EP04.14.03
Intrinsically Stretchable Polymer Electronics for Merging with Living Systems Sihong Wang; University of Chicago, United States.

2:45 PM EP04.14.04
Effects of Molecular Weight of Donor-Acceptor Semiconducting Polymers on Molecular Packing, Charge Transport and Mechanical Resilience Hung-Chin Wu; Stanford University, United States.

3:00 PM BREAK

SESSION EP04.15: Soft Electronics—Manufacturing and Design II
Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 222 A

3:30 PM *EP04.15.01
“Cut-Solder-Paste” Process for the Rapid Prototyping of Wireless and Reconfigurable Electronic Tattoos Nanshu Lu; The University of Texas at Austin, United States.

4:00 PM *EP04.15.02
3D Designed Sensor Systems with Complex Form Factors Woo Soo Kim; Simon Fraser University, Canada.

4:30 PM EP04.15.03
Fiber Assembly-Based Concurrent Multimodal and Multifunctional Sensors for e-Textiles Kony Chatterjee; North Carolina State University, United States.

Session Chairs: Roozbeh Ghaffari and Cunjiang Yu
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 222 A

1:30 PM *EP04.14.01
Silver Nanowire Composite Electrode and Deformable Light Emitting Devices Qibing Pei; University of California, Los Angeles, United States.
SESSION EP05.01: Multicellular Systems and Technologies I
Session Chairs: Rashid Bashir and Liang Guo
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 226 B

10:30 AM *EP05.01.01
Nano-and Microfabricated Hydrogels for Regenerative Engineering Ali Khademhosseini; University of California, Los Angeles, United States.

11:00 AM EP05.01.02
Fabrication of Neurobiological Circuits Liang Guo; The Ohio State University, United States.

11:15 AM *EP05.01.03
Engineered Disease Models with Aged Tissue Microenvironments Pinar Zorlutuna; University of Notre Dame, United States.

11:45 AM *EP05.01.04
Forward Design, Fabrication and Programming of Multi-Cellular Biomachines Using Neurons and Muscles Rashid Bashir; University of Illinois at Urbana-Champaign, United States.

SESSION EP05.02: Multicellular Systems and Technologies II
Session Chairs: Rashid Bashir and Liang Guo
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 226 B

1:30 PM *EP05.02.01
Emergence of Hierarchy and Functions from Cell Clusters In Vitro Taher Saif1; 2; 1University of Illinois at Urbana-Champaign, United States; 2University of Illinois at Urbana-Champaign, United States.

2:00 PM *EP05.02.02
On-Chip Interrogation of Neural Activity in Complete Nervous Systems Jacob T. Robinson; Rice University, United States.

2:30 PM BREAK

3:00 PM *EP05.02.03
Organ-on-a-chip—Self-Rolling 3D Biosensors for Electrical Interrogations of Engineered µtissues Tzahi Cohen-Karni; Carnegie Mellon University, United States.

3:30 PM EP05.02.04
Microfiber-Guided Fabrication of Accurately Wired Neural Circuits Yu Wu; The Ohio State University, United States.

3:45 PM *EP05.03.05
Bottom-Up Approaches for Controlling Cell Behavior—Interfacing Synthetic Biology and Biomaterials Tara L. Deans; The University of Utah, United States.

SESSION EP05.03: Bacterium- and Biomolecule Based Systems and Technologies
Session Chairs: Liang Guo and Elizabeth Strychalski
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 226 B
SYMPOSIUM EP06

Organic Electronics—Materials and Devices
April 23 - April 25, 2019

Symposium Organizers
Paddy K. L. Chan, University of Hong Kong
Oana Jurchescu, Wake Forest University
Ioannis Kymissis, Columbia University
Brendan O'Connor, North Carolina State University

Symposium Support
MilliporeSigma

* Invited Paper

SESSION EP06.01: Modeling
Session Chairs: Paddy K. L. Chan and Joon Hak Oh
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 222 C

10:30 AM *EP06.01.01
Will We See Gigahertz Organic Transistors? Hagen Klau; Max Planck Institute for Solid State Research, Germany.

11:00 AM *EP06.01.02
Understanding Tunnel Currents in Organic Transistors—From New Theoretical Models to New Devices Bjorn Lussem; Kent State University, United States.

11:30 AM *EP06.01.03
Interfacial and Dynamic Disorder Limitations of Charge Transport in Organic Semiconductors Enrique D. Gomez; The Pennsylvania State University, United States.

SESSION EP06.02: Device Design
Session Chairs: Enrique Gomez and Hagen Klau
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 222 C

1:30 PM *EP06.02.01
Flexible FET-Type Sensors Based on Nanoscopically Engineered Organic Semiconducting Materials Joon Hak Oh; Seoul National University, Korea (the Republic of).

2:00 PM EP06.02.02
Transparent, Low Voltage, All-Organic Field-Effect Transistors on Plastic and Compliant Substrates Piero Cosseddu; University of Cagliari, Italy.

2:15 PM EP06.02.03
Achieving Ultra-Low Turn-On Voltages in Organic Thin-Film Transistors—Investigating Fluoroalkyl-Phosphonic Acid Self-Assembled Monolayer Hybrid Gate Dielectrics Rachana Acharya1, 2; 3Max Planck Institute for Solid State Research, Germany; 1Institute of Materials Science, University of Stuttgart, Germany.

2:30 PM *EP06.02.04
Designing Solution-Processed Photonic Light- and Heat-Management Structures for Optoelectronic Devices Natalie Stingelin; Georgia Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *EP06.02.05
Large-Area Organic Single-Crystal Semiconductors for Integrated Circuits Jun Takeya; University of Tokyo, Japan.

4:00 PM EP06.02.06
Stability of Printed Organic Thin-Film Transistors Composed of Ultraline Silver Electrodes by SuPR-NaP Technique Gye Kitahara; The University of Tokyo, Japan.

4:15 PM EP06.02.07
Electronic, Optical and Electrical Properties of Single Crystal Dinaphthothieno-thiophene (DNTT) Sujitra Pookpanratana; National Institute of Standards and Technology, United States.

4:30 PM EP06.02.08
Mimicking Associative Learning Using Synapse-Like Non-Volatile Organic Electrochemical Transistor Xu Dong Ji; University of Hong Kong, Hong Kong.

4:45 PM EP06.02.09
Polymer Light-Emitting Diodes with an Emitting Layer Based on a Nano-Confined Semiconducting Polymer Blend Jasper Michels; Max Planck Institute, Germany.

SESSION EP06.03: Poster Session I: Organic Electronics—Materials and Devices
Session Chairs: Oana Jurchescu and Christine Luscombe
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP06.03.01
Underlying Mechanism of the Evaporation of Zinc-Oxide Solution Droplets on Silicon Dioxide /Silicon Nitride Dielectric Material-Based Thin-Film Transistors by Ink-Jet Printing Technique Cheng Jyun Wang; National Chiao Tung University, Taiwan.

EP06.03.02
Physical and Electronic Properties of COF-5 Films with Intercalated Metal Ions Michael S. Bible; U.S. Department of the Navy, United States.

EP06.03.03
Influence of Trapping Effects on Organic Memory Devices Ulli von Goscinski; University of Cologne, Germany.

EP06.03.04
All-Room-Temperature Solution-Processed New Nanocomposites Based Hole Transport Layer from Synthesis to Film Formation for High-Performance Organic Solar Cells Towards Ultimate Energy-Efficient Fabrication Zhuanfeng Huang; The University of Hong Kong, Hong Kong.

EP06.03.05
Dual-Conformation Fluorescent Emitters—From Stimuli-Responsive Materials to Highly Efficient Organic Light-Emitting Diodes Shi-Jian Su; South China University of Technology, China.

EP06.03.06
Utilization of Divinyl Sulfone as a TADF Acceptor Core Joshua T. Koubek; Colorado School of Mines, United States.

EP06.03.07
Work Function Modification of Indium-Tin Oxide by a Combination of Charge-Based Through-Space Interaction and Surface Interaction Da Soul Yang; University of Michigan–Ann Arbor, United States.

EP06.03.08
Charge Transport and Self-Assembly Tuning by Rational Molecular Design David Wisman1, 2; 1Indiana University, United States; 2NAVSEA Crane, United States.

EP06.03.09
Fabrication of UV-Sensitive Semiconductor Thin Films on Ultra-Flat Polymer Sheets with 0.3 nm-High Atomic Step-and-Terrace Surface Tomaoki Oga; Tokyo Institute of Technology, Japan.

EP06.03.10
Roll-to-Roll Deposition Process for Conjugated Polymer Thin Films Derick Ober; UC San Diego, United States.

EP06.03.11
Crystal Growth Mechanism in Meniscus-Line-Guided Coating Method Ming Chen; University of Hong Kong, Hong Kong.

EP06.03.12
Comparing Chemical Doping Methods for Preparing Micron-Thick Films of Semiconducting Polymers for Thermoelectric Applications Dane A. Stanfield; University of California, Los Angeles, United States.
SESSION EP06.01: Synthesis, Characterization, and Devices

9:00 AM *EP06.01.01
Preparation of Functionalized Polystyrene Thin Films for Specific Applications on Glass and Polymeric Substrates Akshat Joshi; University of Cambridge, United Kingdom.

9:15 AM *EP06.01.02
Film Formation of Organic Inorganic Hybrid Composites for Hybrid Organic-Inorganic Electronics M. D. Schaab; North Carolina A&T State University, United States.

9:30 AM *EP06.01.03
Recent Progress in Organic Electronics: A Review of New Materials and Devices with Emphasis on Transistors and Display Applications H. A. Macleod; University of Edinburgh, United Kingdom.

9:45 AM *EP06.01.04
Recent Developments in Organic Field-Effect Transistors (OFETs) and Organic Light-Emitting Diodes (OLEDs) for Display and Lighting Applications Wen; University of Missouri, United States.

SESSION EP06.02: Applications

10:00 AM *EP06.02.01

10:15 AM *EP06.02.02
Recent Advances in Organic Light-Emitting Diodes: From Materials to Devices R. S. Aperahama; University of Wisconsin-Madison, United States.

10:30 AM *EP06.02.03
Recent Developments in Organic Molecular Electronics: From Fundamental Research to Practical Applications J. K. E. rabbit; University College London, United Kingdom.

SESSION EP06.03: Poster Session I: Organic Electronics—Materials and Devices

2:15 PM *EP06.03.01
Surface Chemistry of Organic Materials for Organic Electronics Applications C. L. L. Smith; University of Cambridge, United Kingdom.

2:30 PM *EP06.03.02
Recent Progress in Organic Thin-Film Transistors: From Materials to Devices C. M. Bennett; University of Cambridge, United Kingdom.

2:45 PM *EP06.03.03
Advances in Organic Light-Emitting Diodes: From Materials to Devices F. H. Allen; University of Cambridge, United Kingdom.

SESSION EP06.04: Physics and Characterization

8:00 AM *EP06.04.01
Device Physics of Non-Ideal Organic Thin-Film Transistors and Analysis of Current-Voltage Relations C. L. L. Smith; University of Cambridge, United Kingdom.

8:15 AM *EP06.04.02
Synchrotron-Based X-Ray Analysis of Green Solvent BJH and Nanoparticulate Donor-Acceptor Thin Films for OPV Applications N. P. Holmes; University of Newcastle, Australia.

8:30 AM *EP06.04.03
Developing Atomic-Scale Models to Improve the Processing of Organic Semiconductors S. Li; University of Kentucky, United States.

9:00 AM *EP06.04.04
Formation and Device Implications of Microcrystalline Organic Semiconductor Films and Heterojunctions B. P. Rand; Princeton University, United States.

9:30 AM *EP06.04.05
Ionic Conduction as a Function of Side-Chain Chemistry of Polythiophene Derivatives C. S. Luscombe; University of Washington, United States.

10:00 AM *EP06.04.06
Disregarded Channel Fringe Effect on Mobility Overestimation in Organic Thin-Film Transistors K. Pei; University of Hong Kong, Hong Kong.

10:15 AM *EP06.04.07
In Situ Measurement of Evolving Exciton Dynamics During Organic Film Formation C. Y. Wong; University of Oregon, United States.
EP06.06.05 Vibrational Anharmonicity in Organic Semiconductors Maor Asher; Weizmann Institute of Science, Israel.

EP06.06.06 Development of Novel Electrochromic Materials Based on Viologen-Conjugates Fenmy Su; Southern University of Science and Technology, China.

EP06.06.07 Direct Measurement of Single Molecule Charge Transport—From Molecular Design to Programmable Control Songseong Li; University of Illinois, United States.

EP06.06.08 Understanding the Molecular Origin of Polymorphic Transition via Nucleation and Cooperativity and Their Impact on Organic Semiconductors Hyunjoong Chung; University of Illinois at Urbana-Champaign, United States.

EP06.06.09 Tuning the Interfacial and Energetic Interactions Between a Photocexcited Conjugated Polymer and Open-Shell Small Molecules Daniel A. Wilcox; Purdue University, United States.

EP06.06.10 Solution Process Feasible Highly Efficient Organic Light Emitting Diode with Hybrid Metal Oxide Based Hole Injection/Transport Layer Mangey R. Nagar; National Tsing Hua University, Taiwan.

EP06.06.11 Mean Free Path and Band Transport in Transistors Based on Polymer Semiconductors Xiao Wang; University of Texas at Austin, United States.

EP06.06.12 Implementation of Transparent Composite Electrodes in Current Heterojunction Organic Solar Cells Zhao Zhao; Arizona State University, United States.

EP06.06.13 Highly Sensitive VOC Sensor Based on Fluorinated Isoindigo Conjugated Polymers Transistor Chun-fu Lu; National Taiwan University, Taiwan.

EP06.06.14 Dual Gate Transistors Based on Dual Active Layers Shuyan Huang; The University of Hong Kong, Hong Kong.

EP06.06.15 Morphology Stabilization Using Stamping Transfer Process via Controlled PUA Mold for Perovskite and Organic Electronic Devices Dong Hwan Wang; Chung-Ang Univ, Korea (the Republic of).

EP06.06.16 Structuring Polymer Solutions Upon Liquid-Vapor Mass Exchange Jasper Michels; Max Planck Institute, Germany.

EP06.06.17 Dodecaborane Clusters as Novel Tunable Dopants for Conjugated Polymers Taylor Aubry; University of California, Los Angeles, United States.

EP06.06.18 Amphiphilic Conjugated Polymers for Nanoparticle Stabilization Sonam Seoena; University of Melbourne, Australia.

EP06.06.19 Vertical Organic Charge Modulated FET Devices for Sensing Applications Andrea Spang; FBK-Bruno Kessler Foundation, Italy.


EP06.06.21 Emission Gain Narrowing in Organic Semiconductor Single Crystal Thangavel Kanagasekaran1, 2; 1Tohoku University, Japan; 2Indian Institute of Science Education and Research, Tirupati, India.

EP06.06.22 Influence of the Mobility Ratio and Energetics of x-Conjugated Polymers on the Thermoelectric Properties of Polymer Blends Ashkan Abtahi1, 2; 1University of Kentucky, United States; 2University of Kentucky, United States.

EP06.06.23 Donor-Acceptor Copolymers and Sol-Gel Processable ZnO for Hybrid Photodetectors and Thin-Film Transistors Alec M. Pickett; University of Missouri–Columbia, United States.

EP06.06.24 A Theoretical Study of Two Functional Derivatives to Unsymmetrical Squaraine Donors for Organic Photovoltaics from First-Principle Simulation Siwei Zhang1, 2; 1Tsinghua University, China; 2Tsinghua University, China.

EP06.06.25 Novel Quinoidal Conjugated Molecules and Polymers for High Performance Organic Field-Effect Transistors Yunsul Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

EP06.06.26 Flexible Transparent Electrodes via Printed Polymer-Sphere Networks for Polymer Photodiode and Light-Emitting Diode Juan Zhu; University of California, Berkeley, United States.

EP06.06.27 Dynamic Composition of Electrolyte Gated Organic Mixed Ionic Electronic Conductors Bryan D. Paulsen; Northwestern University, United States.

EP06.06.28 Nanostripe Channel Patterning of Polymer Thin-Film Transistors for Improved Performance Kelly Liang; The University of Texas at Austin, United States.

EP06.06.29 Raman Crystallography as a Probe of Phonon-Mediated Anisotropic Carrier Mobility in Single Crystal Organic Semiconductors Adam Biacchi; National Institute of Standards and Technology, United States.

EP06.06.30 Improvement of the Exciton Dissociation Efficiency in Hybrid OPV Devices by the Incorporation of Carbon Nanomaterials Ibrahim Assis1, 2; 1HBKU, Qatar Foundation, Qatar; 2MPB Communications Inc., Canada.

EP06.06.31 Infrared-to-Visible Up-Conversion OLEDs Using Novel Infrared-Sensitive Low-Bandgap Organic Donors and/or Acceptors Do Young Kim; Oklahoma State University, United States.

EP06.06.32 Highly-Efficient Solution-Processed Organic Light Emitting Diodes with Blend V2O5-PEDOT:PSS Hole-Injection/Hole-Transport Layer Rohit Ashok Kumar Yadav; National Tsing Hua University, Taiwan.

SESSION EP06.07: Processing—Doping and Contacts
Session Chairs: Lee Richter and Chad Risko
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 222 C

8:00 AM *EP06.07.01 Controlling Doping in Semiconducting Polymers Michael L. Chabinyc; University of California, Santa Barbara, United States.

8:30 AM EP06.07.02 Chemical Doping and Stability in Conductive Polymers for Neuromorphic Devices Yoei van de Burg; Eindhoven University of Technology, Netherlands.

8:45 AM EP06.07.03 Doping Organic Semiconductors for Thin-Film Transistors Julianna Panidi; Imperial College London, United Kingdom.

9:00 AM EP06.07.04 Ohmic Charge Injection and Low-Power OFETs Achieved by Organic Semiconductor Monolayer Crystals Boyu Peng; Hong Kong University, China.

9:15 AM EP06.07.05 Molecular Surface Chemistry for Improved Interfaces in Organic Electronics Jacob Ciszek; Loyola University Chicago, United States.
9:30 AM EP06.07.06
Individual Contributions of the Source and Drain Contacts to the Total Resistance in Organic Thin-Film Transistors Investigated Using Kelvin Probe Force Microscopy (KPFM) Mélanie Brouillard1, 2; 1Université de Reims Champagne-Ardenne, France; 2Max Planck Institute for Solid State Research, Germany.

9:45 AM BREAK

10:15 AM EP06.07.07
Preparation, Adhesion and 3D Printing of Highly Conductive PEDOT:PSS Hydrogels Hyunwoo Yuk; Massachusetts Institute of Technology, United States.

10:30 AM EP06.07.08
N-Doped Polythiophene Based Polymers for n-OECTs Ziyauddin Khan; Linköping University, Sweden.

10:45 AM EP06.07.09
A Simple Technique to Reduce Contact Resistance in Organic Field-Effect Transistors Zachary Lampert; Wake Forest University, United States.

11:00 AM EP06.07.10
A New Concept of Electrode for Highly Efficient Ambipolar Carrier Injection in Organic Semiconductors Katsumi Tanigaki; WPI-AIMR, Japan.

11:45 AM EP06.07.13
Printed Low Voltage Organic Field-Effect Transistors and Circuits on Paper Substrate Piero Cosseddu; University of Cagliari, Italy.

SESSION EP06.08: Processing—Printing and Crystallization
Session Chair: Paddy K. L. Chan
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 222 C

1:30 PM *EP06.08.01
Physical and Chemical Organic Vapor Jet Printing for Organic Electronics Max Shtein; University of Michigan, United States.

2:00 PM EP06.08.02
Electrical Conductivity and Optical Transparency Characteristics of oCVD PEDOT Films Using VOCl3 Oxidant Meysam H. Gharahcheshmeh; Massachusetts Institute of Technology (MIT), United States.

2:15 PM EP06.08.03
Isotropic Self-Assembly Process of a Low Crystalline n-Type Semiconducting Polymer with Improved Electron Mobility via Kinetically Fast and Robust Intermolecular Interactions Seung Un Ryu; Pohang University of Science and Technology, Korea (the Republic of).

2:30 PM *EP06.08.04
Meniscus-Guided Large-Area Thin-Film Formation of Organic Semiconductors with Crystallization Control Steve J. Park; KAIST, Korea (the Republic of).

3:00 PM BREAK

3:30 PM *EP06.08.05
Integrated Multi-Process Multi-Material Additive Fabrication of Distributed Electronic Devices Gregory Whiting; University of Colorado Boulder, United States.

4:00 PM EP06.08.06
Achieving Outstanding Thin-Film Deformability of Semiconducting Polymers Through Modulating Molecular Packing in Nanoscale Hung-Chin Wu; Stanford University, United States.

4:15 PM EP06.08.07
Scalable Fabrication of Highly Crystalline Organic Semiconductor Thin-Film Array by Screen Printing Shuming Duan; Tianjin University, China.
SYMPOSIUM EP07

Next-Generation Interconnects—Materials, Processes and Integration
April 23 - April 25, 2019

Symposium Organizers
Silvia Armini, IMEC
Vincent Jousseaume, CEA-LETI
Eiichi Kondoh, University of Yamanashi
Frank Mont, GLOBALFOUNDRIES

Symposium Support
ASM International NV
CEA, LETI
Entegris, Inc
TEL

* Invited Paper

SESSION EP07.01: Dielectrics—New Insights I
Session Chairs: Silvia Armini and Vincent Jousseaume
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 221 B

10:30 AM *EP07.01.01
5nm and Beyond BEOL (Back End of the Line) Interconnect and Heterogeneous Integration Strategies to Continue Moore’s Law Scaling Lawrence Clevenger; IBM T.J. Watson Research Ctr, United States.

11:00 AM *EP07.01.02
Time to Get Over the Lows—A Selectively Colorful yet Chilly Perspective on the Future of Dielectrics in Nanoelectronic Devices Sean King; Intel Corp, United States.

11:30 AM EP07.01.03
Molecular Design of Ultrastiff ULK Dielectric Hybrid Films—Implications of Network Connectivity and Precursor Geometry Karsu I. Kilic; Stanford University, United States.

11:45 AM EP07.01.04
Polysiloxane Thin Films Deposited by iCVD—Application to Through-Silicon via Insulation Vincent Jousseaume1, 2; 1Université Grenoble Alpes, France; 2CEA, LETI, France.

SESSION EP07.02: Emerging Metal Processes and Reliability Physics
Session Chairs: Eiichi Kondoh and Frank Mont
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 221 B

1:30 PM *EP07.02.01
Advanced Interconnects—Materials Overview and Outlook Going Forward Andrew H. Simon; IBM Research Division, United States.

2:00 PM *EP07.02.02
Intermetallic Compounds as Possible Cu Alternatives Junichi Koike; Tohoku University, Japan.

2:30 PM EP07.02.03
The Effects of Dioxime Molecules on the Electrodeposition of Cobalt Qiang Huang; University of Alabama, United States.

2:45 PM EP07.02.04
The Formation of Nano-Voids in Electroless Cu Layers Tobias Bernhard; ATotech Deutschland GmbH, Germany.

3:00 PM BREAK

3:30 PM *EP07.02.05
Reliability Statistics for Next-Generation Interconnects—The Combination of Physical Modeling and Statistical Techniques Shinji Yokogawa; The University of Electro-Communications, Japan.

4:00 PM EP07.02.06
The Effect of Electrical Current Stressing on Microstructure and Properties of Sn You Chi Meng; National Cheng Kung University, Taiwan.

SESSION EP07.03: Novel Materials and New Functionalities
Session Chairs: Eiichi Kondoh and Shinji Yokogawa
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

EP07.03.01
Effect of Ti or Ru Doping in Al Films on Hillock Suppression Youngmo Tak; Seoul National University, Korea (the Republic of).

EP07.03.02
Synthesis and Magnetic Properties of Electrodeposited Co-W Alloy Nanowires According to Tungsten Content EunMin Yoo; Korea University, Korea (the Republic of).

EP07.03.03
Optimizing Growth of TaSe6 Nanowires via Chemical Vapor Deposition Aimee Martinez; University of California, Riverside, United States.

EP07.03.04
Study of the Structure, Electrical Conductivity of Cr-Cu Thin-Film Composition on a Glass Substrate Sergey M. Karabanov; Ryazan State Radio Engineering University, Russian Federation.

EP07.03.06
Effects of Dielectric Curing and Plasma Treatment Conditions on the Interfacial Reliability of RDL for Fan-Out Wafer Level Packaging Young-Bae Park; Andong National University, Korea (the Republic of).

EP07.03.07
Etch Characteristics of Copper Thin Film Using Continuous-Wave and Pulse-Modulated Plasmas of CH3COOH/Ar Chee Won Chung; Inha University, Korea (the Republic of).

SESSION EP07.04: New Era of 3D Interconnection
Session Chairs: Young-Chang Joo and Sean King
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 B

8:30 AM EP07.04.01
High-Resolution 3D Imaging of Structures and Defects in Advanced Interconnect and Packaging Structures Using Laboratory X-Ray Tomography Ehrenfried Zachek1, 2; 1Fraunhofer Institute for Ceramic Technologies and Systems, Germany; 2Technische Universität Dresden, Germany.

9:00 AM *EP07.04.02
3D Integration for Superconducting Qubits Danna Rosenberg; Lincoln Laboratory, United States.

9:30 AM EP07.04.03
3D Sequential Technology—Reliability of Cu/low-k Interconnects at High Temperature Chloe Guerin1, 2; 1Université Grenoble Alpes, France; 2CEA-LETI, MINATEC Campus, France.

9:45 AM BREAK

SESSION EP07.05: Novel Materials and New Functionalities
Session Chairs: Eiichi Kondoh and Shinji Yokogawa
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 221 B

10:15 AM *EP07.05.01
Chemical Vapor Deposition of Nanoporous Metal-Organic Frameworks (MOF-CVD) and Their Integration as Low-k Dielectrics Rob Ameloot; KU Leuven, Belgium.
11:00 AM EP07.05.03
Current Carrying Capacity and Low-Frequency Noise in Quasi-One-Dimensional Van der Waals Nanowires and Nanoribbons Adane Geremew; University of California, Riverside, United States.

11:15 AM EP07.05.04
Metal Based Self-Healable Electrodes for Foldable Electronics with High Reliability Young-Chang Joo; Yonsei University, Korea (the Republic of).

3:30 PM *EP07.06.01
Sputter Deposited Amorphous Carbon for Hard Mask with High Etch Resistance Young-Chang Joo; Seoul National University, Korea (the Republic of).

4:00 PM EP07.06.02
Wet-Chemical Etching of Ruthenium for Advanced Interconnects Harold Philipsen; imec, Belgium.

4:15 PM EP07.06.03
Oxygen-Assisted Etching of Pt in Supercritical CO2 Solutions Eiichi Kondoh; University of Yamanashi, Japan.

4:30 PM EP07.06.04
Plasma-Based Copper Etch—Effects of Surface Treatment and Structure on Reliability Yue Kuo; Texas A&M University, United States.

8:30 AM *EP07.07.01
Electrochemical ALD for Enabling Advanced BEOL Scaling Yejdi Dordi; Lam Research Corporation, United States.

9:00 AM *EP07.07.02
Approaches to Area Selective Deposition for Next Generation Interconnects Stacey F. Bent; Stanford University, United States.

9:30 AM EP07.07.03
Atomic Layer Deposition of Ru for Copper Metallization Anil Mane; Argonne National Laboratory, United States.

9:45 AM BREAK

10:15 AM EP07.07.04
Hyper-Selective Co Metal ALD on Cu and Pt Without Passivation Steven Wolf; University of California, San Diego, United States.

10:30 AM EP07.07.05
The Gap-Fill Performance Effect by Post Treatment of High Temperature Atomic Layer (HT-ALD) in 3D V-NAND Flash Memory Devices Kwak Nohyeon; SK hynix, Korea (the Republic of).

10:45 AM EP07.07.06
Surface Engineering by Plasma and Organic Films to Enable Area Selective Deposition in BEOL Silvia Armin; imec, Belgium.

11:00 AM EP07.07.07
Electrochemical Nanoimprinting of 3D Hierarchical Micro- and Nano-Structures in Silicon Bruno Azreda; Arizona State University, United States.

300 PM EP08.01.01
Nanosecond Resolved Probing of Single Silicon Nanostructure Reversible Phase Change Letian Wang; University of California, Berkeley, United States.

10:45 AM EP08.01.02
A Quantum-Mechanical Map for Bonding and Properties in Materials Matthias Wuttig1, 2; 1RWTH Aachen University, Germany; 2Forschungszentrum Jülich GmbH, Germany.

11:00 AM EP08.01.03
Multiferroics in Interfacial Phase-Change Memory Junji Tominaga; National Institute of Advanced Industrial Science and Technology, Japan.

11:30 AM EP08.01.04
Phase Change Materials Probed by Angularly Resolved Photoelectron Spectroscopy and Scanning Tunneling Spectroscopy Markus Morgenstern; RWTH Aachen University, Germany.

1:30 PM EP08.02.01
Reprogrammable Visible Photonics Using Structural Phase Transitions in Sb2S3 Robert Simpson; Singapore University of Technology and Design, Singapore.

2:00 PM EP08.02.02
GST Integrated Silicon Photonics Arka Majumdar1, 9; 1University of Washington, United States; 9University of Washington, United States.

2:30 PM EP08.02.03

3:00 PM BREAK

SESSION EP08.03: Photonics Applications of Phase Change Materials

3:30 PM EP08.03.01
Gradient Index (GRIN) Optics for Next Generation EO/IR Sensors Clara R. Baleane1, 2; 1Lockheed Martin, United States; 2University of Central Florida, United States.
EP08.04.01
Highly Ordered Nano-Dots of Vanadium Dioxide (VO₂) Using Nanoporous Templates and Their Phase-Change Property
SeongHo Park; Dankook University, Korea (the Republic of).

EP08.04.02
Low Energy Consumption Operation in Voltage Switching RAM by Using Pulsed Voltage Signals
Yuki Watanabe; Tokyo Institute of Technology, Japan.

EP08.04.03
Revisiting the Switching Behavior of Bulk Ag₁₋₃Ag₂O-MoO₃ Glasses in the Quest for a Better Understanding
Tanujit Biswas; Indian Institute of Science, India.

EP08.04.04
A Study of the Electrical Conduction Mechanisms of Bilayer Phase-Change Memory Devices Over the Temperature Range of 5 K to 340 K
Md Kamruz Hassan Majumdar; Boise State University, United States.

EP08.04.05
Chalcogenide Glass Thin Films by 3D Printing and Temperature Dependence of Their Optical Properties
Al-Amin Ahmed Simon; Boise State University, United States.

EP08.04.06
Vis-NIR Responsive Metal-Insulator Transition in Ag-Decorated VO₂ Nanorod Arrays
Kootak Hong; Seoul National University, Korea (the Republic of).

EP08.04.07
Pump-Probe Approach to Optical Phase Change Material Characterization
Gary Sevison¹,²; ¹University of Dayton, United States; ²Air Force Research Laboratory, United States.

EP08.04.08
Resistance Drift and Crystallization Processes in the Reset State of GST—Based PCMs
Kazimierz J. Plucinski; Military University of Technology, Poland.

EP08.04.10
Wide Bandgap Phase Change Chalcogenide Tuned Visible Phononics
Weiling Dang; Singapore University of Technology and Design, Singapore.

EP08.05.03
The Development and Application of Tunable Phase-Change Band-Pass Filters
Liam Trimby; University of Exeter, United Kingdom.

EP08.05.04
Unique Properties of Isotstructural VO₂ Thin-Film Heterostructures
Adole Moattii; North Carolina State University, United States.

9:30 AM BREAK

SESSION EP08.06/EP09.05: Joint Session: Neuromorphic Devices
Session Chairs: Katherine Dubourdieu and Kotaro Makino

Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 224 B

10:00 AM *EP08.06.01/EP09.05.01
Device and Materials Requirements for Neuromorphic Computing
Raisal Islam; Stanford University, United States.

10:30 AM EP08.06.02/EP09.05.02
Emulating Biological Synaptic Behavior for Ultra-Low Power Neuromorphic Applications Using MoS₂/Graphene Heterojunctions
Adithi Pandrakahally Krishnaprasad Sharada¹,²; ¹University of Central Florida, United States; ²University of Central Florida, United States.

10:45 AM EP08.06.03/EP09.05.03
Ferroelectric Spiking Neurons for Unsupervised Clustering
Zheng Wang; Georgia Institute of Technology, United States.

11:00 AM EP08.06.04/EP09.05.04
Parallel Programming of an Ionic Floating-Gate Memory Array for Scalable Neuromorphic Computing
Elliot J. Fuller; Sandia National Laboratories, United States.

11:15 AM EP08.06.05/EP09.05.05
Correlation Between Traps Jumping Distance and Gradual Conductance Change Under Different Conductance Update Schemes in HfO₂-based Memristive Devices
Patu A. Dananjaya; Nanyang Technological University, Singapore.

11:30 AM EP08.06.06/EP09.05.06
Memristive Behavior in Core-Shell Nanowire Networks for Neuromorphic Architectures
Shangradhanva Eswara Vasishth; University of Florida, United States.

11:45 AM EP08.06.07/EP09.05.07
Ultralow Power Dual Gated Sub-Threshold Oxide Neuristors—An Enabler for Higher Order Neuronal Temporal Correlations
Rohit A. John; Nanyang Technological University, Singapore.

SESSION EP08.07: Threshold Switching Behavior and Selector Device
Session Chair: Marie-Claire Cyrille

Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 222 B

1:30 PM EP08.07.00
A New Approach to Accessing the Semiconductor-to-Metal Transition in Two-Dimensional Crystals Using Ionomers
Susan Fullerton; University of Pittsburgh, United States.

1:45 PM EP08.07.01
Electrothermal Model of Ovonc Threshold Switching
Jake Scoggin; University of Connecticut, United States.

2:00 PM EP08.07.02
Volatilie Threshold Switching and Non-Volatile Bipolar Resistive Switching in Mixed Phased a-Vo₂ Symmetric Crossbar Devices
Shruti Nirantar; RMIT University, Australia.

2:15 PM EP08.07.03
Operation and Materials Choice for Chalcogenide Selector Devices
John Robertson; Cambridge University, United Kingdom.

2:30 PM BREAK
SESSION EP08.08: Phase Change Device Characterization  
Session Chair: Junji Tominaga  
Wednesday Afternoon, April 24, 2019  
PCC North, 200 Level, Room 222 B

3:30 PM *EP08.08.01  
Fundamental, Thermal and Energy Limits of Phase-Change Memory  
Eric Pop; Stanford University, United States.

4:00 PM EP08.08.02  
Computational Analysis of Complex Amorphization/Crystallization Dynamics in Large Phase Change Memory Devices  
Md Tashfiq Bin Kashem; University of Connecticut, United States.

4:15 PM EP08.08.03  
Investigation of Resistance Drift in Ge2Sb2Te5 Phase Change Memory Line Cells at Low Temperatures—Contributions of Charge Trapping  
ABM Hasan Talukder; University of Connecticut, United States.

4:30 PM EP08.08.04  
Evaluating iPCM Asymmetry by a Three-Terminal Device  
Kirill V. Mitrofanoy; National Institute of Advanced Industrial Science and Technology, Japan.

4:45 PM EP08.08.05  
Multi-Contact Phase Change Toggle Multiplexer  
Raihan Saveed Khan; University of Connecticut, United States.

SESSION EP08.09: Computational Studies in Phase Change Materials  
Session Chairs: Raffaella Calarco and Paul Fons  
Thursday Morning, April 25, 2019  
PCC North, 200 Level, Room 222 B

9:00 AM *EP08.09.01  
Investigation of Order-to-Order Transition for Phase-Change-Memory Materials  
Xianbin Li; Jilin University, China.

9:30 AM EP08.09.02  
Multi-Phase-Field Modelling of Microstructure Formation During the Non-Congruent Crystallization of an Amorphous Alloy of Germanium, Antimony and Tellurium  
Raphael Bayle1, 2, 3; 1PMC Ecole Polytechnique/CNRS, France; 2STMicroelectronics, France; 3CEA LETI, France.

9:45 AM EP08.09.03  
Ultrafast Photo-Induced Phase Transition in 2D MoTe2  
Bo Peng1, 2; 1Fudan University, China; 2University of Cambridge, United Kingdom.

10:00 AM BREAK

10:30 AM *EP08.09.04  
A Machine-Learned Interatomic Potential for the Elemental Phase Change Material Sb  
Daniele Dragoni; University of Milano-Bicocca, Italy.

11:00 AM EP08.09.05  
Effects of Si Doping on the Electronic Structure and Electrical Conductivity of Ge2Sb2Te5 Crystals—First-Principles Study  
Rajarshi Sinha Roy; CEMES-CNRS, Université de Toulouse, France.

11:15 AM EP08.09.06  
The Role of Electric Fields in the Structural Rearrangements of iPCM Building Blocks  
Paul Fons1, 2; 1National Institute of Advanced Industrial Science and Technology, Japan; 2Spring8, Japan Synchrotron Radiation Institute (JASRI), Japan.

11:30 AM EP08.09.07  
Refrigeration in Two-Dimensions—Electrostatic Caloric Effect in Monolayer Materials  
Daniel A. Rehn1, 2; 1Stanford University, United States; 2Los Alamos National Laboratory, United States.

SESSION EP08.10: Crystal Growth and Structure  
Session Chairs: Daniele Dragoni and Xianbin Li  
Thursday Afternoon, April 25, 2019  
PCC North, 200 Level, Room 222 B

1:30 PM EP08.10.01  
Synthesis and Characterization of TaS2 Based Superlattices for Applications in Electrically-Driven Quantum Phase Transitions  
Sage Bauers; National Renewable Energy Laboratory, United States.

1:45 PM *EP08.10.02  
Structural and Electrical Properties of Phase Change Materials Towards Amorphization  
Stefania Privitera; Istituto per la Microelettronica e Microsistemi - IME, Italy.

2:15 PM EP08.10.03  
A New Structural Phase Transition and C-Axis Transport in HfS2  
Jie Peng; University of Maryland, College Park, United States.

2:30 PM EP08.10.04  
High-Throughput Investigation of Phase-Change Properties of Ge-Sb-Te Ternary Composition Spreads  
Heshan Yu; Department of Materials Science and Engineering, University of Maryland, United States.

2:45 PM BREAK

3:15 PM *EP08.10.05  
Rules in van der Waals Epitaxy  
Raffaella Calarco; Paul-Drude-Institute, Germany.

3:45 PM EP08.10.06  
Growth and Characterization of Epitaxial GeSbTe Films Towards Ge-Rich Compositions  
Stefano Cecchi; Paul-Drude-Institute, Germany.

4:00 PM EP08.10.07  
Phase Segregation and Crystallization of Amorphous Ge-Rich GST Alloys  
Alain Claverie; CEMES-CNRS, France.

4:15 PM EP08.10.08  
Atomic Imaging and Modelling of Bilayers in Hexagonal GST  
Jiangjing Wang; Xi’an Jiaotong University, China.

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SESSION EP09.01: Ferroelectric HfO2
Session Chairs: Rinus Lee and John Robertson
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 224 B

10:30 AM *EP09.01.01
Steep-Slope Devices with New Operation Mechanisms for Ultra-Low-Power Applications Qianqian Huang1, 2; 1Peking University, China; 2Peking University, China.

11:00 AM *EP09.01.02
Negative Capacitance in Ferroelectric Hafnium Oxide Thomas Mikolajick1, 2; 1NaMLab, Germany; 2Technische Universität Dresden, Germany.

11:30 AM *EP09.01.03
A Ferroelectric Semiconductor Field-Effect Transistor Peide P. Ye; Purdue University, United States.

SESSION EP09.02: 2D Materials
Session Chairs: Tony Low and John Robertson
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 224 B

1:30 PM *EP09.02.01
Prospects and Challenges of 2D Materials and Devices Won Jong Yoo; Sungkyunkwan University, Korea (the Republic of).

2:00 PM *EP09.02.02
Theoretical Exploration of Energy Efficient Spin Transduction and Switching Tony Low; University of Minnesota, United States.

2:30 PM *EP09.02.03
2D/3D Semiconductor Heterojunctions of MoS2 and GaN Michael D. Valentín1, 2; 1University of California, Riverside, United States; 2U.S. Army Research Laboratory, United States.

2:45 PM *EP09.02.04
STM Investigation of Graphene/Few-Layer Molybdenum Disulfide Memristor Devices Jesse E. Thompson; University of Central Florida, United States.

3:00 PM BREAK

3:30 PM *EP09.02.05
2D Semiconductor Electronics—Advances, Challenges and Opportunities Ali Javey; University of California, Berkeley, United States.

4:00 PM *EP09.02.06
Contact Engineering for 2D Field-Effect Transistors Po-Wen Chiu1, 2; 1National Tsing Hua University, Taiwan; 2Academia Sinica, Taiwan.

4:30 PM *EP09.02.07
Reducing Contact Resistances, Unpinning Femi Levels and Understanding Schottky Barriers John Robertson; Cambridge University, United Kingdom.

SESSION EP09.03: Poster Session: Devices and Materials to Extend the CMOS Roadmap for Logic and Memory Applications
Session Chairs: Catherine Dubourdieu, Rinus Lee and John Robertson
Tuesday Afternoon, April 23, 2019
PCC North, 300 Level, Exhibit Hall C-E

EP09.03.01
MEMS Process and Characterization for Strain-Engineered 2D Materials Edgar Acosta; University of Texas at El Paso, United States.

EP09.03.02
Application-Driven Perovskite Thin Films with Oxygen Vacancies Controlled Prateek Gopalakrishnan; The University of Texas at San Antonio, United States.

EP09.03.03
Single- and Double-Gate Synaptic Transistor with a TaOx Gate Insulator and an IGZO Semiconductor Channel Layer Keonwoon Beom; Myongji University, Korea (the Republic of).

EP09.03.04
Multiscale Modeling Framework for 2D-Material MOS Transistors Madhuchhanda Brahma; Indian Institute of Science, Bangalore, India.

EP09.03.05
Suppression of Defects at High-K/SiGe Interface with Monolayer Si ALD Deposition Harshil Kashyap; University of California, San Diego, United States.

EP09.03.06
Development of a Hierarchical Process for Optimization of the Design for MEMS Vibrating Ring Gyroscope for Miniaturized Space Attitude Control System Daniel Choi; Khalifa University of Science and Technology, United Arab Emirates.

EP09.03.07
Influence of Intermixing on Perpendicular Magnetic Anisotropy of Ion-Beam-Deposited CoFeB MTJs for STT-RAM Tania Henry; Veeco Instruments Inc, United States.

EP09.03.08
Role of Hypochlorous Acid in Solution-Processed P-Type Oxide Thin-Film Transistors for Oxide Semiconductor-Based CMOS Logic Jusung Chung; Yonsei University, Korea (the Republic of).

EP09.03.09
Ge2Se3/Ge2Se3-M (M = Sn, Al, Ti, W, Cr, Pb, Cu, C)-Based Optically-Gated Transistor—M Influence on Optical and Electrical Properties Md Faisal Kabir; Boise State University, United States.

EP09.03.10
MoTe2 p-n Junction Formed via Edge Contact and Oxidation Changsik Kim; Sungkyunkwan University, Korea (the Republic of).

EP09.03.11
Nonvolatile Capacitance Changes in Metal-Oxide-Semiconductor Device with Resistive Switching Floating-Gate Structure for Nonvolatile Memory and Programmable Logic Device Application Minju Kim; Myongji University, Korea (the Republic of).

EP09.03.12
Influence of Bulk/Interface Anomalies Upon Resistive Switching in Dual Ion Beam Sputtered ZnO Based Memristive Devices Amitesh Kumar; Indian Institute of Technology Indore, India.

EP09.03.13
Impact of Metal/Semiconductor Junctions in the Resistive Switching of Yttria Based Memristive System Amitesh Kumar; Indian Institute of Technology, India.

EP09.03.14
Influence of the Type of Chalcogen (Ch) Atom on the Electrical Properties of a GeSe2/Sn-Ch Memristive Device Pradeep Kumar Kamaravadi; Boise State University, United States.

EP09.03.15
Enhancement of Electrical Properties for Black Phosphorus Using the via Contacts Embedded in h-BN Myeongjin Lee; Sungkyunkwan University, Korea (the Republic of).
EP09.03.16
Giant Electroresistance Effect in Single-Crystalline Lithium Niobate Thin Films Enabled by Domain Wall Control Haidong Lu; University of Nebraska–Lincoln, United States.

EP09.03.17
Transport Analysis of 4H-SiC Power Devices Using Full-Band Ensemble Monte Carlo Method Chi-Yin Cheng; Arizona State University, United States.

EP09.03.18
Fabrication of Ferroelectric V-Doped ZnO Films Fabricated via Sol-Gel Method Woo Jun Seol; Gwangju Institute of Science and Technology, Korea (the Republic of).

EP09.03.19
Manipulating the Electrochemical Metallization Cell Kinetics by the Anion Electrode and Tunable Electrolyte Ziyang Zhang; Tsinghua University, China.

EP09.03.20
Bidirectional and Multilevel Threshold Switching of Ag-Dielectrics Diffusive Devices for Neuromorphic Computing Applications Yaoyuan Wang1, 2, 3; 1Tsinghua University, China; 2Tsinghua University, China; 3Tsinghua University, China.

EP09.03.21
Optoelectronic CMOS Transistors—Performance Advantages for Sub-7nm ULSI, RF ASIC, Memories and Power MOSFETs James Pan; Advanced Enterprise and License Company, United States.

EP09.03.22
Atomic Force High Frequency Phonons Nonvolatile Dynamic Random-Access Memory Compatible with Sub-7nm ULSI CMOS Technology James Pan; Advanced Enterprise and License Company (AELC), United States.

EP09.03.23
Generic 2D Schrödinger-3D Poisson Solver for AlGaN/GaN Nanowire FinFETs Viewanathan Naveen Kumar; Arizona State University, United States.

EP09.03.24
Observation of Threshold and Resistive Switching Behaviors in Epitaxially Regrown GaN p-n Diodes by MOCVD Houqiang Fu; Arizona State University, United States.

EP09.03.26
Non-Volatile Discrete Memristive and Memcapacitive States Enabled by Electric Field Controlled Charge Disproportionate Redox Sreetosh Goswami; National University of Singapore, Singapore.

EP09.03.27
Self-Purification of the Highly Pure Semiconducting Carbon Nanotube Arrays Zhenxing Zhu; Beijing Key Laboratory of Green Chemical Reaction Engineering and Technology, China.

EP09.03.28
Performance Degradation Due to Nonlocal Heating Effects in Resistive ReRAM Memory Arrays Marius K. Orlowski; Virginia Tech, United States.

EP09.03.29
Suppression of Gate-Induced Drain Leakage in Single-Gate Feedback Field Effect Transistors Doohyeok Lim; Korea University, Korea (the Republic of).

EP09.03.30
Introducing a Single MOF Crystal into a Micro CBRAM Device by a Selective Growth Method of MOF Atsushi Shimizu; Tokyo University of Science, Japan.

EP09.03.31
Functional Demonstration of In-Memory Arithmetic Logic Unit in Memristive Crossbar for Software-Defined Memprocessor Yi Li; Huazhong University of Science and Technology, China.

EP09.03.32
CBRAM Based on Single Crystalline Si Thin Films Grown by Solid Phase Epitaxy Inho Kim; Korea Institute of Science and Technology, Korea (the Republic of).

EP09.03.33
Nanoscale Electronics Realization with a Prospectives from Devices Architecture and Interconnect Circuits Theory Preetisudha Meher; National Institute of Technology, India.
Indium Tungsten Oxide Thin Films for Flexible High Performance Transistors and Neuromorphic Electronics

Nidhi Tiwari; Nanyang Technological University Singapore, Singapore.

SYMPOSIUM EP10

Heterovalent Integration of Semiconductors and Applications to Optical Devices
April 24 - April 25, 2019

Symposium Organizers
Isaac Hernandez-Calderon, CINVESTAV
David Smith, Arizona State University
Maria Tamargo, City College of New York
Katsuhiro Tomioka, Hokkaido University

* Invited Paper

SESSION EP10.01: Heterovalent II-VI/III-V Integration
Session Chairs: Isaac Hernandez-Calderon and Achim Trampert
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 B

1:30 PM *EP10.01.01
Semiconductors Heterovalent Interfaces and Integration Yong-Hang Zhang; Arizona State University, United States.

2:00 PM *EP10.01.02
Narrow Linewidth Semiconductor Disk Lasers and Progress Towards ZnCdMgSe Vertical Gain Structures Jennifer Hastie; University of Strathclyde, United Kingdom.

2:30 PM EP10.01.03
Strategies for Analyzing Non-Common-Atom Heterovalent Interfaces—The Case of CdTe-on-InSb Esperanza Luna; Paul-Drude-Inst, Germany.

2:45 PM BREAK

SESSION EP10.02: Heterovalent and Isovalent Integration
Session Chairs: Isaac Hernandez-Calderon and Esperanza Luna
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 B

3:30 PM *EP10.02.01
Development of Scalable Si-Based Composite Substrates for Various Optoelectronic Materials at 6.1 Å and 6.4 Å Yuanping Chen; U.S. Army Research Laboratory, United States.

4:00 PM EP10.02.02
Growth of Silicon Doped InAs by Atomic Layer Epitaxy Guy M. Cohen; IBM T.J. Watson Research Center, United States.

4:15 PM EP10.02.03
High-Hole Mobility (500 cm²/Vs) Polycrystalline Ge Thin Film on a GeO2 Coated Flexible Plastic Substrate Toshifumi Imajo; University of Tsukuba, Japan.

4:30 PM EP10.02.04
Modeling of Transport Through Interfacial Layers in Silicon Heterojunction Solar Cells Pradyumna Muralidharan; Arizona State University, United States.

4:45 PM EP10.02.05
Twin Boundaries in GaP Nanowires—Electronic Structure and Optical Properties Oleg Rubel; McMaster University, Canada.

SESSION EP10.03: Poster Session: Heterovalent Integration of Semiconductors and Applications to Optical Devices
Session Chairs: David Smith and Katsuhiro Tomioka
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E
EP10.03.01 Fabrication of a One-Dimensional AlGaInP/GaAs Microrod via a Top-Down Approach with Micro-Engineering Gang Yeol Yoo; Korea University, Korea (the Republic of).

EP10.03.02 Theoretical Study of Electronic Properties of Heterovalent Semiconductors Based on SnO2: Mykhaylo Yatskin; Oregon State University, United States.

EP10.03.03 Effect of W+ Doping on the Structural, Chemical and Dielectric Properties of GaO3 Vishal Zade1, 2; 1University of Texas, United States; 2CMR, United States.

EP10.03.04 Fabrication of a Remote-Type Single-Package Light-Emitting Diode Using the Mixed Narrowband CaMgAl10O17:Eu,Mn Green Phosphor and the K2SiF6:Mn4+ Red Phosphor for Wide-Gamut White LEDs Heejoon Kang; Kookmin University, Korea (the Republic of).

EP10.03.05 Electrical Characterization of Silicon–Nickel Iron Oxide Heterojunctions James N. Talbert; Texas State University, United States.

EP10.03.06 Understanding the Modification of Oxidation States in GaAs Surface by Etching Using XPS, IBA and 3LCAA Amber A. Chen1, 2; 1Arizona State University, United States; 2SiO2 Innovates LLC, United States.

EP10.03.07 External Piezoelectric Fields Induced Further Trap-Depth Decrease and ML Emissions from ZnS:Mn/PVDF Thin-Film Structures Fulei Wang; State Key Laboratory of Crystal Material, China.

EP10.03.08 The Gas Sensing Properties of CuSbS2 Quantum Dots/rGO Composites to Ammonia at Room Temperature Yuwei Liu; Wuhan University of Technology, China.

EP10.03.09 Tunability of Electronic Transport in Layered Semiconductor Nanostructures with Strain Sanghamitra Neogi; University of Colorado Boulder, United States.

SESSION EP10.04: Heterovalent Integration I
Session Chairs: Yumping Chen and Maria Tamargo
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 226 B

8:00 AM *EP10.04.01 Interface Structure and Defect Formation During III-(Sb,As) Epitaxy on Si(001) Achim Trampert; Paul-Drude-Institut für Festkörperelektronik, Germany.

8:30 AM *EP10.04.02 Heterovalent Integration as a Tool for Controlling Magnetic Properties of Epitaxial Semiconductor and Metal Films Jacek K. Fundyna; University of Notre Dame, United States.

9:00 AM *EP10.04.03 Epitaxial GaAsP/Si Solar Cells Minjoop Lee; University of Illinois Urbana-Champaign, United States.

9:30 AM EP10.04.04 Tunable Optical and Structural Properties of Ga-Doped ZnO Film with In Situ Doped Atomic Layer Deposition Shang-Yu Tsai; National Chiao Tung University, Taiwan.

9:45 AM EP10.04.05 Orientation Shift of ZnTe Epilayers Grown on M-Plane Sapphire Substrates by Introducing Nano-Facet Structures Masakazu Kobayashi1, 2; 1Waseda University, Japan; 2Waseda University, Japan.

10:00 AM BREAK

10:30 AM *EP10.04.06 Selective-Area Epitaxy of Semiconductor Microrod Heterostructure Light-Emitting Diode Arrays for Flexible and Transferable Optoelectronics Young Joon Hong; Sejong University, Korea (the Republic of).
SYMPOSIUM EP11

Hybrid Materials and Devices for Enhanced Light-Matter Interactions
April 23 - April 26, 2019

Symposium Organizers
Jennifer Hollingsworth, Los Alamos National Laboratory
Peter Qiang Liu, State University of New York at Buffalo
Xuedan Ma, Argonne National Laboratory
Luuk Novotny, ETH Zürich

* Invited Paper

SESSION EP11.01: Carrier Dynamics and Ultrafast Processes
Session Chairs: Deep Jariwala and Cherie Kagan
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 B

1:30 PM *EP11.01.01
Imaging and Controlling of Hot Electron Dynamics and Nonlinear
Upconversion in Plasmonic and Dielectric Nanoantennas Yi Li; Ludwig-
Maximilians-Universität München, Germany.

2:00 PM EP11.01.02
Probing the Phonon Scattering in the Strong Light-Matter Coupling
Regime Xiaoxue Liu; University of California, Berkeley, United States.

2:15 PM EP11.01.03
Ultrafast Spectroscopy and Transmission Modulation of Vibration-
Polaritons Blake S. Simpkins; Naval Research Laboratory, United States.

2:30 PM EP11.01.04
Coupled Plasmon-Phonon Modes Enhanced Light-Matter Interaction in the
Hybrid Ag-MoS2 System Yuba Poudel; University of North Texas, United States.

2:45 PM EP11.01.05
Hot-Electron Plasmonics for Ultrafast Control of Intensity, Phase and
Polarization of Light Mohammad Taghinejad; Georgia Institute of Technology,
United States.

3:00 PM BREAK

SESSION EP11.02: Optoelectronic Devices
Session Chairs: Millicent Firestone and Jennifer Hollingsworth
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 225 B

3:30 PM *EP11.02.01
Designing Active Plasmonic Metastructures from Colloidal Nanocrystal
Building Blocks Cherie R. Kagan; University of California, Berkeley, United States.

4:00 PM EP11.02.02
Near Infrared Absorbing Copper (II) Complexes—Improvement of
Absorbance and Hydrothermal Stability Mi-Jeong Kim; Samsung Advanced
Institute of Technology (SAIT), Samsung Electronics, Korea (the Republic of).

4:15 PM EP11.02.03
Enhanced Surface Raman Laser with Organic Monolayer in Silica Hybrid
Resonator Hyungwoo Choi; University of Southern California, United States.

4:30 PM EP11.02.04
Thermally Soldered Au Nanogrids with Enhanced Plasmon Quality for
Quantitative Multiplexing of Trace-Amount Molecules via SERS Snehasree H.
Chak; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:45 PM EP11.02.05
High Performance Visible-Blind UV Photodetector Using ZnO@Au Core-
Shell Nanostructures Maniiri Singh1, 2; 1CSIR-NPL Academy of Scientific & Innovative Research, CSIR-NPL Campus, India; 2AcSIR National Physical Laboratory, India.

SESSION EP11.03: Cavity Quantum Electrodynamics
Session Chairs: Peter Qiang Liu and Ronen Rapaport
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 B

8:30 AM *EP11.03.01
Dressing Quantum Emitters with Nanoantennas and Microparticles Yida Lin; Johns Hopkins University, United States.

9:00 AM *EP11.03.02
Manipulating Quantum Light on a Chip—From Heralded Single Photon
Purification to Effective Photon-Photon Interactions Ronen Rapaport; The
Hebrew University of Jerusalem, Israel.

9:30 AM EP11.03.03
Path Selectivity, Lasing and Super-Radiance Effects in Plasmonic Nano-
Structures—Experimental and Numerical Investigations Renaud Vallec; Centre
de Recherche Paul Pascal, France.

9:45 AM EP11.03.04
Photonic Band Engineering in Absorbing Media for Spectrally-Selective
Optoelectronic Films Yida Lin; Johns Hopkins University, United States.

10:00 AM BREAK

10:30 AM *EP11.03.05
Diamond Quantum Photonics Constantin Dory; Stanford University, United States.

11:00 AM EP11.03.06
Phononic-Joined Structures—Microcavity Enhancement Atzin D.
Ruiz1, 2, 3; 1UNAM, Mexico; 2Posgrado Fisica Unam, Mexico.

11:15 AM EP11.03.07
Electron Transfer in Confined Electromagnetic Fields Alexander Semenov; the
University of Pennsylvania, United States.

11:30 AM *EP11.03.08
Nanoscale Self-Assembly to Smart Optical Materials Yadong Yin; University of
California, Riverside, United States.

SESSION EP11.04: Excitons, Phonons and Polaritons
Session Chairs: Constantin Dory and Raktim Sarma
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 B

1:30 PM *EP11.04.01
Polaritons Beyond the Rotating Wave Approximation Junichiro Kono; William
Marsh Rice University, United States.

2:00 PM *EP11.04.02
Tunable Metamaterials for Vacuum Field Engineering of Two-Dimensional
Systems Jerome Faist; ETH Zurich, Switzerland.

2:30 PM EP11.04.03
Enhanced Light-Matter Interactions in Phononic Superlattices with Fine-
Tuned Shape Chun-Yu T. Huang1, 3; 1University of California, Riverside, United States; 2University of California, Riverside, United States.

2:45 PM EP11.04.04
Study of the Plasmon-Exciton Coupling in Hybrid Nanostructured
Superlattices Jose Luis Montaño-Priede; The University of Texas at San Antonio,
United States.

3:00 PM BREAK

SESSION EP11.05: Metamaterials, Metasurfaces and Topological Photonics
Session Chairs: Peter Qiang Liu and Ronen Rapaport
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 225 B

3:30 PM *EP11.05.01
Topological Photonics via Parametric Driving Aashish Clerk; University of
Chicago, United States.
**SESSION EP11.06: Poster Session: Hybrid Materials and Devices for Enhanced Light-Matter Interactions**

**EP11.06.01**
Detecting Visible Light by Solution Processed Oxide Absorption Layer for IGZO Phototransistor Junsong Chong; Yonsei University, Korea (the Republic of).

**EP11.06.02**
Robust Stretchable Photodetectors Based on Graphene/Co Heterostructure Shuchao Qin; Nanjing University, China.

**EP11.06.03**
Improved Photovoltaic Performance of GaAs Solar Cells Enabled with Plasmonically Enhanced Spectral Upconversion Huandong Chen; University of Southern California, United States.

**EP11.06.04**
Metal Nanoparticles on Crystalline Oxide Nanostructures for Surface Enhanced Raman Spectroscopy Bo Xiao; Norfolk State University, United States.

**EP11.06.05**
Tunable, Vivid Reflective Color Pixel Based on Active Fabry-Perot Broadband Absorber Soo-Jung Kim; Korea University, Korea (the Republic of).

**EP11.06.06**
Indium–Gallium–Zinc Oxide Based Visible Light Phototransistors Using Selenium Passivation Layer Huikjong Yoo; Yonsei University, Korea (the Republic of).

**EP11.06.07**
Laser-Driven, Rewritable Writing Technology in a Full-Color Fluorescent Dye-Diffused Polydimethylsiloxane Elastomer Soon Moon Jeong; Daegu Gyeongbuk Institute of Science and Technology, Korea (the Republic of).

**EP11.06.08**
Absorption Enhancement of the Solar Spectrum with Arrays of Subwavelength Silicon Trumpet Non-Imaging Light Concentrators Ankit Chauhan; Ben-Gurion University of the Negev, Israel.

**EP11.06.10**
Anthracene Dimer-Crosslinked Polyurethanes as Mechanoluminescent Polymeric Materials Lei Kan; Harbin Engineering University, China.

**EP11.06.11**

**EP11.06.12**
Flexible Omnidirectional and Polarisation-Insensitive Broadband Light Absorber Weiling Dong; Singapore University of Technology and Design, Singapore.

**EP11.06.14**
Significant Broadband Photocurrent Enhancement by Epsilon-Near-Zero Gold Nanostructures Photocathodes Shih-Hsuan Huang; National Taiwan University of Science and Technology, Taiwan.

**SESSION EP11.07: Light-Matter Interaction in Low-Dimensional Materials**

**EP11.07.01**
Control of Light-Matter Interaction in van der Waals Materials Vinod Menon; City College & Grad Center of CUNY, United States.

**EP11.07.02**
Nanophotonic Devices in the Atomically-Thin Limit Deep M. Jariwala; University of Pennsylvania, United States.

**EP11.07.03**
Extraordinary Light Absorption and Photoluminescence of Graphene Nanostripes Deepan Kishore Kumar; California Institute of Technology, United States.

**EP11.07.04**
Plasmonics over Hybrid Metasurfaces Andrea Alu1, 2; 1City University of New York, United States; 2The University of Texas at Austin, United States.

**EP11.07.05**
Active Control of Single Photon Sources Using 2D Materials Antoine Reserbat-Plantey; ICF-ICFO - The Institute of Photonic Sciences, Spain.

**EP11.07.06**
Plasmon Induced Thermoelectric Effect in Graphene Viktoriya Shuvalova1, 2; 1University of Oxford, United Kingdom; 2Imperial College London, United Kingdom.

**EP11.07.07**
Anomalous Second Harmonic Generation in Monolayer Molybdenum Disulfide Brian Squires; University of North Texas, United States.

**SESSION EP11.08: Photovoltaics, Photocatalysis and Photo-Assisted Reactions**

**EP11.08.01**
Flexible and Reconfigurable Plasmonics Teri Odom; Northwestern University, United States.

**EP11.08.02**
Light Trapping in Nanowires for Photovoltaic Applications Mahtab Aghaeipour; Technical University of Berlin, Germany.

**EP11.08.03**
Quantum Dot Antennas for Anisotropic Emission in Tandem Luminescent Solar Concentrators Haley Bauser; California Institute of Technology, United States.

**EP11.08.04**
19.9%-Efficient 205 nm-Thick Ultrathin GaAs Solar Cell Using Multi-Resonant Light Trapping Andrea Cattoni; C2N-CNRS, France.

**EP11.08.05**
Quasirandom Nanophotonic Light Trapping Structures Integration into Wafer-Based Silicon Solar Devices Anna Safdar; National Academy of Science and Technology, Pakistan.
8:30 AM EP11.09.01
Magnetic Assembly of Anisotropic Nanostructures into Responsive Photonic Crystal
Zhiwei Li; University of California, Riverside, United States.

8:45 AM EP11.09.02
Anisotropically Shaped Cu Nanostructures as Emerging Plasmonic Materials
Jinxing Chen1, 2; 1University of California, Riverside, United States; 2Soochow University, China.

9:00 AM *EP11.09.03
Digital Assembly and Applications of Hybrid Nanomaterials with Complex Architectures
Yuebing Zheng; The University of Texas at Austin, United States.

9:30 AM EP11.09.04
Room Temperature Synthesis of Nanoscale UV-VIS Photodetector Based on Silicon Nanowires / Amorphous-TiO2 Heterostructure
Debika Banerjee; École de Technologie Supérieure, Canada.

9:45 AM EP11.09.05
Enhanced Light-Matter Interaction in Quantum Dot Supercrystals
Emanuele Marino1, 2; 1University of Amsterdam, Netherlands; 2University of Pennsylvania, United States.

8:30 AM SYMPOSIUM EP12
TUTORIAL: Plasmonics, Metamaterials, and Metasurfaces for Manipulating Light at Nanoscale
April 22 - April 22, 2019

SYMPOSIUM EP12
TUTORIAL: Plasmonics, Metamaterials, and Metasurfaces for Manipulating Light at Nanoscale
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 127 A

The emerging materials research for optical and photonic devices is critical for aligning with current trends in science and technology. An in-depth discussion of the various material options that have sprung up and continue to excite researchers with an accelerating trend put a high demand on exploring a new wave of photonic applications. Plasmonic nanostructures and optical metamaterials control the propagation of light in subwavelength dimensions, enabling novel material properties and optoelectronic devices. This tutorial aims at highlighting strategies to broadly address the grand challenges in plasmonics and metamaterials, spanning novel synthetic methods, advanced nanostructure characterization, and ultimate integration of these advances into diverse areas such as energy conversion, flat optical components, and nanoscale optoelectronic devices. This tutorial session will provide the platform to bring together scientists and engineers from a variety of material research disciplines and engages them in active discussions towards shaping future plasmonic and two-dimensional materials, metamaterials, and their nanoscale application.

8:30 AM
Two-Dimensional Materials Optics and Photonics
Linyou Cao; North Carolina State University

The tutorial is to give a comprehensive introduction for the optics and photonics of atomically thin two-dimensional (2D) materials, in particular, 2D semiconductors like transition metal chalcogenide materials. It will mainly focus on the unique optical properties and photonic applications enabled by the strong exciton binding energy in 2D materials, which cannot be obtained with other material systems. The tutorial will start with the basic physics of excitons in 2D materials, followed by a brief introduction for cutting edge research such as different phases of excitons and exciton condensation. After that, the tutorial will cover the exotic light-matter interaction of 2D materials that are related with the remarkable excitonic properties, including absorption, emission, scattering, and electrically tunable refractive index. It will also cover the novel strategies for the manipulation of light-matter interactions with 2D materials, such as electrical and magnetic fields, cavities, mechanical forces, and substrates.

10:00 AM BREAK

10:30 AM
Achieving the Ultimate Limits of Plasmonic Enhancement
Reuven Gordon; University of Victoria

Plasmonic enhancement has had remarkable success in optical coupling to the nanometer scale, enabling feats such as Raman spectroscopy with single molecule sensitivity. Here it is described how much greater enhancements are possible in the near future by combining the gains of plasmonic resonances, directivity, sub-nanometer gaps and permittivity near zero materials. The physics behind each of these phenomena will be reviewed in this lecture. By pushing the limits of plasmonic enhancement, it is expected that the community will gain a greater appreciation of how physical phenomena such as non-locality, surface scattering and quantum tunneling each play a role in determining the ultimate performance. The impact of these additional effects will also be discussed. The pursuit of such extraordinary enhancements promises to bring new physics such as peering into the world of quantum optomechanics. I will discuss new applications such as quantitative single molecule Raman spectroscopy and low photon number nonlinear optical switching.
Plasmon excitation can result in highly confined optical fields near interfaces. This property has been exploited in devices ranging from photodetectors and solar cells to electrochemical cells, sensors, and color pixels. For such devices, there are tradeoffs between beneficial photon absorption, parasitic optical loss, and electrical conductivity. Further, the optical and electrical properties depend critically on the materials used (metals, alloys, ceramics, highly-doped semiconductors, low-dimensional materials, etc.). In this tutorial, we will discuss a variety of device applications and the associated material tradeoffs. Topics will range from fundamental materials properties, how they can be tuned, effects of hot electrons in plasmonic materials, and future outlooks for such devices.

3:00 PM BREAK

3:30 PM

Plasmonic perfect absorbers can exhibit nearly 100% absorptivity at desired wavelengths, and also emit light at the same wavelengths when they are heated. It has been successfully demonstrated their use such as in wavelength-selective infrared thermal emitters and molecular vibrational sensors. In this seminar I will summarize some recent studies in our group on the perfect absorbers based on the metal-insulator-metal structures, Fabri Perot or other similar types of cavity structures as well as 2D patterned structures. Some of the fabricated mid-infrared perfect absorbers exhibit narrowband resonant absorption as narrow as 22 nm with efficiency higher than 97%. We introduce some applications of these devices such as for selective thermal emitters operated above 1273K, selective surface-enhanced vibrational spectroscopy for high-sensitivity molecular sensing, and wavelength selective IR detectors in combination with pyroelectric, thermoelectric, and bolometer devices.

SYMPOSIUM EP12

Emerging Materials for Plasmonics, Metamaterials and Metasurfaces April 23 - April 25, 2019

Session Chairs: Viktoriia Babicheva and Marina Leite
Tuesday Afternoon, April 23, 2019
PCC North, 300 Level, Exhibit Hall C-E

* Invited Paper

EP12.03.01 Nitride Plasmonics for Enhanced Electrochemical Oxidation Blake S. Simpkins; Naval Research Laboratory, United States.

EP12.03.02 Plasmon Effect Study in Lithium Borate Glasses Doped with Dy3+ and Yb3+ and Containing Silver Nanoparticles Janet A. Elias; Universidad de Guanajuato, Mexico.

EP12.03.03 Colloidal Gold Nanoplate-Based Heterodimers for Charge Transfer Plasmon and Fano Resonances Yunhe Lai; The Chinese University of Hong Kong, Hong Kong.

EP12.03.04 Millivolt-Scale Optical Modulation of Planar Heterostructures via Bias-Induced Transport of Silver Ions Areum Kim; California Institute of Technology, United States.

EP12.03.05 Studies of Electron Transfer Carrier Diffusivity and Rate Constant of Ferricyanide on Au Surfaces Adjacent to Hyperbolic Metamaterials Olivia M. Penrose Hamouch; Norfolk State Univ, United States.

EP12.03.06 Ultra-Sensitive microRNA Detection Using Vertically Coupled Plasmonic Nanoantennas Xinhui Chen1,2; 1Arizona State University, United States; 2Arizona State University, United States.

EP12.03.07 Hybrid Metal-Dielectric-Metal Structures of Controlled Geometry, Based on Large Area Colloidal Lithography with Metallic Spheres as a Patterning Mask Jusung Park; Seoul National University, Korea (the Republic of).
EP12.03.08
Silicon Surface Nanotexturization with Diffraction Gratings via Metal-Assisted Chemical Imprinting
Ahalskand Sharstniou; Arizona State University, United States.

EP12.03.10
Plasmon-Enhanced Emission and Quenching of Magnetic Emitters
Soheila Mashhad; Norfolk State University, United States.

EP12.03.13
Design of Ultrawide Bandwidth Electromagnetic Wave Absorbers Using Frequency Selective Surfaces with Different Patterns and Geometries
Sang-Soo Kim; Chungbuk National University, Korea (the Republic of).

SESSION EP12.04: Composites and Metastructures
Session Chairs: Viktoria Babicheva and Deep Jariwala
PCC North, 200 Level, Room 226 A

8:30 AM *EP12.04.01
Quantum Emission and Nonreciprocal Optical Transmission in Deeply Subwavelength Systems
Jennifer Dionne; Stanford University, United States.

9:00 AM EP12.04.02
Towards Compact Infrared Adaptive Optics by Local Tuning of Nanophotonic Structures Enabled By Phase-Change Materials
Dmitry N. Chigrin1, 2; 1RWTH Aachen University, Germany; 2DWI - Leibniz Institute for Interactive Materials, Germany.

9:15 AM EP12.04.03
Non-Volatile, Reconfigurable, Multilevel Photonic Devices Based on Phase-Change Metasurfaces and Thin Films
Carlota Ruiz de Galarreta; University of Exeter, United Kingdom.

9:30 AM EP12.04.04
A Novel Material Platform for Transparent Photonics
Thomas Farinha1, 2, 3; 1University of Maryland, United States; 2University of Maryland, United States.

9:45 AM EP12.04.05
Dynamically Tuneable PLG Doped SBN75 Thin Film Based Electro Optic Modulator
Sureh Gupta; University of Delhi, India.

10:00 AM BREAK

10:30 AM EP12.04.07
Copper and Aluminum Island Films as Plasmonic Structures for Solar Energy Conversion
Jordi Sancho Parramon; Rudjer Boskovic Institute, Croatia.

10:45 AM *EP12.04.07
Subnanometer Gaps in Metals and Novel Plasmonic-Upconverter Interactions
Reuven Gordon; University of Victoria, Canada.

11:15 AM EP12.04.08
Inkjet-Printing of Plasmonic Reflective Displays
Samir Sardar; Laboratory of Organic Electronics, Linköping University, Sweden.

11:30 AM EP12.04.10
Nonnegative Quadratic Programming Optimization of Focused Ion Beam Fabricated 3D Nanostructures for Structural Colors
Vivek Garg1, 2, 3; 1IITB; 2Indian Institute of Technology Bombay, India; 3Monash University, Australia.

11:45 AM EP12.04.11
Highly Ordered Plasmonic Nets on Modified Mesoporous Silicon
Hanna V. Bandarenka; BSUIR, Belarus.

SESSION EP12.05: Nanostructures
Session Chairs: Eyal Feigenbaum and Ann Roberts
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 A

2:00 PM EP12.05.02
Localized Surface Plasmon Modes in Nanoparticle Arrays and Dimers
Viktoriya Babicheva; The University of Arizona, United States.

2:15 PM EP12.05.03
3D Nanocrystal/Bulk Heterostructures with Giant Chiroptical Properties
Jiaxen Guo; University of Pennsylvania, United States.

2:30 PM BREAK

3:30 PM *EP12.05.04
Spectroscopic Nanotransducers for Infrared Sensing Applications
Tadaki Nagao1, 2, 3; 1National Institute for Materials Science, Japan; 2Hokkaido University, Japan.

4:00 PM EP12.05.05
Synthesis, Characterisation and Applications of Plasmonic Sodium Tungsten Bronze Nanoparticles
Levi Tegg; University of Newcastle, Australia.

4:15 PM EP12.05.06
Non-Resonant Enhancement of Second-Harmonic Generation in a Dielectric Micro/Nano-Hybrid Particle with a Nonlinear Metamaterial Shell
Joong Hwan Bahng; California Institute of Technology, United States.

4:30 PM *EP12.05.07
Cancer Diagnosis and Response to Treatment with Plasmonic Nanoprobes
Rizia Bardhan; Vanderbilt University, United States.

SESSION EP12.06: Photonics
Session Chairs: Fang Liu and Alexey Nikitin
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 226 A

8:00 AM *EP12.06.01
Exciton-Plasmon Coupling at Plasmonic Surfaces and Implications for Thin-Film Optoelectronics
Deirdre O’Carroll1, 2, 3; 1Rutgers University, United States; 2Rutgers University, United States; 3Trinity College Dublin, Ireland.

8:30 AM EP12.06.02
Large Area Asymmetric Plasmonic Crystals Fabricated via Nanoimprint Lithography and Tilted Angle Metal Deposition
Cristiano Matricardi; Instituto de Ciencia de Materiales de Barcelona, Spain.

8:45 AM EP12.06.03
Refractory Character of Plasmonic Nitrides—How We Can Overcome a Blessing Turned into a Curse
Panos A. Patalsas; Aristotle University of Thessaloniki, Greece.

9:00 AM *EP12.06.04
Metamaterials and Metasurfaces for Narrowband Rejection Filters
William M. Shernov; U.S. Army Research Laboratory, United States.

9:30 AM EP12.06.05
Hybridized Plasmonic Gap Mode in Gold Nanorod on Mirror Nanoantenna for Spectrally Tailored Emission Enhancement
Hiroshi Sugimoto; Kobe University, Japan.

9:45 AM EP12.06.06
Atomically-Thin Tunable Exciton Lens
Jorik Van de Groep; Stanford University, United States.

10:00 AM BREAK

10:30 AM *EP12.06.07
Metamaterial Absorber with Nanofluidic Channel for Attomole Nanofluidic Molecular Detection
Takao Tanaka1, 2, 3; 1RIKEN Cluster for Pioneering Research, Japan; 2RIKEN Cluster for Pioneering Research, Japan; 3RIKEN Center for Advanced Photonics, Japan; 4Tokyo Institute of Technology, Japan.

11:00 AM EP12.06.08
Ultra-Flat, Transparent and Rainbow-Free Guided Mode Resonance for Diffractive Optical Eye Tracking Glass
Jung-Hwan Song; Stanford University, United States.

11:15 AM EP12.06.09
Active Tuning of Phonons and Surface-Phonon Polariton Resonances
Adam Dunkelberger; U.S. Naval Research Laboratory, United States.

11:30 AM *EP12.06.10
Thin Films and Metasurfaces for Optical Information Processing
Ann Roberts; University of Melbourne, Australia.
1:30 PM EP12.07.01
Anisotropic Propagation of Phonon-Polaritons in van der Waals
Materials Alexey Nikitin1, 2; 1Donostia International Physics Center, Spain; 2Ikerbasque, Spain.

2:00 PM EP12.07.02
Effects of Nanostructured Plasmonic Environment on Electrochromic Polymer Switching Soheila Mashhadi; Norfolk State University, United States.

2:15 PM EP12.07.03
Enhanced Reflection at Glancing Angles from a Pt/SiN Metamaterial Perfect Absorber Nicole Pfiester; Tufts University, United States.

2:30 PM EP12.07.04
Plasmonic Nanovoids in Silicon—Simulation and Experiment Hanna Bandarenka; Belarusian State University of Informatics and Radioelectronics, Belarus.

2:45 PM EP12.07.05
Compact a-Si Nanopillar Arrays for Spectral Filtering via Guided Mode Resonances Ryan C. Ng; California Institute of Technology, United States.

3:00 PM BREAK

3:30 PM EP12.07.06
On-Chip Free Electron Light Source Fang Liu1, 2; 1Tsinghua University, China; 2Beijing National Research Center for Information Science and Technology, China.

4:00 PM EP12.07.07
Coupling of Boron Dipyromethene Dye Excitons to Plasmonic Surface Lattice Resonances in Aluminum Nanodisk Arrays Robert Collison; The Graduate Center, CUNY, United States.

4:15 PM EP12.07.08
Tailoring UV Circular Dichroism with Semiconducting Metamaterials Sumant Sarkar; Northern Arizona University, United States.

4:30 PM EP12.07.09
Leveraging Momentum to Dictate Spectral Tuning of Infrared Phonon-Polaritons Thomas Beechem; Sandia National Laboratories, United States.

4:45 PM EP12.07.10
Plasmonic Nanostructures Made of Au/Ag Alloyed at Low Temperature—Unlocking an Additional Degree of Freedom Debdatta Ray; EPFL, Switzerland.
SYMPOSIUM EP13
Thermoelectrics—Materials, Methods and Devices
April 23 - April 26, 2019

Symposium Organizers
Yaniv Gelbstein, Ben-Gurion University
Jiaqing He, Southern University of Science and Technology
Theodora Kyriatsi, University of Cyprus
Yimei Zhu, Brookhaven National Laboratory

Symposium Support
Thermo Fisher Scientific

10:30 AM *EP13.01.01
Advances in the Understanding and Performance of High Performance Thermoelectrics
Mercouri G. Kanatzidis; Northwestern University, United States.

11:00 AM *EP13.01.02
First-Principles Simulation of Electron and Phonon Transport in Thermoelectric Materials with Alloys and Defects
Gang Chen; Massachusetts Institute of Technology, United States.

11:30 AM EP13.01.03
High-Throughput Screening for Thermoelectric Material and Transport Descriptors
Kedar Hippalgaonkar1, 2; 1Institute of Materials Research and Engineering, Singapore; 2Nanyang Technological University, Singapore.

11:45 AM EP13.01.04
Integrated Micro-Thermoelectric Coolers with Free-Standing Design and Robust Device Performance
Guodong Li; Leibniz Institute for Solid State and Materials Research Dresden, Germany.

1:30 PM *EP13.02.01
Tuning the Electrical Transport in Rashba Spin-Split BiTeI
Joseph P. Heremans; The Ohio State University, United States.

2:00 PM *EP13.02.02
Electric and Thermal Conduction Behavior of Layered-Oxide Thermoelectric Ceramics
Cewen Nan; Tsinghua University, China.

2:30 PM EP13.02.03
Spin Effects Leading to zT=1: MnTe(Cr) vs MnTe(Li)
Md Mobarak Hossain Polash; North Carolina State University, United States.

2:45 PM EP13.02.04
Electronic Mechanisms for Optimizing the Thermoelectric Properties of PbTeSnTe Alloys
Dana Ben-Ayoun; Ben-Gurion University of the Negev, Israel.

3:00 PM BREAK

3:30 PM *EP13.03.01
Paramagon Drag as a Route to High ZT
Joseph P. Heremans; The Ohio State University, United States.

4:00 PM *EP13.03.02
Chiral Fermion Transport and Their Thermoelectric Properties
Qiang Li; Brookhaven National Laboratory, United States.

4:30 PM EP13.03.03
First-Principles Defect Calculations to Dopability Predictions in Thermoelectric Materials
Anuj Goyal; Colorado School of Mines, United States.

8:00 AM *EP13.04.01
Engineering Thermal and Electrical Interfaces and Grain Boundaries in Thermoelectric Materials
G. J. Snyder; Northwestern University, United States.

9:00 AM *EP13.04.03
Improved Stability and High Thermoelectric Performance Through Cation Site Doping in N-Type La-Doped MgSb2Si
Max Wood; Northwestern University, United States.

The Effect of Mn Doping and Porosity on the Transport Properties of Thermoelectric Alloys in the Mg3Sb2-Family
Yuanhua Zheng; The Ohio State University, United States.

9:30 AM *EP13.04.05
Nano-Structuring of Bi2Te3-xSex Toward High Thermoelectric Performance
Sang-Soon Lim1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2Yonsei University, Korea (the Republic of).

9:45 AM *EP13.04.06
Rapid Solid-State Reaction and Simultaneous Sintering of Nanostructured Thermoelectric Materials Using Microwave Radiation
Abhishek Mulhotra; North Carolina State University, United States.

10:00 AM BREAK

10:30 AM *EP13.05.01
Revealing Heat Transport and Phonon Scattering Using Electron Probes—Challenges and Opportunities
Yimei Zhu; Brookhaven National Laboratory, United States.

11:00 AM *EP13.05.02
Thermoelectric Properties and Topology of Phosphides
Claudia Felser; Max Planck Institute Chemical Physics of Solids, Germany.

11:30 AM EP13.05.03
Slow Diffusion-Fast Vibration Model in Superionic Conductor Thermoelectric AgCrSe2
Lin Xie; Department of Physics, Southern University of Science and Technology, China.

11:45 AM EP13.05.04
Thermoelectric Transport Properties of Iodine Doped Phthalocyanine Copper (CuPc)
Yanling Chen; Shanghai Institute of Ceramics, Chinese Academy of Science, China.
SESSION EP13.06: High Temperature Thermoelectric Materials  
Session Chairs: In Chung and Zhifeng Ren  
Wednesday Afternoon, April 24, 2019  
PCC North, 200 Level, Room 225 A  

1:30 PM *EP13.06.01  
Enhancement of Thermoelectric Properties of Half-Heuslers ZrCoBi and TaFeSb  
Zhifeng Ren; University of Houston, United States.  

2:00 PM EP13.06.02  
A Valence Balanced Rule for Discovering Hidden Dimensions of Low Thermal Conductivity Defective Half-Heuslers  
Shashwat Anand; Northwestern University, United States.  

2:15 PM EP13.06.03  
Electrodeposition  
Thermoelectric Device  
Theoretical Analysis of Evaporative Cooling to Enhance the Performance of Intrinsically Low Thermal Conductivity in Metal Chalcogenides for High Enhancement of Thermoelectric Properties of Half-Heuslers ZrCoBi and EP13.08.03  
(Republic of).  

2:30 PM BREAK  

SESSION EP13.07: High Temperature Thermoelectric Materials and Chalcogenides  
Session Chairs: In Chung and Zhifeng Ren  
Wednesday Afternoon, April 24, 2019  
PCC North, 200 Level, Room 225 A  

3:30 PM *EP13.07.01  
Intrinsically Low Thermal Conductivity in Metal Chalcogenides for High Performance Thermoelectric Energy Conversion  
Kanishka Biswas; Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), India.  

4:00 PM EP13.07.02  
N-Type Cubic GeSe Stabilized by Entropy Driven Alloying of AgBiSe2 Leads to Ultralow Thermal Conductivity and Promising Thermoelectric Performance  
Subhajit Roychowdhury; JNCASR, India.  

4:15 PM EP13.07.03  
Study of Thermoelectric Properties of Mixed Phase Bi2Se3 Films Made by Electrodeposition  
Md Golam Rouf; University of Virginia, United States.  

4:30 PM EP13.07.04  
Boosting the Thermoelectric Performance of Pseudo-Layered Sb2Te3(GeTe)n via Vacancy Engineering  
Xiao Xu; Southern University of Science and Technology, China.  

4:45 PM EP13.07.05  
Optical Properties of Thermoelectric Materials  
Peng Jiang; Dalian Institute of Chemical Physics, China.  

SESSION EP13.08: Poster Session: Thermoelectric Materials and Devices  
Session Chairs: Yaniv Gelbstein and Jiaqing He  
Wednesday Afternoon, April 24, 2019  
5:00 PM - 7:00 PM  
PCC North, 300 Level, Exhibit Hall C-E  

1:30 PM *EP13.08.01  
Impurity-Free, Mechanical Doping for the Reproducible Fabrication of the Reliable N-Type Bi2Te3-Based Thermoelectric Alloys  
Jin-Sang Kim; KIST, Korea (the Republic of).  

1:30 PM *EP13.08.02  
Performance Assessment of an Exhaust Thermoelectric Generator for Applications in the Cement Industry  
Nikolaos - Vlachos; Alter Eco Solutions Ltd., Cyprus.  

1:30 PM *EP13.08.03  
Theoretical Analysis of Evaporative Cooling to Enhance the Performance of Thermoelectric Device  
Liangjun Zheng; Chonnam National University, Korea (the Republic of).  

1:30 PM *EP13.08.04  
Improved Thermoelectric Properties of PEDOT:PSS Films by Utilizing a Sequential Binary Secondary Doping and Hydrazine  
Yemen A. Kotaro Matsuyama; Osaka University, Japan.  

1:30 PM *EP13.08.05  
Thermoelectric and Mechanical Properties of Bi-Doped MgSi12Sn14 Prepared by Mechanical Alloying and Hot Press Sintering  
Elli Symeou; University of Cyprus, Cyprus.  

1:30 PM *EP13.08.06  
Direct Probing of Cross-Plane Thermal Properties of ALD Al2O3/ZnO Superlattice Films with Improved Figure of Merit  
No-Won Park; Chung-Ang University, Korea (the Republic of).  

1:30 PM *EP13.08.07  
Highly-Efficient Metal Dichalcogenide pn Heterojunction Thermoelectric Device for Waste Heat Energy Harvesting  
Sanaram K. Pradhan; Norfolk State University, United States.  

1:30 PM *EP13.08.08  
Thermoelectric Device Fabrication Based on RF Sputtered Bismuth Telluride and Tungsten Disulfide Superlattice  
Andrew W. Howe; Norfolk State University, United States.  

1:30 PM *EP13.08.09  
A System for Thermomagnetic Transport Properties Measurement from 80 K to 400 K  
Roger Dorris; California Polytechnic State University, United States.  

1:30 PM *EP13.08.10  
Synthesis and Thermoelectric Performance of Ceramic Composites  
Julio E. Rodriguez; Univ Nacional de Colombia, Colombia.  

1:30 PM *EP13.08.11  
Relationship Between Thermoelectric Properties and Morphology of Doped P3HT Thin Films for Potential Thermoelectric Applications  
Jonathan J. Montes; Norfolk State University, United States.  

1:30 PM *EP13.08.12  
Ultralow Thermal Conductivity and High Thermoelectric Figure of Merit in Polycrystalline SnSe  
Yong Kyu Lee1, 2; 1Seoul National University, Korea (the Republic of); 2Institute for Basic Science, Korea (the Republic of).  

1:30 PM *EP13.08.13  
Rapid Synthesis and Fabrication of Thermoelectric Materials Using Advanced Manufacturing Technique  
Wnajun Wang; Louisiana State University, United States.  

1:30 PM *EP13.08.14  
Positive and Negative Thermopower by Compositional Tuning of Hybrid Halide Perovskites  
Md Azimul Haque; KAUST, Saudi Arabia.  

1:30 PM *EP13.08.15  
Performance of an Active Peltier Cooler for Electronics/Batteries  
Michael J. Adams; The Ohio State University, United States.  

1:30 PM *EP13.08.16  
Developing and Testing of an Experimental Concept of a Hybrid Solar Thermoelectric (HSTE) System  
Paulina V. Fasogbon; Pontificia Universidad Catolica de Chile, Chile.  

1:30 PM *EP13.08.17  
Thermoelectric Properties of Printed Oxide pn Modules  
Yoonbeom Park; Korea University, Korea (the Republic of).  

1:30 PM *EP13.08.18  
Thermoelectric Effects in Phase Change Memory Cells—A Computational Analysis on Double Mushroom Cells  
Noah Del Coro; University of Connecticut, United States.  

1:30 PM *EP13.08.19  
Thermal Conductivity of Organic-Inorganic Hybrid Perovskite Single Crystals  
Kotaro Matsuyama; Osaka University, Japan.  

1:30 PM *EP13.08.20  
The Role of α- and β- FeSi2 Interfaces on Thermoelectric Properties of Si Arun M. Umari; Indian Institute of Science, India.  

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SESSION EP13.08: High Temperature Materials and Calculations

10:00 AM BREAK

10:30 AM *EP13.08.22
Superior Performance Bi$_2$Te$_3$/PEDOT:PSS Composite for Three-Dimensionally Printed Flexible Thermoelectric Generators Shuping Lin; Hong Kong Polytechnic University, Hong Kong.

10:30 AM *EP13.08.23
Substitutional Effects of Bivalent Zn and Ni Cations on Spin Thermoelectric Properties of Co$_2$O$_4$ Nolan W. Hines; University of Texas Permian Basin, United States.

10:30 AM *EP13.08.24
Silicides as High Temperature Thermoelectrics for Industry Quansheng Guo; National Institute for Material Science, Japan.

10:30 AM *EP13.08.25
Reinvestigation of the Point Defects in N-Type Bismuth Telluride Based Thermoelectric Materials Qi Zhang; Zhejiang University, China.

10:30 AM *EP13.08.27
Novel Design of Wearable Solar Thermoelectric Generator (W-STEG) with High Temperature Difference Over 30 °C Myeong Hoon Jeong; Ulsan National Institute of Science and Technology, Korea (the Republic of).

10:30 AM *EP13.08.28
Non-Equilibrium Thermal Transport and Thermoelectric Effects at the Melt-Solid Interfaces in Semiconductors Ali Gokirmak; University of Connecticut, United States.

10:30 AM *EP13.08.29
Large Valley Degeneracy and High Thermoelectric Performance in P-Type Ba$_{5}$Cu$_{4}$Ge$_{40}$-Based Clathrates Hiroki K. Satoh; Panasonic Corporation, Japan.

10:30 AM *EP13.08.30
Highly Improved Thermoelectric Performance Through Oxygen Manipulation in BiCuTeO Hui-Huang Chuang; *1, 2 National Taiwan University, Taiwan; 3 Academia Sinica, Taiwan; 4 Graduate Institute of Electronics Engineering, Taiwan.

10:30 AM *EP13.08.31
High-Throughput Screening of Efficient Bulk and Monolayer Thermoelectric Materials Kamal Choudhary; National Institute of Standards and Technology, United States.

10:30 AM *EP13.08.32
High Thermoelectric Efficiency in Monolayer PbI$_2$ from 300 K to 900 K Be Peng; Fudan University, China.

10:30 AM *EP13.08.33
Fabrication of Thermoelectric Devices with High Aspect Ratio Pillars by Using Patterned Electro-Chemical Deposition in Multi-Channel Glass Template Ning Su; Tsinghua University, China.

10:30 AM *EP13.08.36
Enhancing Thermoelectric Properties of N-Type Bi$_2$Te$_3$-Based Materials Joonil Cha$^{1, 2}$; 1 Institute for Basic Science (IBS), Korea (the Republic of); 2 Seoul National University, Korea (the Republic of).

10:30 AM *EP13.08.37
Enhanced Thermoelectric Performance of Highly Crystalline Ge$_{1-x}$Sb$_x$Te Crystals Tianwey Lan; Academia Sinica, Taiwan.

10:30 AM *EP13.08.38
Electron-Phonon Interactions in Normal and Inverse Nickel Substituted Cobalt Spinel Oxides Gustavo Damis Resende; University of Texas of The Permian Basin, United States.

10:30 AM *EP13.08.39
Effect of Annealing on Thermoelectric Characteristics of Ag$_2$Te Nanoparticle Thin Films Seunghun Yang; Korea University, Korea (the Republic of).

10:30 AM *EP13.08.40
Development of Novel Eutectic Thermoelectric Alloy Systems and the Effect of Directional Solidification Sirisha P; Indian Institute of Science, India.

10:30 AM *EP13.08.41
Developing an Optimized Preparation Process for Bi$_2$Te$_3$,Sb$_3$ Based Alloys for Thermoelectric Power Generation Applications Omer Meroz; Ben Gurion University of the Negev, Israel.

10:30 AM *EP13.08.42
Conduction Band Engineering and Phonon Softening for High Performance N-Type PbSe Thermoelectrics Chongjian Zhou$^{1, 2}$; 1 Center for Nanoparticle Research, Institute for Basic Science (IBS), Korea (the Republic of); 2 School of Chemical and Biological Engineering, Korea (the Republic of).

SESSION EP13.09: Low Thermal Conductivity

Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 225 A

8:15 AM *EP13.09.01
Liquid-Like Thermoelectric Materials Xun Shi$^{1, 2}$; 1 Shanghai Institute of Ceramics, Chinese Academy of Sciences, China; 2 Shanghai Jiao Tong University, China.

8:45 AM *EP13.09.02
Crystal Chemistry and Transport Properties of Chalcogenides and Antimonides Franck Gascoin; CRISMAT, France.

9:15 AM *EP13.09.03
Influence of the Site-Disorder and Local Structure on the Thermoelectric Transport in AgBiSe$_2$; Wolfgang Zeier; University of Giessen, Germany.

9:30 AM *EP13.09.04
Tuning Electronic Heat Transport in Graphene/Metal Heterostructures with Ultralow Thermal Conductivity Yeo Kan Koh; National University of Singapore, Singapore.

9:45 AM *EP13.09.05
Potential for Thermoelectric Enhancement in Modulation-Doped Layered Composites Matt Beekman; California Polytechnic State University, United States.

10:00 AM BREAK

10:30 AM *EP13.09.06
Nano-Engineering Thermoelectric to Boost Their Efficiency—Some Examples Marisol Martin-Gonzalez; Instituto de Micro y Nanotecnologia, CSIC, Spain.

11:00 AM *EP13.09.07
Design, Syntheses and Properties of Novel Thermoelectric Compounds with Low Thermal Conductivities Ling Chen; Beijing Normal University, China.

11:30 AM EP13.09.08
Enhancement of Thermoelectric Performance in N-Type Bismuth-Telluride-Based Solid Solutions Prepared via Liquid-Phase Sintering Combined with Hot Deformation Yehao Wu; Zhejiang University, China.

11:45 AM *EP13.09.09
Enhancing Thermoelectric Performance of Bi$_2$Sb$_2$Te$_3$ by Compositional Optimization and Circulating Liquid Phase Sintering Hua-Lu Zhuang; Tsinghua University, China.

SESSION EP13.10: High Temperature Materials and Calculations

Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 225 A

1:30 PM *EP13.10.01
Unveiling the Ultralow Thermal Conductivity and Exceptionally High Thermoelectric Performance in Polycrystalline SnSe Materials In Chung; Seoul National University, Korea (the Republic of).

2:00 PM EP13.10.02
High Temperature Stability of Thermoelectric Materials Yaniv Gelstein; Ben-Gurion University, Israel.

2:15 PM EP13.10.03
Combined Theory and Data-Driven Approaches Thermoelectrics Materials Discovery Anubhav Jain; Lawrence Berkeley National Laboratory, United States.

2:30 PM EP13.10.04
Electron-Phonon Coupling and Electronic Transport in N-Type PbTe from First Principles Ivana Savic; Tyndall National Institute, Ireland.

8:15 AM *EP13.10.04
Electron-Phonon Interactions in Normal and Inverse Nickel Substituted Cobalt Spinel Oxides Gustavo Damis Resende; University of Texas of The Permian Basin, United States.

8:45 AM *EP13.10.05
Highly Improved Thermoelectric Performance Through Oxygen Manipulation in BiCuTeO Hui-Huang Chuang; *1, 2 National Taiwan University, Taiwan; 3 Academia Sinica, Taiwan; 4 Graduate Institute of Electronics Engineering, Taiwan.

9:15 AM *EP13.10.06
Influence of the Site-Disorder and Local Structure on the Thermoelectric Transport in AgBiSe$_2$; Wolfgang Zeier; University of Giessen, Germany.

9:30 AM *EP13.10.07
Tuning Electronic Heat Transport in Graphene/Metal Heterostructures with Ultralow Thermal Conductivity Yeo Kan Koh; National University of Singapore, Singapore.

9:45 AM *EP13.10.08
Potential for Thermoelectric Enhancement in Modulation-Doped Layered Composites Matt Beekman; California Polytechnic State University, United States.

10:00 AM BREAK

10:30 AM *EP13.10.09
Nano-Engineering Thermoelectric to Boost Their Efficiency—Some Examples Marisol Martin-Gonzalez; Instituto de Micro y Nanotecnologia, CSIC, Spain.

11:00 AM *EP13.10.10
Design, Syntheses and Properties of Novel Thermoelectric Compounds with Low Thermal Conductivities Ling Chen; Beijing Normal University, China.

11:30 AM *EP13.10.11
Enhancement of Thermoelectric Performance in N-Type Bismuth-Telluride-Based Solid Solutions Prepared via Liquid-Phase Sintering Combined with Hot Deformation Yehao Wu; Zhejiang University, China.

11:45 AM EP13.10.12
Enhancing Thermoelectric Performance of Bi$_2$Sb$_2$Te$_3$ by Compositional Optimization and Circulating Liquid Phase Sintering Hua-Lu Zhuang; Tsinghua University, China.
2:45 PM EP13.10.05
Structural and Electronic Properties of Ferroelectric Domain Walls in GeTe from First Principles Djordje Dangic1, 2; 1Tyndall National Institute, Ireland; 2University College Cork, Ireland.

3:00 PM BREAK

3:30 PM *EP13.10.06
Defective Half-Heusler Thermoelectric Compounds with Intrinsic Vacancies Tiejun Zhu; Zhejiang University, China.

4:00 PM EP13.10.07
High Temperature Bonding Technique for Optimized Half-Heusler Modules Udara Saparamadu; The Pennsylvania State University, United States.

4:15 PM EP13.10.08
Impact of Scattering Mechanism Details on the Thermoelectric Power Factor of Complex Materials Patrizio Graziosi; University of Warwick, United Kingdom.

4:30 PM EP13.10.09
Magnetic Field Aligned N-Type Thermoelectric Nanocomposites with Large Power Factors Ziqi Liang; Fudan University, China.

4:45 PM EP13.10.10
Investigation of Electrical and Thermal Properties of 2D Semimetallic Transition Metal Dichalcogenides ZrTe2 and TiSe2 Keivan Esfarjani; University of Virginia, United States.

SESSION EP13.11: Organic Materials
Session Chairs: Kanishka Biswas and Yaniv Gelbstein
Friday Morning, April 26, 2019
PCC North, 200 Level, Room 225 A

8:45 AM *EP13.11.01
Electronic and Ionic Thermoelectric Effects with Conducting Polymers Xavier Crispin; Linkoping University, Sweden.

9:15 AM EP13.11.02
Enhanced Thermoelectric Performance of PEDOT:PSS Nanotubes via AAO Template-Assisted Growth Hyejoung Lee; Gwangju Institute of Science and Technology, Korea (the Republic of).

9:30 AM EP13.11.03
Organic Micro Thermoelectric Generators for Waste Heat Energy Harvesting Marco Cassinelli; Istituto Italiano di Tecnologia, Italy.

9:45 AM EP13.11.04
The Role of Polymer Structure on N-Type Organic Thermoelectric Suhao Wang; Linkoping Univ, Sweden.

10:00 AM BREAK

10:30 AM EP13.11.05
Improved N-Type Doping and Thermoelectric Properties of a Polymer Semiconductor by Minimizing Donor-Acceptor Character Jian Liu; University of Groningen, Netherlands.

10:45 AM EP13.11.06
Doping in Organic Thermoelectrics—The Tale of Two Charge Transfer States Bharat Noehamratri; The University of Arizona, United States.

11:00 AM EP13.11.07
Carbon Nanotube Based Thermoelectric Bracelet Fabricated by Direct Printing on a Flexible Cable Kyung Tae Park1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2Seoul National University, Korea (the Republic of).

11:15 AM EP13.11.08
Tuning of Charge-Carrier Type in Hybrid Perovskites Thermoelectric Thin Films by Low-Cost Wet Printing Process Shrikant Saini; Kyushu Institute of Technology, Japan.

SESSION EP13.12: Thin Film, Device and Others
Session Chairs: Theodora Kyrtasi and Takao Mori
Friday Afternoon, April 26, 2019
PCC North, 200 Level, Room 225 A

1:30 PM *EP13.12.01
Development of Thermoelectric Thin Films for IoT and Characterization Methods Takao Mori1, 2; 1National Institute for Materials Science (NIMS), Japan; 2University of Tsukuba, Japan.

2:00 PM EP13.12.02
Solution-Processed PbSe:Te thin-film Thermoelectrics Prathamesh B. Vartak; Arizona State University, United States.

2:15 PM EP13.12.03
Flexible Aerosol Jet Printed Thermoelectric Films via Versatile Photonic Sintering Mortaza Saeidi-Javash; University of Notre Dame, United States.

2:30 PM EP13.12.04
Uni-Leg Thermoelectric Module Comprised by Coated Hybrid-Perovskite Thin Film Shrikant Saini; Kyushu Institute of Technology, Japan.

2:45 PM EP13.12.05
Pulsed-Mode Heat Spreading in Electronics Using Thin-Film Thermoelectrics Lakshmi Amulya Nimmagadda; University of Illinois at Urbana-Champaign, United States.

3:00 PM BREAK

3:30 PM *EP13.12.06
Origin of High Thermoelectric Performance in n- and p-Type SnSe Crystals Li Huang; Southern University of Science and Technology, China.

4:00 PM EP13.12.07
Optimization of Thermoelectric Materials and Devices for Self-Powered Wearable Health and Environmental Tracking Systems Abhishek Malhotra; North Carolina State University, United States.

4:15 PM EP13.12.08
Interfacial Patterning as a Framework for Creating High ZT Thermoelectric Materials Shane G. Davies; University of Exeter, United Kingdom.

4:30 PM EP13.12.09
Thermal Transport in Electrodeposited Antimony Telluride Films of Varying Silver Content Ziqi Yu; University of California, Irvine, United States.

4:45 PM EP13.12.10
Thermoelectric Figure-of-Merit of Polycrystalline P-Type Doped SiGe Thin Films Mohammadali Esfamiasary; University of Minnesota, United States.
SYMPOSIUM ES01

Organic Materials in Electrochemical Energy Storage
April 23 - April 26, 2019

Symposium Organizers
Tianbiao Liu, Utah State University
Y. Shirley Meng, University of California, San Diego
Philippe Poizot, Université de Nantes
Yan Yao, University of Houston

Symposium Support
IFP Energies nouvelles
Neware Technology (Hong Kong) Ltd.
Vigor Tech USA, Ltd.

* Invited Paper

SESSION ES01.01: Redox Organic Electrolyte Materials in Aqueous Organic Redox Flow Batteries I
Session Chairs: Tianbiao Liu and Qing Wang
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 126 A

10:30 AM *ES01.01.01
Recent Progress in Organic-Based Aqueous Flow Batteries Michael J. Aziz; Harvard University, United States.

11:00 AM *ES01.01.02
High Energy Density Anolyte for Aqueous Organic Redox Flow Batteries Wei Wang; Pacific Northwest National Laboratory, United States.

11:30 AM *ES01.01.03
Designing Organic and Organometallic Materials for Next-Generation Redox Flow Batteries Hye Ryung Byon1, 2; 1Korea Advanced Institute of Science and Technology, Korea (the Republic of); 2KAIST Institute for NanoCentury, Korea (the Republic of).

SESSION ES01.02: Redox Organic Electrolyte Materials in Aqueous Organic Redox Flow Batteries II
Session Chairs: Michael Aziz and Song Jin
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 A

1:45 PM *ES01.02.01
Soluble, Stable Organic Redox-Active Materials for Redox Flow Batteries Xiaoliang Wei; Indiana University-Purdue University, United States.

2:15 PM *ES01.02.02
Sulfonate Functionalized Viologens for Energy Storage with Superior Energy Density and Cycling Stability Jian Luo; Utah State University, United States.

2:45 PM BREAK

3:15 PM ES01.02.03
Alkaline Organic Salt of Tetramethylpyridine N-oxyl for Aqueous Organic Redox Flow Battery Savda Toumli1, 2; 1IFP Energies nouvelles, France; 2Institut des Matériaux Jean Rouxel (IMN), France.

3:30 PM *ES01.02.04

4:00 PM ES01.02.05
A Sulfonate Viologen Anode Material for Neutral Aqueous Organic Redox Flow Batteries with High Stability and High Energy Density Wenda Wu; Department of Chemistry and Biochemistry, Utah State University, United States.
**SYMPOSIUM ES02**

**Next-Generation Intercalation Batteries**  
April 23 - April 25, 2019

**Symposium Organizers**  
Brent Melot, University of Southern California  
Benjamin Morgan, University of Bath  
Louis Piper, Binghamton University, The State University of New York  
Kimberly See, California Institute of Technology

**Symposium Support**  
Bio-Logic USA, Ltd.  
CBMM North America, Inc.  
Chemical Science | Royal Society of Chemistry  
Materials Horizons | Royal Society of Chemistry  
Journal of Materials Chemistry A | Royal Society of Chemistry  
Sciencia Omicron, Inc.

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* Invited Paper

**SESSION ES02.01: Oxygen Redox Chemistry I**  
Session Chairs: Y. Shirley Meng and Louis Piper  
Tuesday Morning, April 23, 2019  
PCC North, 100 Level, Room 126 C

**10:30 AM ES02.01.01**  
Structural Origin of Oxygen Redox Reversibility in Li-Rich Layered Oxide Cathodes for Li-Ion Batteries Chong Yin1, 2; 1Brookhaven National Laboratory, United States; 2Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China.

**10:45 AM ES02.01.02**  
First-Principles Modeling Of Peroxo-/Superoxo-Like O-O Dimers for High Capacity Cathode Materials of Lithium-Ion Batteries Zhenlian Chen1, 2; 1Chinese Academy of Sciences, China; 2University of Nebraska–Lincoln, United States.

**11:00 AM ES02.01.03**  
Reversible Anionic-Cationic Redox in High-Capacity Poly-anionic Tetrahedral Silicate Cathode Materials Xianhui Zhang; Chinese Academy of Sciences, China.

**11:15 AM ES02.01.04**  
Li-Rich Layered Sulfides—An Indirect Way to Better Understand Anionic Redox in Oxides Sujoy Sah1, 2, 3; 1Collège de France, France; 2University Pierre and Marie Curie, France; 3Reseau sur le Stockage Electrochimique de l’Energie (RS2E), France.

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**SESSION ES02.02: Na-Ion Intercalation**  
Session Chairs: Bryan McCloskey and Benjamin Morgan  
Tuesday Afternoon, April 23, 2019  
PCC North, 100 Level, Room 126 C

**1:30 PM ES02.03.01**  
Increasing the Energy Densities of Na-Ion Batteries—Fundamental and Practical Aspects Sativa Marivepaa1, 2; 1Collège de France, France; 2Reseau sur le Stockage Electrochimique de l’Energie (RS2E), France.

**2:00 PM ES02.03.02**  
Solution Phase Na2VPO4xF: Nanoparticles Synthesis for High Power and High Energy Density Sodium-Ion Battery Hungseok Kim1, 2; 1Univ of California-Los Angeles, United States; 2KIST, Korea (the Republic of).

**2:15 PM ES02.03.03**  
Reversible Asymmetric Structure Evolution in NaTiMo2 Xin Li; Harvard University, United States.

**2:30 PM ES02.03.04**  
Structural Phase Transitions and Intercalant Ordering in Layered Na- and K-Ion Cathode Materials Jonas Kaufman; University of California, Santa Barbara, United States.
SESSION ES02.03: Advanced Characterization
Session Chairs: Brent Melot and Louis Piper
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 C

3:15 PM *ES02.02.01
mRINS of Novel Transition-Metal and Oxygen Redox States in Intercalation Batteries Wanli Yang; Lawrence Berkeley National Laboratory, United States.

3:45 PM ES02.02.02
How to Obtain Bulk Sensitive Soft X-Ray Spectra Operando From Lithium-Ion Batteries Artur Braun; Empa, Switzerland.

4:00 PM ES02.02.03
Investigation of the Interactions Between Electrodes in Li2Ti3O7 – Based Batteries with Complementary Surface Analysis Techniques (XPS, SAM, ToF-SIMS) Nicolas Gauthier1, 2; 1IPREM (UMR5254), France; 2SAFT, France.

4:15 PM *ES02.02.04
Tracing Reactivity Through Outgassing in Ni-Rich and Li-Rich Li-Ion Cathode Materials Bryan D. McCloskey1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

SESSION ES02.04: Solid Electrolytes
Session Chairs: Brent Melot and Benjamin Morgan
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 C

8:30 AM *ES02.04.01
Challenges of Developing Solid State Batteries Marca M. Doeff; Lawrence Berkeley National Laboratory, United States.

9:00 AM *ES02.04.02
Towards New Thiophosphate and Sulfide Based Solid Electrolytes—Challenges and Perspectives Bettina V. Loitsch1, 2; 1Max Plank Institute for Solid State Research, Germany; 2University of Munich (LMU), Germany.

9:30 AM *ES02.04.03
Understanding and Enhancing Ion Diffusion in Novel closo-borate Solid Electrolyte Candidates Brandon Wood; Lawrence Livermore National Laboratory, United States.

10:00 AM BREAK

SESSION ES02.05: Electrode-Electrolyte Interfaces
Session Chairs: Louis Piper and Kimberly See
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 C

10:30 AM *ES02.05.01
Controlling Electrochemical Deposition and Stripping of Lithium Through Charged Separator and Liquid Electrolytes Heng-Liang Wu; Center for Condensed Matter Sciences, National Taiwan University, Taiwan.

11:00 AM ES02.05.02
Mastering the Anode/Electrolyte Interphase Reactivity with Slight Surface Fluorination Youn Charles-Blin4, 1, 2; 1Institut des Sciences Analytiques et de Physicochimie pour l’Environnement et les Matériaux – UMR 5254, France; 2Université de Rennes, France; 3Laboratoire de Chimie des Matériaux Inorganiques et de Nanotechnologies, CNRS, Montpellier (France), France.

11:15 AM ES02.05.03
Synthetic Design of Surface Stabilized High-Ni Layered Cathodes for Lithium-Ion Batteries Feng Wang; Brookhaven National Laboratory, United States.

11:30 AM ES02.05.04
Iron-Based Fluoro(hydroxy)phosphate AFePO4Y (A= Na, Li; Y= F, OH) as Cathode Materials for Aqueous Batteries—Two Case Studies Lalit Sharma; Indian Institute of Science, Bangalore, India.

SESSION ES02.06: State of the Art Li-Ion Batteries
Session Chairs: Benjamin Morgan and Kimberly See
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 C

1:30 PM *ES02.06.01
Evidences of Structural Metastability and Reversibility for Voltage Decay in High-Capacity Li-Rich Layered Cathode Oxides Y. Shirley Meng; University of California, San Diego, United States.

2:00 PM ES02.06.02
Oxygen-Release Mediated Electrochemical and Structural Evolution Li2MnO3 Louis F. Piper; Binghamton University, United States.

2:15 PM ES02.06.03
Direct Probe of the Nature and Stability of Oxidized Oxygen Environments Zachary W. Lebens-Higgins; Binghamton University, United States.

2:30 PM ES02.06.04
Correlation Between Oxygen Redox Chemistry and Metastable Phase Formation in Lithium-Rich Layered Oxides Wei Yin1, 2; 1Collège de France, France; 2Sorbonne Université, France.

2:45 PM BREAK

SESSION ES02.07: State of the Art Li-Ion Batteries
Session Chairs: Benjamin Morgan and Kimberly See
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 C

3:30 PM *ES02.07.01
Solvate Ionic Liquids and Their Polymer Electrolytes—Possible Beyond LIB Electrolytes Masayoshi Watanabe; Yokohama National University, Japan.

4:00 PM ES02.07.02
Suppression of Interlayer Atom Migration in Layered Transition-Metal Oxides Julija Vinckeviciute; University of California, Santa Barbara, United States.

4:15 PM ES02.07.03
NMC—Is it Possible to Obtain More Capacity by Reducing the 1st Cycle Capacity Loss? Hui Zhou; SUNY Binghamton, United States.

4:30 PM ES02.07.04

5:00 PM - 7:00 PM
SESSION ES02.08: Poster Session
Wednesday Afternoon, April 24, 2019
PCC North, 300 Level, Exhibit Hall C-E

SESSION ES02.08: Poster Session
Wednesday Afternoon, April 24, 2019
PCC North, 300 Level, Exhibit Hall C-E

ES02.08.01
Towards Battery Chemistries Beyond Lithium-Ion Batteries—Ultrafast Sodium/Potassium-Ion Intercalation into Hierarchically Porous Thin Carbon Shells Asif Mahmood1, 2; 1Southern University of Science and Technology, China; 2Peking University, China.

ES02.08.02
Theoretical Lithium Perchlorate Transport Properties Calculation to Lithium-Air Battery Applications Juliane Fiates; University of Campinas, Brazil.

ES02.08.03
New Generation of Flexible Li-Ion Batteries Based on a Sheet of Carbon Nanotubes Hamda M. Alshibli1, 2; 1Khalifa University of Science, Technology and Research, United Arab Emirates; 2Khalifa University of Science, Technology and Research, United Arab Emirates.
SESSION ES02.08: Towards Enhanced Functionality in Electrochemical Devices

8:45 AM ES02.08.04
A Universal Approach to Produce Nanostructured Binary Transition Metal Selenides as High Performance Sodium Ion Battery Anodes Yanglong Hong\textsuperscript{1, 2};
\textsuperscript{1}Peking University, China; \textsuperscript{2}Beijing Key Laboratory for Magnetoelectric Materials and Devices (BKLMMD), China; \textsuperscript{3}Beijing Innovation Centre for Engineering Science and Advanced Technology (BIC-ESAT), China.

9:00 AM ES02.08.05
A Cost Effective Route to Synthesize LiFePO\textsubscript{4}/C in a Quasi-Open Environment Assisted by Starch as an Oxidation Protective Component Fei Ge; University of California, Riverside, United States.

9:15 AM ES02.08.06
Electrochemical Intercalation of 2D Graphene with FeCo Kaci L. Kuntz; University of North Carolina at Chapel Hill, United States.

9:30 AM ES02.08.07
Three-Dimensional Hierarchical LiNi\textsubscript{0.5}Mn\textsubscript{1.5}O\textsubscript{4} Desert-Waves—Topography-Inspired Conductive Network for Lithium-Ion Batteries with High-Rate Capability Tao Mei; University of California, Riverside, United States.

9:45 AM ES02.08.08
Tunnel Intergrowth Structures in Manganese Dioxide and Their Influence on Ion Storage Yiwei Yuan; University of Illinois at Chicago, United States.

10:00 AM ES02.08.09
Sodium Ion Conduction in Germanium Phosphide and Germanium Arsenide Midad Raza; University of California, Davis, United States.

10:15 AM ES02.08.10
An Innovative Metal-Sulfide Cathode Active Material for Aluminum-Ion Batteries Yuexiang Hu; University of Queensland, Australia.

10:30 AM ES02.08.11
Nitrogen-Filling into Oxygen Vacancy Enable the Enhanced Fast Lithium-Ion Storage Yang-Jansen Cui; The University of New South Wales, Australia.

10:45 AM ES02.08.12
Tin Phosphide Based Materials with Low Irreversible Capacity as Anode for Sodium-Ion Batteries and Capacitors Francois Beguin; Poznan University of Technology, Poland.

11:00 AM ES02.08.13
Effect of Porosities and Surface Morphologies in Si Anode for Lithium Ion Batteries using Magnesiothermic Reduction Jingjing Liu; University of California, Riverside, United States.

11:15 AM ES02.08.14
Sodium Intercalation in TiO\textsubscript{2} Electrodes During Dis/Charging of Sodium-Ion Batteries Monitored by Operando XANES Measurements Andreas Siebert; Helmholtz-Zentrum Berlin, Germany.

11:30 AM ES02.08.15
Intermetallic Chlathrates as Insertion Anodes for Li-Ion Batteries Andrew M. Dopika; Arizona State University, United States.

11:45 AM ES02.08.16
Intercalation Energy Barrier Tuning of MoS\textsubscript{2} for Aqueous Zinc Ion Storage Hanfeng Liang; King Abdullah University of Science and Technology, Saudi Arabia.

12:00 PM ES02.08.17
Layered Vanadium Oxides as a High Energy Cathode Material for Nonaqueous Magnesium-Ion Batteries Seung-Tae Hong; DGIST (Daegu Gyeongbuk Institute of Science and Technology), Korea (the Republic of).

SESSION ES02.08.09: Pushing the Capacity Limits of Li-Ion Session Chairs: Brent Melot and Louis Piper Thursday Morning, April 25, 2019 PCC North, 100 Level, Room 126 C

8:45 AM ES02.08.09
Multi-Alkali Ion Intercalation Reactions Make Feasible Higher Energy Density Cathodes M. Stanley Whittingham; State University of New York at Binghamton, United States.

9:00 AM ES02.08.10
Multi-Electron Vanadyl Phosphate Cathodes for High-Energy Density Batteries Jatin Kumar Rana; Binghamton University, United States.

9:15 AM ES02.08.11
Nonaqueous Magnesium-Ion Batteries and Capacitors Yuki Okawa; Ritsumeikan University, Japan.

9:30 AM ES02.08.12
Exposing the Positive Side of Iron Oxide—Li-Ion Insertion in Cation-Vacant Aluminum- and Vanadium-Substituted Spinel Ferrite Aerogels Christopher N. Chervin; US Naval Research Laboratory, United States.

9:45 AM ES02.08.13
Effects of Nanoparticle Size on Mg\textsuperscript{2+} Intercalation into the Cathode Materials Wenxiang Chen; University of Illinois at Urbana-Champaign, United States.

10:00 AM ES02.08.14
Layered Vanadium Phosphide Cathodes for High-Capacity Alkali-Ion Batteries Shyue Ping Ong; University of California, San Diego, United States.

10:15 AM ES02.08.15
Real-Time Identification and Understanding of Zinc Compounds in Rechargeable Zinc Electrodes Brendan E. Hawkins; The City College of New York, United States.

2:45 PM BREAK

SESSION ES02.08.12: Mesostructuring for Enhanced Functionality

3:15 PM ES02.08.16
Measuring and Defining Electrochemical Reactions of Transition Metal Oxides in Mg Electrolytes Jordi Cabana; University of Illinois at Chicago, United States.

3:30 PM ES02.08.17
One-Dimensional Nanomaterials for Emerging Energy Storage Liqiang Mai; Wuhan University of Technology, China.
Facile Synthesis of Vanadium (III) Oxide/Carbon Core/shell Hybrid Particles as an Anode for Lithium-Ion Batteries

Öznil Budak¹, ², ¹INM - Leibniz Institute for New Materials, Germany; ²Universität des Saarlandes, Germany.

Polyacrylic Acid Assisted Assembly of MnO₂ Nanosheets and Carbon Nanotubes for High-Performance Flexible Zinc-Ion Battery Cathode

Jiyan Zhang; Peking University ShenZhen Graduate School, China.

SYMPOSIUM ES03
TUTORIAL: Advanced Characterizations for Energy Materials
April 22 - April 22, 2019

Advanced Soft X-Ray Spectroscopy and Cryo-TEM in Studies of Batteries and Electrocatalysts

Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 126 B

This tutorial focuses on the fundamentals and applications of several advanced characterization techniques to understand the atomic and electronic structures of energy materials, especially batteries and electrocatalysts. The tutorial will include detailed explanations of recent advances and developments in soft X-ray spectroscopy, including soft X-ray absorption spectroscopy (XAS), X-ray emission spectroscopy (XES), and high-efficiency mapping of resonant inelastic X-ray scattering (mRIXS) with in-situ operando capabilities. The second part of the tutorial will focus on cryogenic electron microscopy and spectroscopy of energy materials with emphasis on reactive materials and liquid-solid interfaces. Fundamental and practical aspects of cryo-focused ion beam milling (cryo-FIB), cryo-scanning transmission electron microscopy (cryo-STEM), electron energy loss spectroscopy (EELS) and spectroscopic mapping will be discussed. Two invited speakers, Wanli Yang from Lawrence Berkeley National Laboratory and Lena F. Kourkoutis from Cornell University, will highlight examples of these techniques used in their energy materials research in addition to providing details on principles. The tutorial will therefore cover both fundamentals and frontier research, and emphasize the strategies to use proper tools for the studies of electrochemical energy systems under extreme conditions.

1:30 PM
Advanced Soft X-Ray Spectroscopy of Energy Storage Materials
Wanli Yang; Lawrence Berkeley National Laboratory

This course is intended for chemists, physicists, materials scientists, and engineers with an interest in applying advanced soft X-ray techniques to study a broad variety of electrochemical materials. The highlight will be on the recent developments of high-efficiency mapping of resonant inelastic X-ray scattering (mRIXS) for studying energy materials, but conventional X-ray emission spectroscopy (XES) and five different channels of soft X-ray absorption spectroscopy (sXAS) will be explained in details. The attendee will develop a basic understanding of these modern soft X-ray spectroscopic techniques, the proper data interpretations, and their pros and cons, with plenty of examples on energy storage material studies.

3:00 PM BREAK

3:30 PM
Cryogenic Electron Microscopy for Electrochemical Systems
Lena F. Kourkoutis; Cornell University

This lecture will cover the principles of cryogenic electron microscopy and spectroscopy of energy materials with emphasis on reactive materials and liquid-solid interfaces. Fundamental and practical aspects of cryo-focused ion beam (cryo-FIB), cryo-scanning transmission electron microscopy (cryo-STEM) and electron energy loss spectroscopy (EELS) will be discussed including signal interpretation, artifacts and limits of each technique. Examples of structural and chemical mapping of processes at solid-liquid interfaces in lithium-metal batteries will be provided and will demonstrate the potential of cryogenic electron microscopy for probing nanoscale processes at intact solid-liquid interfaces in functional devices for energy applications.
**SYMPOSIUM ES03**

Electrochemical Energy Materials Under Extreme Conditions
April 23 - April 25, 2019

Symposium Organizers
Hye Ryung Byon, Korea Advanced Institute of Science and Technology
Chen Chen, U.S. Army Research Laboratory
Hua Zhou, Argonne National Laboratory

Symposium Support
Army Research Office

* Invited Paper

SESSON ES03.01: Catalytic and Energy Conversion Processes Under Various Environments
Session Chairs: Ren Yang and Hua Zhou
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 126 B

10:30 AM *ES03.01.01
Highly Stable Carbon-Based Catalysts for Bifunctional Oxygen Reduction and Evolution for Reversible Alkaline Fuel Cells
Cang Wu, State University of New York at Buffalo, United States.

11:00 AM *ES03.01.02
Interfacial Bonding Layer for High Mechanical and Chemical Robustness of Polymer Electrolyte Fuel Cells for Vehicle Applications
Hee-Tak Kim, Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of); 2KAIST Institute for the NanoCentury, Korea (the Republic of).

11:30 AM ES03.01.03
3D Graphene-Coated Ni Foam Heterostructures as Bipolar Plates of a Polymer Electrolyte Membrane Fuel Cell
Yeonesun Sim, Ulsan National Institute of Science and Technology, Korea (the Republic of).

11:45 AM ES03.01.04
Uncovering the Effect of Anion Defects on Electro-Catalytic Activity of Perovskite-Based Oxides
Yan Chen, South China University of Technology, China.

SESSION ES03.02: Expanding High Performance Energy Storage Materials for Safe and Durable Extreme Applications
Session Chairs: Yan Chen and Gang Wu
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 126 B

1:30 PM *ES03.02.01
Energy Storage Technologies for Extreme Environments in NASA Missions
Ratnakumar V. Bugga, California Institute of Technology, United States.

2:00 PM ES03.02.02
Novel Molecular Designing of High-Performance Bio-Based Polybenzimidazole to Prepare Single-Ion Conducting Solid Polymer Electrolyte
Aniruddha Nag, Japan Advanced Institute of Science and Technology, Japan.

2:15 PM ES03.02.03
Proton Transport in Solid Electrolytes Under High Pressure
Artur Braun, Empa, Switzerland.

2:30 PM BREAK

3:00 PM *ES03.02.04
Lithium-Sulfur Batteries—The Next Frontier in Energy Storage
Nikhil Koratkar, Rensselaer Polytechnic Institute, United States.

3:30 PM *ES03.02.05
Rational Design and Synthesis of Nanostructured Hybrid Cathode Materials for Lithium-Sulfur Batteries
Yanglong Hou, Peking University, China.

4:00 PM ES03.02.06
Crack Formation in LiCoO2 Particles During Overcharge and Its Impact on Battery Safety
Juhyun Oh, Seoul National University, Korea (the Republic of).

4:15 PM ES03.02.07
A High Rate Lithium Battery Anode Using Nanoporous Sn Deposited by High-Pressure-Assisted Evaporation
Hyunjeong Oh1, 2; 1Korea Advanced Institute of Machinery and Materials (KIMM), Korea (the Republic of); 2University of Science and Technology (UST), Korea (the Republic of).

4:30 PM ES03.02.08
Adaptive Fast Charging Algorithm to Extend the Cycle Life of Commercial Lithium-Ion Batteries
Sanjeev S. Sebastian, University of California, Riverside, United States.

4:45 PM ES03.02.09
Microstructural Complexations in Extreme Fast Charging of Li-Ion Batteries
Aashutosh Mistry, Purdue University, United States.

SESSION ES03.03: Understanding Fundamental Processes and Interactions at Electrode and Electrolyte Interfaces
Session Chairs: Erik Brandon and Chengjun Sun
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 126 B

8:00 AM *ES03.03.01
In Situ and Operando Imaging of Structural and Phase Transitions in Functional Oxides
Yingge Du, Pacific Northwest National Laboratory, United States.

8:30 AM ES03.03.02
Exploring Interfacial Processes in Electrochemical Systems by Synchrotron Source Spectroscopies
Angelique J. Jarry, University of Maryland, United States.

8:45 AM ES03.03.03
The Role of Interlayer Structural Water During Ion Intercalation in Crystalline Transition Metal Oxides
Veronica Augustyn, North Carolina State University, United States.

9:00 AM *ES03.03.04
Superwetting Electrodes for Gas-Involving Electrocataylsis
Xiaoming Sun, Beijing University of Chemical Technology, China.

9:30 AM ES03.03.05
In Situ Studies of Electrocatalyst for Oxygen Evolution Reaction in Acidic Condition Using a Combination of X-Ray Scattering and Spectroscopy
Maoyu Wang, Oregon State University, United States.

9:45 AM BREAK

10:15 AM *ES03.03.06
Understanding the Origin of Overpotentials in Conversion Reactions—Visualizing the Interface
Tim Fister, Argonne National Laboratory, United States.

10:45 AM *ES03.03.07
Ultrathin Few-Layer Graphene Electrodes as Versatile Platforms for Testing the Limits of Ion Intercalation
Joaquin Rodriguez-Lopez, University of Illinois at Urbana Champaign, United States.

11:15 AM ES03.03.08
Understanding Interfacial Reaction of LiCoO2 Positive Electrode in Aqueous Lithium-Ion Batteries
Hyunjeong Oh1, 2; 1Korea Advanced Institute of Science and Technology, Korea (the Republic of); 2KAIST, Korea (the Republic of).

11:30 AM ES03.03.09
Multi-Length-Scale Characterization and Optimization of Extreme Battery Fast Charging
Peter Attia, Stanford University, United States.

11:45 AM ES03.03.10
High-Performance Electrochromic Device via Controlling Charge Injection
Pham S. Nguyen, Soongsil University, Korea (the Republic of).
SESSION ES03.04: Promoting Advanced Battery Electrodes for Auto Mobility and Stationary Storage
Session Chairs: Yingge Du and Tim Fister
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 126 B

1:30 PM *ES03.04.01
Ion Transport and Electrochemistry in Battery Electrolytes Over Wide Range of Salt Concentrations Oleg Borodin; U.S. Army Research Laboratory, United States.

2:00 PM ES03.04.02
High Temperature vs High State-of-Charge—Optimizing the Triad of Energy Density, Cycling Rate and Lifetime Clement Bonnivet1, 2; 1Princeton University, United States; 2Princeton University, United States.

2:15 PM ES03.04.03
Graphite Lithiation Under Fast Charging Conditions—Atomistic Modeling Insights Hakim Iddir; Argonne National Laboratory, United States.

2:30 PM BREAK

3:30 PM *ES03.04.04
Aqueous Organic Redox Flow Batteries for Large-Scale and Dispatchable Energy Storage Tianbiao L. Liu; Utah State University, United States.

4:00 PM *ES03.04.05
Thin-Film Fabrication for Diverse and High Value Battery Applications ChuanFu Lin; University of Maryland, United States.

4:30 PM ES03.04.06
Design and Development of 21700 Type Cells for Electric Vehicle Applications Gung Yang; SF Motors Inc, United States.

4:45 PM ES03.04.07
Design of Supercapacitors for Wide Temperature Operation Erik Brandon; California Institute of Technology, United States.

SESSION ES03.05: Poster Session
Session Chairs: Zhenxing Feng and Hua Zhou
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES03.05.01
MnVO3/MnO@C Perovskite-like Binder-Free Electrospun Nanofibers as Excellent Electrodes for Supercapacitor Devices Menna S. Said; The American University in Cairo, Egypt.

ES03.05.02
Free-Standing Graphene Films Prepared via Foam Film Method for Impressive Performance Flexible Supercapacitors Zhu Yuan; University of Electronic Science and Technology of China, China.

ES03.05.03
Dynamic Processes in Si and Si/C Anodes in Lithium-Ion Batteries During Cycling Guoan Cheng; Beijing Normal University, China.

SESSION ES03.06: Flexible, Stretchable and Adaptive Energy Storage Devices for Versatile Applications
Session Chairs: Hye Ryung Byon and Yuan Yang
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 126 B

8:00 AM *ES03.06.01
Flexible Nanocellulose Based Energy Storage Devices Leif Nyholm; Uppsala University, Sweden.

8:30 AM *ES03.06.02
Extreme Environments for Electrochemical Energy Storage Materials—Inspiration Gained from Implantable Medical Devices Amy C. Marschilok; Stony Brook University, United States.

9:00 AM ES03.06.03
Strain Regulation of Editable Devices for Stretchable Supercapacitors Zhiheng Lv; Nanyang Technological University, Singapore.

9:15 AM ES03.06.04
Ultra-Extendable Supercapacitors Consisting of Plied and Supercoiled Fibers Changsoo Cho; DGIST, Korea (the Republic of).

9:30 AM ES03.06.05
mm-Thick Soft Hybrid Scaffolds Enabling Wearable Supercapacitors with Ultra-High Energy and Power Densities Jian Shang; The Hong Kong Polytechnic University, China.

9:45 AM BREAK

10:15 AM *ES03.06.06
UV-Cured Gel Polymer Electrolytes for Advanced Aqueous Li-Ion Batteries Konstantinos Gerasopoulos; Research and Exploratory Development Department, Johns Hopkins University, United States.

10:45 AM *ES03.06.07
Li-Ion Capacitors with Long Cycle Life and Wide Temperature Range for Military and Space Applications Jim P. Zheng; Florida State University, United States.

11:15 AM ES03.06.08
Lithium-Ion Capacitors and Hybrid Lithium-Ion Capacitors—Evaluation of Electrolyte Additives Under High Temperature Stress Jonathan Boltersdorf; U. S. Army Research Laboratory, United States.

11:30 AM ES03.06.09
Wearable Supercapacitor Based on Metal Oxide Grown Carbon Fiber Electrodes Kowsik Sambath Kumar1, 2; 1University of Central Florida, United States; 2University of Central Florida, United States.

SESSION ES03.07: Versatile Energy Storage for Emerging Applications
Session Chairs: Xiaoming Sun and Hua Zhou
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 126 B

1:30 PM *ES03.07.01
Bio-Inspired Flexible and Stretchable Batteries Yuan Yang; Columbia University, United States.

2:00 PM ES03.07.02
Intercalation-Type Electrode Materials for Calcium-Ion Batteries Seune-Tae Hong; DGIST (Daegu Gyeongbuk Institute of Science and Technology), Korea (the Republic of).

2:15 PM ES03.07.03
Sb2Te3/CNT Composite Anodes for High Performance Sodium Ion Full Cells with Exceptional Energy and Power Densities Muhammad Ihsan Ul Haq; The Hong Kong University of Science and Technology, Hong Kong.
**SYMPOSIUM ES04**

**Solid-State Electrochemical Energy Storage**

April 23 - April 26, 2019

**Symposium Organizers**

Donald Siegel; Wolfgang Zeier

Tuesday Morning, April 23, 2019

PCC North, 100 Level, Room 122 A

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**10:30 AM *ES04.01.01**

Developments of Lithium-Ion Conductors with the LGPS Type for All-Solid-State Batteries

**Kyoto Kanno**; Tokyo Institute of Technology, Japan.

**11:00 AM *ES04.01.02**

Key Parameters for Solid Electrolytes—Learnings from Beta-Alumina and Future Opportunities

**M. Stanley Whittingham**; State University of New York at Binghamton, United States.

**11:30 AM *ES04.01.03**

Dendrites at the Alkali Metal/Solid Electrolyte Interface

**Peter Bruce**; University of Oxford, United Kingdom.

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**SESSION ES04.02: Solid-State Electrolytes II**

Session Chairs: Nancy Dudney and Juergen Janek

Tuesday Afternoon, April 23, 2019

PCC North, 100 Level, Room 122 A

**1:30 PM *ES04.02.01**

Cooperative Ion Migration in Li-Ion Conducting Glasses

**Donald Siegel**; University of Michigan, United States.

**2:00 PM **ES04.02.02

Simultaneous Topographical and Electrochemical Mapping Using Scanning Ion Conductance Microscopy – Scanning Electrochemical Microscopy (SICM-SECM)

**Byong Kim**; Park Systems, Mexico.

**2:15 PM **ES04.02.03

Raman Crystallography of Superionic AgI Reveals a Connection Between Anharmonicity and Ionic Conductivity

**Thomas M. Brenner**; Weizmann Institute of Science, Israel.

**2:30 PM **ES04.02.04

Mesoscopic Modeling of Microstructural Effects on the Effective Ionic Diffusivity of Solid Electrolytes for All-Solid-State Li Batteries

**Tae Wook Heo**; Lawrence Livermore National Laboratory, United States.

**2:45 PM BREAK**

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**3:15 PM **ES04.02.05

Toward Room Temperature Solid State Fluoride Ion Batteries

**Anji Reddy Munnangi**; Helmholtz Institute Ulm (HIU), Germany.

**3:30 PM **ES04.02.06

The Effect of La-Site Dopants on the Microstructure and Ionic Conductivity of the Garnet-Type Li₇La₃M₃Zr₂O₁₂ (M=Sm, Dy, Gd, Er, Yb; x=0.1-0.1.0) Solid Electrolyte

**Musah Abdulla**; Eskisehir Technical University, Turkey.

**3:45 PM **ES04.02.07

Correlation Between the Activation Energy and Pre-Exponential Factor in Solid-State Li-Ion Conductors

**Sokseiba Muy**; Massachusetts Institute of Technology, United States.

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**4:00 PM **ES04.02.08

Strain-Induced Effect on Defect Formation in Cubic Li₆.25Al₀.25La₃Zr₂O₁₂ Solid Electrolyte

**Ashkan Moradabadi**; Freie Universität Berlin, Germany; Technical University of Darmstadt, Germany.

**4:15 PM **ES04.02.09

Solid-State Electrolytes with SiS₂ as a Glass Former

**Ran Zhao**; Iowa State University, United States.

**4:30 PM **ES04.02.10

Ionic Conductivity and Short Range Order Structures of Sodium Oxy-Thio Phosphate Glasses

**Steven J. Kim**; Iowa State University, United States.

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8:00 AM *ES04.03.01

All-Solid-State Lithium Metal Batteries Utilizing Solid Polymer Electrolytes

**Martin Winter**; Forschungszentrum Jülich GmbH, Germany; University of Münster, Germany.

**8:30 AM **ES04.03.02

Garnet-Based Advanced Solid-State Batteries

**Liangbing (Bing) Hu**; University of Maryland, United States.

**9:00 AM **ES04.03.03

Prospects and Challenges of Solid Electrolytes in Lithium Rechargeable Batteries

**Ranakumar V. Bugge**; Jet Propulsion Laboratory-Caltech, United States.

**9:30 AM **ES04.03.04

Wet Chemical Processing of Lithium Garnets—Previous Challenges, A New “Solution”

**Zachary D. Hood**; Massachusetts Institute of Technology, United States.

**9:45 AM BREAK**

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**10:15 AM **ES04.03.05

Solid-State On-Chip Energy Storage Devices Based on Photopatternable Ionogel Solid Electrolytes

**Bruce S. Dunn**; University of California, Los Angeles, United States.

**10:45 AM **ES04.03.06

Thin Film Technology—Opening New Frontiers for 3D Solid-State Energy Storage

**Keith Gregorczyk**; University of Maryland, United States.

**11:15 AM **ES04.03.07

Advanced Sulfide Solid Electrolyte and Battery Design for 5V Cathode

**Xin Li**; Harvard University, United States.

**11:30 AM **ES04.03.08

Thin-Film Battery Architecture Approaches for High Power and Energy

**David M. Stewart**; University of Maryland, United States.

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**SESSION ES04.04: Solid-State Battery Composite Constructs**

Session Chairs: Jeff Sakamoto and Yoshitaka Tateyama

Wednesday Afternoon, April 24, 2019

PCC North, 100 Level, Room 122 A

**1:30 PM **ES04.04.01

Interfacial Engineering of Solid-State Batteries Using Atomic Layer Deposition

**Neil P. Dasgupta**; University of Michigan, United States.

**2:00 PM ** ES04.04.02

Developing a Deeper Understanding and Optimization of Solid Electrolytes for the Use in Solid-State Batteries

**Wolfgang Zeier**; Justus-Liebig-University Giessen, Germany.

**2:30 PM BREAK**

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**3:30 PM **ES04.04.03

Composite Solid Electrolytes for Lithium Batteries

**Cewen Nan**; Tsinghua University, China.

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**SESSION ES04.03: Solid-State Cell Integration and Architecture**

Session Chairs: Donald Siegel and Wolfgang Zeier

Wednesday Morning, April 23, 2019

PCC North, 100 Level, Room 122 A

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**8:00 AM **ES04.02.01

All-Solid-State Lithium Metal Batteries Utilizing Solid Polymer Electrolytes

**Martin Winter**; Forschungszentrum Jülich GmbH, Germany; University of Münster, Germany.

**8:30 AM **ES04.02.02

Garnet-Based Advanced Solid-State Batteries

**Liangbing (Bing) Hu**; University of Maryland, United States.

**9:00 AM **ES04.02.03

Prospects and Challenges of Solid Electrolytes in Lithium Rechargeable Batteries

**Ranakumar V. Bugge**; Jet Propulsion Laboratory-Caltech, United States.

**9:30 AM **ES04.02.04

Wet Chemical Processing of Lithium Garnets—Previous Challenges, A New “Solution”

**Zachary D. Hood**; Massachusetts Institute of Technology, United States.

**9:45 AM BREAK**

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**10:15 AM **ES04.02.05

Solid-State On-Chip Energy Storage Devices Based on Photopatternable Ionogel Solid Electrolytes

**Bruce S. Dunn**; University of California, Los Angeles, United States.

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**Xin Li**; Harvard University, United States.

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Thin-Film Battery Architecture Approaches for High Power and Energy

**David M. Stewart**; University of Maryland, United States.

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**SESSION ES04.04: Solid-State Battery Composite Constructs**

Session Chairs: Jeff Sakamoto and Yoshitaka Tateyama

Wednesday Afternoon, April 24, 2019

PCC North, 100 Level, Room 122 A

**1:30 PM **ES04.04.01

Interfacial Engineering of Solid-State Batteries Using Atomic Layer Deposition

**Neil P. Dasgupta**; University of Michigan, United States.

**2:00 PM ** ES04.04.02

Developing a Deeper Understanding and Optimization of Solid Electrolytes for the Use in Solid-State Batteries

**Wolfgang Zeier**; Justus-Liebig-University Giessen, Germany.

**2:30 PM BREAK**

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**3:30 PM **ES04.04.03

Composite Solid Electrolytes for Lithium Batteries

**Cewen Nan**; Tsinghua University, China.
SESSION ES04.05: Poster Session: Solid-State Electrochemical Energy Storage
Session Chairs: Jeff Sakamoto and Kazunori Takada
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES04.05.01
Ionic Liquid Embedded Polymethacrylate-Comb-Copolymer Electrolytes for Solid-State Supercapacitor Jiajia Xie; Yonsei University, Korea (the Republic of).

ES04.05.02
Stabilizing Lithium Electrodeposition in Solid Polymer Electrolyte through Introducing Polymeric Ionic Liquid Xianwei Li; Drexel University, United States.

ES04.05.03
Mixed Electronic and Ionic Conduction Properties of Reduced Lithium Lanthanum Titanate Michael Wang; University of Michigan, United States.

ES04.05.04
A Novel De-Coupling Solid Polymer Electrolyte via Semi-Interpenetration Network for Lithium Metal Battery Yongwei Zheng; Drexel University, United States.

ES04.05.05
Compositional Dependence of Structural, Thermal and Electrochemical Properties of Lithium Oxythio-Silicophosphate Glassy Solid-State Electrolytes Guantai Hu; Iowa State University, United States.

ES04.05.06
Solid State LiLaZrO3 –Polymer Composite Electrolyte for All–Solid–State Lithium Batteries Parisa Bashiri; Wayne State University, United States.

ES04.05.07
High-Capacity Slurry-Coated Sheet-Style Tin Anodes for All-Solid-State Lithium-Ion Batteries Nathan A. Dunlap; University of Colorado - Boulder, United States.

ES04.05.10
Atomic-Level Understanding of Thermal Management for Superionic Conductor Battery Materials Ming Hu; University of South Carolina, United States.

ES04.05.11
Investigation of LiPON Thin Films Grown by Pulsed Laser Deposition for Application as a Solid-State Electrolyte Thomas C. Callaway; Missouri State University, United States.

ES04.05.12
Flexible Lithium-Air Batteries Based on Polymer Gel Electrolytes Tie Wang; Pudan University, China.

ES04.05.13
Combinatorial Study on Lithium-Ion Conductivity of Amorphous Li-La-Zr-O Thin-Films with Sol-Gel Processing Myung-Gil Kim; Chung-Ang University, Korea (the Republic of).
2:00 PM *ES04.07.02
DFT Studies on Li-Ions Around Electrode-Solid Electrolyte Interfaces via Efficient Structure Search Techniques Yoshitaka Tateyama¹ 2; ¹National Institute for Materials Science, Japan; ²Kyoto University, Japan.

2:30 PM BREAK

3:00 PM *ES04.07.03
Modeling the Origin of the Interface Resistance in Solid-State Batteries Yue Qi; Michigan State University, United States.

3:30 PM ES04.07.04
Low Temperature Processing Innovation and Structure Design of Li-Garnets for Solid State Batteries and Environmental Sensing of Chemicals Juan Carlos Gonzalez-Rosillo; Massachusetts Institute of Technology, United States.

3:45 PM ES04.07.05
An Analysis of Kinetics at the Solid Polymer Electrolyte/Lithium Lanthanum Zirconium Oxide Electrolyte Interface Arushi Gupta; University of Michigan, United States.

4:00 PM ES04.07.06
Degradation Mechanisms in All-Solid-State Li-S Batteries with Li₆PS₅Cl and Their Optimization Saneyuki Ohno; Justus Liebig University Giessen, Germany.

4:15 PM ES04.07.07
Interface Stability Between Solid-State Electrolytes and Cathodes in Lithium-Ion Batteries Jung-Hyun Kim; The Ohio State University, United States.

4:30 PM ES04.07.08
Enhanced Grain Growth Kinetics in Polycrystalline Li₆.25Al₀.25La₃Zr₂O₁₂ Solid Electrolyte Regina Garcia-Mendez; University of Michigan, United States.

SESSION ES04.08: Solid-State Electrolyte Synthesis and Processing
Session Chair: Cewen Nan
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 122 A

8:00 AM *ES04.08.01
Synthesis and Characterization of Fast Li-Ion Conducting Solid State-Electrolytes Jan L. Allen; U.S. Army Research Laboratory, United States.

8:30 AM ES04.08.02
Adapting Materials Processing and Structure Toward Improved NaSICON-Based Sodium Ion Conductors Erik D. Spoerke; Sandia National Laboratories, United States.

8:45 AM ES04.08.03
On Thin-Film LLZO Electrolytes for All-Solid-State Batteries Jordi Sastre-Pellicer; Empa - Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

9:00 AM ES04.08.04
Molten Salts as a Versatile Synthetic Medium for Lithium Conducting Garnets—Design Principles and Challenges Jon M. Weller; Arizona State University, United States.

9:15 AM ES04.08.05
Computational Study of Lithiation of Ba-Doped Type I Si/Ge Clathrates Xihong Peng; Arizona State University, United States.

9:30 AM BREAK

10:00 AM *ES04.08.06
Electron Microscopy for All-Solid-State Batteries—Addressing Challenges at Atomic Scale Miaofang Chi; Oak Ridge National Laboratory, United States.

10:30 AM ES04.08.07
Green Synthesis of Size-Controlled Li-S Nanocrystals for Use in Solid State Batteries Yangzhi Zhao; Colorado School of Mines, United States.

10:45 AM ES04.08.08
Unusual Temperature Dependent Li-ion Conductivity and Influence of Air Exposure on NASICON-type Solid Electrolyte Hirotoshi Yamada; Nagasaki University, Japan.
**SESSION ES05.01: Heterogeneous Catalysts**

**Session Chair:** Huiyuan Zhu  
**Tuesday Morning, April 23, 2019**  
**PCC North, 100 Level, Room 122 B**

10:30 AM *ES05.01.01*  
**Metal-Support Cooperativity in Highly Dispersed Re Catalysts for Olefin Metathesis**  
**Susannah Scott; University of California, Santa Barbara, United States.**

11:00 AM **ES05.01.02**  
**Generation of Subnanometric Metal Species in Zeolites and Their Catalytic Applications**  
**Jochen Lig; Instituto de Tecnologia Quimica, Spain.**

11:15 AM **ES05.01.03**  
**Oxidation and Hydrolysis of Small Molecules and Organophosphorous Compounds via Thermal and Photocatalytic Pathways at Oxidation-Stable, Plasmonic Cu/TiO2 Aerogels**  
**Jeremy J. Pietron; U.S. Naval Research Laboratory, United States.**

11:30 AM **ES05.01.04**  
**Two-Dimensional Transition Metal Carbides as Supports for Tuning the Chemistry of Catalytic Nanoparticles for Effective Shale Gas Dehydrogenation**  
**Yue Wu; Iowa State University, United States.**

11:45 AM **ES05.01.05**  
**Highly Active and Stable Carbon Nanosheets Supported Iron Oxide for Fischer-Tropsch to Olefins Synthesis**  
**Douglas R. Kauffman; National Energy Technology Laboratory, United States.**

**SESSION ES05.02: Electrocatalysts**

**Session Chairs:** Shaojun Guo and Dong Su  
**Tuesday Afternoon, April 23, 2019**  
**PCC North, 100 Level, Room 122 B**

1:30 PM *ES05.02.01*  
**Getting to the Core of the Matter—A Comparison of Core@Shell Nanocatalysts Built from Random Alloy and Intermetallic Seeds**  
**Sara E. Skrabalak; Indiana University - Bloomington, United States.**

2:00 PM *ES05.02.02*  
**Heterostructure Interface-Promoted Oxygen Electrocatalysis for Renewable Energy Applications**  
**Sen Zhang; University of Virginia, United States.**

2:30 PM **ES05.02.03**  
**Ethanol Electro-Oxidation Using PtSn Nanoparticles**  
**Yifan Liu; Johns Hopkins University, United States.**

2:45 PM **ES05.02.04**  
**Tuning Hybrid Low-Dimensional Nanostructures for Efficient and Selective Electrochemical Reduction of Carbon Dioxide**  
**Sehmus Oxden; Los Alamos National Laboratory, United States.**

3:00 PM BREAK
Atomic-Resolution *In Situ* Observations of Metal-Support Interactions on Nanostructured Pt/CeO$_2$ Catalysts J. Vincent, Arizona State University, United States.

**SESSION ES05.04: Electro-catalysts II**
Session Chairs: Shaojun Guo and Sen Zhang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 122 B

8:00 AM ES05.04.01
Bioinspired Hard-Soft Matter Interfaces for Applications in Cooperative Electrocatalysis and Photoelectrosynthesis M. Moore, Arizona State University, United States.

8:15 AM *ES05.04.02
Well-Defined Surfaces Show How Ti Addition to IrO$_2$ and RuO$_2$ Modifies Oxygen Electro-Adsorption and Oxygen Evolution Electrocatalysis J. Sanvitich, Cornell University, United States.

8:45 AM *ES05.04.03
Tuning the Outcome of CO$_2$ Reduction via Cooperative Interactions Between Bismuth Electrodes and Electrolyte Cations I. Rosenthal, University of Delaware, United States.

9:15 AM ES05.04.04
Electrochemical Reduction of Aqueous CO$_2$ to Synthesis Gas Using β-PdH Wenchao Sheng, Tongji University, China.

9:30 AM ES05.04.05
Sequential Cascade Electrocatalysis Converts Carbon Dioxide to C-C Coupled Products Gurudayal Gurudayal, United States; 2University of California, Berkeley, United States.

9:45 AM BREAK

10:15 AM *ES05.04.06
Carbon Dioxide Utilization by a Cyclam-Based Metal Organic Framework A. Morris, Virginia Polytechnic Institute and State University, United States.

10:45 AM ES05.04.07
Nanoporous Au-Sn with Solute Strain for Simultaneously Enhanced Selectivity and Durability During Electrochemical CO$_2$ Reduction L. Qian, Huazhong University of Science and Technology, China.

11:00 AM ES05.04.08
Strain As an Axis to Tune Selectivity in Electrochemical CO$_2$ Reduction J. Kim, University of California, San Diego, United States.

11:15 AM ES05.04.09
Functional Nanogels for Robust Single-Atom Catalysts X. Li, 1Arizona State University, United States; 2University of Science and Technology of China, China.

11:30 AM ES05.04.10
Robust and Synthesizable Photocatalysts for CO$_2$ Reduction—A Data-Driven Materials Discovery A. Singh, Arizona State University, United States.

**SESSION ES05.05: Photocatalysis**
Session Chairs: Jingyu Liu and Bilge Yildiz
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 B

1:30 PM *ES05.05.01
Robust Single-Atom Catalysts for Energy and Environmental Applications J. Liu, Arizona State University, United States.

2:00 PM ES05.05.02
Does Polaronic Self-Trapping Occur at Anatase TiO$_2$ Surfaces? J. Carey, University of York, United Kingdom.

2:15 PM ES05.05.03
Nanoscale Modification of Plasmonic Aerogels for Photocatalytic H$_2$ Generation J. Pietron, Naval Research Laboratory, United States.

**SESSION ES05.06: Joint Session: Cooperative Catalysis**
Session Chairs: Wenchao Sheng and Jin Suntivich
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 122 B

3:30 PM *ES05.06.01/ES06.05.01
Mechanisms and Selectivity of the Electrochemical CO$_2$ Reduction Reaction on Multiple-Site vs Single-Site Catalysts P. Strasser, Technical University Berlin, Germany.

4:00 PM *ES05.06.02/ES06.05.02

4:30 PM ES05.06.03/ES06.05.03
Oxide Bilayers as High Efficiency Water Oxidation Catalysts Through Electronically Coupled Phase Boundaries S. Mathur, University of Cologne, Germany.

4:45 PM ES05.06.04/ES06.05.04
Design of Supported Transition Metal Catalysts for Methane Partial Oxidation D. Primo, 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

**SESSION ES05.07: Poster Session II: General Catalysis**
Session Chairs: Lichen Liu and Dong Su
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES05.07.01
Theory-Guided Sn/Cu Alloying for Efficient CO$_2$ Eletroreduction at Low Overpotentials X. Zhong, Stanford University, United States.

ES05.07.03

ES05.07.04
Multilayered Graphene-Organic Hybrid Films for Gas Barrier Applications D. Shin, Seoul National University, Korea (the Republic of).

ES05.07.05
Chevrel-Phase Mo$_6$S$_8$—A Platform for Probing Ensemble Effects on Selective Conversion of CO$_2$ and CO to Methanol Over Metal-Promoted Sulfides J. Perryman, University of California, Davis, United States.

ES05.07.06
Fe-Doped NiP on Stainless Steel for Efficient Oxygen Evolution at High Current Densities L. Cai, The Hong Kong Polytechnic University, China.

ES05.07.07
Hexagonal Tungsten Oxide Nanoflowers as Enzymatic Mimetics and Electrocatalysts C. Park, Chung-Ang University, Korea (the Republic of).

ES05.07.09
Operando Visualization of Metal-Support Interface in Working Pt/CeO$_2$ Catalysts J. L. Vincent, Arizona State University, United States.

ES05.07.10
Optimized Fabrication Process of Electrospun Nanofiber Film Using Circular Electrode for Multifunctional Filter Application D. Kang, Chonnam National University, Korea (the Republic of).

ES05.07.11
Simulation of Realistic Dynamic NMR Spectra of Zeolites F. Brivio, Charles University, Czechia.
ES05.07.12
Photocatalytic Performance of Highly Transparent and Mesoporous Molybdenum-Doped Titania Films Fabricated by Templating Cellulose Nanocrystals Yonghee Yoon; Sejong University, Korea (the Republic of).

ES05.07.13
sp-sp2 Hybridx Conjugated Microporous Polymers Derived Pd Encapsulated Porous Carbon Materials for Lithium-Sulfur Batteries Xu Li1,2; 1Shanghai Jiao Tong University, China; 2Tsinghua Univ, China.

ES05.07.14
Polyaniline Coated Bacterial Cellulose Mat for Removal of Hexavalent Chromium from Drinking Water Kousar Jahan; Indian Institute of Technology Kanpur, India.

SESSION ES05.08: Advanced Characterization I
Session Chairs: Peter Crozier and Shaojun Guo
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 122 B

8:00 AM ES05.08.01
Easy and General Synthesis of Large Size Mesoporous Metal Oxides Bishnu Bastakoti; North Carolina A&T State University, United States.

8:15 AM *ES05.08.02
High Energy Rechargeable Zinc-Air Batteries Zhongwei Chen; University of Waterloo, Canada.

8:45 AM *ES05.08.03
Approximate Density Functional Theory for Computational Heterogeneous Catalysis Stephan Irle; Oak Ridge National Laboratory, United States.

9:15 AM ES05.08.04
Nanoscale Probing of Adsorbates on Catalyst Surfaces with Allof Beam Vibrational Electron Energy-Loss Spectroscopy Kartik Venkatraman; Arizona State University, United States.

9:30 AM ES05.08.05
Pocket-Like Active Sites of Rh/MoS2 for 100% Selective Hydrogenation of Crotonaldehyde Young Lee; Arizona State University, United States.

9:45 AM ES05.08.06

10:00 AM BREAK

10:30 AM *ES05.08.07
Atomic Resolution In Situ and Operando Characterization of Cooperative Catalysts Peter Crozier; Arizona State University, United States.

11:00 AM ES05.08.08
MoS2 Supported Gold Nanoparticle Catalysis of CO to CO2 William C. Coley; UCR, United States.

11:15 AM ES05.08.09
Spectromicroscopy of Ultrathin Bilayer Silicate Films on Pd(100) and Pd(111) Samuel A. Tenney; Brookhaven National Laboratory, United States.

11:30 AM ES05.08.10
Controlling the Concentration of Oxygen Vacancies in CeO2-ZrO2 Nanoparticles via Spatial Tailoring of the Active Site James A. Dorman; Louisiana State University, United States.

SYMPOSIUM ES06

TUTORIAL: Simulating Electrochemical Systems from First Principles with Quantum-Espresso
April 22 - April 22, 2019

Symposium Organizers

Quantum-Espresso is an open-source software widely used for predicting the properties of materials from first principles [P. Giannozzi et al., Journal of Physics: Condensed Matter 21, 395502 (2009)].

In this tutorial, we will train the participants on how to use the Quantum-Espresso software for different applications. The focus is on the simulation of molecular species, metal electrodes, and semiconductor photoelectrodes under electrochemical conditions using the self-consistent continuum solvation (SCCS) model [O. Andreussi, I. Dabo, N. Marzari, Journal of Chemical Physics 136, 064102 (2012)].

URL: www.quantum-espresso.org; www.quantum-environment.org

The tutorial will follow the format adopted in previous Quantum-Espresso workshops. It will contain brief overviews of the theory behind the codes, followed by tutorials and hands-on activities. The morning session will cover: Fundamentals of Density-Functional Theory and the afternoon session will cover: Quantum Chemistry in Continuum Environments.

8:30 AM
Overview of Density-Functional Theory Ismaila Dabo; The Pennsylvania State University

The first lecture will cover the basic concepts behind DFT simulations using a plane-waves basis set and pseudo-potentials to treat core electrons. The main flavors of DFT, their advantages and their limitations for the study of molecular species, bulk metals and semiconductors, interfaces and heterogenous systems will be reviewed.

9:45 AM BREAK

10:15 AM
Hands-ON: Equilibrium Structure Calculations Ismaila Dabo; The Pennsylvania State University

The core functionalities of the PWscf code of the open-source Quantum-ESPRESSO package will be explored: self-consistent electronic structure calculations, geometry and cell optimizations, simple ab-initio molecular dynamics simulations will be performed. An overview of input and output files and post-processing of the simulation results will be provided.

1:30 PM
Overview of Implicit Solvation Oliviero Andreussi; University of North Texas

Continuum embedding models in condensed-matter simulations will be reviewed, focusing on the recently developed self-consistent continuum solvation (SCCS) and to the soft-sphere continuum solvation (SSCS) models. Models to treat metal and semiconductor electrified interfaces will be reviewed.

2:45 PM BREAK
3:15 PM Hands-On: Quantum-Continuum Solution Oliviero Andreussi; University of North Texas

The core features of the Environ plugin to the PWscf code will be explored, including SCCS and SSCS simulations with default and non-default parameters. A comprehensive overview of input and output files, as well as post-processing and visualization of the simulation results, will be presented. Simulations of electrified interfaces and advanced continuum interfaces will also be included.

**SYMPOSIUM ES06**

**Atomic-Level Understanding of Materials in Fuel Cells and Electrolyzers**

*April 23 - April 25, 2019*

**Symposium Organizers**

Ismaila Dabo, The Pennsylvania State University

Yelena Gorlin, Robert Bosch LLC

Wenchao Sheng, Tongji University

Jin Suntivich, Cornell University

**Symposium Support**

Bio-Logic USA

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JPhys Materials | IOP Publishing

Murata Electronics North America, Inc.

Pine Instruments

Scribner Associates, Inc.

* Invited Paper

SESSION ES06.01: In Situ Characterizations

Session Chairs: Shuo Chen and Kelsey Stoerzinger

Tuesday Morning, April 23, 2019

PCC North, 100 Level, Room 122 C

10:30 AM *ES06.01.01

In Situ and Operando Electrochemical Interfacial Properties Revealed by Ambient Pressure XPS Ethan J. Crumlin1, 2; 1Lawrence Berkeley National Laboratory, United States; 2Lawrence Berkeley National Laboratory, United States.

11:00 AM ES06.01.02

Stimulated Raman Spectroscopy of Amorphous Oxide Catalyst During Oxygen Evolution Reaction Chuhyon J. Eom; Cornell University, United States.

11:15 AM ES06.01.03

Introducing Geometric Distortions in Disordered Nickel (Oxy)hydroxide Electrocatalysts by Incorporation of Fe(III) Rodney Smith; University of Waterloo, Canada.

11:30 AM ES06.01.04

Atomic-Level Structure Engineering of Metal Active Sites for Efficient Oxygen Evolution Reactions Xuedi Zheng; Stanford University, United States.

11:45 AM ES06.01.05

On-Chip Signaling Approaches for In Situ Investigation of Electrochemical Processes Mengning Ding; Nanjing University, China.

SESSION ES06.02: Electrocatalysis I

Session Chairs: Ismaila Dabo and Yelena Gorlin

Tuesday Afternoon, April 23, 2019

PCC North, 100 Level, Room 122 C

1:30 PM *ES06.02.01

Catalyst Development for Water Electrolysis and Fuel Cell Reactions Involving H2, O2, H2O, and H2O2 Thomas Jaramillo1, 2, 3; 1Stanford University, United States; 2Stanford University, United States; 3SLAC National Accelerator Laboratory, United States.

2:00 PM *ES06.02.02

Molecular Understanding of the Oxide Electrocatalyst Surface Kelsey A. Stoerzinger1, 2; 1Pacific Northwest National Laboratory, United States; 2Oregon State University, United States.

2:30 PM ES06.02.03

Combining Electrochemistry, Surface Science and Density Functional Theory to Identify Electrocatalytic Structure-Property Relationships in OER Catalysts Douglas R. Kauffman; National Energy Technology Lab, United States.

2:45 PM ES06.02.04

Measurements of Oxygen Electroadsorption Kinetics on RuO2(110) and IrO2(110) Ding-Yuan Kuo; Cornell University, United States.

3:00 PM BREAK

3:30 PM *ES06.02.05

Identify Atomic-to-Nano Structures and Structure Evolution of Pt and PGM-Free Electrocatalysts for Oxygen Reduction Reaction Yuyan Shao; Pacific Northwest National Laboratory, United States.

4:00 PM ES06.02.06

Modification of Fuel Cell ORR Catalyst Surface with Organic Ligands for Enhanced Activity and Durability—The Effect of Ligand Structures Yuta Ikehata; Toyota Motor Corporation, Japan.

4:15 PM ES06.02.07

Optimization of Pt Loading Ratio in Low Pt-Cathode Catalysts for PEFC Application Toshihiro Mandai; Iwate University, Japan.

4:30 PM ES06.02.08

Catalytic Activity of Oxygen Reduction Reaction on Mono-Layer Molecule Electrode using the Transition-Metal Oxide Nanosheet Takehiro Saida; Meijo Univ, Japan.

4:45 PM ES06.02.09

Maximization of Quadruple Phase Boundary for Alkaline Membrane Fuel Cell Using Non- Stoichiometric α-MnO2 as Cathode Catalyst Xuan Shi; Arizona State University, United States.

SESSION ES06.03: High-Temperature Electrocatalysis

Session Chairs: Kelsey Stoerzinger and Jin Suntivich

Wednesday Morning, April 24, 2019

PCC North, 100 Level, Room 122 C

8:45 AM ES06.03.01

In Situ/Operando XRD Study of a Reversible PtOx Formation at the Pt/YSZ Interface Sergey A. Volkov; DESY, Germany.

9:00 AM *ES06.03.03

Thermochemical and Electrochemical Trends in the Ceria-Zirconia System Sosanna M. Haile; Northwestern University, United States.

9:30 AM ES06.03.04

Nanoscale Design of Grain Boundary Composition for Improved Ionic Conductivity in CeO2 Ceramics Tara M. Boland; Arizona State University, United States.

9:45 AM ES06.03.06

Determining the Atomic Structures at Fluorite-Perovskite Interfaces Bonan Zhu; University of Cambridge, United Kingdom.

10:00 AM BREAK

10:30 AM *ES06.03.05

Strategic Design of Catalysts and Electrolytes for the Electrochemical Reduction of CO2 Alexis Bell; University of California, Berkeley, United States.

11:00 AM ES06.03.07

CO Site Preference on Copper Surfaces in Electrochemical Environments—Deciphering Voltage and Electrolyte Composition Effects Stephen F. Wettlaufer; Lawrence Livermore National Laboratory, United States.

11:15 AM ES06.03.08

Hierarchical Quasi-1D CuOx-Derived Nanostructured Copper Catalysts for CO Reduction Fabio Di Fonzo; Istituto Italiano di Tecnologia, Italy.

11:30 AM *ES06.03.09

Isolated Transition Metal Single Atom Catalysts for Selective CO2 Reduction Haoqian Wang; Rice University, United States.
Tetrahexahedral Nanocrystals

An Efficient Acid-Stable N2-Plasma Treated Hafnium Oxyhydroxide Electrochemical Hydrogen Evolution Tracking and Identifying the Active Origin in Chalcogenide Catalysts for Active Sites and Activity of Sub-/Multi-Atomic Layer Electrocatalysts on Enhanced Electrocatalytic Activities of Ruddlesden-Popper Catalysts for the Oxidation of Urea and Small Alcohols By Active Site Variation

Shi-Gang Sun; Xiamen University, China.

3:30 PM *ES06.05.01/ES05.05.01
Mechanisms and Selectivity of the Electrochemical CO2 Reduction Reaction on Multiple-Site vs Single-Site Catalysts
Peter Strasser; Technical University Berlin, Germany.

4:00 PM *ES06.05.02/ES05.05.02
CO Oxidation on Supported Ir Single Atoms—Consequences of Strong CO Adsorption on Kinetics and Resting State of the Catalyst
Ayman M. Karim; Virginia Tech, United States.

4:30 PM ES06.05.03/ES05.05.03
Oxide Bilayers as High Efficiency Water Oxidation Catalysts Through Electronically Coupled Phase Boundaries
Sanjay Mathur; University of Cologne, Germany.

4:45 PM ES06.05.04/ES05.05.04
Design of Supported Transition Metal Catalysts for Methane Partial Oxidation
Darinka Prizer1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

8:15 AM ES06.06.01
Core/Shell Li1+Mn2+O4 (M=Fe,Co) Nanoparticles with Atomic Pt Shell as Highly Stable and Active Oxygen Reduction Reaction Catalysts for Fuel Cells
Jinrui Li; Brown University, United States.

8:30 AM ES06.06.02
Three-Dimensional Honeycomb-Like Cu3Bi2+1/3Bi+1/3O Nanosheet Arrays on Nickel Foam as a High Efficient Oxygen Evolving Electrocatalyst for Anion Exchange Membrane Electrolyzer
Kyu Hwan Lee1, 2; 1Korea Institute of Materials Science, Korea (the Republic of); 2Korea University of Science and Technology (UST), Korea (the Republic of).

8:45 AM ES06.06.03
Structure-Performance Relation for Amorphous Transition Metal Chalcogenides Nanostructured Hydrogen Evolution Electrocatalysis
Girglio Giuffredi1, 2; 1Istituto Italiano di Tecnologia, Italy; 2Politecnico di Milano, Italy.

9:00 AM *ES06.06.04
Tracking and Identifying the Active Origin in Chalcogenide Catalysts for Electrochemical Hydrogen Evolution
Huangtian Li; U.S. Army Research Laboratory, United States.

9:30 AM *ES06.06.05
An Efficient Acid-Stable N2-Plasma Treated Hafnium Oxyhydroxide Electrocatalyst for Hydrogen Evolution and Oxidation Reactions
Bruce E. Koel; Princeton University, United States.

10:00 AM BREAK

Nonprecious Electrocataysts for Hydrogen Evolution via Water Electrolysis
Shuo Chen; University of Houston, United States.

Atomic-Level Insights into Platinum Group Metal-Free Electrocataysts Derived from Metal Organic Frameworks
David Cullen; Oak Ridge National Laboratory, United States.

In Situ TEM Tracking of Picoscale Cationic Motion For Characterization of Exchange Processes in Energy Materials
Hamamy D. Levin; Arizona State University, United States.

Observing and Simulating Oxygen Vacancies in Anatase
Benjamin N. Shindel; Arizona State University, United States.

1:30 PM *ES06.08.01
Continuum Models to Handle Electrolyte Solutions Effects in First-Principles Simulations of Materials
Oliviero Andreussi; University of North Texas, United States.

First-Principles Discovery and Understanding of Materials for Renewable Hydrogen Production
Brandon Wood; Lawrence Livermore National Laboratory, United States.

First-Principles Studies of Activity and Selectivity in the Electrocatalysis of CO2 Reduction into Methanol
Jianguo Yu; Idaho National Laboratory, United States.

MXene Electrode Materials for Electrochemical Energy Storage—First-Principles and Grand Canonical Monte Carlo Simulations
Yasuki Okada; Murata Manufacturing Co., Ltd., Japan.

3:00 PM BREAK

Metal Phosphte Catalysts for Low Temperature Fuel Cells and Beyond
Scott Geyer; Wake Forest University, United States.

Synthesis and Electroanalytical Characterization of Binary and Ternary Sulfides for the Conversion of CO and CO2 to Methanol
Jesus M. Velazquez; University of California, Davis, United States.

10:30 AM ES06.07.01
SESSION ES06.07.01: Computational Methods
Session Chairs: Ismaila Dabo and Jin Suntivich
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 122 C

11:00 AM ES06.07.02
SESSION ES06.07: New Electrocatalytic Materials
Session Chairs: Olivier Andreussi and Wenchao Sheng
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 122 C

11:30 AM ES06.07.03
SESSION ES06.07: Nanoscale Characterizations
Session Chairs: Wenchao Sheng and Jin Suntivich
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 122 C

11:45 AM ES06.07.04
4:30 PM ES06.09.03
Electrochemical Conversion of CO₂ into C₅ Products at Anion Vacancy of Transition-Metal Dichalcogenides—A Computational Mechanism Study and Material Screening Sungwoo Kang, Seoul National University, Korea (the Republic of).

4:45 PM ES06.09.04
PBI-Type Polymers and Acidic Proton Conducting Ionic Liquids—Conductivity and Molecular Interactions Jingjing Lin, Forschungszentrum Jülich, Germany.

SYMPOSIUM ES07

New Carbon for Energy—Materials, Chemistry and Applications
April 23 - April 25, 2019

Symposium Organizers
Jean-Pol Dodelet, INRS Energie et Matériaux
Xiulie (David) Ji, Oregon State University
Hongli Zhu, Northeastern University

Symposium Support
TEL Technology Center, America, LLC

* Invited Paper

SESSION ES07.01: Carbon-Based Materials for Catalysis
Session Chair: Yuyan Shao
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 127 A

10:30 AM *ES07.01.01
Sustainable Noble Metal-Free Electrocatalysts for Fuel Cells and Electrolyzers Sanjeev Mukerjee; Northeastern University, United States.

11:00 AM *ES07.01.02
Searching for the Active Site in Carbon-Based Noble Metal-Free Oxygen Reduction Electrocatalysts Piotr Zelenay; Los Alamos National Laboratory, United States.

11:30 AM ES07.01.03
Carbon-Based Materials for Electrochemical Transformation in Energy Conversion and Storage—Defects or Not? Yuyan Shao; Pacific Northwest National Laboratory, United States.

SESSION ES07.02: Carbon-Based Materials for Catalysis and Syntheses of New Carbon-Based Materials
Session Chairs: Deborah Myers and Gang Wu
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 A

1:30 PM *ES07.02.01
MOF-Dervied Atomically Dispersed Metal Site Cathode Catalysts for Proton Exchange Membrane Fuel Cells Gang Wu; State University of New York at Buffalo, United States.

2:00 PM *ES07.02.02
High-Throughput Synthesis and Characterization of PGM-Free Oxygen Reduction Electrocatalysts for Polymer Electrololyte Fuel Cells Deborah Myers; Argonne National Laboratory, United States.

2:30 PM ES07.02.03
Conversion of Solar Power to Chemical Energy Based on Carbon Nanoparticle Modified Solar-Thermoelectric Generator and Electrochemical Water Splitting System Xiaofei Zhang1,2; 1Shandong University, China; 2Georgia Institute of Technology, United States.

2:45 PM ES07.02.04
Self-Assembly of Large-Area 2D Polycrystalline Transition Metal Carbides for Hydrogen Electrocratatalysis Xining Zang; Massachusetts Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *ES07.02.05

4:00 PM *ES07.02.06
Graphite Electrodes for Potassium-Ion Batteries Shinichi Komaba1,2; 1Tokyo University of Science, Japan; 2Kyoto University, Japan.
SESSION ES07.03: Poster Session I: Carbon-Based Materials in Energy Applications
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES07.03.02 Copper-Promoted Nitrogen-Doped Carbon Derived from Zeolitic Imidazole Frameworks for Oxygen Reduction Reaction Yunchao Xie; University of Missouri-Columbia, United States.

ES07.03.03 Rapid Synthesis of Zeolitic Imidazole Frameworks in Laser Induced Graphene Microreactors Yunchao Xie; University of Missouri-Columbia, United States.

ES07.03.04 Nitrogen Doped Coal—A High Efficient Electrocatalyst for Oxygen Reduction Reaction Chi Zhang; University of Missouri Columbia, United States.

ES07.03.05 Texture Controllable Hierarchical Porous Carbon as Flexible Electrode for High Rate Performance Supercapacitor Jiang Hedong; University of Electronic Science and Technology of China, China.

ES07.03.07 Soft-TemplatedTellurium-Doped Mesoporous Carbons as a Pt-Free Electrocatalyst for High-Performance Dye-Sensitized Solar Cells Chang Ki Kim; Korea University, Korea (the Republic of).

ES07.03.08 Multifunctional Metal Incorporated Graphene Aerogels for Energy Management Applications Sahila Perananthan; University of Arizona, United States.

SESSION ES07.04: Syntheses and Characterization of New Carbon-Based Materials
Session Chairs: Sheng Dai and Jun Lu
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 A

8:15 AM ES07.04.01 Iodine-Doped Graphene Films for High-Performance Electrochemical Capacitive Energy Storage Zho Yucan; University of Electronic Science and Technology of China, China.

8:30 AM ES07.04.02 Single Walled Bil5 and Gd5 Nanotubes Encapsulated within CNT Leonard D. Frances; International Iberian Nanotechnology Laboratory, Portugal.

8:45 AM ES07.04.03 Functional Nanoporous Graphene@Metal-Organic Frameworks—Design, Synthesis, Properties and Applications Jayaramulu Kollebyima 1, 2; 1Regional Centre of Advanced Technologies and Materials, , Czechia; 2Technical University of Munich, Germany.

9:00 AM *ES07.04.04 Self-Assembly Synthesis of Carbon Electrode Architectures for Energy-Related Applications Sheng Dai; 1, 2; 1Oak Ridge National Laboratory, United States; 2The University of Tennessee, Knoxville, United States.

9:30 AM ES07.04.05 Science of Nitrogen and Boron Doped Electrically Conductive Ultrananocrystalline Diamond Thin Films and Applications to Energy Generation/Storage Devices Flida I. de Oubaldia; Universidad Tecnológica de Panamá, Panama.

9:45 AM ES07.04.06 Analysis and Ionic Conductivity of Lithium Carbonphosphonitride Thermosets Andrew Purdy; Naval Research Laboratory, United States.

10:00 AM BREAK

10:30 AM *ES07.04.07 Encapsulating Various Sulfur Allotropes within Graphene Nanocages for Long-Lasting Lithium Storage Jun Lu; Argonne National Laboratory, United States.

11:00 AM *ES07.04.08 Electrochemical Quartz Crystal Microbalance for Study of Iodide Affinity to Carbon Surface Elzbieta Prackowiak; Poznan University of Technology, Poland.

11:30 AM ES07.04.09 The Electronic Structure Underlying Carbon for Energy Applications Yuanyue Liu; The University of Texas at Austin, United States.

11:45 AM ES07.04.10 Effect of Ionic Liquid Confinement in Carbon Nanopores on Electrical Double-Layer Charging Francois Beguin; Poznan University of Technology, Poland.

SESSION ES07.05: Advanced Characterization on Carbon Energy Materials
Session Chairs: Andrea Ferrari and David Mitlin
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 127 A

1:30 PM *ES07.05.01 Advances in Raman Spectroscopy of Carbon Materials Andrea Ferrari; University of Cambridge, United Kingdom.

2:00 PM *ES07.05.02 Directional Flow-Aided Sonochemistry Yields Graphene with Tunable Defects to Provide Fundamental Insight on Sodium Metal Plating Behavior David Mitlin; Clarkson University, United States.

2:30 PM BREAK

3:30 PM *ES07.05.03 Advanced Carbon Materials for Lithium-Sulfur Batteries—From Basic Research to Pouch Cells Stefan Kaskel; 1, 2; 1Fraunhofer IWS, Germany; 2TU Dresden, Germany.

4:00 PM ES07.05.04 Structure of Bulk and Confined Ionic Liquids from Ab Initio Molecular Dynamics Simulations and X-Ray Scattering Yuan Anh Pham; Lawrence Livermore National Laboratory, United States.

4:15 PM ES07.05.05 In Operando Characterization of SEI Formation and Long Term Cycling in NMC/SiGr Composite Pouch Cells Through Non-Invasive Acoustic Measurements Clement Bommier; 1, 2; 1Princeton University, United States; 2Princeton University, United States.

4:30 PM ES07.05.06 Probing Local Structure and Disorder in Graphitic Carbon Nitrides Diane Haiber; Arizona State University, United States.

4:45 PM ES07.05.07 Carbon Fiber-Paper–Supported Carbon Nanofoams as Free-Standing Electrode Architectures for Reversible Sodium-Ion Storage Ryan H. DeBlock; University of California, Los Angeles, United States.

SESSION ES07.06: Poster Session II: Carbon-Based Materials in Energy Applications
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E
**ES07.06.01**
Preparation of Nitrogen-Doped and Interconnected Hollow Carbon Nanospheres for Superior Lithium-Sulfur Battery  
Cheng Ma; East China University of Science and Technology, China.

**ES07.06.02**
Surface Functionalization of Graphene Prior to CO₂ Tethering for Oxygen Reduction Catalysis in Both Acidic and Alkaline Media  
Simranjit K. Grewal; University of California, Merced, United States.

**ES07.06.03**
The Effect of Synthesis Parameters for the Mesoporous Carbons Using Silica Aerogel Templates  
Naima A. Sezai; Middle East Technical University, Turkey.

**ES07.06.04**
Multiscale Simulations of Hole Formation and Growth During Holey Graphene Synthesis via Chemical Etching  
Dini Wang; Arizona State University, United States.

**ES07.06.05**
Pillared Reduced Graphene Oxide with Mg in the Interlayer Space as Hydrogen Storage Material  
Feng Yan; Zernike Institute for Advanced Materials, University of Groningen, Netherlands.

**ES07.06.06**
Influence of Carbon Microstructure on High-Performance Supercapacitor  
Amir Reza Aref Laleh; The Pennsylvania State University, United States.

**ES07.06.08**
Synthesis of Highly Conjugated Carbon Quantum Dots for Li-Ion Battery Applications  
Jiyong Kim; University of California, Riverside, United States.

**SESSION ES07.07: Carbon-Based Materials for Supercapacitors and Batteries**

**ES07.07.01**  
11:00 AM ES07.07.09  
Design of Nanohybrid Materials to Enable Efficient Junctions for Strong Electrolyte Binding in Ionic Liquid-Based Supercapacitors  
Feili Lai; Max Planck Institute of Colloids and Interfaces, Germany.

**ES07.07.10**  
11:15 AM ES07.07.10  
Designed N/O/S Tri-Doped Carbons for CO₂ Capture and Supercapacitors  
Zhihong Tian; Zhengzhou University, China; Max Planck Institute of Colloids and Interfaces, Germany.

**ES07.07.11**  
11:30 AM ES07.07.11  
Improving the Performance of Lignin-Derived Supercapacitor Electrode by Inducing Lignin Crosslinking and Controlling its Derived Carbon's Morphology  
Hei Chun Ho; Oak Ridge National Lab, United States; The University of Tennessee, Knoxville, United States.

**ES07.07.12**  
11:45 AM ES07.07.12  
High-Energy-Density Graphite Dual-Ion Batteries for Stationary Storage of Electricity—Status, Prospects and Future Challenges  
Kostiantyn Kravchuk; ETH Zurich, Switzerland; Empa-Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

**SESSION ES07.08: Carbon-Based Materials in Batteries**

**ES07.08.01**  
1:30 PM *ES07.08.01  
On the Role of Heteroatom Doping of Carbon-Based Catalysts for Water Splitting Reactions and the Oxygen Reduction Reaction  
Ulrike Kramm; TU Darmstadt, Germany.

**ES07.08.02**  
2:00 PM *ES07.08.02  
Disordered Carbon Anodes for Na-Ion Battery and Their Sodium Storage Mechanism  
Yaxiang Lu; Chinese Academy of Sciences, China.

**ES07.08.03**  
2:30 PM ES07.08.03  
Dual-Functional, Tunable, Nitrogen-Doped Carbon for High Performance Li-S Full Cell  
Hongli Zhu; Northeastern University, United States.

**ES07.08.04**  
3:00 PM ES07.08.04  
Rational Design of 1D Partially Graphitized Nitrogen Doped Porous Carbon with Highly Aligned Carbon Nanotubes for Lithium-Ion Batteries  
Hang In Cho; Seoul National University, Korea (the Republic of).

**ES07.08.05**  
3:30 PM ES07.08.05  
New Hybrid Nano-Architecture of LiS/Si Electrodes for Rechargeable Li-Ion Batteries  
Mariam Ezzaouia; Ecole Polytechnique, France.

**ES07.08.06**  
3:45 PM ES07.08.06  
Novel Carbon Electrodes for Next Generation Intercalation Batteries  
Mariappan P. Paranathan; Oak Ridge National Laboratory, United States.

**ES07.08.07**  
4:00 PM ES07.08.07  
Metal Organic Framework Derived Metal Species Encapsulated into BCN Nanotubes for Energy Conversion and Storage Devices  
Hassina Tabassum; Peking University, China.

**ES07.08.08**  
4:15 PM ES07.08.08  
Dual Template-Assisted Fabrication of High-Surface-Area Hollow Carbon Nanospheres for Enhanced Energy Storage  
Mingqi Chen; East China University of Science and Technology, China.

**ES07.08.09**  
4:30 PM ES07.08.09  
Processable and Moldable Sodium-Metal Anodes  
Ao-xuan Wang; Tianjin University, China.

**ES07.08.10**  
4:45 PM ES07.08.10  
MoSe₂ Nanosheet Anodes Embedded in Carbon/Graphene Substrate for Sodium Energy Storage  
Junxiong Wu; The Hong Kong University of Science and Technology, Hong Kong.
**SYMPOSIUM ES08**

Materials Challenges in Surfaces and Coatings for Solar Thermal Technologies

April 24 - April 25, 2019

Symposium Organizers
Andrea Ambrosini, Sandia National Laboratories
Ramon Escobar Galindo, Universidad de Cadiz
Elena Guillén, Profactor GmbH
Matthias Krause, Helmholtz Zentrum-Dresden-Rossendorf

Symposium Support
Prevac

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* Invited Paper

SESSION ES08.01/ES12.05: Joint Session: Future Trends in CSP Enabled by Redox-Active Oxides

Session Chairs: Andrea Ambrosini and Ellen Stechel

Wednesday Afternoon, April 24, 2019

PCC North, 100 Level, Room 123

1:30 PM *ES08.01.01/ES12.05.01
Aluminum-Doped Strontium Ferrite Perovskites for High-Purity N₂ Accomplished with O₂ Separation from Air via Two-Step Solar Thermochemical Cycles

Peter G. Loutzenhiser; Georgia Institute of Technology, United States.

2:00 PM *ES08.01.02/ES12.05.02
Concentrated Solar Radiation to Power High Temperature Thermochemical Heat Storage

Christos Aperjis; German Aerospace Center (DLR), Germany.

2:30 PM BREAK

3:00 PM BREAK

SESSION ES08.02: Nanostructured Solar Absorbers

Session Chairs: Clifford Ho and Olivier Raccourt

Wednesday Afternoon, April 24, 2019

PCC North, 100 Level, Room 123

3:30 PM *ES08.02.01
Spinel Metal Oxide Nanostructures for Solar Absorber Coating

Renkun Chen; University of California, San Diego, United States.

4:00 PM *ES08.02.02
Spectrally Selective and Thermally Enduring Refractory Nanoneedles

Lizzie Rubin; University of California, San Diego, United States.

4:15 PM *ES08.02.03
High-Performance Solution-Processed Selective Absorbers for Next-Generation Concentrating Solar Power

Yame Li; Hong Kong University of Science and Technology, Hong Kong.

4:30 PM *ES08.02.04
Black Oxides in the Spinel Group—Promising Materials for Highly Durable Solar Selective CSP Absorber Coatings

Andreas Schuler; Swiss Federal Institute of Technology EPFL, Switzerland.

SESSION ES08.03: Corrosion Mitigation in CSP Plants

Session Chairs: Elena Guillén and Andreas Schuler

Thursday Morning, April 25, 2019

PCC North, 100 Level, Room 123

8:45 AM ES08.03.01
An Integrated Strategy in Pursuit of Corrosion Control in 750°C Chloride Salt Heat Transfer Fluids


9:00 AM *ES08.03.02
Corrosion Mitigation in Molten Chlorides to Meet Targets in Next Generation Concentrating Solar Power

Judith C. Vidal; National Renewable Energy Laboratory, United States.

9:30 AM *ES08.03.03
Nickel-Aluminide Based Anticorrosion Coatings Prepared by Plasma Spray for Concentrating Solar Power Applications

Sarah Yasir; Cranfield University, United Kingdom.

9:45 AM ES08.03.04
Nanostructured Solid Ionic Hydrogen Barrier Coatings—Engineering Defect Chemistry and Interfaces for Corrosion Resistance

William J. Bowman; Massachusetts Institute of Technology, United States.

10:00 AM BREAK
SESSION ES08.06: Disruptive Concepts for Increasing Absorptance in CSP Receivers
Session Chairs: Ramon Escobar Galindo and Judith Vidal
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 123

3:30 PM *ES08.06.01
Materials Structuring for Enhanced Solar Energy Absorption and Retention Sungbo Jin; NanoSD, LLC, United States.

4:00 PM ES08.06.02
Preparation and Characterization of Solar Thermal Absorbers by Nanoimprint Lithography and Sputtering Tina Mitteramskogler; Profactor GmbH, Austria.

4:15 PM *ES08.06.03
Fractal-Like Designs for Increased Solar Absorptance and Efficiency of High-Temperature Solar Thermal Receivers Clifford Ho; Sandia National Laboratories, United States.

4:45 PM CLOSING

SYMPOSIUM ES10
Rational Designed Hierarchical Nanostructures for Photocatalytic System
April 23 - April 25, 2019

Symposium Organizers
Feng Bai, Henan University
Ying-Bing Jiang, Angstrom Thin Film Technologies LLC
Yugang Sun, Jia Tao Zhang, Beijing Institute of Technology

Symposium Support
Henan University

* Invited Paper

SESSION ES10.01: Photocatalytic Mechanism
Session Chairs: Feng Bai, Ying-Bing Jiang and Xinhe Zheng
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 121 A

10:30 AM *ES10.01.01
Colloidal Inorganic Nanocrystals with Reduced Symmetry P. Davide Cozzoli1, 2; 1University del Salento, Italy; 2CNR NANTOC - Institute of Nanotechnology, Italy.

11:00 AM ES10.01.02
A Non-Power Strategy for Photo-Generated Charge Carrier Separation—Effect of Lorentz Force in Photocatalytic System Wenqiang Gao; Shandong University, China.

11:15 AM ES10.01.03
Isolating Nonthermal Light Effects in Plasmon-Enhanced Catalytic Reactions Xueqian Li; Duke University, United States.

11:30 AM ES10.01.04
Primary Amines Enhance Triplet Energy Transfer from CdSe Nanocrystals for Photon Upconversion Emily Moses; University of California, Riverside, United States.

SESSION ES10.02: Self-Assembly and Photocatalysis
Session Chairs: Yugang Sun, Jia Tao Zhang and Xinhe Zheng
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 121 A

1:30 PM *ES10.02.01
Self-Organized Oxide Nanotubes—Critical Factors in Photocatalytic Applications Patrik Schmuki; Univ of Erlangen-Nuremberg, Germany.

2:00 PM *ES10.02.02
Interfacial Self-Assembly of Hierarchically Structured Nanoparticles with Photocatalytic Activity Hongyou Fan; University of New Mexico/Sandia National Laboratories, United States.

2:30 PM ES10.02.03
Surface Plasmon Resonant Gold-Palladium Bimetallic Nanoparticles for Promoting Catalytic Oxidation Jonathan Boltersdorf; U. S. Army Research Laboratory, United States.

2:45 PM ES10.02.04
Hole Transport in Selenium Semiconductors Using Density Functional Theory and Bulk Monte Carlo Dragica Vasileska; Arizona State University, United States.

3:00 PM BREAK

3:30 PM *ES10.02.05
Programmable Assemblies of Inorganic Colloids for Photocatalytic Applications Mikhail Zamkov; Bowling Green State University, United States.
SESSION ES10.03: Poster Session I
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES10.03.01
Peering into Water Splitting Mechanism of g-C3N4-Carbon Dots Metal-Free Photocatalyst Dan Ou; Beijing Institute of Technology, China.

ES10.03.02
Orbital Energies Determine Interactivity of Hole Transport Materials with Iodide Species in Degrading Perovskite Devices Andrew Shapiro; Princeton University, United States.

ES10.03.03
Insight into the Phase Stability of Cesium Lead Iodide Perovskite Zihan Zhang; Florida State University, United States.

ES10.03.04
Mixed-Halide Perovskites with Stabilized Blue Emission Xavier A. Quintana; Florida State University, United States.

ES10.03.05
Reactive Ion Beam Assisted Deposition of Rare Earth Cuprates Stephen McCoy; University of California, Riverside, United States.

ES10.03.06
Development of Ozone Gas Sensors Based on Delfasite Thin Films Joso Alfonso; Luxembourg Institute of Science and Technology, Luxembourg.

ES10.03.07
Synthesis of Hydrated KTaWO6 Nanoparticles and Sn(II) Incorporation for Visible Light Absorption Roland Marschall 1, 2; 1Justus-Liebig-University Giessen, Germany; 2University of Bayreuth, Germany.

ES10.03.08

ES10.03.09
 Alloying Cu and Co with Pt Co-Catalyst Loaded on TiO2 Nanosheets Enhances the Generation of Reactive Oxygen Species and Photocatalytic Degradation Weiwei He; Xuchang Univ, China.

ES10.03.10
Focused Helium Ion Beam Induced Superconductor Insulator Transition in YBCO Holly Grezdo; University of California, Riverside, United States.

ES10.03.11
Fabrication of ZnO/TiO2 Nanofibers and Their Photocatalytic Activity for Particulate Matter Removal Chang-Gyu Lee; Gangneung-Wonju National University, Korea (the Republic of).}

ES10.03.12
Dopant Incorporation in Poly crystalline Diamond for PN Junction Fabrication Amber Wingfield; Howard University, United States.

ES10.03.13
Thermal Rectifier in a Melamine Containing Bi-Component Hydrogel Ting Meng; University of Science and Technology of China, China.

SESSION ES10.04: Photocatalytic Water Splitting I
Session Chairs: Zaicheng Sun and Lianzhou Wang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 121 A

8:30 AM *ES10.04.01
Water Splitting Using Photocatalyst Systems with Hierarchical Structures Takashi Hisatomi; Shinshu University, Japan.

9:00 AM *ES10.04.02
Semiconductor Electrodes for Integrated Photo-Electrochemical Water Splitting Lianzhou Wang; University of Queensland, Australia.

9:30 AM ES10.04.03
Studying Photo-Induced Charge Transfer with Quantum Dots and Molecular Catalysts Assembly for Photocatalytic Applications Xiharika Krishna Botcha; The University of Alabama in Huntsville, United States.

9:45 AM ES10.04.04
Self-Optimized Photocatalysts—Hot-Electron Driven Selective Photo-Synthesis of Catalytic Nanoparticles Evgenia Kontoule; AMOLF Institute, Netherlands.

10:00 AM BREAK

10:30 AM *ES10.04.05
Rational Design of Z-Scheme Type Photocatalyst with Highly Efficient Charge Separation Efficiency Zaicheng Sun; Beijing University of Technology, China.

11:00 AM *ES10.04.06
Development of Photocatalyst Systems with Reduced Graphene Oxide for Artificial Photosynthetic Water Splitting and CO2 Reduction Akhide Iwase; Tokyo University of Science, Japan.

11:30 AM *ES10.04.07
Janus-Type MnOx-AgI Nanoparticles as Self-Sensitized Photochemical Water Oxidation Jie He; University of Connecticut, United States.

11:45 AM ES10.04.08
Comparing Catalyst-Mass-Normalized Activity and Approximated Quantum Yields for Polychromatic Photocatalytic Systems Larissa Y. Kunz; Stanford University, United States.

SESSION ES10.05: Photocatalytic Water Splitting II
Session Chairs: Jian Zhang and Jiatao Zhang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 A

2:00 PM *ES10.05.01
Cocatalysts Decorated Amorphous Silicon Photoanodes for Efficient Bias-Free Water Splitting Jian Zhang; Guang University of Electronic Technology, China.

2:30 PM BREAK

3:30 PM *ES10.05.02
Plasmonic Driving of Chemical Reactions Jianfang Wang; The Chinese University of Hong Kong, Hong Kong.

4:00 PM ES10.05.03
Silicon Photocathodes with Integrated Catalysts Perform Selective CO2 Reduction to Hydrocarbons and Oxygenates Gunadaya Gunadaya 1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

4:15 PM ES10.05.04
Photoelectrochemical Hydrogen Generation in CdSe Quantum Dot/β-Pb0.33V2O5 Nanowire Heterostructures, Mediated by Midgap States Nuwanthi Suwandaratne; University at Buffalo, The State University of New York, United States.
The Optical Spectrum of UVLED Excitation Using NTC Nanometer Particles to Replace Rare Earth Doping

Lihong Su; Northwest Polytechnical University, China.

SESSION ES10.06: Poster Session II
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES10.06.01 Fabrication of Gold Nanorods-Porphyrin Core-Shell Structure Wenbo Wei; Henan University, China.

ES10.06.02 Ultra Small Metal Oxide/Phosphide Clusters Anchored on TiO2 Nano-Sheets Remarkably Enhance Photocatalytic H2 Generation Yun Gao; Hubei University, China.

ES10.06.03 Controlling Stoichiometry and Morphology in Tin-Halide Perovskite Films Deposited by Carrier-Gas Assisted Vapor Deposition Catherine P. Clark; University of Minnesota, United States.

ES10.06.04 Defect Chemistry-Inspired Design of Ir/FeOx Single-Atom Catalyst for Water Splitting Photoanode Wonhyo Joo; Seoul National University, Moldova (the Republic of).

ES10.06.05 Quantifying Strain and Dislocation Density in Assembled and Epitaxially Welded Nanocubes Harshal Agrawal; AMOLF, Netherlands.

ES10.06.06 Highly Efficient Plasmonic Membrane Activation of Peroxide for Quantized Oxidation Bruce Hinds; University of Washington, United States.

ES10.06.07 Elucidating Interfacial Visible Light Absorption in TiO2-Supported CeO2 Photocatalysts Drake Halber; Arizona State University, United States.

ES10.06.08 Interface Recombination Suppress Using PEALD Group-III Nitrides for Quantum Dots Solar Cells Xinhe Zheng; University of Science and Technology Beijing, China.

ES10.06.09 Microstructural Effects on Photocatalytic Performance in Bi2MoO6/Ag3PO4 Z-Scheme Systems Kai Leeb M. Ayalew; University of Nevada Las Vegas, United States.

ES10.06.10 Biomimetic Erythrocyte-Like Nanostructure for Selective Oxygen Transport Grace Jiang; Angstrom Thin Film Technologies LLC, United States.

ES10.06.11 Spray Deposition of Insulating Layers at the Rear Side of Silicon Solar Cells to Enhance their Internal Reflectance George M. Spruille; Alabama A&M University, United States.

ES10.06.12 Highly Efficient MIL-100(Fe)/TiO2 Composite Photocatalysts for Environmental Remediation Xiang He; Virginia Commonwealth University, United States.

ES10.06.13 Directed Self-Assembly of Symmetric Block Copolymers in Thin Films on Soft Grating Patterns Jung Seob Shim; Dankook University, Korea (the Republic of).

ES10.06.14 Wet Etching Mechanism of Epitaxial Er2O3 on Si for Integration to Semiconductor Technology Tomas Grinys; Vilnius University, Lithuania.

ES10.06.15 Modeling Current-Potential Responses of Homogeneous-Heterogeneous Photocathodes Brian L. Wadsworth; Arizona State University, United States.

ES10.06.16 The Distinctly Enhanced Electromagnetic Wave Absorption Properties of FeNi/GO Nanocomposites Compared with Pure FeNi Alloys Dong An; North University of China, China.

ES10.06.17 Highly Dispersed Doped Semiconducting Nanocrystal for Efficient Opto-Electronics Application Taliya Gunawansa; Norfolk State University, United States.

ES10.06.18 Density Functional Theory Calculations of Nanopyramidal ZnO—Crystal Growth and Improved Performance in Water Splitting PbGh Mirabekeh; University of California, Riverside, United States.

ES10.06.19 Impact of Average, Local and Electronic Structure on Visible Light Photocatalysis in Novel BiREWO4 (RE = Eu & Tb) Nanomaterials Pradeep P. Shanbhag1, 2; 1Poomnapajna Institute of Scientific Research, India; 2Manipal Academy of Higher Education, India.

ES10.06.20 Nonequivalent Self-Assembly and Formation of Active Porphyrin Nanostructures Gavin Heam; Albuquerque Academy, United States.

ES10.06.21 Nanomaterial-Dependent Electrowetting Phenomena of Nanofluids Urice Tohba1, 2; 1Azimuth Corporation, United States; 2Materials and Manufacturing Directorate, Air Force Research Laboratory, United States.

ES10.06.22 Application of Low-Energy Photoelectron Spectroscopies to Probe the Energetics in Organic Tin Halide Perovskites and the Influence of Interfacial Energetics on Photovoltaic Performance Alex M. Boehm; University of Kentucky, United States.

ES10.06.23 Exotic Magneto-Caloric Effect and Quadrupolar Interaction in Ho1-xDyxB4O12 Composite Photocatalysts for Environmental Remediation FeNi/rGO Nanocomposites Compared with Pure FeNi Alloys FeNi/rGO Nanocomposites Compared with Pure FeNi Alloys Jun Hwan Moon; Korea University, Korea (the Republic of).

ES10.06.24 Rationally Designed Metal Heterostructures for Plasmon-Enhanced Photocatalysis Han Zhang; The Chinese University of Hong Kong, China.

ES10.06.25 Formation of Novel HCSs/Nb3O7F Heterostructured Materials with Enhanced Carrier Separation Efficiency and Carrier Transfer Fei Huang1, 2; 1China University of Mining and Technology, China; 2Arizona State University, United States.

ES10.06.26 The Fabrication and Characterization of Co-Co3O4 Core-Shell/Au Barcode Nanowires Jun Hwan Moon; Korea University, Korea (the Republic of).

ES10.06.27 Electronic Textiles Based on Aligned Electrospun Belf-Like Cellulose Acetate Nanofibers and Graphene Sheets—Portable, Scalable and Eco-Friendly Strain Sensor Xu WanLin; Southeast University, China.

ES10.06.28 Nanomaterials for Mesoscopic Perovskite Solar Cells Zheiling Zhang; Guilin University of Electronic Technology, China.

ES10.06.29 Spray Deposited ZnO/BiO Thin-Film Heterojunctions with Enhanced Visible Photocatalytic Activity Juliette Reyes Arango; UNAM, Mexico.

ES10.06.30 Highly Transparent Catalysts for Solar Fuels Applications via Mesoscale Photonic Design Won-Hui Cheng; California Institute of Technology, United States.

ES10.06.31 Secondary Electron Emissive Coatings from ALD—Metal Oxides and Fluorides Maximilian Gebhard; Argonne National Laboratory, United States.

ES10.06.32 Novel Method of Transferring CNT Forest to Any Substrates Chi P. Huynh; Lintec of America, United States.
8:30 AM *ES10.07.01 Chromophore-Catalyst Assemblies for Solar Fuels 
Kirk Schanze; The University of Texas at San Antonio, United States.

9:00 AM *ES10.07.02 
An *In Situ* Room Temperature Route to CuBiI4 Based Bulk-Heterojunction Perovskite-Like Solar Cells
Zhi Zheng; Xuchang University, China.

9:30 AM ES10.07.03 
Hierarchical Zinc Oxide Nanostructures for the Photochemical Reduction of Bicarbonate to Solar Fuels
Hanqing Pan; New Mexico Institute of Mining and Technology, United States.

9:45 AM ES10.07.04 
Plasmon-Enhanced Photocatalytic Reaction on Titanium Nitride Nanoparticles-Combined Experimental and Theoretical Study
Sanchari Chowdhury; New Mexico Tech, United States.

10:00 AM BREAK

10:30 AM *ES10.08.01 Design Strategies for Novel Catalyst for (Photo)Electrocalytic CO\textsubscript{2} Reduction Reaction
Francesca Maria Toma; Lawrence Berkeley National Laboratory, United States.

11:00 AM *ES10.08.02 Functionalizing Si with WO\textsubscript{3} or BiVO\textsubscript{4} for Photoelectrochemical Applications
Guido Mul; University of Twente, Netherlands.

11:30 AM ES10.08.03 
Solar-Driven Photocatalytic CO\textsubscript{2} Reduction in Water Utilizing a Ru Complex Catalyst on p-Type Fe\textsubscript{2}O\textsubscript{3} with a Multiheterojunction
Keita Sekizawa; Toyota Central R&D Laboratories, Inc., Japan.

1:45 PM ES10.09.01 
Consciously Constructing Z-Scheme Photocatalysis via Photo-Deposition Method for Improving Photocatalytic Activity
Wenshuai Jiang; Beijing University of Technology, China.

2:00 PM ES10.09.02 
Branched Nanostructures with Enhanced Photoelectrochemical Water Splitting Activities
Yuanbing Mao\textsuperscript{1, 2}; \textsuperscript{1}The University of Texas at Rio Grande Valley, United States; \textsuperscript{2}University of Texas at Rio Grande Valley, United States.

2:15 PM ES10.09.03 
Experimental and Theoretical Investigation of AgBiS\textsubscript{2}-TiO\textsubscript{2} Heterojunctions for Enhanced Photocatalytic Applications
Priyanka Ganguly; Institute of Technology Sligo, Ireland.

2:30 PM ES10.09.04 
Preparation of ZnO Based Heteroarchitecture for High Performance Photocatalysis
Jun Wu; Wuhan University, China.

2:45 PM BREAK

3:15 PM ES10.09.05 
Catalytic Alloys Enabled Halide Perovskite Photocathode for Selective and Stable CO\textsubscript{2} Reduction to Formic Acid in Aqueous Solution
Jie Chen; King Abdullah University of Science and Technology, Saudi Arabia.
**SYMPOSIUM ES11**

Advanced Low Temperature Water-Splitting for Renewable Hydrogen Production via Electrochemical and Photoelectrochemical Processes

April 23 - April 26, 2019

Symposium Organizers
Katherine Ayers, Proton OnSite
Todd Deutsch, National Renewable Energy Laboratory
Chengxiang Xiang, California Institute of Technology
Changfeng Yan, Chinese Academy of Sciences

10:30 AM ES11.01.01/ES12.01.01
Development of Protocols and Standards for Low Temperature Electrolysis
Katherine Ayers
Nel Hydrogen, United States.

10:45 AM ES11.01.02/ES12.01.02
Development of Protocols and Standards for Photoelectrochemical Water-Splitting
Chengxiang Xiang
California Institute of Technology, United States.

11:00 AM ES11.01.03/ES12.01.03
Framework and Test Protocols for High Temperature Electrolysis
Olga Marschall
Pacific Northwest National Laboratory, United States.

11:15 AM ES11.01.04/ES12.01.04
Framework and Test Protocols for Solar Thermochemical Water Splitting
Ellen B. Stechel
Arizona State University, United States.

11:30 AM PANEL DISCUSSION

SESSION ES11.02: Metal Oxides
Session Chairs: Joel Haber and Chengxiang Xiang
PCC North, 100 Level, Room 121 C

1:45 PM *ES11.02.01
Electrochemical and Photoelectrochemical Water Splitting Using Bioinspired Catalysts That Out-Perform Nobel Metals
Gerard C. Dismukes
Rutgers, The State University of New Jersey, United States.

2:15 PM ES11.02.02
Nanostructured Spinel Ferrite Photoanodes for Photoelectrochemical Water Splitting
Roland Marschall
Justus-Liebig-University Giessen, Germany.

2:30 PM ES11.02.03
Excitation Wavelength- and Medium-Dependent Photoluminescence of Reduced Hierarchical TiO2: Films
Luca Maserati
Politecnico di Milano, Italy.

2:45 PM ES11.02.04
Intermediates in PEC Water Oxidation—How They Come and How They Go
Artur Braun
Empa, Switzerland.

3:00 PM BREAK

SESSION ES11.03: Photoanodes
Session Chairs: Joel Haber and Chengxiang Xiang
Tuesday, April 23, 2019
PCC North, 100 Level, Room 121 C

3:30 PM ES11.03.01
High Throughput, Multi-pH Evaluation of Earth-Abundant, Multi-Metal Oxide OER Catalysts and of Integrated BiVO4-Based Photoanodes
Joel Haber
California Inst of Technology, United States.

3:45 PM ES11.03.02
WITHDRAWN 4/2/2019 ES11.03.02 Tungsten Doped Graphitic Carbon Nitride–Bismuth Vanadate Hybrid Films for Enhanced Photoelectrochemical Water Oxidation
Jyoti Prakash
The Polytechnic School, Ira. A. Fulton Schools of Engineering, Arizona State University, United States.

4:00 PM ES11.03.03
Study of Enhancement in Photoelectrochemical Water Oxidation Performance of Monoclinic BIVO4s with Systematic Doping with Yttrium
Umash Prasad
Arizona State University, United States.

4:15 PM ES11.03.04
Effects of Vanadium Precursor Solution Aging on Material Properties and Photoelectrochemical Water Oxidation Performance of BIVO4 Thin-Film Photoanodes
Gihun Jung
Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:30 PM ES11.03.05
Behavior of Electrochemically Generated Hydrogen Bubbles on Silicon Microwire Arrays
Paul A. Kempler
California Institute of Technology, United States.

4:45 PM ES11.03.06
Modeling Impedance Spectra at Semiconductor-Electrolyte Interface—A Multiscale Approach
Kiran George
Dutch Institute for Fundamental Energy Research (DIFFER), Netherlands.

SESSION ES11.04: Poster Session I: Low Temperature Water Splitting Via Electrochemistry and Photoelectrochemistry
Session Chairs: Todd Deutsch and Chengxiang Xiang
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES11.04.01
GaAs Nanomembranes for Solar Water Splitting
Haneol Lim
University of Southern California, United States.

ES11.04.02
Piezoelectric-Photoelectrochemical Characteristics of ZnO Nanopyramids for Sono-Assisted Water Splitting
Jyoti Prakash
The Polytechnic School, Ira. A. Fulton Schools of Engineering, Arizona State University, United States.

ES11.04.03
Low and High -Temperature Electrolysis, Photoelectrochemical and Solar Thermochemical Water Splitting Materials Characterization and Development at Berkeley Lab Under the HydroGEN Consortium
Nemanja Danilovic
Lawrence Berkeley National Laboratory, United States.

ES11.04.04
CuGaSe2/Zn0.5Mg0.5O Photocathodes for Photoelectrochemical Water Splitting
Imran S. Khan
National Renewable Energy Laboratory, United States.

ES11.04.05
Measurement of the IPCD of Photocatalytic Electrodes Using a Pump-and-Probe Method
Abhishek G. K. Khan
King Abdullah University of Science and Technology, Saudi Arabia.

ES11.04.06
Kichang Jung
Korea Advanced Institute of Science and Technology, Korea (the Republic of).

ES11.04.07
Photocatalytic Characterization of Cuprous Oxide (Cu2O) Thin Films Deposited by Chemical Bath Deposition (CBD)
Yun-Mo Sung
Korea Univ, Korea (the Republic of).

ES11.04.08
Enhanced Photoelectrochemical Responses of ZnO NR/p-n Cu2O Z-Scheme PV-PEC Cells
Yun-Mo Sung
Korea Univ, Korea (the Republic of).
HydroGEN PEC Supernode—Emergent Degradation Mechanisms with Integration and Scale Up of PEC Devices

J. Young; National Renewable Energy Laboratory, United States.

Thursday Morning, April 25, 2019

9:00 AM *ES11.10.01
Hierarchical Transition Metal-Based Electrocatalysts Modulated by Cerium Element for Efficient Water Splitting

Johnny C. Ho1, 2; 1City Univ of Hong Kong, Hong Kong; 2Shenzhen Research Institute, City University of Hong Kong, China.

9:30 AM *ES11.10.03
Layered Double Hydroxides Based Catalysts for Electrochemical Water Splitting

Yun Kuang; Beijing University of Chemical Technology, China.

9:45 AM *ES11.10.04
Modeling of Anion-Exchange Membrane Electrolyzers to Guide Materials Development

Michael R. Gerhardt; Lawrence Berkeley National Laboratory, United States.

10:00 AM BREAK

SESSION ES11.11: HER Electrocatalysis

Session Chairs: Katherine Ayers and Peikang Shen

Thursday Afternoon, April 25, 2019

PCC North, 100 Level, Room 121 C

1:30 PM *ES11.12.01
Highly Active Electrocatalysts for Efficient Water Splitting and Hydrogen Generation

Pei Kang Shen; Guangxi University, China.

1:45 PM *ES11.12.02
Oxygen Evolution on Well-Defined NiFe Oxides

Ifan E. Stephens; Imperial College London, United Kingdom.

2:00 PM *ES11.12.03
The Role of Catalyst Metastability in Enhancing the Oxygen Evolution Reaction

Nathalie Vonrüti; Universität Bern, Switzerland.

2:15 PM *ES11.12.04
Controlled Electro-Deposition of IrO2 Nano-Arrays with Different Length on TiO2 Nanotube Arrays

Zhi-da Wang; Guangzhou Institute of Energy Conversion, Chinese Academy of Science, China.

3:00 PM BREAK

SESSION ES11.13: Stack Level Perspective

Session Chair: Peter Strasser

Thursday Afternoon, April 25, 2019

PCC North, 100 Level, Room 121 C

3:30 PM *ES11.13.01
Effects of Low Loading and Intermittency on Low Temperature Electrolysis from a Catalyst Perspective

Shaun Alia; National Renewable Energy Laboratory, United States.
8:00 AM *ES11.14.01
Monolithically Integrated InGaN/Si Tandem Photoelectrodes for Efficient and Stable Photoelectrochemical Water Splitting Zetian Mi; University of Michigan, United States.

8:30 AM *ES11.14.02
Thermal Synergies in Photo-Electrochemical Fuel Processing Devices Sophia Haussener; Ecole Polytechnique Federale de Lausanne, Switzerland.

9:00 AM *ES11.14.03
Hybrid Perovskite Photo-Absorbers for Efficient Photoelectrochemical Water Splitting Aditya Mohite; Rice University, United States.

9:30 AM ES11.14.04
Surface-Tailored GaP 2 Photocathodes for High Performance Solar Water Splitting Haneol Lim; University of Southern California, United States.

9:45 AM ES11.14.05

10:00 AM BREAK

10:30 AM ES11.15.01
Stability Testing for Photoelectrochemical Water-Splitting Devices—What Can We Learn from Corrosion Science and Engineering? Kimberly Papadantonakis; California Inst of Technology, United States.

11:00 AM ES11.15.02
Stability of II-VI Semiconductors Under Conditions for Photoelectrochemical Solar Fuel Production Pakpoom Buabthong; California Institute of Technology, United States.

11:15 AM ES11.15.03
Probing the Surface Chemistry and Stability of III-V Photocathodes with First-Principles Simulations and In Situ Experiments Tuan Anh Pham; Lawrence Livermore National Laboratory, United States.

11:30 AM ES11.15.04
Gap-Plasmon Driven the Inhibition of Photocorrosion of Cu2O Photoelectrode Hee Jun Kim; Ulsan National Institute of Science and Technology, Korea (the Republic of).
4:00 PM ES12.02.06
Tunable Redox-Active Metal Oxide Frameworks Alina Schimpf; UC San Diego, United States.

4:15 PM *ES12.02.07
Chemical and Electrochemical Stability of Perovskite Oxide Surfaces in Energy Conversion—Mechanisms and Improvements Bilge Yildiz; Massachusetts Institute of Technology, United States.

SESSION ES12.03: Poster Session: Redox-Active Oxides
Session Chairs: Olga Marina and Ellen Stechel
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES12.03.01
B-Site Doped Strontium Cobalt Oxides for Water Splitting via Thermochemical Redox Reactions George Wilson; Imperial College London, United Kingdom.

8:30 AM *ES12.04.01
Tailoring Solid Oxide Cells Redox Electrode Interfaces John Irvine; University of St Andrews, United Kingdom.

9:00 AM ES12.04.02
In-Situ Defect Mapping of High Temperature STCH Materials in Oxidizing and Reducing Environments Robert T. Bell; National Renewable Energy Laboratory, United States.

9:15 AM *ES12.04.03
The “Perovskite Playground”—Engineering Defect Chemistry in Doped Perovskite and Perovskite-Related Oxides for High Temperature Redox-Active Chemical and Electrochemical Applications Ryan O’Hayre; Colorado School of Mines, United States.

9:45 AM ES12.04.04
Predictive Framework for Materials Synthesis Pathways—In Situ X-Ray Studies of Manganese Oxide Polymorph Formation Bor-Rong Chen; Stanford Synchrotron Radiation Lightsource, United States.

10:00 AM BREAK

10:30 AM *ES12.04.05
Oxygen Off-Stoichiometry and Defect Entropies in Solar Thermochemical Water Splitting Materials Chris Wolverton; Northwestern University, United States.

11:00 AM ES12.04.06
The Electronic Entropy of Charged Defect Formation and Its Impact on Thermochemical Redox Cycles Stephan Lany; National Renewable Energy Laboratory, United States.

11:15 AM *ES12.04.07
Phase Transitions in Perovskite Oxides for Thermochemical Redox Reactions in Energy Science Arun Majumdar; 1,2 Stanford University, United States; 3SLAC National Accelerator Laboratory, United States.

11:45 AM ES12.04.08
The Effect of Structure on Oxygen Vacancy Formation Energy in Ce-Substituted Sr-Mn Oxides Michael D. Sanders; Colorado School of Mines, United States.

SESSION ES12.05/ES08.01: Joint Session: Future Trends in CSP Enabled by Redox-Active Oxides
Session Chairs: Andrea Ambrosini and Anthony McDaniel
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 123

1:30 PM *ES12.05.01/ES08.01.01
Aluminum-Doped Strontium Ferrite Perovskites for High-Purity N2 Accomplished with O2 Separation from Air via Two-Step Solar Thermochemical Cycles Peter G. Loutzenhiser; Georgia Institute of Technology, United States.

2:00 PM *ES12.05.02/ES08.01.02
Concentrated Solar Radiation to Power High Temperature Thermochemical Heat Storage Christos Agrafiotis; German Aerospace Center (DLR), Germany.

2:30 PM BREAK

SESSION ES12.06/ES11.08: Joint Session: Water-Splitting Technology Directions
Session Chairs: Katherine Ayers and Anthony McDaniel
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 121 C

3:30 PM *ES12.06.01/ES11.08.01
HydroGEN Overview, Projects and the AWSM Node Capabilities Huyen N. Dinh; National Renewable Energy Lab, United States.

4:00 PM *ES12.06.02/ES11.08.02
European Efforts to Accelerate the Market Introduction of Renewable Hydrogen Production Christian Sattler; 1,2 German Aerospace Center (DLR), Germany; 3TU Dresden, Germany.

4:30 PM *ES12.06.03/ES11.08.03
Benchmarking Water-Splitting Materials at the Intersection of Electrocatalysis and Photoelectrochemistry Nemanja Danilovic; Lawrence Berkeley National Laboratory, United States.

8:30 AM *ES12.07.01
Thermochemical Trends in ABO3-Type Compounds for Solar Fuel Generation Sossina M. Haile; Northwestern University, United States.

9:00 AM ES12.07.02
Stable Proton-Conducting Solid Oxide Electrolysis Cells for Pure Hydrogen Production at Intermediate Temperatures Boxun Hu; University of Connecticut, United States.

9:15 AM *ES12.07.03
Solid Oxide Electrolysis Cells for Hydrogen and Synthetic Fuel Production from Renewable Energy Anne Hauk; Department of Energy Conversion and Storage, Technical University of Denmark, Denmark.

9:45 AM ES12.07.04
Durability Assessment of High Temperature Electrolysis Cells Olga Marina; Pacific Northwest National Laboratory, United States.

10:00 AM BREAK

10:30 AM *ES12.07.05
Principles of Materials Selection for Thermochemical Fuel Production Cycles Brendan Buffin; ETH Zürich, Switzerland.

11:00 AM ES12.07.06
Perovskite-Based Thermochemical Oxygen Pumping—A Down-Stream Applicational Approach to Increase H2O/CO2-Splitting Efficiency in Concentrated Solar Power Plants Matthias Pein; German Aerospace Center (DLR), Institute of Solar Research, Germany.

11:15 AM *ES12.07.07
Using SCAN+/U Calculations and the Sub-Lattice Formalism to Estimate Off-Stoichiometry in Oxides Sai Gautam Gopalakrishnan; Princeton University, United States.

11:45 AM ES12.07.08
Study of the Reduction Thermodynamics of Sr 1-x Ce x MnO 3 Perovskites for Solar Thermochemical Hydrogen Production Anyka Bergeson-Keller; Colorado School of Mines, United States.
1:30 PM ES12.08.01
Development of Solid-Oxide Fuel-Cell Stacks Based on Proton-Conducting Ceramics Neal P. Sullivan; Colorado School of Mines, United States.

1:45 PM ES12.08.02
Electrode Degradation in Proton-Conducting Ceramic Fuel Cells and Electrolyzers Marcos Hernandez Rodriguez; Colorado School of Mines, United States.

2:00 PM ES12.08.03
Ammonia Synthesis in Two Cyclic Steps—Basic Thermodynamic Considerations James E. Miller; Arizona State University LightWorks®, United States; Sandia National Laboratories, United States.

2:15 PM ES12.08.04
High-Performance Reversible Proton-Conducting Ceramic Cells for Power Generation and Energy Storage Through Ammonia Liangzhu Zhu; Colorado School of Mines, United States.

2:30 PM ES12.08.05

2:45 PM ES12.08.06
Nanostructured Ceria Based All-Oxide Electrodes as the Key to Efficient and Robust High-Temperature Energy Storage Technology Christopher Graves; Technical University of Denmark, Denmark; Noon Energy Inc., United States; Cyclotron Road Fellow at Lawrence Berkeley National Laboratory, United States.

3:00 PM ES12.08.07
Stabilization of Brownmillerite SrCoO2.5 for Oxygen Enrichment Applications Arun M. Umarji; Indian Institute of Science, India.

3:15 PM ES12.08.08
Thermal-Driven Oxygen Pumping in Thermochemical Fuel Production Ivan Ermanoski; Arizona State University LightWorks®, United States.

**SYMPOSIUM ES09**

Advanced Materials for the Water-Energy Nexus
April 23 - April 25, 2019

**Symposium Organizers**
Veronica Augustyn, North Carolina State University
Roland Cusick, University of Illinois at Urbana-Champaign
Ekaterina Pomerantseva, Drexel University
Matthew Suss, Technion Israel Inst of Technology

**Symposium Support**
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SESSION ES09.01: Batteries I
Session Chairs: Veronica Augustyn and Roland Cusick
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 131 A

10:30 AM *ES09.01.01
Manganese Oxides—Functional Electrochemistry and Insight into Their Redox Mechanisms Esther S. Takeuchi; Stony Brook Univ, United States.

11:00 AM *ES09.01.02
Toward a Low-Cost High-Voltage Sodium Aqueous Battery Kisuk Kang; Seoul National University, Korea (the Republic of).

11:30 AM *ES09.01.03
Architectural Re-Design of Zinc Anodes Physically Thwarts Dendrite Formation—With Zinc Batteries Now Rechargeable, What’s Next? Debra R. Rolison; U.S. Naval Research Laboratory, United States.

SESSION ES09.02: Water Desalination I
Session Chairs: Roland Cusick and Matthew Suss
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 131 A

1:30 PM *ES09.02.01
Material Requirements for Capacitive Deionization Electrodes Michael Sessler; Lawrence Livermore National Laboratory, United States.

2:00 PM *ES09.02.02

2:30 PM ES09.02.03
Global Sensitivity Analysis to Assess Performance and Characterize Operational Limitations Across Capacitive Deionization Technologies Steven M. Hand; University of Illinois at Urbana-Champaign, United States.

2:45 PM ES09.02.04
Cooperative Effects in Molecular Dynamics of Water Confined in Hydrophobic and Hydrophilic Nanopores Margarita Russina; Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

3:00 PM BREAK
3:30 PM *ES09.03.01
Two-Dimensional Carbides and Nitrides (MXenes) for Water Purification and Electrochemical Energy Storage Yury Gogotsi; Drexel University, United States.

4:00 PM *ES09.03.02
High Performance Carbon/Carbon Electrochemical Capacitors Implementing Concentrated Aqueous Electrolytes Francois Bregim; Poznan University of Technology, Poland.

4:30 PM ES09.03.03
2D MXenes as Building Blocks for Fabrication of Highly Stable Pseudocapacitive Electrodes Majid Beidaghi; Auburn University, United States.

8:30 AM *ES09.05.01
Crystal Water Containing Materials for Post-Lithium-Ion Batteries Jang Wook Choi; Seoul National University, Korea (the Republic of).

9:00 AM *ES09.05.02
The Influence of Interlayer Water on the Structure and Electrochemical Performance of δ-MnO2 Katherine Page; Oak Ridge National Laboratory, United States.

9:30 AM *ES09.05.03
Vanadium-Oxygen Cell in Dual-Circuit Vanadium Redox Flow Battery Elzbieta Prackowiak; Poznan University of Technology, Poland.

10:00 AM BREAK

3:30 PM *ES09.08.01
Rationally Selecting Intercalating Electrode Materials for the Water-Energy Nexus Christopher Gorski; Pennsylvania State University, United States.
Hydrogels as an Emerging Material Platform for the Water-Energy Nexus

ES09.08.02
Guihua Yu; The University of Texas at Austin, United States.

Physically-Crosslinked Ion Exchange Membranes Defy Conductivity-Selectivity Tradeoff

ES09.08.03
Ryan S. Kingsbury; University of North Carolina at Chapel Hill, United States.

Layered Manganese Oxides as Intercalation Electrodes for Water Desalination via Hybrid Capacitive Deionization

ES09.08.04
Ekaterina Pomerantseva; Drexel University, United States.

SESSION ES09.09: Water Desalination III
Session Chairs: Roland Cusick and Keith Stevenson
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 A

Desalination of High-Salinity Brines—Novel Energy-Efficient Technologies

ES09.09.01
Ngai Yin Yip; Columbia University, United States.

The Mechanism of LCST Transition of Alkyl Phosphonium Benzene Sulfonates/Water Draw Solute for Forward Osmosis Process

ES09.09.02
Robert Kostecki; Lawrence Berkeley National Lab, United States.

Capacitive Deionization—Leveraging the Electric Double Layer for Selective Water Desalination

ES09.09.03
Matthew Suss; Technion Israel Inst of Technology, Israel.

Enhanced and Tunable Ion Selectivity in Flow-Through Electrode Capacitive Deionization with Advanced Carbon Aerogel Electrodes

ES09.09.04
Patrick G. Campbell; Lawrence Livermore National Lab, United States.

SESSION ES09.10: Water-Energy Nexus II
Session Chairs: Ekaterina Pomerantseva and Matthew Suss
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 A

Turning a Cheap, Poor Catalyst into a Cheap, Excellent Catalyst—Optimizing Layered MnO-Based Materials for Water Oxidation Using Experiment and Theory

ES09.10.01
Michael J. Zdilla; Temple University, United States.

Amorphous Photocatalysts for Photocatalytic Solar-to-Chemical Production

ES09.10.02
Candace K. Chan; Arizona State Univ, United States.

Janus Membrane Fabrication via Diffusion-Limited Atomic Layer Deposition

ES09.10.03
Ruben Waldman; University of Chicago, United States.

Mechanisms of Aqueous Charge Storage and Degradation in Manganese-Rich P2 Oxides

ES09.10.04
Shelby Boyd; North Carolina State University, United States.

Atom Probe Tomography as an Emerging Characterization Technique for Materials Applications to the Water-Energy Nexus

ES09.10.05
Ingrid McCarroll; The University of Sydney, Australia.

SESSION ES09.11: Catalysis and Membranes
Session Chairs: Ekaterina Pomerantseva and Jay Whitacre
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 A

Turning a Cheap, Poor Catalyst into a Cheap, Excellent Catalyst—Optimizing Layered MnO-Based Materials for Water Oxidation Using Experiment and Theory

ES09.11.01
Michael J. Zdilla; Temple University, United States.
Materials are critical enablers for reducing the resource intensity of society's industrial, commercial and energy systems. But materials themselves also require resources and can negatively impact humans and the environment, thereby compromising the sustainability of our world. To promote materials development for a more sustainable world, it is essential that the material footprint be better understood and improved for all products and processes. Fundamental research is required that addresses: the creation and sharing of sustainability-related data, metrics and assessments of materials, processes, and performance; use of this knowledge to inform sustainability-focused decision making; improved decision-making tools to enable product and process designers and engineers to incorporate sustainability metrics at the earliest stages of the design phase; and establish better defined sustainability metrics for policy makers. This tutorial brings together leading experts in sustainability who are using machine learning and data-driven design of materials and processes to focus equally on the economic, performance and societal dimensions of sustainability.

This tutorial will introduce approaches and tools for quantifying not only the technological performance impacts of selecting specific materials and processes, but also their economic, environmental, societal, and human health impacts. This approach puts design tools in the hands of materials researchers for creating materials and processes that meet the needs of humanity, not just for today but for future generations.

**TUTORIAL**

**Data-Driven Design of Sustainable Materials with Artificial Intelligence, Machine Learning and Assessment**

Monday Afternoon, April 22, 2019

PCC North, 100 Level, Room 123

This tutorial will present two tools – GreenScreen for Safer Chemicals and Chemical Footprint Project – and examples of their application for measuring the chemical footprint of products and organizations. Chemical footprinting is the process of measuring chemicals of high concern in products and supply chains. GreenScreen provides a framework for both identifying chemicals of high concern and safer chemicals. Chemical Footprint Project specifies how to aggregate chemical of high concern data from products to the organizational level. This tutorial will detail examples of how companies and standards use GreenScreen to identify chemicals of high concern and safer chemicals, and how companies use Chemical Footprint Project to calculate their chemical footprint, quantify their baseline use of chemicals, and report reductions in their chemical footprint.

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**SYMPOSIUM ES13**

Materials Selection and Design—A Tool to Enable Sustainable Materials Development and a Reduced Materials Footprint

April 23 - April 24, 2019

Symposium Organizers

Carol Handwerker, Purdue University
William Olson, ASM International
Alan Rae, Incubatorworks
Julie Schoenung, University of California, Irvine

Symposium Support

ASM International
Arizona State University
Los Alamos National Laboratory
National Science Foundation
University at Buffalo, Center of Excellence in Materials Informatics

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* Invited Paper

**SESSION ES13.01: Sustainable Materials Development—Strategies and Approaches**

Session Chairs: Eric Masanet and William Olson
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 123

**10:30 AM ** *ES13.01.01*

**Design and Manufacture for Disassembly, Repair, Recover and Reuse**  
**Diran Apelian**  
1, 2, 1WPI, United States; 2University of California, Irvine, United States.

**11:00 AM ** *ES13.01.02*

**Leveraging Institutional Purchasing Power for Sustainable Materials**  

**11:30 AM ** *ES13.01.03*

**Quantitative Tools to Advance the Use of Safer Chemicals and Sustainable Materials**  
**Mark Rossi**, Clean Production Action, United States.

**SESSION ES13.02: Sustainable Materials Development—Electronics and Additive Manufacturing**

Session Chairs: Eric Masanet and William Olson
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 123

**11:00 AM ** *ES13.02.01*

**Design and Manufacture for Disassembly, Repair, Recover and Reuse**  
**Diran Apelian**  
1, 2, 1WPI, United States; 2University of California, Irvine, United States.

**11:30 AM ** *ES13.02.02*

**Leveraging Institutional Purchasing Power for Sustainable Materials**  

**12:00 PM ** *ES13.02.03*

**Quantitative Tools to Advance the Use of Safer Chemicals and Sustainable Materials**  
**Mark Rossi**, Clean Production Action, United States.
**SYMPOSIUM ES14**

Materials Circular Economy for Urban Sustainability  
April 24 - April 24, 2019  

Symposium Organizers  
Jean-Christophe Gabriel, CEA  
Sahajwalla Veena, University of New South Wales  
Yan Wang, Worcester Polytechnic Institute  
Qingyu Yan, Nanyang Technological University

* Invited Paper

SESSION ES14.01/ES13.05: Joint Session: Sustainable Materials Development—Promoting Green Engineering and a Circular Economy  
Session Chairs: Ryan Ginder and Julie Schoenung  
Wednesday Afternoon, April 24, 2019  
PCC North, 100 Level, Room 121 B

1:30 PM ES14.01.01/ES13.05.01  
Panel Discussion  
Carol A. Handwerker; Purdue University, United States.

2:30 PM BREAK

3:30 PM ES14.01.02/ES13.05.02  
Validation of Ostrom Principles to Support the Circular Economy in Used Electronics  
Carol A. Handwerker; INEMI, United States.

3:45 PM ES14.01.03/ES13.05.03  
A Practical Means for Assessing Circular Economic Value of an ICT Product  
Mark Schaffer; INEMI, United States.

4:00 PM ES14.01.04/ES13.05.04  
Pyrolysis and Detoxification of Waste Electrical and Electronic Equipment (WEEE) for Feedstock Recycling  
Panagiotis Evangelopoulos; Kungliga Tekniska Hogskolan, Sweden.

4:15 PM ES14.01.05/ES13.05.05  
Life Cycle Assessment of Bioleaching in Rare Metals Recovery  
Annemarie Falke; Technische Universität Bergakademie Freiberg, Germany.

4:30 PM ES14.01.06/ES13.05.06  
Closing the Loop on Fiber Reinforced Composite Materials  
Ryan S. Ginder; 1The University of Tennessee, Knoxville, United States; 2Oak Ridge National Laboratory, United States.

4:45 PM ES14.01.07/ES13.05.07  
Characterisation and Determination of the Industrial Potentials of Ugwuaji Clay Deposit  
Nkem E. Nwankwo; Nnamdi Azikiwe University, Nigeria.

**SYMPOSIUM ES15**

Fundamental Understanding of the Multifaceted Optoelectronic Properties of Halide Perovskites  
April 23 - April 26, 2019  

Symposium Organizers  
Pablo Boix, University of Valencia  
Yabing Qi, Okinawa Institute of Science and Technology  
Tze Chien Sum, Nanyang Technological University  
Carolin Sutter-Fella, Lawrence Berkeley National Laboratory

* Invited Paper

SESSION ES15.01/ES16.03/ES17.03: Joint Session: Halide Perovskites—Celebrating the 10th Anniversary of Perovskite Solar Cell Invention (JACS, 2009, 131, 6050)  
Session Chairs: Tze Chien Sum and Yuanyuan Zhou  
Tuesday Morning, April 23, 2019  
PCC North, 100 Level, Room 125 AB

10:30 AM *ES15.01.01/ES16.01.01/ES17.03.01  
Present Status and Next Important Challenge of Perovskite Photovoltaics Towards Industrialization  
Tatutom Miya, Toin University of Yokohama, Japan.

11:00 AM *ES15.01.02/ES16.01.02/ES17.03.02  
Issues and Solutions in Perovskite Solar Cells  
Nam-Gyu Park; Sungkyunkwan University, Korea (the Republic of).

11:30 AM *ES15.01.03/ES16.01.03/ES17.03.03  
Hybrid Halide Perovskite Semiconductors—An Historical Perspective  
David R. Miriz; Duke University, United States.

SESSION ES15.02: Perovskite Composition and Defects Engineering I  
Session Chairs: Jacques-E. Moser and Tom Savenije  
Tuesday Afternoon, April 23, 2019  
PCC North, 100 Level, Room 130

1:30 PM *ES15.02.01  
Towards Highly Emissive Halide Perovskites for Optoelectronic Applications  
Samuel D. Stranks; University of Cambridge, United Kingdom.

2:00 PM ES15.02.02  
Atomic Scale Analysis of Perovskite CH3NH3PbI3 Ultra-Thin Films by Scanning Tunneling Microscopy  
Afshan Jamshaid; Okinawa Institute of Science and Technology, Japan.

2:15 PM ES15.02.03  
Concentration and Precursor Delivery Effects on Hybrid Perovskites Deposited by Resonant Infrared Matrix-Assisted Pulsed Laser Evaporation  
Enrique T. Barraza; Duke University, United States.

2:30 PM ES15.02.04  
Unraveling the Impact of Halide Mixing on Perovskite Stability via Scanning Tunneling Microscopy and Photoelectron Spectroscopy  
Jeremy G. Hieulle; Okinawa Institute of Science and Technology, Japan.

2:45 PM ES15.02.05  
Role of Different Cations (MA+, FA+ and Cs+ and Rb+) on Charge Carrier Recombination in Perovskite Solar Cells  
R. S. Ginder; Nanyang Technological University Singapore, Singapore.

3:00 PM BREAK
SESSION ES15.03: Carrier Dynamics—Carrier Recombination and Hot Carriers I
Session Chairs: Libai Huang and Koichi Yamashita
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 130

3:30 PM *ES15.03.01
How Charge Carrier Dynamics are Affected by Light Soaking and Additives in (Mixed) Metal Halide Perovskites
Tom Saveniæje; Delft University of Technology, Netherlands.

4:00 PM ES15.03.02
Grain Resolved Charge Carrier Kinetics in Chalcogenide and Perovskite Materials—A Pump-Probe Microscopy and Spectroscopy Study
Elham Ghadiri; Wake Forest University, United States.

4:15 PM ES15.03.03
Charge Carrier Dynamics in Thickness-Controlled Halide Perovskite Nanoplatelets
Alexander S. Urban; LMU Munich, Germany.

4:30 PM ES15.03.04
How Charge Carrier Dynamics Are Affected by Light Soaking and Additives in (Mixed) Metal Halide Perovskites
Tom Saveniæje; Delft University of Technology, Netherlands.

4:45 PM ES15.03.05
What Can Be Learned From the Self-Healing in Halide Perovskites?
Davide R. Ceratti; Weizmann Institute of Science, Israel.

SESSION ES15.04: Carrier Dynamics—Carrier Recombination and Hot Carriers II
Session Chairs: David Ginger and Samuel Stranks
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 130

8:00 AM *ES15.04.01
Charge Transfer Exciton Dynamics in Mixed-Composition Perovskites and 2D-3D Layered Materials
Jacques-E. Moser; EPFL, Switzerland.

8:30 AM *ES15.04.02
Long-Range Hot Carrier Transport in Hybrid Perovskites Visualized by Ultrafast Microscopy
Libai Huang; Purdue University, United States.

9:00 AM ES15.04.03
Utilizing Hot Carriers in Perovskite Nanocrystals for New-Generation Light Harvesting Technologies
Mingjie Li; Nanyang Technological University, Singapore.

SESSION ES15.05: First Principles and Computational Screening I
Session Chairs: David Ginger and Samuel Stranks
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 130

9:15 AM *ES15.05.01
Physical Properties of 2D and 3D Hybrid Perovskites—Recent Results
Jacky Even; INSA Rennes, France.

9:45 AM ES15.05.02
The Electronic Origin of the Thermal and Phase Instability of Metal Halide Perovskites from First Principle
Tao Shu Xia; Center for Computational Energy Research, Netherlands.

10:00 AM BREAK

10:30 AM ES15.05.03
Point Defect Engineering in Lead-Based Mixed Halide Hybrid Perovskites via First Principles Computations
Arun Kumar Mannodi Kanakkithodi; Argonne National Laboratory, United States.

10:45 AM *ES15.05.04
Charge Carrier Trapping at Surface Defects and Optical Properties of Halide Perovskites
Koichi Yamashita; Univ of Tokyo, Japan.

11:15 AM ES15.05.05
Spin Mixing Induced by Dynamical Disorder in Halide Perovskites
Liang Z. Tan; Lawrence Berkeley National Laboratory, United States.

SESSION ES15.06: Spotlight Talks I: Fundamental Understanding of the Multifaceted Optoelectronic Properties of Halide Perovskites
Session Chairs: David Ginger and Samuel Stranks
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 130

11:30 AM ES15.06.01
Spotlight Talk—Impact of Flash Infrared Annealing on Growth and Photophysics of MAPbI3 Perovskité
Loreta A. Muscarella; FOM Institute AMOLF, Netherlands.

11:35 AM ES15.06.02
Spotlight Talk—Planar Perovskite Solar Cell by Two-Step Deposition Method via Blade-Coating Technique
Zahrah S. Almutawah; University of Toledo, United States.

11:40 AM ES15.06.03
Spotlight Talk—Quantification of Ion Migration in MAPbBr3 Solar Cells with Varying Grain Size
Lucie McGovern; AMOLF, Netherlands.

11:45 AM ES15.06.04
Spotlight Talk—Versatile Pseudo-Halide Based Perovskites—Photophysics and Utility in Optoelectronic Devices
Waqaas Rehman; University of Oxford, United Kingdom.

11:50 AM ES15.06.05
Spotlight Talk—Control the Charge Accumulation for Efficient, Repeatable and Interface Stable Homo-Junction Planar Perovskite Solar Cells
Jianxing Xia; University of Electronic Science and Technology of China, China.

SESSION ES15.07: Perovskite Composition and Defects Engineering II
Session Chairs: Jacky Even and Antoine Kahn
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 130

1:30 PM *ES15.07.01
Defect Physics and (In)Stability in Metal-Halide Perovskite Semiconductors
Annamaria Petrozza; Istituto Italiano di Tecnologia, Italy.

2:00 PM ES15.07.02
Effect of Post-Deposition Annealing on Coevaporated CsPbBr3 Thin Films
Sebastian Caeado Davila; Helmholtz-Zentrum Berlin, Germany.

2:15 PM ES15.07.03
Improved Efficiency and Stability of Perovskite Solar Cells Induced by C=O Functionalized Hydrophobic Ammonium-Based Additives
Zhifang Wu; Okinawa Institute of Science and Technology, Japan.

2:30 PM BREAK

SESSION ES15.08: First Principles and Computational Screening II
Session Chairs: David Ginger and Jacky Even
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 130

3:30 PM ES15.08.01
Atomistic Origins of Carrier Recombination in Grain Boundaries of Halide Perovskites
H-Sang Park; Imperial College London, United Kingdom.

3:45 PM ES15.08.02
Long-Range FRET-Mediated Exciton Diffusion in Cesium Lead Halide Perovskite Nanostructures
Monica Lorenzon; Lawrence Berkeley National Laboratory, United States.

4:00 PM ES15.08.03
Structural Disordering and Inversion Symmetry Breaking in Layered Hybrid Perovskite Halides
Wei Xie; University of California, Berkeley, United States.

4:15 PM ES15.08.04
Rashba-Dresselhaus Triggered Electronic and Optical Properties in De Novo Designed Mixed Halide Hybrid Perovskites—Implication of Composition Route and Stoichiometry
Anitava Banerjee; Uppsala University, Sweden.
SESSION ES15.09: Spotlight Talks II: Fundamental Understanding of the Multifaceted Optoelectronic Properties of Halide Perovskites
Session Chairs: David Cahen and Jacky Even
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 130

4:30 PM ES15.09.01
Spotlight Talk—First-Principles Study on Water Dissociation in Grain Boundary of MAPbI3 Perovskite Abdullah A. Asad; Okayama University, Japan.

4:35 PM ES15.09.02
Spotlight Talk— Vapor Growth of In-Plane Directional CsPbX3 Perovskite Nanowires for High-Performance Photonics and Optoelectronic Devices Weihao Zheng; Hunan University, China.

4:40 PM ES15.09.03
Spotlight Talk—The Study of PbI2 Residues in Sequential Deposition Chih-Liang Wang; National Chung Hsing University, Taiwan.

4:45 PM ES15.09.04
Spotlight Talk—Analysis of Charge Transfer Dynamics in Planar and Mesoporous Mixed Halide Perovskite Solar Cells Zhongguo Li1,2; Changshu Institute of Technology, China; 3Case Western Reserve University, United States.

4:50 PM ES15.09.05
Spotlight Talk—Conductivity Tuning via Doping with Electron Donating and Withdrawing Molecules in Perovskite CsPbI3 Nanocrystal Films Ashley Gaulding; National Renewable Energy Lab, United States.

SESSION ES15.10: Poster Session
Session Chairs: Luis Ono and Yabing Qi
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES15.10.01
Spotlight Talk—Analysis of Charge Transfer Dynamics in Planar and Mesoporous Mixed Halide Perovskite Solar Cells Zhongguo Li1,2; Changshu Institute of Technology, China; 3Case Western Reserve University, United States.

ES15.10.02
Spotlight Talk—The Study of PbI2 Residues in Sequential Deposition Chih-Liang Wang; National Chung Hsing University, Taiwan.

ES15.10.03
General Strategy for Defects Passivation in Crystalline Organo-Metal Halide Perovskite Film to Enhance Its Photovoltaic Performance and Stability Kai-Chu Hsiao; National Taiwan University, Taiwan.

ES15.10.04
Spotlight Talk—Vapor Growth of In-Plane Directional CsPbX3 Perovskite Nanowires for High-Performance Photonics and Optoelectronic Devices Weihao Zheng; Hunan University, China.

ES15.10.05
Spotlight Talk—First-Principles Study on Water Dissociation in Grain Boundary of MAPbI3 Perovskite Abdullah A. Asad; Okayama University, Japan.

ES15.10.06
Spotlight Talk—Control the Charge Accumulation for Efficient, Repeatable and Interface Stable Homo-Junction Planar Perovskite Solar Cells Jianxin Xing; University of Electronic Science and Technology of China, China.

ES15.10.07

ES15.10.08
Spotlight Talk—Quantification of Ion Migration in MAPbBr3 Solar Cells with Varying Grain Size Lucie McGovern; AMOLF, Netherlands.

ES15.10.09
Spotlight Talk—Planar Perovskite Solar Cell by Two-Step Deposition Method via Blade-Coating Technique Zahra S. Almutawah; University of Toledo, United States.

SESSION ES15.11 Interface Physics and Charge Extraction
Session Chair: Sanford Ruhman
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 130

8:00 AM *ES15.11.01
Interfaces Halide Perovskites: Passivating Defects for Reduced Non-Radiative Recombination David S. Ginger; University of Washington, United States.

8:30 AM *ES15.11.02
Interface Energies of Halide Perovskites Philip Schulz; CNRS-Institut Photovoltaique d’Ile de France (IPVF), France.

9:00 AM *ES15.11.03
Electronic Properties at Surfaces of n= 1 and 2 Ruddlesden-Popper Phase Perovskites Antoine Kahn; Princeton University, United States.

9:30 AM ES15.11.04
Spiro-MeOTAD Hole Transport Material in Perovskite-Based Solar Cells Luis K. Ong; Okinawa Institute of Science and Technology (OIST), Japan.

9:45 AM ES15.11.05
Effect of Ligand Groups on Photoexcited Charge Carrier Dynamics at Perovskite/TiO2 Interface Landon Johnson; North Dakota State University, United States.

10:00 AM BREAK

10:30 AM *ES15.11.06
Circumventing Defects in Halide Perovskite Solar Cells Through the Application of Ferroelectric Oxide Extraction Layers Monica Lira-Cantu; Catalan Institute of Nanoscience and Nanotechnology (ICN2), Spain.

11:00 AM ES15.11.07
Understanding the Energy Transfer Mechanism at the Perovskite—Organic Hybrid Interface Lea Niethaus; Florida State University, United States.

11:15 AM ES15.11.08
Ultra High Vacuum Scanning Probe Microscopy Investigations on Hybrid Organic Inorganic Perovskites Alex Redinger; University of Luxembourg, Luxembourg.

11:30 AM ES15.11.09
Why Are Hot Holes Easier to Extract Than Hot Electrons From Methylammonium Lead Iodide Perovskite? Ibrahim Dursun; King Abdullah University of Science and Technology, Saudi Arabia.

11:45 AM ES15.11.10
Understanding the Nanocrystal Size Dependence of Phase Stability in CsPbI3 Ruoxi Yang; Lawrence Berkeley National Laboratory, United States.

SESSION ES15.12: Novel Photophysics and Quasi-Particle Phenomena I
Session Chairs: Philip Schulz and Cesare Soci
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 130

1:30 PM *ES15.12.01
Defects and Halide Perovskites—What Does This Combination Tell Us? David Cahen1,2; Weizmann Institute of Science, Israel; 3Bar Ilan University, Israel.
8:30 AM *ES16.01.01
Understanding and Designing Interfaces and Defects in Perovskite Solar Cells Juan-Pablo Correa-Baena; Georgia Institute of Technology, United States.

9:00 AM *ES16.01.02
Interface Modification and Molecular Engineering in the Perovskite Architecture Enable Highly Efficient, Stable and Electroluminescent Perovskite Solar Cells Mohammad Mahdi Tavakoli; Massachusetts Institute of Technology, United States.

9:30 AM ES16.01.03
Surface Defects of CH3NH3PbBr3 and Their Effect on Interfacial Device Properties Collin Stecker; Okinawa Institute of Science and Technology, Japan.

9:45 AM ES16.01.04
Halide Homogenization vs Cation Segregation—A Balancing Act to Achieve High-Performance Alloyed Perovskite Solar Cells Yanqi Luo; University of Electronic Science and Technology, China.

10:00 AM BREAK

10:30 AM *ES16.01.05
Grain-Boundary Functionalization in Halide Perovskites Yuanyuan Zhou; Brown University, United States.

11:00 AM ES16.01.06
Effectively Transparent Superstrates for Perovskite Solar Cells Michael Kelzenberg; California Institute of Technology, United States.

11:15 AM ES16.01.07
Controlling the Morphology and Optoelectronic Properties of Perovskite Films Using Colloidal Sponge Particles—Towards One-Step Deposition of Semi-Transparent Solar Cells Brian Saunders; Univ of Manchester, United Kingdom.

11:30 AM ES16.01.08
Inorganic Carrier-Selective Contacts for Perovskite Solar Cells Zhongshan J. Yu; Arizona State University, United States.

11:45 AM ES16.01.09
Enhanced Transport and Carrier Selectivity at Perovskite Interfaces Enabled by Ordered Perylene Monolayers Alexander D. Carl; Worcester Polytechnic Institute, United States.
SESSION ES16.05: Poster Session I
Tuesday, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES16.05.01
A Facile Route to Grain Morphology Controllable Perovskite Thin Films Towards Highly Efficient Perovskite Solar Cells Yaxiao Zhang; KTH Royal Institute of Technology, Sweden.

ES16.05.02
Interface Induced Vertical Phase Separation for Economical, Efficient and Stable Perovskite Solar Cell—A Universal Strategy Simplifying the Device Preparation Process Jianxiao Xia; University of Electronic Science and Technology of China, China.

ES16.05.03
Single-Step Solution-Processed CH3NH3PbBr3 Perovskite Active Layer for Enhanced Efficiency of Light-Emitting Diodes Manik Oh; Chonbuk National Univ, Korea (the Republic of).

ES16.05.04
Interface Control for Perovskite Solar Cells Using GaN Thin Film Deposited by PEALD Huivun Wei; University of Science and Technology Beijing, China.

ES16.05.05
Dion-Jacobson Type Ti-Based Halide Perovskite Solar Cells Min Chen; Brown University, United States.

ES16.05.06
Water Effect on Cesium Doped Triple-Cation Hybrid Perovskite Solar Cells Zhang Wei; City University of Hong Kong, Hong Kong.

ES16.05.07
Grain-Boundary Functionalization for Highly Stable and Efficient Perovskite Solar Cells Based on Formamidinium Lead Iodide Zhenqian Dai; Brown University, United States.

ES16.05.08
Strategic Synthesis of Ultra-Small NiCo2O4 NPs as Hole Transport Layer for Highly Efficient Perovskite Solar Cells Ouyang Dan; Hong Kong University, Hong Kong.

ES16.05.09
Suppressing Phase Segregation of Mixed-Halide Perovskite for Highly Light-Stable Perovskite/Perovskite/Si Multi-Junction Tandem Solar Cells Su Geun Jh; Department of Materials Science and Engineering, Seoul National University, Korea (the Republic of).

ES16.05.10
The Influence of Guanidinium Cations on the Performance of Perovskites Solar Cells Mohammad Haval Ahojati; King Abdullah City for Science and Technology (KACST), Saudi Arabia.

ES16.05.11
Ambient-Processed Perovskites for Broadband, Ultrafast and Efficient Flexible Photodetectors Ivy Asua; 1, 2, INRS, Canada; 3Ecole de technologie supérieure (ETS), Canada.

ES16.05.12
High-Efficiency Perovskite Solar Cell Fabricated by Slot-Die Coating Through Near-Infrared Heating in Ambient Shih-Han Huang; National Taiwan University, Taiwan.

ES16.05.13
Thermionic Emission-Based Interconnecting Layer Featuring Solvent Resistance for Monolithic Tandem Solar Cells with Solution-Processed Perovskites Can Li; The University of Hong Kong, Hong Kong.

ES16.05.14
Diboron-Assisted Interfacial Defect Control Strategy for Highly Efficient Planar Perovskite Solar Cells Yongguang Tu; State Key Laboratory for Artificial Microstructure and Mesoscopic Physics, Department of Physics, Peking University, China.

ES16.05.15
Enhanced Performance of Perovskite Solar Cells by Micro-Structuring the Mesoporous TiO2 Layer Jingsong Sun; 1, 2, 3Monash University, Australia; 4Monash University, Australia; 5ARC Centre of Excellence in Exciton Science, Australia.

ES16.05.17
Sustainable Pb0 and I0 Defects Elimination for Stable and Efficient Perovskite Solar Cells Luyang Wang; 1, 2, Peking University, China; 3Peking University, China.

ES16.05.18
Analysis for Non-Radiative Recombination in Perovskite and Perovskite/Si Tandem Solar Cells Masafumi Yamaguchi; Toyota Technological Inst, Japan.

ES16.05.19
Side-Chain Polymer-Based Hole-Transporting Materials for High-Efficient Perovskite Solar Cells Yangqiang Tran; Southern University of Science and Technology, China.

ES16.05.20
Development Large Area Flexible Perovskite Solar Cells Using Embedded-Type Cu Mesh Transparent Conductive Electrodes Ba-Jong Kim; Korea Electronics Technology Institute, Korea (the Republic of).

ES16.05.21
CH3NH3PbI3 Exhibits Distinct NIR Sub-Gap Absorption Features in Response to AC Anodic and Cathodic Electrochemical Modulation Timothy Pollock; University of Washington, United States.

ES16.05.22
Effects of Strain Modulation on the Charge Carrier Transport in 2D/3D Hybrid Formamidinium Perovskite Solar Cell Sungwon Song; POSTECH, Korea (the Republic of).

ES16.05.23
High-Efficiency Perovskite Solar Cells Prepared by Low-Temperature Solution-Process for Commercialization Shih-Hsuan Chen; Chang Gung University, Taiwan.

ES16.05.24
Ferroelectric, Photoconductivity and Photovoltaic Properties of Bi1-CaFe3-xTi2O9 Thin Films Subhajit Nandy; Indian Institute of Technology Madras, India.

ES16.05.26 Study of Perovskite Thin Films Obtained by Conversion of Lead Iodide (PbI2) Deposited by RF Sputtering Using Formamidinium and Methylammonium Solutions Nelson F. Villegas; Unicamp, Brazil.

ES16.05.28 Effects of Environmental Factors on the Performance and Stability of Perovskite Solar Cells Jyotiska Chakraborty; Grand Valley State University, United States.

ES16.05.29 Investigating Viable Sn-Based Perovskite Solar Device by Utilizing a Cu2O Hole Transport Layer (HTL), a Cu Back-Electrode and by In Situ Optimization of Component Layer Thickness Jalen Harris; California State University, Fresno, United States.

ES16.05.30 Simulation Studies on Optimizing Sn-Based Perovskite Solar Cell by Excluding Electron Transport Layer (ETL) and Modulating Device Component Thickness Jon Shaffer; Buffalo State College, United States.

ES16.05.32 Planar Perovskite Solar Cells with SnO2: Electron Transporting Layer Deposited by Atomic Layer Deposition (ALD) Seonhwa Jeong; Sungkyunkwan University, Korea (the Republic of).

ES16.05.33 Optimization of Sb-Based Perovskite Solar Cell by Choosing Electron Transport Layer (ETL) and Modifying Device Component Thickness Michael Pham; Buffalo State College, United States.

ES16.05.34 Optically Controlled Two-Terminal Mechanical Perovskite/Silicon Tandem Solar Cells with Transparent Conductive Adhesives In Young Choi; Ulsan National Institute of Science and Technology, Korea (the Republic of).

ES16.05.35 Effects of Urea Addition on Photovoltaic Properties of Perovskite Solar Cells Aditya S. Yerramilli; Arizona State University, United States.

ES16.05.36 Long-Term Thermal and Operational Condition Stable Perovskite Solar Cells with Inorganic Charge Transport Layers Grown via Atomic Layer Deposition (ALD) Seognrok Seo; Sungkyunkwan University, Korea (the Republic of).

ES16.05.37 High Stability Perovskite Solar Cell—Impact of Hole Transport Layer on Stability Priyanka Tyagi; Bangor University, United Kingdom.

ES16.05.39 Interfaces in Efficient and Stable Organic-Inorganic Hybrid Perovskite Solar Cells Ying-Chiao Wang; National Institute for Materials Science, Japan.

ES16.05.40 Electrified Spray Technique for Fabrication of Air-Stable Low-Toxic Bismuth Halide Thin Films—Perovskite Solar Cells Tauheed Mohammad; Indian Institute of Technology Delhi, India.

ES16.05.41 Lead Free Tin Iodide Based Perovskite Solar Cells—Incorporation of CuO/Cu Based HTL and Back Contact Electrode Shelby Sturgeon; California State University, Fresno, United States.

ES16.05.42 Transport of Perovskite Precursors in Nitrogen Carrier Gas Anurag Panda; Massachusetts Institute of Technology, United States.
Efficiency Solar Cells
Superhydrophobic Perovskite Based on the Alkylamine Compound for High Scattering
Mi Hee Jung; Sejong University, Korea (the Republic of).

Multijunction Solar Cells
Enhancing Air Stability of Sn-Based Metal Halide Perovskite Materials by the Exploration of the Two-Dimensional Perovskites Incorporating Inorganic Bismuth (III)-Based Material—A Lead-Free, Air-Stable Perovskite Using Arylation Approach for Efficient and Stable Perovskite Solar Cells
Miaoqiang Lyu; School of Chemical Engineering, Australia.

Carbon Nanotube Yarn as Working and Counter Electrode
Riyas Ahmad1, 2; 1Energy Management Schemes, 2Center for Nanoparticle Research, Institute for Basic Science (IBS), Korea (the Republic of).

Cation Perovskite Through the Use of Trap Density Measurements
Geoffrey R. Adams; Florida State University, United States.

Condition Evaluation of Perovskite/Cu(In,Ga)Se2 Tandem Solar Cells Under Real World Condition
Jasim M. Uddin; The University of Texas at Austin, United States.

Water Induced Defects Suppression for Efficient Inverted Perovskite Solar Cells
Yeonsu Choi2, 3; 2Gwangju Institute of Science and Technology, Korea (the Republic of); 3Commonwealth Scientific and Industrial Research Organisation, Australia.

The Key Processing Issues and Their Solutions for High-Quality Perovskite Solar Cells
Hojjatollah Sarvari; University of Kentucky, United States.

Reducing Trap-Assisted Recombination in Pb-Less Perovskite Solar Cells by Combined Compositional and 2D/3D Engineering
Deepak Thrithamarassery; AMOLF, Netherlands.

Eliminating Artifacts Resulted from Preferential Sputtering of Metal Halide Perovskites by Using Proper Sputter Source During ToF-SIMS Analysis
Li-Ji Jhang; Research Center for Applied Science, Academia Sinica, Taiwan.

Stability of Perovskite Photovoltaic Devices as a Function of Cation Composition Under Controlled Environmental Conditions
Kai Zhu; National Renewable Energy Laboratory, United States.

Planar Perovskite Solar Cells Based on Quasi 2D Perovskite with Mixed Binary Organic Spacer
Baomin Xu; Southern University of Science and Technology, China.

High Performance Planar Solar Cells Based on Quasi 2D Perovskite with Mixed Binary Organic Spacer
Baomin Xu; Southern University of Science and Technology, China.

Synthesize and Characterization of Microshaped Perovskite Solar Cell Using Carbon Nanotube Yarn as Working and Counter Electrode
Jasim M. Uddin; The University of Texas at Rio Grande Valley, United States.

Can We Make Oxide Perovskite/Halide Perovskite Interfaces Selective?
Anat Itzhak; Bar Ilan University, Israel.

An Upscaled Chemical Vapor Deposition Process (CVD)
Claudia Morton; Technische Universität Darmstadt, Germany.

High Performance and Long-Term Stability Lead-Reduced Perovskite Solar Cells Based on Mesoscopic Zn-TiO2 Electron Transport Layer
Ming-Chung Wu; Chang Gung University, Taiwan.

Efficiency Solar Cells
Evaluation of Perovskite/Cu(In,Ga)Se2 Tandem Solar Cells Under Real World Condition
Ramez Hosseinian Ahangharnegh; University of Toledo, United States.

Interfacial Design of Highly Efficient Vacuum-Deposited Perovskite Solar Cells
Pablo Boix; University of Valencia, Spain.

Optimization of Device Design for Low Cost and High Efficiency Planar Monolithic Perovskite/Silicon Tandem Solar Cells
Chunyuan Li; Korea University, Korea (the Republic of).

Efficient Two-Terminal All-Perovskite Tandem Solar Cells
Zhaoning Song; University of Toledo, United States.

Optimization of Device Design for Low Cost and High Efficiency Planar Monolithic Perovskite/Silicon Tandem Solar Cells
Chan U1 Kim; Ulsan National Institute of Science and Technology, Korea (the Republic of).
SESSION ES16.11: Beyond Single-Junction Solar Cells
Session Chairs: Anita Ho-Baillie and Yixin Zhao
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 125 AB

3:30 PM *ES16.11.01
Perovskite-Based Tandems—Approaches to High Efficiency
Kylie Catchpole; Australian National University, Australia.

4:00 PM ES16.11.02
Thermionic Emission-Based Interconnecting Layer Featuring Solvent Resistance for Monolithic Tandem Solar Cells with Solution-Processed Perovskites
Wallace C. Choy; Department of Electrical and Electronic Engineering, The University of Hong Kong, China.

4:15 PM ES16.11.03
Strategies to Improve Perovskite on Silicon Tandem Solar Cells Performance
Annulisa Brung; Nanyang Technological University, Singapore.

4:30 PM ES16.11.04
Efficient Wide-Bandgap Perovskite Solar Cells Enabled by Combining Bulk and Surface Passivation Strategies
Cong Chen; 1, 3, 4The University of Tokyo, United States; 2Wuhan University, China.

4:45 PM ES16.11.05
High Efficiency and Flexible Monolithic All-Perovskite Tandem Solar Cells
Axel F. Palmstrom; National Renewable Energy Laboratory, United States.

8:00 AM *ES16.09.01
The Challenge of Pilot Scale Manufacturing Trials for Perovskite Solar Cell Modules via Sheet to Sheet and Roll to Roll Processing
Trystan Watson; Swinburne University, United Kingdom.

8:30 AM *ES16.09.02
Advances of Inverted Planar Heterojunction Perovskite Solar Cells
Rui Zhu; Peking University, China.

9:00 AM ES16.09.03
Rapid Aqueous Spray Fabrication of Robust NiO—A Simple and Scalable Platform for Efficient Perovskite Solar Cells
William J. Scheideler; Stanford University, United States.

9:15 AM ES16.09.04
Mechanochemical Approaches to Inorganic-Organic Hybrid Materials for Perovskite Solar Cells
Daniel Prochowicz; Polish Academy of Sciences, Poland.

9:30 AM ES16.09.05
High Photovoltage for Inverted Planar Heterojunction Perovskite Solar Cells with Metal Oxide Hole and Electron Extraction Layers
Xin Liu; University of Electronic Science and Technology of China, China.

9:45 AM ES16.09.06
Single-Source Vacuum Deposition of Mechanosynthesized Inorganic Halide Perovskites
Yousra El Ajjouri; University of Valencia Institute of Molecular Science, Spain.

10:00 AM BREAK

10:30 AM *ES16.09.07
Approaches for Practical Perovskite Photovoltaics
Jimong Hu; 1, 2Institute of Chemistry, Chinese Academy of Sciences, China; 3University of Chinese Academy of Sciences, China.

11:00 AM ES16.09.08
What's the Story with Shockley and Queisser
Chris Case; Oxford Photovoltaics, United Kingdom.

11:15 AM ES16.09.09
High Performance, Robust, and Stable Compound Perovskite Solar Cells with a Low-Cost Lens Array for Passive Tracking and Photon Management
Oliver Zhao; Stanford University, United States.

11:30 AM ES16.09.10
Perovskite Ink Chemistry—A Key for Scalable Anti-Solvent-Free Deposition Technique
Trey Minge Koh; Energy Research Institute aNTU, Singapore.

SESSION ES16.10: Beyond Solar Cells and New Materials
Session Chairs: Anita Ho-Baillie and Yixin Zhao
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 125 AB

1:30 PM ES16.10.01
Photoluminescence Mechanisms in MAPbBr3 Films with Controlled Crystal Size
Natalie Buneti; University of Bern, Switzerland.

1:45 PM ES16.10.02
Simulation Studies of Viable Perovskite Photovoltaic Devices—Non-Toxic, Cheap Material Alternatives That Have Been Optimized In Situ with Their Thickness
Saqib Ahmed; Buffalo State College, United States.

2:00 PM *ES16.10.03
Encapsulating Perovskite Solar Cells to Withstand Environmental Stress
Anita Ho-Baillie; University of New South Wales, Australia.

2:30 PM ES16.10.04
Ionotronic Halide Perovskite Drift-Diffusive Synapses for Low-Power Neuromorphic Computation
Rohit A. John; Nanyang Technological University, Singapore.

2:45 PM ES16.10.05
Dual-Source Evaporation of Multidimensional Semiconducting Bismuth Halides for Planar Junction Solar Cells
Marvam Khazaei; 1, 2Duke University, United States; 3Institute for Materials Science and Center for Nanointegration Duisburg-Essen (CENIDE), Germany.

3:00 PM BREAK
Hybrid Halide Perovskite Semiconductors—An Historical Perspective
Issues and Solutions in Perovskite Solar Cells
Towards Industrialization
Present Status and Next Important Challenge of Perovskite Photovoltaics
Perovskites for High Performance Light Emitting Diodes
Tracking Halide Ion Mobility in Mixed Halide Lead Perovskites
Ion Transport in Hybrid Perovskites

Barry P. Rand; Princeton University, United States.

Light Emitting Diodes
Toward Efficient, Color Tunable, Flexible, and Stable Metal Halide Perovskite

Chen1, 2; 1University of North Carolina at Chapel Hill, United States; 2University of

GaAsNanocrystals for the Light-Emitting

Yungtaek Yeo; Chung-Ang University, Korea (the Republic of).

Interaction between Solvate Complexes and Light-Induced Phase Separation

Cheng Kung University, Taiwan.

SESSION ES17.05: Poster Session
Session Chair: Yuanyuan Zhou
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES17.05.01
Insight into the Role of Ligands in Halide Perovskite Nanocrystal Synthesis and Tuning the Perovskite Structure, Shape and Size of the CsPbBr3 Nanocrystal

ES17.05.02
Unprecedented White-light Emission from the Deep Trap States of Two-Dimensional Perovskites (Cs2H6CH2NH3)2PbBr4-xClx for the Light-Emitting Diodes

ES17.05.03
Synthesis of Core/Shell Perovskite Nanocrystal for Fabrication Wide-Color-Gamut LCDs

ES17.05.04
Development of Novel and Highly Stable Crystals of Lead-Free Double Perovskite

ES17.05.05
Blue-Emissive CsPbBr3 Quantum Dots in a Gel Matrix

ES17.05.06
Photoluminescence Properties of Ba(Mg0.85Nb2/3)O3:Eu3+ Red-emitting Phosphor with High Color Purity

ES17.05.07
Yellow Emissive Near Ultraviolet Light-Emitting Diodes Using MAPbBr3 Perovskite as a Phosphor

ES17.05.08
New Cross-Linkable Hole Transporting Materials for Perovskite LEDs

ES17.05.09
Low Temperature Photoluminescence Mapping of Solar Cells

ES17.05.10
Functionalized Grain Boundaries in Halide Perovskite Materials and Devices

ES17.05.11
Efficient and Stable Ti- and Sn-Based Lead-Free Perovskite Solar Cells

ES17.05.12
Extra-Large Grain Formation in Formamidinium Lead Iodide Perovskite Thin Films and Observation of Special Sub-Grain Boundaries

ES17.05.13
Magnetic Ordering of a Perovskite-Like La-, Nd-, and Gd-Doped Bismuth Ferrite

SESSION ES17.03/ES15.01/ES16.03: Joint Session: Halide Perovskites—Celebrating the 10th Anniversary of Perovskite Solar Cell Invention (JACS, 2009, 131, 6050) Session Chairs: Tze Chien Sum and Yuanyuan Zhou Tuesday Morning, April 23, 2019 PCC North, 100 Level, Room 125 AB

SESSION ES17.04: Ion/Molecule Motion in Halide Perovskites Session Chairs: Tsung-Fang Guo and Maria Antonietta Loi Tuesday Afternoon, April 23, 2019 PCC North, 100 Level, Room 131 B

SESSION ES17.05: Poster Session
Session Chair: Yuanyuan Zhou Tuesday Afternoon, April 23, 2019 5:00 PM - 7:00 PM PCC North, 300 Level, Exhibit Hall C-E
ES17.05.14
Low-Dimensional Lead-Free Halide Perovskites with Functional Organic Spacers
Minggang Ju; University of Nebraska-Lincoln, United States.

SESSION ES17.06: New Physics in Halide Perovskites
Session Chairs: Joshua Choi and Yan Li
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 131 B

8:30 AM *ES17.06.01
Exciton Spin Coherence in Hybrid Organic-Inorganic Perovskites
Yan Li; University of Utah, United States.

9:00 AM *ES17.06.02
Spin-Orbital Coupling Effects in Perovskite Photovoltaic and Light-Emitting Devices Ranging from 3D to 2D Design
Bin Hu; The University of Tennessee, Knoxville, United States.

9:30 AM ES17.06.03
Computational Study of Polaron Emission in CsPbBr3 Nanocrystal
Aaron Forde; North Dakota State University, United States.

9:45 AM ES17.06.04
Spin-Selective Light-Matter Interaction in Lead Halide Perovskites
David Giovanni; Nanyang Technological University, Singapore.

10:00 AM BREAK

10:30 AM *ES17.06.05
Epitaxy of Halide Perovskite Thin Films and Nanostructures
Jian Shi; Rensselaer Polytechnic Institute, United States.

11:00 AM *ES17.06.06
Tuning Physical Properties of Halide Perovskites Using Composite Structures
Hanwei Gao; Florida State University, United States.

11:30 AM ES17.06.07
Femtosecond Time-Resolved Excited State Dynamics at Interfaces and in the Bulk of MAPbI3-xClx
Clemens Burdi; Case Western Reserve University, United States.

11:45 AM ES17.06.08
Tailoring Properties of Hybrid Perovskites by Domain-Width Engineering with Charged Walls
Yurong Yang1, 2; 1Nanjing University, China; 2University of Arkansas-Fayetteville, United States.

SESSION ES17.07: Nanocrystals and Single-Crystals of Halide Perovskites
Session Chairs: Qing Shen and Jian Shi
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 B

1:30 PM *ES17.07.01
Optoelectronic Applications of Single-Crystal Nanomaterials and Heterostructures of Halide Perovskites
Song Jin; University of Wisconsin-Madison, United States.

2:00 PM ES17.07.02
Molecular Engineering of Two-Dimensional Organic-Inorganic Hybrid Perovskites
Letian Dou; Purdue University, United States.

2:15 PM ES17.07.03
CsPbBr3-CsPbBr5 Perovskite Core-Shell Structure and its Applications
Junwei Xu; Wake Forest University, United States.

2:30 PM BREAK

3:30 PM *ES17.07.04
Phase-Stable and High Optoelectronic Quality All-Inorganic Perovskite Quantum Dots and Their Application in Optoelectronic Devices
Qing Shen; The University of Electro-Communications, Japan.

4:00 PM ES17.07.05
Stabilization of Cubic Crystalline Phase in Organo-Metal Halide Perovskite Quantum Dots via Surface Energy Manipulation
Som Sarang; University of California, Merced, United States.

SESSION ES17.08: Photophysics and Light-Emission Mechanisms of Halide Perovskites
Session Chairs: Maria Antonietta Loi and Hernán Míguez
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 B

4:15 PM ES17.08.01
Atomistic Mechanism of Broadband Emission in Metal Halide Perovskites
Yanfa Yan; University of Toledo, United States.

4:45 PM ES17.08.02
Photoelectronic Properties of Halide Perovskites and Devices
Daniela Marongiu; Università di Cagliari, Italy.

8:15 AM *ES17.08.03
Pressure Enhanced Photoluminescence of a Lead Halide Perovskite
Yingyi Wang; Center for High Pressure Science & Technology Advanced Research, China.

10:00 AM ES17.08.05
Element-Specific Contributions to the Electronic Structures of Inorganic Cesium Lead Halide Perovskites Revealed by Resonant X-Ray Photoelectron Spectroscopy
Xuechen Jiao1, 2; 1Monash University, Australia; 2Australian Nuclear Science and Technology Organisation, Australia.

10:15 AM BREAK

10:45 PM *ES17.08.06
Photophysical Properties of Perovskite Thin Films, Microcrystals and Nanocrystals
Hernán Míguez; Consejo Superior de Investigaciones Científicas, Instituto de Ciencia de Materiales de Sevilla, Spain.

11:15 AM ES17.08.07
Transport Properties of All-Inorganic Perovskite CsPbX3 Nanocubes—Developed by a Facile Room Temperature Surfactant-Mediated Emulsion Approach
Sayantani Das; Jadavpur University, India.

11:30 AM *ES17.08.08
Impact of Monovalent Cation in Metal Halide Perovskites on Monomolecular and Bimolecular Charge Recombination
Joshua Choi; University of Virginia, United States.

SESSION ES17.09: Compositions and Structures of Halide Perovskites
Session Chairs: Steve Cranford and Michael Saliba
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 B

1:30 PM *ES17.09.01
The Versatility of Polyelemental Perovskite Compositions
Michael Saliba; Adolphe Merkle Institute, Switzerland.

2:00 PM ES17.09.02
Atomic Scale Analysis of Perovskite MAPbI3 for Light Emitting Applications
Ashkan Jamshaid; Okinawa Institute of Science & Technology, Japan.

4:15 PM ES17.07.06
Low Band Gap Lead Iodide Perovskite Nanocrystals and Their Application in LED
Raihana Begum; Nanyang Technological University, Singapore.

4:30 PM ES17.07.07
Manipulating the Excited State of CsPbBr3 Nanoplatelets for Superior Optical Properties
Manuel Engelmann; University of Augsburg, Germany.

4:45 PM ES17.07.08
Continuous Flow Synthesis and Anion Exchange of Colloidal Perovskite Quantum Dots
Milad Abolhasani; NC State University, United States.
## SYMPOSIUM ES18

**Frontiers in Organic Photovoltaics**  
April 23 - April 26, 2019

**Symposium Organizers**  
Nicolas Blouin,  
Fei Huang,  
South China University of Technology  
Bumjoon Kim, Korea Advanced Institute of Science and Technology  
Barry Thompson, University of Southern California

**Symposium Support**  
EMD Performance Materials (a business of Merck KGaA, Darmstadt, Germany)  
Enli Technology Co., Ltd.

* Invited Paper

| Session Chairs: Bumjoon Kim and Yueh-Lin (Lynn) Loo |
| Tuesday Afternoon, April 23, 2019 |
| PCC North, 100 Level, Room 131 C |

**10:30 AM *ES18.01.01**

Excitons and Exciton Confinement in Organic Heterojunctions

Stephen Forrest; University of Michigan, United States.

**11:00 AM ES18.01.02**

Intrinsic and Extrinsic Factors Influencing Non-Radiative Voc Losses in Solution-Processed Organic Solar Cells

Xiaoyan Du; Institute of Materials for Electronics and Energy Technology (i-MEET), Germany.

**11:15 AM ES18.01.03**

Role of Disorder in Charge Generation in Organic Photovoltaics

Ivan Kassal; University of Sydney, Australia.

**11:30 AM *ES18.01.04**

Photovoltaic Performance in Ternary Blend Polymer Solar Cells

Hideo Ohkita; Kyoto Univ., Japan.

**SESSION ES18.02: Morphology**

Session Chairs: Bumjoon Kim and Yueh-Lin (Lynn) Loo  
Tuesday Afternoon, April 23, 2019  
PCC North, 100 Level, Room 131 C

**1:30 PM *ES18.02.01**

Efficient NIR Organic Bulk Heterojunction Solar Cells Using Nonfullerene Acceptors

Thue-Quyen Nguyen; University of California, Santa Barbara, United States.

**2:00 PM *ES18.02.02**

Role of Domain Purity in Non-Fullerene Acceptor Based Organic Solar Cells

Dean DeLongchamp; National Institute of Standards and Technology, United States.

**2:30 PM BREAK**

**3:00 PM ES18.02.03**

Laser-PEEM—A New Tool for Deciphering the Morphology of Semi-Crystalline Polymer Films

Falk Nießdorff; Leibniz-Institut für Oberflächenmodifizierung e.V., Germany.

**3:15 PM ES18.02.04**

Evolution of Blend Morphology and Detailed Charge Transport and Bimolecular Recombination Characteristics with Thermal Annealing in a Liquid Crystalline Small Molecule Donor-Fullerene Blend

Michael C. Heiber1,2; 1Northwestern University, United States; 2National Institute of Standards and Technology, United States.

**3:30 PM *ES18.02.05**

The Interpenetrating Network of Polymer/Nonfullerene Blend—Controlling Crystallization Kinetics and Molecular Diffusion

Yanchun Han; Changchun Institute of Applied Chemistry, China.

**4:00 PM ES18.02.06**

Novel 4D-STEM Characterization of Nanoscale Morphology and Molecular Ordering in Organic Photovoltaics

Jinwoo Hwang; The Ohio State University, United States.

**4:15 PM *ES18.02.07**

Miscibility and Mixed Domains in OPVs—Is the Ever-Evolving Story of the Role of Mixed Domains Converging to a Stable Structure-Function Paradigm?

Harald Ade; North Carolina State University, United States.

**4:45 PM ES18.02.08**

Hidden Structure Ordering Along Backbone of Fused-Ring Electron Acceptors Enhanced by Ternary Bulk Heterojunction

Yiyan Xiao; Chinese University of Hong Kong, Hong Kong.

**SESSION ES18.03: Non-Fullerene Acceptors I**

Session Chairs: Yanchun Han and Barry Thompson  
Wednesday Morning, April 24, 2019  
PCC North, 100 Level, Room 131 C

**8:00 AM *ES18.03.01**

Design and Synthesis of Small Molecule Electron Acceptors for High Performance Organic Solar Cells

Hongzheng Chen; Zhejiang Univ, China.

**8:30 AM *ES18.03.02**

Development of Non-Fullerene Electron Acceptors for Organic Solar Cells

Iain McCulloch1, 2; 1King Abdullah University of Science and Technology, Saudi Arabia; 2Imperial College London, United Kingdom.

**9:00 AM ES18.03.03**

Photo-Stability of Organic Solar Cells—Fullerene vs Non-Fullerene Polymer Solar Cells

Nutifafa Y. D. Doumou; University of Groningen, Netherlands.

**9:15 AM ES18.03.04**

Designing Highly Efficient Non-Fullerene Acceptors via Tuning the Intramolecular Charge Transfer Effect

Huiying Yao; Institute of Chemistry, Chinese Academy of Sciences, China.

**9:30 AM *ES18.03.05**

Fused-Ring Electron Acceptors for Organic Photovoltaics

Xiaowei Zhan; Peking University, China.

**10:00 AM BREAK**

**SESSION ES18.04: Device Physics II**

Session Chairs: Dean DeLongchamp and Fei Huang  
Wednesday Morning, April 24, 2019  
PCC North, 100 Level, Room 131 C

**10:30 AM *ES18.04.01**

Materials and Device Structures for Efficient Organic Solar Cells and Photodetectors

Karl Leo; TU Dresden, Germany.

**11:00 AM ES18.04.02**

Nature of Photogenerated Defects in Bulk Heterojunction OPVs

Joshua Wolanyk; Iowa State University, United States.

**11:15 AM ES18.04.03**

Voltage Loss in Polymer Solar Cells and Perovskite Solar Cells

Hyungdo Kim; Kyoto Univ., Japan.

**11:30 AM *ES18.04.04**

Quantifying Tie-Chain Fraction and Its Impact on Charge Transport in Model Conjugated Polymers

Yueh-Lin (Lynn) Loo; Princeton University, United States.

**SESSION ES18.05: Synthesis I**

Session Chairs: Iain McCulloch and Barry Thompson  
Wednesday Afternoon, April 24, 2019  
PCC North, 100 Level, Room 131 C

**4:00 PM ES18.05.01**

Evolution of Blend Morphology and Detailed Charge Transport and Bimolecular Recombination Characteristics with Thermal Annealing in a Liquid Crystalline Small Molecule Donor-Fullerene Blend

Michael C. Heiber1,2; 1Northwestern University, United States; 2National Institute of Standards and Technology, United States.
ES18.06.01 Molecular Design, Morphological Control and Device Characterization of Non-Fullerene Solar Cells with Significantly Reduced Photovoltage Loss and Enhanced Power Conversion Efficiency Alex Jem1-3; 1University of Washington, United States; 2City University of Hong Kong, Hong Kong.

ES18.06.02 B−N-Containing N-Type Conjugated Polymers and Polyarenes Chuandong Dou; Changchun Institute of Applied Chemistry, CAS, China.

ES18.06.03 Sidechain Engineering in Morphology Control in Organic Semiconductors David J. Jones; University of Melbourne, Australia.

2:30 PM BREAK

SESSION ES18.06: Theory
Session Chairs: Jean-Luc Bredas and Taiho Park
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 131 C

ES18.06.04 Assessing the Nature of the Charge-Transfer Electronic States in Organic Solar Cells. Jean-Luc Bredas; Georgia Institute of Technology, United States.

ES18.06.05 A Dynamic Picture of Energy Conversion in Organic Photovoltaics Elisabeth von Hauff; VU Amsterdam, Netherlands.

ES18.06.06 Charge Separation in Organic Solar Cells—Energy Bending vs Energy Disorder Gjergji Sini; University of Cergy-Pontoise, France.

ES18.06.07 High-Throughput Virtual Screening of the Optoelectronic Properties of (Binary) Co-Polymers for Organic Photovoltaics Martijn Zwijnenburg; University College London, United Kingdom.

ES18.06.08 Non-Adiabatic Molecular Dynamics Study on Charge Transfer Dynamics at the Boron Subphthalocyanine Chloride/C60 Interface Kosuke Sato; Toyota Central R&D Labs., Inc., Japan.

SESSION ES18.07: Poster Session
Session Chairs: Fei Huang, Bumjoon Kim and Barry Thompson
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES18.07.01 Origin of Asymmetric Photovoltaic Properties on Semi-Transparent Organic Photovoltaics Senku Tanaka; Kindai University, Japan.

ES18.07.02 Doping ZnO Electron Transport Layers with MoS2: Nanosheets Enhances the Efficiency of Polymer Solar Cells Ren Hao Lee; National Chiao Tung University, Taiwan.

ES18.07.03 The Charge Separation Pathway Controlled by the Orientation of the Delocalized Electronic Wavefunction Tika R. Karle; University of Kansas, United States.

ES18.07.04 Structural Isomerism as a Tool to Tune Properties in BODIPY Copolymers for Fullerene-Free Solar Cell Gourav Tarafdar; Indian Institute of Science, India.

ES18.07.05 A DOE to Determine Significant Process Design Parameters in OPVs Jin Tracton1, 2; 1Rochester Institute of Technology, United States; 2Rochester Institute of Technology, United States.

ES18.07.06 A Study on Mechanical Properties of Semicrystalline N-Type Polymers via Controlling the Molecular Weight—The Importance of Critical Molecular Weight for Stretchable Organic Electronics Joonyeong Choi; KAIST, Korea (the Republic of).

ES18.07.07 Impact of Molecular Planarity of Acceptor–Donor–Acceptor-Type Small Molecules on Molecular Packing and Photovoltaic Properties Joonyeong Choi; Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).

ES18.07.08 High Temperature Semiconducting Polymer Blends Aristide Gumyusenge; Purdue University, United States.

ES18.07.09 Relating Molecular Morphology to Charge Transport Through Efficient Multi-Scale Techniques Matthew L. Jones; Boise State University, United States.

ES18.07.10 Photonically Manipulated Polymer Solar Cells to Enhance Their Performance by Spectral Upconversion Systems Ha-Fun Cho; Kookmin University, Korea (the Republic of).

ES18.07.11 Semi-Transparent Quaternary Organic Photovoltaics Using NIR-Sensitive 4-Terminal Tandem System Joo-han Kang; Kyung Hee University, Korea (the Republic of).

ES18.07.12 The Importance of Molecular Weight in Optimizing the Mechanical and Electrical Performance of All-Polymer Solar Cells Nrup Balar; North Carolina State University, United States.


ES18.07.14 Preparation of Conjugated Polymers for Solar Cell Applications Using Direct Arylation Polymerization (DArP) Robert M. Pankow; University of Southern California, United States.

ES18.07.15 Efficient Ternary Organic Solar Cells Near-IR Sensitized by Porphyrins Xiaobin Peng; South China University of Technology, China.

ES18.07.16 Effect of Fluorine Substitution on Molecular Interaction and Performance in Organic Electronics In-Bok Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

ES18.07.17 Influence of Energy Level Offsets in Ternary Blend Organic Photovoltaics Sanket Samal; University of Southern California, United States.

ES18.07.18 Overcoming Morphological and Efficiency Limit in All-Polymer Solar Cells by Designing Copolymers Containing naphtho[1,2-c:5,6-c’][bis[1,2,5]thiazole] moiety Wei Yang; South China University of Technology, China.

ES18.07.19 New Fully Conjugated Block Copolymer Bearing Wide-Bandgap Donor and Narrow-Bandgap Acceptor Blocks —Application to Single Active Material Polymer Solar Cell Joo-han Kang; Kyung Hee University, Korea (the Republic of).

ES18.07.20 Novel Terpolymer with Broad Complementary Absorption and Robust Morphology for Highly Efficient All Polymer Solar Cells Young Un Kim; Korea University, Korea (the Republic of).

ES18.07.21 Efficient Semi-Transparent Organic Photovoltaics Using Quaternary Blends Jisu Shin; Kyung Hee University, Korea (the Republic of).
Multi-Layered Polymer Solar Cells Using Stamped Active Layers from WATER Jung-Yong Lee: Korea Advanced Institute of Science and Technology, Korea (the Republic of).


Toward Solution-Processed High-Performance Large Area Polymer Solar Cells Zhang Kai: South China University of Technology, China.

Co-solvent Processing of Low-Solubility Polymer in Bulk Heterojunction Organic Photovoltaics and Hyperspectral Microscopy Characterization Ian Pelke: Georgia Inst of Technology, United States.

All-Polymer Solar Cells Based on Conjugated Perylenediimide Polymer Acceptors Duhui Zhao: College of Chemistry, Peking University, China.

SESSION ES18.09: Ternary OPV
Session Chairs: Martin Heeney and Barry Thompson
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 131 C

Ternary-Blend Solar Cell, a Leading Strategy in Development of OPV Technology Tayebeh Ameri: University of Munich (LMU), Germany.


Correlating Morphological Characterization of the Active Layer of Ternary Organic Solar Cells with Their Photovoltaic Performance Iman A. Ayhan: The Pennsylvania State University, United States.


SESSION ES18.10: Advanced Performance and Design I
Session Chairs: Jung-Yong Lee and Barry Thompson
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 C

Fully Stretchable Semiconducting Polymers—Concept, Development and Application to Solar Cells Taiho Park: Pohang University of Science and Technology, Korea (the Republic of).

Optical Design for Advanced Tandem and Semitransparent Polymer Solar Cells Hin-Lap Yip: South China University of Technology, China.

SESSION ES18.11: Device Physics III
Session Chairs: Tayebeh Ameri and Fei Huang
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 131 C

Flexible and Durable Perovskite Solar Cells Using Fullerenes and Nanocarbon Materials Yutaka Matsuo1, 2; 1The University of Tokyo, Japan; 2University of Science and Technology of China, China.

Intrinsic Reverse Dark Current in Organic Photodetectors Jonas Kublitski: Technische Universität Dresden, Germany.


Two-Dimensional benzo[1,2-b:4,5-b']difuran-Based Conjugated Polymers for High Performance Polymer Solar Cells Yong Zhang: Harbin Institute of Technology, China.


Surface Photovoltage Spectroscopy of Bulk Heterojunction and Dilute Donor Organic Photovoltaic Structures Lakshmi Narayanan Mosur Saravana Murthy: The University of Texas at Dallas, United States.

SESSION ES18.12: Synthesis II
Session Chairs: Bumjoon Kim and Barry Thompson
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 131 C

Developing High Performing Ladder-Type Materials for Organic Solar Cells Martin Heeney: Imperial College London, United Kingdom.

Optimizing the Active Layers of High-Performance Organic Photovoltaic Cells Jianhui Hou: Institute of Chemistry, Chinese Academy of Sciences, China.

Electron-Donating Conjugated Polymers Containing pyrrolo[3,4-f]benzotriazole-5,7-dione Unit for Polymer Solar Cells Le Yi: Institute of Polymer Optoelectronic Materials and Devices, State Key Lab of Luminescent Materials and Devices, China.

Pt-Containing Conjugated “Roller-Wheel”-Shaped Materials for Organic Photovoltaic (OPV) Applications Yang Qin: The University of New Mexico, United States.

Design and Synthesis of Ladder-Type Organic Conjugated Materials for Organic Photovoltaics Yen-Ju Cheng: National Chiao Tung University, Taiwan.
10:30 AM *ES18.13.01
Aqueous-Processable Organic Photovoltaic Materials for Green Energy Sources
Han Young Woo; Korea University, Korea (the Republic of).

11:00 AM ES18.13.02
Improvement of Polymer Solar Cell Efficiency by Solution-Processed of TIPS-Pentacene Thin Films on Electron Transport Layer
Yi-Jiun Huang; National Chiao Tung University, Taiwan.

11:15 AM ES18.13.03
Controlling the Recombination in Ternary Organic Solar Cells—A Path Towards >14% Efficiency
Nicola Gasparini; King Abdullah University of Science and Technology, Saudi Arabia.

11:30 AM ES18.13.04
Importance of Critical Molecular Weight of Polymer Acceptor on the Mechanical and Electrical Properties of All-Polymer Solar Cells
Joonhyeong Choi; KAIST, Korea (the Republic of).

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SYMPOSIUM ES19

Excitonic Materials and Quantum Dots for Energy Conversion
April 23 - April 25, 2019

Symposium Organizers
Joseph Luther, National Renewable Energy Laboratory
Wanli Ma, Soochow University
MingLee Tang, University of California, Riverside
Nobuhiro Yanai, Kyushu University

Symposium Support
Nanoscale Advances & Chemical Science | Royal Society of Chemistry

* Invited Paper

SESSION ES19.01: Perovskite Quantum Dots
Session Chairs: Joseph Luther and Susanna Thon
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 132 A

10:30 AM *ES19.01.01
Near-Infrared-Emissive Colloidal Nanocrystals of Multinary Lead Halide Perovskites
Maksym V. Kovalenko1, 2; 1ETH Zurich, Switzerland; 2Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

11:00 AM *ES19.01.02
Exciton Fine Structure in Cesium Lead Halide Perovskite Nanocrystals
Peter C. Sercel; California Institute of Technology, United States.

11:30 AM *ES19.01.03
Quantum-Cutting Ytterbium-Doped Halide Perovskites Showing Photoluminescence Quantum Yields Approaching 200%
Daniel Gamelin; University of Washington, United States.

SESSION ES19.02: Colloidal Quantum Dot Photovoltaics and Thin Films
Session Chairs: Wanli Ma and Matthew Panthani
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 A

1:30 PM *ES19.02.01
High Efficiency Inverted Structural Colloidal Quantum Dot Solar Cells
Zhijun Ning; ShanghaiTech University, China.

2:00 PM ES19.02.02
Concentration Factor Thermodynamic Limits in Luminescent Solar Concentrators
Megan E. Phelan; California Institute of Technology, United States.

2:15 PM ES19.02.03
PbS QD/ZnO Nanowire Solar Cells for Series-Connected Triple-Junction Solar Cells with Approximately 30% Efficiency
Takaya Kubo; The University of Tokyo, Japan.

2:30 PM *ES19.02.04
Transport in Quantum Dot Solids
Vanessa Wood; ETH Zürich, Germany.

3:00 PM BREAK

3:30 PM *ES19.02.05
Pre-Exchanged Quantum Dot Ink Based Solar Cells
Sung-Yeon Jang; Kookmin University, Korea (the Republic of).

4:00 PM ES19.02.06
GaTeAs Quantum Well Solar Cells for Sub-Band Gap Absorption
Ahmed Zayan; Tufts University, United States.

4:15 PM ES19.02.07
Ligand Passivation Strategies for CsPbX3 Nanocrystals
Ashley Marshall; University of Oxford, United Kingdom.
4:30 PM *ES19.02.08
Colloidal Quantum Dot Photovoltaics Edward H. Sargent; University of Toronto, Canada.

SESSION ES19.03: Poster Session I
Session Chairs: MingLee Tang and Joel Yuen Zhou
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES19.03.01
RGB QLED Device Prepared by Inkjet Printing with Mixed Solvent and Printing Rout Tai Yu-Chieh; National Tsing Hua University, Taiwan.

ES19.03.02
Size-Tunable Synthesis of Cadmium Selenide Quantum Dots to Increase Solar Cell Efficiency Jacob Strimaitis; Norfolk State University, United States.

ES19.03.03
Efficient Production of Ultraviolet Light from Kinetically Controlled Synthesis of CdS Nanocrystals Paulina Jaimes; University of California, Riverside, United States.

ES19.03.04
Zinc Thiolate Determines the Identity of ZnS Shells on Cu-Deficient Cu-In-S QDs Eric Hansen; Massachusetts Institute of Technology, United States.

ES19.03.05
Novel Dendritic Large Molecules Exhibiting Thermally Activated Delayed Fluorescence for Simple-Processed Organic Light Emitting Diodes Hyung J. Kim; Korea University, Korea (the Republic of).

ES19.03.06
Lanthanide Decorated Semiconductor Quantum Dots for Use as Broadly Absorbing Downshifters Joseph Swabeck1, 2; 1University of California, Berkeley, United States, 2Lawrence Berkeley National Laboratory, United States.

ES19.03.07
Critical Casimir Forces Drive Quantum Dot Epitaxy Emanuele Marino1, 2; 1University of Amsterdam, Netherlands, 2University of Pennsylvania, United States.

SESSION ES19.04: Singlet Fission and Downconversion
Session Chairs: Sean Roberts and Nobuhiro Yanai
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 A

8:00 AM *ES19.04.01

8:30 AM *ES19.04.02
Up- and Down-Converting Photons in Molecular Singlet Fission Materials Dirk M. Guldi; University of Erlangen-Nuremberg, Germany.

9:00 AM ES19.04.03
Counting Triplets on Single Polymer Chains for Solar Cells Benjamin D. Dukor; University of New Mexico, United States.

9:15 AM ES19.04.04
Conformational Preference for Triplet Production in Multichromophoric Molecules via Single Molecule Spectroscopy David J. Waldeck; University of New Mexico, United States.

9:30 AM *ES19.04.05
Polariton Assisted Photophysics—Remote-Energy Transfer, Singlet-Fission and Triplet Harvesting Joel Yuen-Zhou; University of California, San Diego, United States.

10:00 AM BREAK

10:30 AM *ES19.04.06
Singlet Fission—Triplet Harvesting and Probing Triplet-Triplet Interactions Neil Greenham; University of Cambridge, United Kingdom.

11:00 AM ES19.04.07
Singlet Fission in Designed Architectures for Triplet Exciton Harvesting Justin Johnson; National Renewable Energy Laboratory, United States.

11:15 AM ES19.04.08
Two Temperature Regimes of Triplet Transfer in the Dissociation of the Correlated Triplet Pair in Singlet Fission Tia Lee; Princeton University, United States.

11:30 AM *ES19.04.09

SESSION ES19.05: Excitons in Indirect Gap Semiconductors
Session Chairs: Justin Johnson and MingLee Tang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 132 A

1:30 PM *ES19.05.01
Sensitization of Silicon by Singlet Exciton Fission Marc Baldo; Massachusetts Institute of Technology, United States.

2:00 PM *ES19.05.02
Photophysics of Solution-Processed Nanostructured Thin Films of Indirect Semiconductors Kathryn E. Knowles; University of Rochester, United States.

2:30 PM BREAK

SESSION ES19.06: Hybrid Materials for Energy Conversion I
Session Chairs: Bruno Ehler and MingLee Tang
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 132 A

3:30 PM *ES19.06.01
Designing Organic—Inorganic Junctions for Photon Conversion Sean T. Roberts; The University of Texas at Austin, United States.

4:00 PM ES19.06.02
Photon Upconversion in Molecular Assemblies and Hybrid Materials Nobuhiro Yanai1, 2; 1Kyushu University, Japan, 2JST-PRESTO, Japan.

4:15 PM ES19.06.03
Photon Upconversion—Novel Annihilators for Photoredox Catalysis Andrew Pun; Columbia University, United States.

4:30 PM *ES19.06.04
Progress Using Hybrid Nanomaterials for Excitonic Photon Conversion Mark W. Wilson; University of Toronto, Canada.

SESSION ES19.07: Poster Session II
PCC North, 100 Level, Room 132 A

5:00 PM - 7:00 PM

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ES19.07.01
Samarium Activated La3Hf2O7 as New UV, X-Ray and Thermographic Nanophosphors Yueming Mao; The University of Texas at Rio Grande Valley, United States.

ES19.07.02
Room-Temperature Bound Exciton with Long Lifetime in Monolayer GaN Bo Peng; Fudan University, China.

ES19.07.03
Accessing the Marcus Inverted Regime with CdSe Nanocrystals and Perylene Yang Chih Lee; University of California, Riverside, United States.

ES19.07.04
Photoexcited Electron Lifetimes Influenced by Momentum Dispersion in Silicon Nanowires, Fatima; North Dakota State University, United States.
ES19.07.05
Photosystem I in Confined Space—Biohybrid Porous ITO Electrodes for the Photo-Conversion of Redox Mediators Kody Wolfe; Vanderbilt University, United States.

ES19.07.06
Singlet Fission in a Hybrid PbS Nanocrystal Diphenylhexatriene System Helen M. Thayer; University of California, Riverside, United States.

SESSION ES19.08: Photophysical Properties: from the Bulk to the Nanoscale
Session Chairs: Kathryn Knowles and Wanli Ma
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 A

8:00 AM *ES19.08.01
Halide Perovskite Bulk vs. Nanoparticles—What is different? What is similar? Ivan Mora-Sero; Universitat Jaume I, Spain.

8:30 AM *ES19.08.02
Subpicosecond Photoionization of Mn-Doped CdSe Quantum Dots Mediated by Spin-Exchange Auger Interactions Rohan Singh; Los Alamos National Laboratory, United States.

8:45 AM *ES19.08.03
Group IV Semiconductor Nanocrystals and Nanosheets Matthew G. Panthani; Iowa State University, United States.

9:15 AM *ES19.08.04
Asymmetrically Strained Quantum Dots with Ultrastable Single-Dot Emission Spectra and Subthermal Room-Temperature Linewidths Young-Shin Park1, 2; 1Los Alamos National Laboratory, United States; 2The University of New Mexico, United States.

9:30 AM *ES19.08.05
Colloidal Synthesis of Ternary and Heterostructured 2D Semiconductor Nanocrystals Alina Schimpf; UC San Diego, United States.

10:00 AM BREAK

SESSION ES19.09: Hybrid Materials for Energy Conversion II
Session Chairs: Mark Wilson and Nobuhiro Yanai
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 132 A

10:30 AM *ES19.09.01
Mixed-Anion Semiconductors for Photocatalytic Water Splitting Under Visible Light Ryu Abe; Kyoto University, Japan.

11:00 AM *ES19.09.02
Size Dependent Donor and Acceptor Pair Recombination in Colloidal Silicon Quantum Dots Hiroshi Sagimoto; Kobe University, Japan.

11:15 AM *ES19.09.03
Excited-State Charge-Transfer Reactivity of QD-Linker-Metal Oxide Heterostructures with Amine-Bearing Bifunctional Molecular Linkers Natalia Rivera-Gonzalez; University at Buffalo, The State University of New York, United States.

11:30 AM *ES19.09.04
Molecularly-Modulated Energy of Exciton Confined in the One-Dimensional Nanostructures of Single-Walled Carbon Nanotubes Tomohiro Shiraki1, 2; 1Kyushu University, Japan; 2Kyushu University, Japan.

SESSION ES19.10: Excitonic Devices
Session Chairs: Ivan Mora-Sero and Zhijun Ning
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 A

1:30 PM *ES19.10.01
Electronic Metamaterials with Colloidal Quantum Dots Maria Antonietta Loi; University of Groningen, Netherlands.
**SYMPOSIUM ES20**

**TUTORIAL: Young Scientists Tutorial on Characterization Techniques for Thin-Film Solar Cells**
April 22 - April 22, 2019
PCC North, 100 Level, Room 132 B

This tutorial is intended for young researchers (students and post-graduates within 3 years of degree completion) who are active in the field of thin-film solar cells and would like to learn the fundamentals of characterization methods that are being used in research and development of these materials and devices. All presentations will be given (mostly) by young, yet experienced researchers who are active in the characterization of Si-, III-V-, chalcogenide-, kesterite-, as well as perovskite-based solar cells. Although these materials will be discussed as model systems, the presentations will primarily focus on the characterization and simulation techniques and thus should be of interest to participants from other symposia as well.

**8:30 AM**
Electrical Device Characterization and Modeling of Thin-Film Solar Cells Mike Scarpulla, The University of Utah

I-V and C-V DC analyses, AC characterization (CV, DLCP, DLTS and related techniques), localized state and band-structure-related responses; simulations using 1D solvers such as SCAPS and extensions to 2D; “hands-on” simulation demonstration.

**10:00 AM BREAK**

**10:30 AM**
Soft X-Ray and Electron Spectroscopies: Investigating the Chemical and Electronic Structure of Surfaces and Interfaces Dirk Hauschild, Karlsruhe Institute of Technology

Introduction to several soft x-ray and electron characterization techniques, including x-ray (XPS) and UV (UPS) photoelectron spectroscopy, inverse photoemission spectroscopy (IPES), x-ray excited Auger electron spectroscopy (XAES), and x-ray emission spectroscopy (XES). The tutorial includes a discussion of experimental requirements, information content, as well as data analysis and interpretation. Examples how the techniques can be used to determine the electronic and chemical structure of surfaces and interfaces in thin-film photovoltaic devices will be given.

**1:30 PM**
Time-Resolved Terahertz Spectroscopy on Energy Materials Hannes Hempel; Helmholtz-Zentrum Berlin für Materialien und Energie

Introduction to measurement, analysis and application of time-resolved terahertz spectroscopy (TRTS). Determination of charge carrier mobility, bulk lifetime and surface recombination velocity demonstrated on the example of perovskites, kesterites and metal oxides. Impact of these key properties on solar cell efficiencies. Comparison of TRTS to alternative measurement techniques.

**2:30 PM BREAK**

**3:00 PM**
Atomic Structure of Solar Materials by High-Resolution STEM and In Situ Microscopy Chen Li; Electron Microscopy for Materials Science, University of Antwerp

Introduction to scanning transmission electron microscopy and the accompanying analytical techniques including atomic number contrast annular dark field imaging, electron energy loss spectroscopy (EELS) and Energy Dispersive X-ray spectroscopy (EDX). The focus will be the application of these techniques on understanding structure and composition in solar materials, with examples from CdTe and CIGS solar cells. In addition, state-of-the-art in-situ heating technique will be discussed as a powerful means of understanding solar materials growth.

**4:00 PM**
Atomistic Modeling of Defects in Materials Kyounghun Kweon; Lawrence Livermore National Laboratory

Understanding defects and their roles in determining materials properties. Demonstration on how to compute thermodynamic and kinetic properties of (point) defects and defect complexes, particularly in Cu(In,Ga)Se2. Discussion includes how the atomistic calculations can be used to interpret/understand experimental observations.

* Invited Paper

**SYMPOSIUM ES20**

Thin-Film Chalcogenide Semiconductor Photovoltaics
April 23 - April 26, 2019

Symposium Organizers
Shubhra Bansal, University of Nevada, Las Vegas
Nicolas Barreau, Université de Nantes
Alex Redinger, University of Luxembourg
Mike Scarpulla, The University of Utah

Symposium Support
AVANCIS GmbH
Codex International
First Solar
University of Luxembourg/Fonds national de la recherche (Luxembourg)

* Invited Paper

**SESSION ES20.01: Device Modelling**
Session Chairs: Stephan Lany and Pawel Zabierowski
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 132 B

**10:30 AM *ES20.01.01**
Development of an Integrated ACIGS Solar Cell Device Model at MiaSolé Hi-Tech Jeff Bailey; MiaSole Hi-Tech, United States.

**11:00 AM ES20.01.02**
Diagnosing Recombination and Resistive Losses in Thin-Film Chalcogenide Solar Cells Using a Silicon-Inspired Characterization Platform Arthur Onno; Arizona State University, United States.

**11:15 AM ES20.01.03**
Spatial Inhomogeneities of Carrier Transport Properties in Polycrystalline Thin-Film Solar Cells Mario Ochoa; Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

**11:30 AM *ES20.01.04**
A Unified 1D/2D Solver for Modeling Carrier and Defect Transport in CdTe Solar Cells Abdul Shank; Arizona State University, United States.

**SESSION ES20.02: Material Preparation**
Session Chairs: Jeff Bailey, Charles Hages, Manuel Ramos and Edgardo Saucedo
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 B
1:30 PM *ES20.02.01
Developing Next-Generation Chalcogenide Semiconductors for Photovoltaics Charles J. Hages; University of Florida, United States.

2:00 PM ES20.02.02
The Challenges to Develop SbSe/CdS Based Solar Cells in Substrate Configuration Eduardo Saezde; IREC, Spain.

2:15 PM ES20.02.03
Antimony Chalcogenide with Tunable Quasi-One-Dimensional Ribbons Thin-Film Solar Cells Grown by Close-Space Sublimation Feng Yan; The University of Alabama, United States.

2:30 PM *ES20.02.04
Recent Advances in Si/CIGS Tandem Cells Daniel Lincot; CNRS-IPVF, France.

3:00 PM BREAK

3:30 PM *ES20.02.05
Cu(In,Ga)Se2—Some Recent Results on Properties and Performance of Thin-Film Solar Cells—Are New Device Concepts Required for Further Efficiency Leap? Romain Caron; Empa Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

4:00 PM ES20.02.06
12.2% CIS and 13.6% CIGS Solar Cells Fabricated from Copper-Rich DMF Molecular Precursor Solutions Hao Xin; Nanjing University of Posts & Telecommunications, China.

4:15 PM ES20.02.07
Wet-Chemical Treatment of Cadmium Telluride (CdTe) Photovoltaics for Enhanced Open-Circuit Voltage (Voc) and Fill Factor (FF) Ebin Bastola; University of Toledo, United States.

4:30 PM *ES20.02.08
Status and Challenges of CdTe Photovoltaics Wyatt Metzger; National Renewable Energy Laboratory, United States.

SESSION ES20.03: Poster Session I: Material Growth
Session Chairs: Nicolas Barreau and Alex Redinger
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

ES20.03.01
Revealing the Optimal Conditions for the Synthesis of High Efficiency Cu2ZnSnGe4 Wide Band Gap Absorber Eduardo Saezde; IREC, Spain.

ES20.03.02
Tin Antimony Sulfide Thin Films by In Situ Chemical Solution Deposition for Their Application as Absorber in Solar Cells Luis A. Rodriguez-Guadarrama; Cinvestav Unidad Saltillo, Mexico.

ES20.03.03
Beyond 13% Efficient Cu2ZnSn(S,Se)4 Solar Cells from DMSO Molecular Precursor Solution Yuancui Gong; Nanjing University of Posts & Telecommunications, China.

ES20.03.04
ZnSbN — A Novel Ternary Nitride for Optoelectronic Applications Allison Mira; 1 Colorado School of Mines, United States; 2 National Renewable Energy Laboratory, United States.

ES20.03.05
CZTS Solar Cells Absorbers Produced by Sputtering or Pulsed Laser Deposition Jorgen Schoen; 1 TU Denmark, Denmark; 2 TU Denmark, Denmark.

ES20.03.06
Engineering Ga Profile in Low Temperature-Processed Cu(In,Ga)Se2 Thin Film by Using a Thin Ag Precursor Layer Hyeonggon Yu; Korea Institute of Science and Technology, Korea (the Republic of).

ES20.03.07
Enhanced Optical and Electronic Properties of 2D n-MoS2 by Thin-Layer Al2O3 Surface Passivation for Photovoltaic Applications Atteq U. Rehman; Qatar Environment and Energy Research Institute, Qatar.

ES20.03.08
Solution-Processed Earth-Abundant Cu2BaSn(S, Se)4 Solar Absorber Using a Non-Toxic Solvent Betul Teymur; 1, 2 Duke University, United States; 3 Duke University, United States.

ES20.03.09
Chemical, Structural and Photovoltaic Properties of Cd Chalcogenide Thin Films Grown by Chemical Bath Deposition on GaAs(100) Ofir Friedman; Ben-Gurion University of the Negev, Israel.

ES20.03.10
Semiconductor Ternary Nitride with Tunable Quasi-One-Dimensional Ribbons Thin Film Solar Cells Grown by Close-Space Sublimation Feng Yan; The University of Alabama, United States.

SESSION ES20.04: Specific Material Applications
Session Chairs: Daniel Lincot and Sascha Sadewasser
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 B

8:30 AM *ES20.04.01
Monolithic Tandem Solar Cell Potential of CZTS on TOPCon Si Filipe Martinho; Technical University of Denmark, Denmark.

9:00 AM ES20.04.02
Development of CIS and Perovskite Solar Cells for all Thin-Film Tandem Applications Thomas Feurer; Empa Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

9:15 AM ES20.04.03
Zn-Sn-MgO Contact Layer Integration with Wide Band Gap CuGaSe2 Absorbers Imran S. Khan; National Renewable Energy Laboratory, United States.

9:30 AM *ES20.04.04
Studies on MoS2—Thin-Film Matrix by Means of Atom Probe Tomography Manuel A. Ramos; 1 Universidad Autonoma de Cd. Juarez, Mexico; 2 Karlsruhe Institute of Technology—Institute for Applied Materials, Germany.

10:00 AM BREAK
Progress and Challenges in Absorber and Interface Fabrication of Polycrystalline CdTe Photovoltaics

Amrit H. Munshi; Colorado State University, United States.

Different Alkali-Fluoride Post-Deposition Treatments on the Cu(In,Ga)Se2 Solar Cell

William Weigand; Arizona State University, United States.

Determining the Properties of Cd1−xIn2+x/3S4−δ Thin Films—A Key to Better Understand CIGSe/CdS Heterojunction?

Nicolas Barreau; Institut des Matériaux Jean Rouxel (IMN), France.

ALD-Zn-Ti-O as Window Layer in Cu(In,Ga)Se2 Solar Cells

Johannes Loeckinger; Empa–Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

SESSION ES20.06: Material Characterization

Different Alkali-Fluoride Post-Deposition Treatments of Cu(In,Ga)Se2; Investigated by Kelvin Probe Force Microscopy

Sascha Sadewasser; International Iberian Nanotechnology Laboratory, Portugal.

Role of Alkali Metals at Grain Boundaries of Cu(In,Ga)Se2 Thin Films

Daniel Abou-Ras; Helmholtz-Zentrum Berlin, Germany.

Ultra-High Vacuum Scanning Tunneling Spectroscopy on CulnSe Thin-Film Solar Cell Absorber Layers

Christian Kameni Boumenou; University of Luxembourg, Luxembourg.

Revealing How Cu-Diffusion at Grain Boundaries Assists Grain Growth in CulnSe Solar Cells via In Situ STEM

Chen Li; Max Planck Institute for Solid State Research, Germany.

Direct AFM-based Nanoscale Mapping and Tomography of Open Circuit Voltages for Photovoltaics

Bryan D. Huey; University of Connecticut, United States.

SESSION ES20.07: Post-Mortem Analysis of Solar Cells

Improved Reaction Pathway for Efficient CZTSe Solar Cells from Metal Alloys via a Cu-Rich Selenization Stage

Teoman Taskesen; Carl von Ossietzky University of Oldenburg, Germany.

Cation-Substituted Kesterite Solar Cells from Precursor Solutions

Sara Engebø; Technical University of Denmark, Denmark.

SESSION ES20.08: Interfaces and Materials Characterization

Fabrication of Band-Gap Graded CZTSSe Thin-Film Solar Cells

Teoman Taskesen; University of Oldenburg, Germany.

Over 13% Efficient CZTSSe and CIGS Solar Cells Processed from Non-Hydrazine Solutions

Hao Xing; Key Laboratory for Organic Electronics and Information Displays, Jiangsu National Synergetic Innovation Center for Advanced Materials (SICAM), College of Materials Science and Engineering, Nanjing University of Posts & Telecommunications, China.

Impact on Selenium Control at Growth and Annealing for Cu:ZnSns Solar Cells

Hitoshi Tampo; National Institute of Advanced Industrial Science and Technology, Japan.

Effect of Alkali Post-Deposition Treatments on the Cu(In,Ga)Se2 Surface and the Deeply Buried Cu(In,Ga)Se2/Mo Interface Structure

Jakob Bombach; Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany.

A Study of the Degradation Mechanisms of Ultra-Thin CIGS Solar Cells Submitted to a Damp Heat Environment

Thierry Kohl1, 2, 3; 1University of Hasselt, Belgium; 2imec, Belgium; 3EnergyVille, Belgium.

Reflective Back Contacts for High-Efficiency Ultra-Thin CIGS Solar Cells

Louis Guollart1, 2; 1C2N, CNRS, France; 2IPVF, CNRS, France.

Localization and Characterization of Secondary Phases in CIGS Thin-Film Solar Cells

Sven Schöntherr; Friedrich Schiller University Jena, Germany.

(Ag,Cu)(In,Ga)Se2 Thin-Film Solar Cells Analyzed by Atom Probe Tomography

Hisham Aboulfadl; Chalmers University of Technology, Sweden.

Studying the Light-Soaking Effect on the Absorber Layer of Cu(In,Ga)Se2 Solar Cells Using Raman Analysis

Sina Soltanmohammadi; Colorado School of Mines, United States.

In-Depth Analysis of Phase Distribution in Zn(O,S) Thin Films Deposited by a Reactive Sputtering Technique

Dae-Hyang Cho1, 2; 1Electronics and Telecommunications Research Institute (ETRI), Korea (the Republic of); 2Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).

The Overall Distribution of Rubidium and Cesium in Highly Efficient Cu(In,Ga)Se2 Solar Cells

Philipp Schöppe; Friedrich Schiller University Jena, Germany.

Microstructure Alternation in Heterojunction Interface Engineering of CZTS Solar Cell

Haiqiang Huang; University of New South Wales, Australia.

Crystal Structure of (In,Ga)2Se3 Solid Solution Studied by XAFS

Kouke Beppu; Ryukoku University, Japan.

Characterization of Defect Levels in BaSi2 by DLTS and Significant Improvement of Photoresponsivity by Increasing Growth Temperature

Yudai Yamashita; University of Tsukuba, Japan.

Industrially Viable Rear Surface Passivation Approach for Cu(In,Ga)Se2 Solar Cells

Gizem Birant1, 2, 3; 1Hasselt University, Belgium; 2imec division IMOMEC (partner in Solliance), Belgium; 3EnergyVille, Belgium.

A Case Study of a High Efficiency Cu(In,Ga)Se2 Solar Cell by Microscopic Analysis

Maximilian Krause; Helmholtz-Zentrum Berlin für Materialien und Energie, Germany.

Relating Cation Composition, Carrier Dynamics and Photovoltaic Device Performance in CZTSe Single Crystals

Jason Baxter; Drexel University, United States.

SESSION ES20.10: Processing and Manufacturing of New Materials

SESSION ES20.11: Posters and Poster Presentations
2:00 PM *ES20.10.01
Disorder Effects in Photovoltaic Chalcogenides and Nitrides Stephan Lany;
National Renewable Energy Laboratory, United States.

2:30 PM *ES20.10.02
Predicting Defect Formation Energies from Statistical Learning of Bulk Properties Amit Samanta; Lawrence Livermore National Laboratory, United States.

2:45 PM *ES20.10.03
Machine Learned Defect Level Predictor for Cd-Based Chalcogenides Arun Kumar Mannodi Kanakkithodi; Argonne National Laboratory, United States.

3:00 PM BREAK

SESSION ES20.11: Module Fabrication and Stability
Session Chairs: Amit Munshi and Mario Ochoa
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 132 B

3:30 PM *ES20.11.01
Research Opportunities for CdTe PV to Reach 25% Efficiency Markus Glöckler; First Solar, United States.

4:00 PM *ES20.11.02
Degradation Mechanisms Occurring in CIGS Solar Cells and Modules Mirjam Theelen; TNO, Netherlands.

4:30 PM *ES20.11.03
17.2% Efficiency CuIn_{x}Ga_{1-x}Se_{2} Thin-Film Based Mini-Module Thanks to Alternative Architecture Justine Lorthioir; Institut des Matériaux Jean Rouxel, France.

4:45 PM *ES20.11.04
Identifying Optimal Laser Parameters for a Shunt-Free P3 Scribe of CIGS Using Raman Spectroscopy Veronique S. Gevaerts; Solliance (ECN part of TNO), Netherlands.

SESSION ES20.12: Defects Characterization
Session Chairs: Daniel Abou-Ras, Akira Nagaoka, Philipp Schöppe and Adele Tamboli
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 132 B

8:30 AM *ES20.12.01
Using Correlative EBIC-EBSD-APT to Identify Limitations in Cu(In,Ga)Se_{2} Photovoltaic Cells Jens Keutgen; RWTH Aachen University, Germany.

9:00 AM *ES20.12.02
Suitable Complex S-Se Graded Bandgap Profiles on Kesterite-Based Solar Cells Jacob Andrade-Arvizu; Catalonia Institute for Energy Research (IREC), Spain.

9:15 AM *ES20.12.03
Control of the Composition of CZTSe Absorber Material and Its Influence on Solar Cell Performance Levent Gültay; University of Oldenburg, Germany.

9:30 AM *ES20.12.04
II-IV-V_{2} Semiconductors—Cation Order-Disorder Properties and Photovoltaic Applications Adele Tamboli{1,2}; 1National Renewable Energy Laboratory, United States; 2Colorado School of Mines, United States.

10:00 AM BREAK

10:30 AM *ES20.12.05
Quantitative Evaluation of Metastability Mechanisms in CIGS Solar Cells Marco Nardone; Bowling Green State University, United States.

11:00 AM *ES20.12.06
Group-V Doping Limit in Cd-Rich CdTe for High Open-Circuit Voltage Akira Nagaoka{1,2,4}; 1Kyoto University, Japan; 2University of Miyazaki, Japan; 4University of Utah, United States.
Nanogenerators and piezoelectric are the two recently developed technologies for effective harvesting of ambient mechanical energy for self-powered systems. Ever since the wide-range applications of laptop computers and cell phones, the search for power sources for driving portable electronics has become increasingly important. The current technology mainly relies on rechargeable batteries. However, for the near future, micro-/nanosystems will be widely used in health monitoring, infrastructure and environmental monitoring, internet of things and defense technologies. The traditional batteries may not meet or may not be the choice for power sources. The nanogenerator was invented to meet these technological challenges. There are currently three effects commonly used for converting tiny physical motion into electricity: piezoelectric, triboelectric and pyroelectric effect. Piezoelectricity, a phenomenon known for centuries, is an effect of the production of electrical potential in a substance as the pressure on it changes. Piezo-photonics has attracted much attention because it may find broad applications in mechnano-optical conversion, structural health diagnosis, nondestructive analysis, novel light sources and displays. The piezo-phototronic effect is a result of three-way coupling among piezoelectricity, photonic excitation and semiconductor transport, which allows tuning and controlling of electro-optical processes by strain-induced piezopotential. The tutorial will include two sections:

- Nanogenerators: from Sustainable Power Source to Self-Powered Systems
- Piezotronics, Piezo-photonics and Piezo-Phototronics: from Electrochemical Catalyst to 2D Materials

8:30 AM
Nanogenerators and Piezotronics – History and Fundamental Principles
Zhong Lin Wang; Georgia Institute of Technology

Prof. Wang will first introduce the fundamental science, engineering approach and technological applications of nanogenerator as a sustainable, self-sufficient power source for micro-/nanosystems by harvesting energy from our body and living environment. Prof. Wang will then introduce the fundamentals of piezotronics and piezo-phototronics and to give an updated progress about their applications in energy science, electronics and sensors.

9:15 AM
High Performance Triboelectric Nanogenerators for Continuous Self-Powered Electronics
Jeong Min Baik; Ulsan National Institute of Science and Technology

Prof. Baik will first introduce the fabrication of triboelectric nanogenerators with high-output as well as the preparation of the triboelectric active materials. This will be followed by a review of the physical and chemical understanding for the mechanism to generate the high-output in terms of energy conversion efficiency. Prof. Baik will also survey the potential applications for the self-powered systems such as IOT sensors, filters etc.

10:00 AM BREAK

10:30 AM
Triboelectric Nanogenerators for Internet of Things
Haixia Zhang; Peking University

This part will introduce the development of IoT and requirements of energy harvesting. Then, we will review the progress of materials, performance of triboelectric nanogenerators and other energy harvesters. Lastly, the demonstrations of TENGs for IoT Applications will be investigated with latest research achievements. The trend of IoT, TENGs and energy harvester technology will be discussed.

11:15 AM
Implantable and Wearable Self-Powered Medical Electronics
Zhou Li; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences

This part will first demonstrate the first in vivo mechanical energy harvester and devices. We will then show a pacemaker prototype for controlling the frequency of heartbeat for the first time. Finally, Prof. Li will demonstrate other applications as real-time acquisition and wireless transmission of self-powered cardiac monitoring data. These works are concentrated on live-powered implantable medical devices.

1:30 PM
Piezotronic Effect for Efficient (Photo)Electrochemical and Catalyst Applications
Xudong Wang; University of Wisconsin-Madison

This part will first discuss the fundamental principles of applying the piezotronic effect in engineering the interfacial band structure. Practical systems that implement the piezotronic enhancement will also be discussed. At last, Prof. Wang will show that piezoelectric potential can raise the energy of electrons at the surface of piezoelectric material (or electrode) to such a level that is sufficient to drive proton reduction reactions within its immediate vicinity.

2:15 PM
Piezotronics for 2D Materials
Wenzhuo Wu; Purdue University

This part will first elaborate on the fundamental physics and material science of the piezotronic effect in 2D materials, which serve as the basis for understanding and utilizing the interfacial and charge carrier engineering in 2D piezotronics. Prof. Wu will then discuss the latest progress in the fundamental exploration and technological advances in 2D materials piezotronics. Finally, Prof. Wu will provide a perspective of this rapidly-advancing field.

3:00 PM BREAK

3:30 PM
Piezo-Phototronics of 3rd Generation Semiconductor
Weigu Hu; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences

This part will first introduce the framework of the piezo-phototronic effects in III-Nitrides quantum well. Furthermore, Prof. Hu shall survey the carrier dynamic process in piezo-phototronic effects with the transit piezophototronic model and the time-resolved photoluminescence. Finally, Prof. Hu will discuss the applications of piezo-phototronic effect on III-Nitrides visible light communications, micro LEDs and solar cells.

4:15 PM
Principle and Luminescence Application of Piezo-Photonics
Jianhua Hao; The Hong Kong Polytechnic University

This part will first introduce physical mechanisms of piezo-photonics. Some host materials and metal-ion activators will be described for demonstrating piezo-photonic effect. Prof. Hao will then provide a unified profile and recent prototypical demonstrations of light-emission triggered by various mechanical stimuli. Finally, Prof. Hao will discuss the challenges and perspectives of this research field.
SYMPOSIUM ES21

Nanogenerators and Piezotronics
April 23 - April 26, 2019

Symposium Organizers
Jianhua Hao, The Hong Kong Polytechnic University
Sohini Kar-Narayan, University of Cambridge
Caofeng Pan, Chinese Academy of Sciences
Xudong Wang, University of Wisconsin-Madison

Symposium Support
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* Invited Paper

SESSION ES21.01: Piezoelectric and Triboelectric Nanogenerators I
Session Chairs: Gregory Rohrer and Junyi Zhai
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 132 C

10:30 AM *ES21.01.01
Piezotronics and Piezo-Phototronics of the Third Generation of Semiconductors Zhong Lin Wang1, 2; 1Georgia Institute of Technology, United States; 2Beijing Institute of Nanoenergy and Nanosystems, CAS, China.

11:00 AM *ES21.01.02
Sustainable Power Generation from Multifunctional Triboelectric Nanogenerators Sang-Woo Kim; Sungkyunkwan University, Korea (the Republic of). 11:30 AM *ES21.01.03
Theoretical Potential for Low Energy Consumption Phase Change Memory Utilizing Electrostatically-Induced Structural Phase Transitions in 2D Materials Evan Reed; Stanford University, United States.

SESSION ES21.02: Piezotronics I
Session Chairs: Sang-Woo Kim and Evan Reed
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 C

1:30 PM *ES21.02.01
Controlling Polar Domains on Oxide Surfaces to Optimize Photochemical Reactivity Gregory Rohrer; Carnegie Mellon University, United States.

2:00 PM ES21.02.02
Impedance Tomography Mapping and Data Analytics Based Characterization of Non-Thermal Plasma Assisted Surface Modification of Piezoelectric and Multifunctional ZnO and BaTiO3 Based Electro-Active Thin Films Yuanyuan Xie; California State University, Fresno, United States.

2:15 PM *ES21.02.03
Piezotronic/Piezophototronic Based Sensors and Applications Junyi Zhai1, 2; Beijing Institute of Nanoenergy and Nanosystems, CAS, China; 2Guangxi University, China.

2:45 PM ES21.02.04
Piezo-Phototronic Effect in GaN Based Optoelectronic Devices Weiguo Hu; Beijing Institute of Nanoenergy and Nanosystems, China.

3:00 PM BREAK

SESSION ES21.03: Piezoelectric and Triboelectric Nanogenerators II
Session Chairs: Chenguo Hu and Qiongliang Liao
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 132 C

3:30 PM *ES21.03.01
Rational Materials Design for High-Output Triboelectric Nanogenerator Jeong Min Baik; Ulsan National Institute of Science and Technology, Korea (the Republic of).

4:00 PM ES21.03.02
Exceptional Piezoresponse of Zinc-Oxide Nanosheets Grown via Ionic Layer Epitaxy for Next-Generation Piezotronics Carlos Corey; University of Wisconsin-Madison, United States.

4:15 PM *ES21.03.03
Stretchable and Wearable Triboelectric Nanogenerators for Human Machine Interface Pooi See Lee; Nanyang Technological University, Singapore.

4:45 PM ES21.03.04
Self-Powered Motion Sensors and Monitoring Systems Based on Triboelectric Nanogenerator Zhiqiang Liao; University of Science and Technology Beijing, China.

8:00 AM ES21.04.01
Large-Area Solution-Grown Two-Dimensional Tellurene for Smart, Ubiquitous Electronics Yixiu Wang; Purdue University, United States.

8:15 AM *ES21.04.02
Conformal Piezoelectric Energy Harvesting and Storage from Motions of Internal Organs Canan Dagdeviren; Massachusetts Institute of Technology, United States.

8:45 AM ES21.04.03
Fibre-Based Triboelectric Generators for Smart Textiles Using Surface-Modified Electrospun Polymer Fibres Tommaso Busolo; AGH University of Science and Technology, Poland.

9:00 AM *ES21.04.04
Triboelectric Technology Based Sensors for Human-Machine Interaction Chenguo Hu; Chongqing University, China.

9:30 AM ES21.04.05
Developing Energy Storage Devices for Nanogenerators as Small-Power Energy Harvesters Xianmao Lu; Beijing Institute of Nanoenergy & Nanosystems, China.

9:45 AM BREAK

SESSION ES21.05: Piezotronics II
Session Chairs: Xiaoming Tao and Chi Zhang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 132 C

10:15 AM *ES21.05.01
Scalably-Manufactured 2D Tellurene for Ubiquitous Electronics and Smart Sensors Wenzhao Wu; Purdue University, United States.

10:45 AM *ES21.05.02
Printing Two-Dimensional Piezoelectric Layers Using Liquid Metal Reaction Media Kourosh Kalantar-zadeh; University of New South Wales, Australia.

11:15 AM *ES21.05.03
Piezoelectric Nanotransducers: Unique Advantages, Challenges and Possible Solutions Christian Falconi; University of Tor Vergata, Italy.

11:45 AM ES21.05.04
Wearable Multiphasic PVDF-Based Energy Harvesting Fabrics—Enhancement of the Piezoelectric and Dielectric Properties of Electrospun PVDF Fibers Through Incorporation of Barium Titanate Nanoparticles and Graphene Walker Tuff; California State University, Fresno, United States.
ES21.06.01
Piezo-Phototronic Effect Enhanced Photoelectrocatalysis
Linlin Li; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.06.02
Structure Design and Enhancing the Performance by Dielectric Modulation of TENG for Harvesting the Blue Energy
Yi Xi; Chongqing University, China.

ES21.06.03
Unidirectionally Polarized Diphenylalanine Nanotube Based Piezoelectric Energy Generator
Ju Hyuck Lee1, 2; 1Daegu Gyeongbuk Institute of Science and Technology, Korea (the Republic of); 2University of California, Berkeley, United States.

ES21.06.04
Enhanced Triboelectric Effect in PVDF—Changing Its Surface Roughness, Polarizability and Hydrophobicity
Huidrom Hemojit Singh; Indian Institute of Technology Delhi, India.

ES21.06.05
Additive Patterning of Multilayer Ferroelectric Oxide Devices by Inkjet Printing
Aleksander Matave2; 1Jozef Stefan Institute, Slovenia; 2University of California, Berkeley, United States.

ES21.06.06
Tribotronics for Active Mechanosensation and Self-Powered Systems
Chi Zhang; Chinese Academy of Sciences, China.

ES21.06.07
Conducting Polymer-Based Triboelectric Nanogenerators for Self-Powered, Transparent and Flexible System of Instantaneous Touch Visualization
Bo-Yeon Lee1, 2; 1Korea Advanced Institute of Science and Technology, Korea (the Republic of); 2Seoul National University, Korea (the Republic of).

ES21.06.08
Flexible and Controllable Piezo-Phototronic Pressure Mapping Sensor Matrix by ZnO NW/p-Polymer LED Array
Rongrong Bao; Chinese Academy of Sciences, China.

ES21.06.09
Quantifying the Triboelectric Series
Haiyang Zou; Georgia Institute of Technology, United States.

ES21.07.06
A Novel Multi-Functional Self-Powered Pressure Sensor with Hierarchical Wrinkle Structure
Liming Miao; Peking University, China.

ES21.07.07
Helicene-Based Polymers
Joshua C. Seylar; University of Akron, United States.

ES21.07.08
Localized Plasmon-Stimulated Triboelectric Nanogenerator
Gi Hyeon Han; UNIST, Korea (the Republic of).

ES21.07.09
Tunable Tribronic Dual-Gate Logic Devices Based on 2D MoS2 and Black Phosphorus
Guoyun Gao1, 2; 1Beijing Institute of Nanoenergy and Nanosystems, China; 2University of Chinese Academy of Science, China.

ES21.07.10
An Amphibious Triboelectric Nanogenerator for Multi-Environmental Smart Monitoring
Zening Zhao; State Key Laboratory for Advanced Metals and Materials, School of Materials Science and Engineering, University of Science and Technology Beijing, China.

ES21.07.11
High Voltage Output Contact-Separation Mode Triboelectric Nanogenerators Based on Commercial-Available Polymers
Micky Wong; Hong Kong Polytechnic Univ, Hong Kong.

ES21.07.12
Vibration Based Piezoelectric-Electromagnetic Hybrid Energy Harvester for Autonomous Sensor Systems
Chong Yun Kang1, 2; 1Korea Institute of Science and Technology, Korea (the Republic of); 2Korea University, Korea (the Republic of).

ES21.07.13
Tuning the Photoluminescence of Aggregation-Induced Emission Luminogens via Magnetostriective Stress and Piezoelectric Strain
Li Chen1, 2; 1Hong Kong Polytechnic Univ; Hong Kong; 2Guangxi University, China; 3Guangxi Institute of Nanoenergy, China.

ES21.07.14
Growth and Characterization of Spatially-Ordered PZT Nanostructures by Glancing Angle Pulsed Laser Deposition
Sarah Witanscheki; University of South Florida, United States.

ES21.07.15
Mechanically Stable ZnO Hexagonal Nanopryamids Array for High Performance Piezoelectric Applications
Taehoon Lim; University of California, Riverside, United States.

ES21.07.16
Ultrasensitive Triboelectric Nanogenerator for Weak Ambient Energy
Zhizhen Zhao; Peking University, China.

ES21.07.17
Piezoelectric Effect Tuning on ZnO Microwire WGM Lasing
Junfeng Lu; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.18
Biodegradable Triboelectric Nanogenerator for Biomedical Devices
Qiang Zheng; Chinese Academy of Sciences, China.

ES21.07.19
Ultrathin Piezotronic Transistors with 2 Nanometer Channel Lengths
Longfei Wang1, 2; 1Georgia Institute of Technology, United States; 2Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.20
A Monocharged Electret Nanogenerator-Based Self-Powered Device for Pressure and Tactile Sensor Applications
Kailiang Ren; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.21
Integrated Rotating Triboelectric Nanogenerator with Wireless Energy Delivery for Smart Home
Yane Jie; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.22
Effective Wound Healing Enabled by Wearable Triboelectric Nanogenerator
Yin Long; University of Wisconsin-Madison, United States.

ES21.07.23
Comprehensive Pyro-Phototronic Effect Enhanced Ultraviolet Detector with ZnO/Ag Schottky Junction
Laipan Zhu; Chinese Academy of Sciences, China.
ES21.07.24
Redefinition the Quasi-Fermi Energy Levels Separation of Electrons and Holes Inside and Outside Quantum Wells of GaN Based Multi-Quantum-Well Semiconductor Laser Diodes Due to Piezo-Photonic Effect Ding Li; Chinese Academy of Sciences, China.

ES21.07.25
Efficient Piezocatalytic Activity Driven by the Piezoelectric Effect of BaTiO3 Nanowires Jiang Wu; Sun Yat-Sen University, China.

ES21.07.27
Multimodal Enhancement of Luminous Light Harvester And Triboelectric Touch Sensor via P(VDF-TrFE) Hong Joon Yoon; Sungkyunkwan University, Korea (the Republic of).

ES21.07.28
Butylated Melamine Formaldehyde and CaCu3Ti4O12 Particles Based Composite Dielectric Layer for High Output Performance Triboelectric Nanogenerators Jihe Kim; Sungkyunkwan University, Korea (the Republic of).

ES21.07.29
In Situ TEM Investigation of Stress-Induced Recoverable Charged Domain Walls in Barium Titanate Qianwei Huang; The University of Sydney, Australia.

ES21.07.30
Piezoelectric Acoustic Sensor Based on Two-Dimensional MoS2 Hyoung Taek Kim; Sungkyunkwan University, Korea (the Republic of).

ES21.07.31
Direct Current Generator Based on Microdischarge via Accumulation of Triboelectric Charge in Atmospheric Condition Minki Kang; Sungkyunkwan University, Korea (the Republic of).

ES21.07.32
Multi-Functional Robust Reduced Graphene Oxide-P(VDF-TrFE) Flexible Nanocomposite Thin Film for Efficient Green Energy Harvesting Raman Bhuï; Indian Institute of Technology-Kanpur, India.

ES21.07.33
Flexible PVDF Nanocomposite Films for Enhanced Piezoelectric Effect Neeraj Khare; Indian Institute of Technology Delhi, India.

ES21.07.34
Deep-Trap Dominated Sustainable Mechanoluminescence from Layered Perovskite SrSnO3:Sm+ Dong Lu1,2; 1Wuhan University, China; 2National Institute of Advanced Industrial Science and Technology, Japan.

ES21.07.35
Triboelectric Nanogenerator Networks Integrated with Power Management Module for Water Wave Energy Harvesting Tao Jiang; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.36
Piezotronic Magnetoelectric Sensors for Biomedical Diagnostics Mona M. Mintken; Kiel University, Germany.

ES21.07.37
High Sensitive Self-Powered Triboelectric Auditory Sensor for Social Robotics and Hearing Aid Hengyu Guo2, 3, 1; 1Georgia Institute of Technology, United States; 2Chongqing University, China; 3Beijing Institute of Nanoenergy & Nanosystems, China.

ES21.07.38
Self-Powered Multifunctional Motion Sensor Enabled by Magnetic Regulated Triboelectric Nanogenerator Zhiyi Wu; Georgia Institute of Technology, United States.

ES21.07.39
Ultrasensitive and Highly Selective Self-Powered Room Temperature NO2 Detection Enabled by Triboelectric Nanogenerator Yuanjie Su; University of Electronic Science and Technology of China, China.

ES21.07.40
Piezotronic Effect In 1D Solid of Elemental Tellurium Nanobelt for Smart Adaptive Electronics Shengjie Gao1,2; 1Purdue University, United States; 2Flex Laboratory, United States.

ES21.07.41
Engineered and Laser Processed Chitosan Biopolymers for Sustainable and Biodegradable Triboelectric Power Generation Ruoxing Wang; Purdue University, United States.

ES21.07.42
Solution-Synthesized Chiral Piezoelectric Selenium Nanowires for Wearable Self-Powered Human-Integrated Monitoring Min Wu; Purdue University, United States.

ES21.07.43
Nanocomposites Electret with Unique Surface Potential Self-Recovery Characteristics for Harvesting Mechanical Energy in Extreme Environment Huayang Li; University of Nottingham Ningbo China, China.

ES21.07.44
Mapping Pressure with Flexible and High-Resolution p-GaN /n-ZnO Nanowires Arrays by Piezo-Phototronic Effect Yiyao Peng; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.45
Strain Modulation Band Alignment of Monolayer MoS2/ZnO Nanorod Mixed-Dimensional Heterostructure Arrays for Efficient Charge Transfer Baishan Liu; State Key Laboratory for Advanced Metals and Materials, School of Materials Science and Engineering, University of Science and Technology Beijing, China.

ES21.07.46
Networks of High Performance Triboelectric Nanogenerators Based on Liquid-Solid Interface Contact Electrification for Harvesting Low-Frequency Blue Energy Jiarui Tao; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.47
A Highly Stretchable Transparent Self-Powered Triboelectric Tactile Sensor with Metallized Nanofibers for Wearable Electronics Xiandi Wang; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

ES21.07.48
In2O3 Nanowires Field-Effect Transistors with Sub-60 mV/dec Subthreshold Swing Stepping from Negative Capacitance and Their Logic Applications Qian Xu; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.49
The Controllable Growth of Aligned Monocrystalline CsPbBr3 MW Arrays for Strain-Induced Dynamic Modulating of Single-Mode-Lasing Zheng Yang; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.50
An Ultralight, Self-Powered and Self-Adaptive Motion Sensor for Perceptual Layer Application in Internet of Things Xuan Zhao; University of Science and Technology Beijing, China.

ES21.07.51
Ultrafast, Sunlight-Triggerable Transient Energy Harvester and Sensors Based on Triboelectric Nanogenerator Using Acid-Sensitive Poly(phthalaldehyde) Changsheng Wu; Georgia Institute of Technology, United States.

ES21.07.52
Piezoelectric Gated Interfacial Charge Modulation in WSe2-ZnO Mixed-Dimensional Van Der Waals Heterostructures for Ultrasensitive Flexible Photodetectors Jun Li Du; School of Materials Science and Engineering, University of Science and Technology Beijing, China.

ES21.07.53
Super-Stretchable and Mechanically-Durable Triboelectric Nanogenerators for Deformable and Wearable Energy Sources and Self-Powered Electronic Skins Yung-Chih Lai1,2, 1National Chung Hsing University, Taiwan; 2National Chung Hsing University, Taiwan.

ES21.07.54
Harsh-Environmental-Resistant Triboelectric Nanogenerator Xianlong Chen; Beijing Institute of Nanoenergy and Nanosystems, China.

ES21.07.55
Silicon-Based Spintronics—Experimental and Theoretical Validation of Spin Manipulation in Silicon Sarah L. Allee; University of California, Riverside, United States.

ES21.07.56
Friction Force Effect on the Electrical Output Performance of Sliding-Mode Triboelectric Nanogenerator Wensiang Zhang; Key Laboratory of Education Ministry for Modern Design and Rotor-Bearing System, Xi’an Jiaotong University, China.

ES21.07.57
Fe3O4 Doped PMS-PZN-PZT Ceramics with High Piezoelectric Performance and Low Losses Jing Zhou; Wuhan University of Technology, China.
Piezoelectricity and Ferroelectricity in 2D Layered Materials for Electronic Devices  
SG Yuan; The Hong Kong Polytechnic University, China.

SESSION ES21.08: Piezoelectric and Triboelectric Nanogenerators IV  
Session Chairs: Keon Jae Lee and Morten Willatzen  
Thursday Morning, April 25, 2019  
PCC North, 100 Level, Room 132 C

8:00 AM ES21.08.01  
Enhanced Electrochemical Reducing Efficiency of Heavy Metal Pollutant by Pulsed Output of Triboelectric Nanogenerator  
Jie Wang; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

8:15 AM *ES21.08.02  
Fiber-Based Hybrid Energy Conversion Systems  
Xiaoming Tao; Institute of Textiles & Clothing, The Hong Kong Polytechnic University, Hong Kong.

8:45 AM ES21.08.03  
Self-Powered Electronic Medical Devices  
Zhou Li; Beijing Institute of Nanoenergy and Nanosystem,CAS, China.

9:00 AM *ES21.08.04  
Triboelectric Nanogenerator for Weak Mechanical Energy Source  
Youfan Hu; Peking University, China.

9:30 AM ES21.08.05  
Triboelectric Nanogenerators for Wearable Physical Monitoring Systems  
Wei Tang; Beijing Institute of Nanoenergy and Nanosystems, China.

9:45 AM BREAK

SESSION ES21.09: Piezotronics III  
Session Chairs: Youfan Hu and Zhou Li  
PCC North, 100 Level, Room 132 C

10:15 AM *ES21.09.01  
Self-Powered Flexible Electronics Beyond Thermal Limits  
Keon Jae Lee; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

10:45 AM *ES21.09.02  
A Quantum-Mechanical Treatment of Contact Electrification  
Morten Willatzen;  
*Beijing Institute of Nanoenergy and Nanosystems, China;* School of Nanoscience and Technology, China.

11:15 AM *ES21.09.03  
Universal Approach of Enhancing Piezotronics by Creating Pores in Piezoelectric Semiconductors  
Chuan-Pu Liu; National Cheng Kung University, Taiwan.

11:45 AM ES21.09.04  
Porous Polymer Thin Films for Mechanical Energy Harvesting and Self-Powered Electronics  
Yanchao Mao; Zhengzhou University, China.

SESSION ES21.10: Piezoelectric and Triboelectric Nanogenerators V  
Session Chairs: Dongseok Suh and Jun Zhou  
Thursday Afternoon, April 25, 2019  
PCC North, 100 Level, Room 132 C

1:30 PM *ES21.10.01  
Optimized Interface Conditions for Piezoelectric and Energy Harvesting Potential in ZnO  
Julien Roedel; Technische Universität Darmstadt, Germany.

2:00 PM ES21.10.02  
A Biomimetic Pressure Sensor Based on Ultrathin Supercapacitor and Flexible Triboelectric Nanogenerator  
Xin Cao; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.

2:15 PM *ES21.10.03  
Design and Energy Application of Piezoelectric Biomaterials  
Rusen Yang; Xidian University, China.

SESSION ES21.11: Piezoelectric and Triboelectric Nanogenerators VI  
Session Chairs: Juergen Roedel and Yunlong Zi  
Thursday Afternoon, April 25, 2019  
PCC North, 100 Level, Room 132 C

3:00 PM BREAK

SESSION ES21.12: Nanogenerators and Piezotronics II  
Session Chairs: Kourosh Kalantar-zadeh and Wenzhuo Wu  
Friday Morning, April 26, 2019  
PCC North, 100 Level, Room 132 C

8:30 AM ES21.12.01  
Computation of Electronic Energy Band Diagrams Applied to Piezotronic Photoelectrochemical Electrodes  
Lazarus N. German; University of Wisconsin-Madison, United States.

8:45 AM *ES21.12.02  
Energy Harvesting by Triboelectric Nanogenerators for Self-Powered Sensing Systems  
Guang Zhu;  
1Beijing Institute of Nanoenergy and Nanosystems, CAS, China;  
2University of Nottingham Ningbo China, China.

9:15 AM *ES21.12.03  
Ferroelectric and Piezoelectric Control of the Optical Properties of Advanced Materials  
Yang Zhang; Nankai University, China.

9:45 AM BREAK

10:15 AM *ES21.12.04  
Chip-Based Wide-Field Far-Field Super-Resolution Imaging  
Qing Yang; Zhejiang University, China.

10:45 AM ES21.12.05  
Piezoelectricity and Ferroelectricity in Nylons for Energy Harvesting  
Saleem Arwar;  
1Max Planck Institute for Polymer Research, Germany;  
2National University of Sciences & Technology, Pakistan.

11:00 AM ES21.12.06  
Electromechanical Response of Few-to-Monolayer SnS PVD-Grown on Flexible Mica  
Naoki Hijishitarumi; The University of Tokyo, Japan.

11:15 AM ES21.12.07  
Intrinsic Energy Conversions for Photon-Generation in Piezo-Phototronic Materials—A Case Study on Alkaline Niobates  
Bolong Huang; The Hong Kong Polytechnic University, Hong Kong.

11:30 AM ES21.12.08  
Implanted Battery-Free Direct-Current Micro-Power Supply from In Vivo Breath Energy Harvesting  
Jun Li; University of Wisconsin-Madison, United States.

11:45 AM ES21.12.09  
Triboelectric Nanogenerators as Soft Power Sources  
Xiong Pu; Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, China.
SESSION ES21.13: Nanogenerators and Piezotronics III
Session Chairs: Qing Yang and Guang Zhu
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 132 C

1:30 PM ES21.13.01
Boosting the Energy Conversion Efficiency of a Combined Triboelectric Nanogenerator-Capacitor
Jin Pyo Lee; Ulsan National Institute of Science and Technology, Korea (the Republic of).

1:45 PM ES21.13.02
A Novel Triboelectric Nanogenerator Based on Electrospun Polyvinylidene Fluoride Nanofibers for Effective Acoustic Energy Harvesting and Self-Powered Multifunctional Sensing
Haiwu Zheng; Henan University, China.

2:00 PM ES21.13.03
Remarkable Output Power Enhancement of Sliding-Mode Triboelectric Nanogenerator Through Direct Metal-to-Metal Contact with the Ground
Jeong Yang; Ulsan National Institute of Science and Technology, Korea (the Republic of).

2:15 PM ES21.13.04
Mechanically Induced Light Generator Based on Doped Piezophotonic Quaternary Oxysulfide
Dengfeng Peng; Shenzhen University, United States.

2:30 PM ES21.13.05
Thermodynamic Approach to Tailor Porosity in Piezoelectric Polymer Fibers for Application in Nanogenerators
Mohammad Mahdi Abolhasani; Max-Planck Institute for Polymer Research, Germany.

2:45 PM ES21.13.06
Modulation of Voltage Profile in Triboelectric Nanogenerator by Printed Ion Gel Capacitors
Ju Hyun Lee; POSTECH, Korea (the Republic of).

3:00 PM BREAK

3:30 PM ES21.13.07
Pumping Charges for Ultrahigh-Performance Triboelectric Nanogenerators at Ambient Conditions
Liang Xu1, 2; Chinese Academy of Sciences, China; 2University of Chinese Academy of Sciences, China.

3:45 PM ES21.13.08
Flexible and Transparent Au Nanoparticle-Embedded Polyethyleneimine/Poly(vinyl alcohol) Matrix for Mechanical Energy Harvesting
Lingyun Wang; City University of Hong Kong, Hong Kong.

4:00 PM ES21.13.09
Stretchable, Transparent and Self-Healing Triboelectric Nanogenerators with Ionic Current Collector
Kaushik Pandya; Nanyang Technological University, Singapore.

4:15 PM ES21.13.10
Triboelectric Charging Characteristics of Two-Dimensional Layered Materials
Minsu Seol; Samsung Advanced Institute of Technology, Korea (the Republic of).

4:30 PM ES21.13.11
Polymer Nano/Micro-Pattern with High Surface Area for Triboelectric Nanogenerator Application
Long-biao Huang; Shenzhen University, China.

4:45 PM ES21.13.12
A Soft and Stretchable Self-Powered Band for Biomechanical Motion Detection and Identity Recognition
Fang Yi; Sun Yat-sen University, China.
Localization with a Twist—Duality Between Configuration Space and Momentum Space in Incommensurate Stacked Layers of 2D Materials

Tony Low; University of Minnesota, United States.

2:30 PM BREAK

3:00 PM *QN01.04.01

Strongly Quantum Confined Excitons in 2D Layered Hybrid Metal Chalcogenolate Multi Quantum Wells

Kaiyuan Yao1, 2, 3; 1University of Wisconsin, Madison, United States; 2Lawrence Berkeley National Laboratory, United States; 3Lawrence Berkeley National Laboratory, United States.

3:15 PM *QN01.04.02

Origin of Antiferromagnetism and Magnetoelectric Effect in CrI3 Bilayers

Di Origin of Antiferromagnetism and Magnetoelectric Effect in CrI3 Bilayers

Francis H. Davies; University of Exeter, United Kingdom.

3:30 PM *QN01.04.03

Calculating Critical Temperatures for Ferromagnetic Order in 2D Materials—The Critical Role of Magnetic Anisotropy

Chull H. Kim; University of California, Berkeley, United States.

4:00 PM *QN01.04.04

Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials—The Critical Role of Magnetic Anisotropy

Steven Louie1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

4:15 PM *QN01.04.05

Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials—Theory, Discovery and Design

Session Chairs: Xiaofeng Qian and Qimin Yan

Wednesday Afternoon, April 24, 2019

PCC North, 100 Level, Room 129 A

4:30 PM *QN01.04.06

High-Throughput Prediction and Charge-Transfer Stabilization of Multidimensional Electrodes

Jack D. Sundberg; University of North Carolina, Chapel Hill, United States.

4:45 PM *QN01.04.07

Defects and Substrate Screening on the Electronic, Optical and Plasmonic Properties of 2D Materials

Woon-Seop Choi; Hoseo University, Korea (the Republic of).

5:00 PM *QN01.04.08

Large-Area Ultra-Clean Dry Transfer of 2D Materials by Spin-Coated Pressure Sensitive Adhesive Polymers

Yong Seok Choi; Seoul National University, Korea (the Republic of).

5:15 PM *QN01.04.09

A CVD-Free Solution Process Synthesis Method for 2D MoS2 Materials

Di OSMO. Chong; Honghe University, Korea (the Republic of).
SESSION QN01.09.08
Size and Strain Effects on Mechanical and Electronic Properties of 2D Green Phosphorene Monolayer and Nanoribbons Xihong Peng; Arizona State University, United States.

SESSION QN01.09.09
Investigating the Exfoliation of Ni-B 2D Sheets from NiZnB MAB Phase Amir Rezaei; University of California, Riverside, United States.

SESSION QN01.09.10
Intercalation-Tuned Chemochromism in 2D Layered MoO3 Bryan P. Moser; University of California, Davis, United States.

SESSION QN01.09.11
Linking DFT Calculations on Hydroxyl Group Concentration with Experimental ALD Growth Mechanics Matthew Lawson; Boise State University, United States.

SESSION QN01.09.12
CO2 Capture and Conversion Chemistry with 2D Layered Materials Calley N. Ends; Brookhaven National Laboratory, United States.

SESSION QN01.09.13
Mechanical and Thermal Properties of Grain Boundary in a Planar Heterostructure of Graphene and Hexagonal Boron Nitride Anran Wei; Shanghai Jiao Tong University, China.

SESSION QN01.09.14
Growth of MoS2 Nanotubes by Chemical Vapor Deposition Using FeO Nanoparticles as Catalysts Takashi Yanase; Hokkaido University, Japan.

SESSION QN01.09.15
Hydrophilic Tannic Acid-Modified WS; Nanosheets for Enhanced Polysulfide Conversion in Aqueous Media Yuheng Tian; University of New South Wales, Australia.

SESSION QN01.09.16
2D Titanium Carbide (MXene)/Silver Nanoparticle Hybrid Material for Highly Sensitive and Selective Surface-Enhanced Raman Scattering Abubakar Mohammad; North Carolina Central University, United States.

SESSION QN01.10: Topological and Nonlinear Optical Properties of 2D Materials
Session Chairs: Xiaofeng Qian and Meng Ye
Thursday Morning, April 25, 2019
8:30 AM *QN01.10.01
Topological Effects in 1D and 2D Materials—Topological Band Engineering, Optical Selection Rules and Excitonic Shift Currents Steven Louie; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.

8:45 AM QN01.10.02
Application of High-Throughput DFT Methods to Low-Dimensional, Topological and Energy-Related Materials Kamal Choudary; National Institute of Standards and Technology, United States.

9:00 AM QN01.10.03
Quantum Nonlinear Ferroic Optical Hall Effect Hao Wang; Texas A&M University, United States.

9:15 AM *QN01.10.04
Optoelectronic Properties of Topological Transition Metal Chalcogenides Ji Peng; Peking University, China.

10:00 AM BREAK

10:30 AM *QN01.10.05
Topological Magneto-Optical Effect and Its Quantization in Noncoplanar Antiferromagnets Yagan Yao; Beijing Institute of Technology, China.

11:00 AM *QN01.10.06
Prediction of 2D Topological Insulators from First-Principles Calculation Hongming Weng; Institute of Physics, Chinese Academy of Sciences, China.

SESSION QN01.11: Defects, Growth, and Phase Transformations in 2D Materials
Session Chair: Li Yang
Thursday Afternoon, April 25, 2019
3:00 PM *QN01.11.01
Defects and Phase Transformations in 2D Materials Ju Li; Massachusetts Institute of Technology, United States.

3:15 PM *QN01.11.02
Phase Polymorphism and Electronic Structures of TeSe2 and Its Ferroelectricity Tekalign Tefha Debela; Institute for Application of Advanced Materials, Jeonju University, Korea (the Republic of).

3:30 PM *QN01.11.03
Supported Two-Dimensional Materials Under Ion Irradiation—The Substrate Governs Defect Production Arkady Krasheninnikov 1, 2, 3; Helmholtz-Zentrum Dresden, Germany; 2Aalto University, Finland.

4:00 PM *QN01.11.04
Effects of Large Strain on the Electronic and Structural Properties of 2D Materials Hélio Chacham; Universidade Federal de Minas Gerais, Brazil.

4:30 PM QN01.11.05
Domain Shape Engineering of CVD Grown Hexagonal Boron Nitride Mohammad W. Malik; Université catholique de Louvain, Belgium.

SESSION QN01.12: Topological and Nonlinear Optical Properties of 2D Materials
II
Session Chairs: Thomas Olsen and Li Yang
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 128 A
1:30 PM QN01.12.01
Engineering New van der Waals Heterostructures—α- and β-Antimonene on α-Bismuthene Pawel J. Kowalczyk; University of Lodz, Poland.

1:45 PM QN01.12.02
First-Principles Prediction of Stable Transition Metal Dichalcogenide Alloys John Cavin; Washington University in St. Louis, United States.

2:00 PM *QN01.12.03
Intrinsic Magnetic Topological Insulators in van der Waals Layer MoBi2T34-Family Materials Yong Xu 1, 2; Tsinghua University, China; 3RIKEN Center for Emergent Matter Science (CEMS), Japan.

2:30 PM BREAK

SESSION QN01.13: Defects, Growth, and Phase Transformations in 2D Materials
Session Chair: Li Yang
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 128 A
3:00 PM *QN01.13.01
Defects and Phase Transformations in 2D Materials Ju Li; Massachusetts Institute of Technology, United States.

3:30 PM QN01.13.02
Phase Polymorphism and Electronic Structures of TeSe2 and Its Ferroelectricity Tekalign Tefha Debela; Institute for Application of Advanced Materials, Jeonju University, Korea (the Republic of).

3:45 PM QN01.13.03
Supported Two-Dimensional Materials Under Ion Irradiation—The Substrate Governs Defect Production Arkady Krasheninnikov 1, 2, 3; Helmholtz-Zentrum Dresden, Germany; 2Aalto University, Finland.

4:00 PM *QN01.13.04
Effects of Large Strain on the Electronic and Structural Properties of 2D Materials Hélio Chacham; Universidade Federal de Minas Gerais, Brazil.

4:30 PM QN01.13.05
Domain Shape Engineering of CVD Grown Hexagonal Boron Nitride Mohammad W. Malik; Université catholique de Louvain, Belgium.

SESSION QN01.14: Novel 2D Materials and Their Physical and Chemical Properties
Session Chairs: Thomas Olsen and Qimin Yan
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 128 A
8:30 AM *QN01.14.01
Novel 2D Semiconductors—Effects of p-Element Chemistry and Electrical Polarization Emmanouil Kipounakis; University of Michigan, United States.
9:00 AM QN01.14.02
Binary Compound Bilayer with Vertical Polarizations—Two-Dimensional Ferroelectrics, Multiferroics and Nanogenerators Menghao Wu; Huazhong University of Science and Technology, China.

9:15 AM QN01.14.03
Giant Spin Hall Effect in Two-Dimensional Monochalcogenides Jagoda Slawinska; University of North Texas, United States.

9:30 AM QN01.14.04
Theoretical Investigations on Structural Stability of Two-Dimensional Ultrathin Films in Group III-V Materials Toru Akiyama; Meine University, Japan.

9:45 AM QN01.14.05
Understanding Axis-Dependent Conduction Polarity in Goniopolar Layered Metals from *Ab Initio* Informed Tight Binding Theory Yaxian Wang; The Ohio State University, United States.

10:00 AM BREAK

10:30 AM *QN01.14.06
Black Phosphorus and Beyond Li Yang1, 2; 1Washington University, United States; 2Washington University, United States.

11:00 AM QN01.14.07
Understanding Electrons in Flat Land for Electronic and Energy Applications Yuanxue Liu; The University of Texas at Austin, United States.

11:15 AM QN01.14.08
Exceptional Points in Energy Spectrum of Magnetic Materials Alexey Galkin1, 2; 1University of Chicago, United States; 2Argonne National Laboratory, United States.

11:30 AM QN01.14.09
MXene-Based Electrode with Tunable Catalytic Activity for Oxygen Reduction/Evolution Reaction in Lithium-Air Batteries Alireza Ostadhossein; Stanford University, United States.

11:45 AM QN01.14.10
Bond Saturation Significantly Enhances Thermal Energy Transport in Two-Dimensional Pentagonal Materials Zeyu Liu; University of Notre Dame, United States.

SESSION QN01.15: Thermal Properties of 2D Materials
Session Chairs: Yuanxue Liu and Xiaofeng Qian
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 128 A

1:45 PM QN01.15.01
Anharmonic Coalescence and Decay Contributions in Raman Linewidths of 2D Transition-Metal Dichalcogenides Gyaneshwar P. Srivastava; University of Exeter, United Kingdom.

2:00 PM QN01.15.02
Molecular Dynamics Study of 2D Ferroelastic Materials Using Machine-Learning Force Fields Yang Yang1, 2; 1Texas A&M University, United States; 2Xi’an Jiaotong University, China.

2:15 PM QN01.15.03
Anomalous Interlayer Vibrations in Strongly Coupled Layered PDs: Alexander Purzótsk; Oak Ridge National Laboratory, United States.

2:30 PM BREAK

SESSION QN01.16: Advanced Synthesis and Characterization of 2D Materials
Session Chairs: Yuanxue Liu and Xiaofeng Qian
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 128 A

3:00 PM QN01.16.01
First-Principles Theory of Nonlinear Optical Responses in 2D Materials Xiaofeng Qian; Texas A&M University, United States.
Defects in crystalline solids are ubiquitous. It is the second law of thermodynamics that gives rise to the appearance of a certain amount of disorder in crystalline materials at finite temperatures. Moreover, defects can be present in synthetic materials well above the equilibrium concentration due to the imperfections in material production processes or due to the exposure of the system to irradiation with energetic particles. Such lattice imperfections have a strong influence on the electronic, magnetic, optical, thermal, and mechanical properties of the solids, normally deteriorating their characteristics. However, defects do not always have detrimental effects on material properties, with the most prominent example being the doping of semiconductors by controllable introduction of impurities using ion implantation.

All of the above is relevant to two-dimensional (2D) materials, such as graphene and hexagonal boron nitride, or transition metal dichalcogenides (TMDs). It is intuitively clear that due to the reduced dimensionality the defects should have a much stronger influence on the properties of 2D materials, as compared to their bulk counterparts. Moreover, due to the morphology of 2D systems, it is much easier to introduce defects into them in a controllable manner and add new functionalities. Furthermore, the experimental realization of ferromagnetism at the monolayer level in 2D van der Waals materials beyond graphene has drawn a great deal of research interest in the recent past. In addition, these materials have exciting prospects for next generation low-power ultra-compact spintronic applications. This tutorial will review the recent developments in the rapidly growing field of defects and magnetic properties of a broad spectrum of 2D materials through a combination of theoretical and sensitive experimental approaches, and will immensely benefit scientists at all the levels.

1:30 PM
Defects in 2D Materials – Theory
Arkady V. Krasheninnikov; Helmholtz-Zentrum Dresden-Rossendorf

In this tutorial, Krasheninnikov will present the "state of the art" in the physics of defects in two-dimensional (2D) inorganic materials with the main focus on the theoretical developments. The computational and analytical methods used in theoretical physics to get insights into defect behavior will be briefly summarized, and then the effects of impurities and point/line defects on various properties of 2D inorganic materials will be addressed. He will further discuss defect- and impurity-mediated engineering of the electronic structure of inorganic 2D materials. He will also present the results of the theoretical studies of electronic-atom peak defects in 2D transition metal dichalcogenides (TMDs) when electric charge, mechanical strain and vacancies are present.

2:30 PM BREAK

3:00 PM
Defects in 2D Materials – Electron Paramagnetic Resonance Spectroscopy
André Stesmans; KU Leuven

In this tutorial, Stesmans will deal with some basic principles and methodology of the electron paramagnetic resonance (EPR) spectroscopy, outlining it as a reliable 'magnetic' technique based on non-destructively sensing of unpaired electrons, which is successfully applied in a broad range of scientific fields. Next, the attention will be directed to its application in tracing the nature of point defects, both intrinsic as well as of impurity related nature, in 2D semiconducting materials. In an exploring attitude, the latter include bulk TMD's, both of geological origin as well synthetically composed, where the research is focused on robust p-type doping by covalently bonded impurities. It will be outlined how EPR can arrive at in-depth reliable characterization of these dopants, including solid atomic identification, accurate quantification, spatial distribution, and inference of electrically key properties such as their thermal activation energy, and a fortiori, defect level(s) in the semiconductor bandgap. In combination with its outstanding selectivity, EPR takes a unique position when it comes to selectively dopant characterization on true atomic level. A separate part will deal with intrinsic defects in synthetic large-area 2D TMD layers deposited on dielectrics, where intrinsic point defects are revealed as an inherent aspect, and hence performance degrading, of current state-of-the-art fabrication methods. Main attention here will go to identification and quantification of defects, and monitoring of their behavior and stability under thermal load.

4:00 PM
Magnetic Properties in 2D Materials
Roland Kawakami; The Ohio State University

Kawakami will cover some of the advances for both the intrinsic 2D magnets and extrinsic magnetism in 2D materials with dilute magnetic doping. With the goal of getting participants up to speed on this fast moving topic, the tutorial will blend a number of experimental and theoretical concepts in the topics of sample fabrication and characterization, exchange coupling in intrinsic and extrinsic magnetic systems, considerations for stability of magnetic order in 2D systems, electric field control of magnetism, spin transport in magneto-tunnel junctions, and prospects for future science and applications.
1:30 PM *QN02.03.01

2:00 PM QN02.03.02
Line Defects in Two-Dimensional Transition Metal Dichalcogenides—Insights from First-Principles Calculations Arkady Krasheninnikov1, 2; 1Helmholtz-Zentrum Dresden, Germany; 2Aalto University, Finland.

2:15 PM QN02.03.03
Defect-Induced Phase Transformation in Low-Symmetry 2D Materials for High Performance Electronics Kai Xiao; Oak Ridge National Laboratory, United States.

2:30 PM BREAK

3:00 PM *QN02.03.04
Interfacial and Defect Engineering of 2D Materials for Optoelectronics Ashwin Ramasubramaniam; University of Massachusetts Amherst, United States.

3:30 PM QN02.03.05
In Situ Study of Defects Produced in Free-Standing MoS2 During Irradiation Kory Burns; University of Florida, United States.

3:45 PM QN02.03.06
Interlayer Couplings in Tuning Magnetic Properties of Two-Dimensional Materials Wei Ji; Renmin University of China, China.

4:00 PM QN02.03.07
Contact-Free Electrical-Acoustic Characterization of Transition Metal Dichalcogenide Films Grown by Chemical Vapor Deposition Ludwig Bartels; University of California, Riverside, United States.

4:15 PM QN02.03.08
Adhesion of Pd Metal Clusters to WTe2—Binding at the Ideal and Defective Lattice Sites Peter V. Sushko; Pacific Northwest National Laboratory, United States.

4:30 PM QN02.03.09
Tuning the Interlayer Properties of van der Waals Heterostructures with Substrate Surface Defects—van der Waals to Covalent Bonding Transformation Se-Yang Kim; UNIST, Korea (the Republic of).

4:45 PM QN02.03.10
Atomic Structure, Stacking Order and Electronic Structure of Two-Dimensional III-VI Alloys Armin Araz; 1, 2; 1Department of Physics, University of California at Berkeley, United States; 2Kavli Energy NanoScience Institute, University of California at Berkeley, United States.

SESSION QN02.04: Magnetic and Electronic Properties in 2D Materials
Session Chairs: Kenneth Burch, Jian-Hao Chen, Danielle Hickey and Ashwin Ramasubramaniam
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 128 B

8:00 AM *QN02.04.01
Understanding Properties of Advanced Two-Dimensional Materials Based on Low-Voltage Atomic Scale TEM Experiments Ute Kaiser; University of Ulm, Germany.

8:30 AM *QN02.04.02
Properties of Monolayer Vanadium Dichalcogenides Grown by Molecular Beam Epitaxy Matthias Batzill; University of South Florida, United States.

9:00 AM QN02.04.03
Magnetic Characterizations of Proton Irradiated van der Waals Magnet CrS1-xTeXs Luis M. Martinez; The University of Texas at El Paso, United States.

9:15 AM QN02.04.04
Magnetic Frustration and Antiferromagnetism in Saw-Tooth Lattice Mn2Si3-xSex (x = 0 - 4) Chalcogenides Harikrishnan S. Nair; The University of Texas at El Paso, United States.

9:30 AM *QN02.04.05
Magnetism and Chemical Disorder in van der Waals Bonded Crystals Michael McGuire; Oak Ridge National Laboratory, United States.

10:00 AM BREAK

10:30 AM *QN02.04.06
Gate-Tunable Room-Temperature Ferromagnetism in Two-Dimensional FeGeTe2 Yujun Deng; Fudan University, China.

11:00 AM *QN02.04.07
Critical Behavior and Magnetocaloric Effect in CrI3 and Cr2Ge2Te6 Yu Liu; Brookhaven National Laboratory, United States.
SESSION QN02.08: Poster Session: Defects, Electronic and Magnetic Properties in Advanced 2D Materials Beyond Graphene
Session Chairs: Srinivasa Rao Singamaneni and Andre Stesmans
Wednesday Afternoon, April 24, 2019
5:00 PM – 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

**QN02.08.01**
Electron Spin Resonance Properties of Cr$_2$ and CrCl$_3$ Single Crystals
*Christian Saiz*
University of Texas at El Paso, United States.

**QN02.08.02**
Magnetic Properties of Proton Irradiated van der Waals Fe$_2$GeTe$_3$
*Rubiann Olmos*
The University of Texas at El Paso, United States.

**QN02.08.03**
Solution-Processable Method for Producing High-Quality Reduced Graphene Oxide Displaying ‘Self-Catalytic Healing’
*Geonhee Lee*, $^{1,2}$ *Korea Research Institute of Chemical Technology, Korea (the Republic of); Sangkyunkwan University, Korea (the Republic of).*

**QN02.08.04**
Synthesis of Amorphous 2D Metal Oxides and Hybrid Organic-Inorganic Films
*Sean Martens*
University of North Carolina at Chapel Hill, United States.

**QN02.08.05**
Oliveite Mn$_{1-x}$Si$_x$O$_{2}$—Magnetic Frustration and Spin-Flop Transition in Triangular Sawtooth Lattice
*Raju Baral*
The University of Texas at El Paso, United States.

**QN02.08.06**
Magnetic Instabilities in Low-Dimensional C$_{4+x}$Mg$_x$Ta$_2$O$_6$ Trirutile
*Cristian Rueda*
The University of Texas at El Paso, United States.

**QN02.08.07**
Defect Dominated Trion Dynamics in Monolayer WS$_2$
*Paul D. Cunningham*
U.S. Naval Research Laboratory, United States.

**QN02.08.08**
Electrical Conductivity of Stabilized Bilayer Graphene
*Jesús R. González Martínez*
Universidad de Sonora, Mexico.

**QN02.08.09**
Grain Growth in Nanocrystalline MoS$_2$—An Experimental and Computational Investigation
*Aman Haque*
The Pennsylvania State University, United States.

**QN02.08.10**
A Novel 2D Material—Long-Range Ferrimagnetic Order in a Two-Dimensional Supramolecular Kondo Lattice
*Thomas A. Jung*, $^{1,2}$ *Paul Scherrer Institute, Switzerland; Swiss Nanoscience Institute, Univ. Basel, Switzerland.*

**QN02.08.11**
Role of Non-Covalent Interactions in Tuning Magnetic Properties of Two-Dimensional Materials
*Wei Ji*
Remnin University of China, China.

**QN02.08.12**
Disentangling the Oxygen and Water Vapor Effects on Optoelectronic Properties of Monolayer WS$_2$
*Sanjini Nanavakkara*
National Renewable Energy Laboratory, United States.

**QN02.08.13**
Transferable Polymeric Carbon Nitride/Nitrogen-Doped Graphene Films for Solid-State Optoelectronics
*Ruitao Lv*
Tsinghua University, China.

**QN02.08.14**
Long Valley Relaxation Time of Free Carriers in Monolayer WSe$_2$
*Siyuan Yang*
The University of Hong Kong, Hong Kong.

**QN02.08.15**
Probing the Exciton k-Space Dynamics in Monolayer Tungsten Diselenides
*Siyuan Yang*
The University of Hong Kong, Hong Kong.

**QN02.08.16**
On the Electronic Properties of 2D Transition Metal Carbides and Nitrides (MXenes)
*Kanit Hantanasirisuk*
Drexel University, United States.

**QN02.08.17**
Control of MXenes’ Electronic Properties Through Termination and Interfacialization
*James L. Hart*
Drexel University, United States.

SESSON QN02.09: TEM, Theory, Growth and Other Physical Properties of 2D
Session Chairs: Yujun Deng, Danielle Hickey, Srinivasa Rao Singamaneni and Andre Stesmans
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 128 B

8:00 AM *QN02.09.01
Defect Enhanced SERS from Graphene-Gold Modified Substrates for Molecular Detection
*Balakrishna Ananthapadmanabhan*
The University of Manchester, United Kingdom.

8:15 AM *QN02.09.02
Tungsten Disulfide (WS$_2$)—Hexagonal Nanosheets—Surfactant-Free Synthesis, Characterization and Applications
*Poonam Sharma*
HIT Kharagpur, India.

8:30 AM *QN02.09.03
Using Transmission Electron Microscopy to Explore Atomic Structure in 2D Materials
*Alex Zettl*, $^{1,2}$ *University of California, Berkeley, United States; Lawrence Berkeley National Laboratory, United States.*

9:00 AM *QN02.09.04
Cathodoluminescence and Low Loss Electron Energy Loss Spectroscopy at the Interface of Lateral Confined Mo$_x$S$_{2-x}$/WS$_2$ Heterostructures
*Sandhya Susarla*, $^{1,2}$ *Rice University, United States; Université Paris-Sud, France.*

9:15 AM *QN02.09.05
The Electronic Structure Underlying the Electrochemistry of 2D Materials
*Yuanyue Liu*
The University of Texas at Austin, United States.

9:30 AM *QN02.09.06
Direct Picometer-Scale Characterization of Dopants and Defect Structures in 2D Materials Using Electron Pychography
*David Muller*
Cornell University, United States.

10:00 AM BREAK

10:30 AM *QN02.09.07
The Colorful Palette of 2D-Materials—Shapes, Tints and Defects from the First Principles
*Boris I. Yakobson*
Rice University, United States.

11:00 AM *QN02.09.08
Controlled Polymorph Transition of Molybdenum Disulfide by Carbon Monoxide Induced Sulfur Vacancy
*Ji Yong Kim*
Seoul National University, Korea (the Republic of).

11:15 AM *QN02.09.09
Magnetic Properties of Proton Irradiated MnSi/Tes Single Crystals
*Christian Saiz*
The University of Texas at El Paso, United States.

SESSON QN02.10/QN01.11/QN03.12: Keynote: Joint Session: Materials Science with Two-Dimensional Atomic Layers
Session Chair: Deep Jariwala
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 A

11:30 AM *QN02.10.01/QN01.11.01/QN03.12.01
Materials Science with Two-Dimensional Atomic Layers
*Pulickel Ajayan*
Rice University, United States.
1:30 PM *QN02.11.01
Antiferromagnetic van der Waals Materials TMPS3 and Its Potentials
Je-Geun Park; Seoul National University, Korea (the Republic of).

2:00 PM QN02.11.02
Photoluminescence as an Indication of Hydro-Desulfurization Catalytic Actives on the Surface of Monolayer Direct Bandgap MoS2
Koichi Yamanaka; University of California, Riverside, United States.

2:15 PM QN02.11.03
Surface Termination Dependent Work Function and Electronic Properties of TiC2T, MXene Thorsten Schultz; Humboldt University Berlin, Germany.

2:30 PM BREAK

3:00 PM *QN02.11.04
Epitaxial Growth of Transition Metal Dichalcogenides—The Route to Wafer-Scale Single Crystal Monolayers
Jeon M. Redwing1, 2; 1The Pennsylvania State University, United States; 2The Pennsylvania State University, United States.

3:15 PM QN02.11.05
Ionic Layer Epitaxy Growth of Two-Dimensional Zinc-Oxide with Exotic Electronic Properties
Carlos Corey; University of Wisconsin–Madison, United States.

3:45 PM QN02.11.06
Growth and Characterization of Monolayer WSe2-Hybrid Thin-Film Heterostructures for Spintronics
Nguyen M. Vu; University of Michigan, United States.

4:00 PM QN02.11.07
Bulk Properties of van-der-Waals Hard Ferromagnet VI3
Suhan Son1, 2; 1Institute of Basic Science, Korea (the Republic of); 2Seoul National University, Korea (the Republic of).

4:15 PM QN02.11.08
Mobility Fluctuation Induced Linear Positive Magnetoresistance in 2D Semiconductor Bi2O2Se Nanoplates
Peng Li1, 2; 1University of Waterloo, Canada; 2King Abdullah University of Science and Technology, Saudi Arabia.

4:30 PM QN02.11.09
Optical Phonon Coherent Oscillations in Single Layer MoS2
Chiara Trovatello1, 2, 4; 1Politecnico di Milano, Italy; 2Université Catholique de Louvain, Belgium; 4University of Cambridge, United Kingdom.

SYMPOSIUM QN03

2D Materials—Tunable Physical Properties, Heterostructures and Device Applications
April 22 - April 26, 2019

Symposium Organizers
Victor Brar, University of Wisconsin-Madison
Deep Jariwala, University of Pennsylvania
SungWoo Nam, University of Illinois at Urbana-Champaign
Ursula Wurstbauer, Technical University of Munich

Symposium Support
Accurion Inc.
attocube systems AG
MilliporeSigma
CreaTec GmbH, represented by Sentys Inc.

* Invited Paper

SESSION QN03.01: Resistive Memory, Neuromorphic and Other Electronic Devices
Session Chair: Deep Jariwala
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 129 A

9:30 AM QN03.01.01
Novel Synaptic Memory Device Based on 2D TMDC Materials for Neuromorphic Computing
Min-Hyun Lee1, 2; 1Samsung Advanced Institute of Technology, Korea (the Republic of); 2Samsung Advanced Institute of Technology, Korea (the Republic of).

9:45 AM QN03.01.02
Synergistic Gating of Electro-Iono-Photoactive 2D Chalcogenide Neuristors—Co-Existence of Hebbian and Homeostatic Synaptic Metaplasticity
Rohit A. John; Nanyang Technological University, Singapore.

10:00 AM BREAK

10:30 AM *QN03.01.03
Two-Dimensional Charge-Density-Wave Materials—Unique Properties and Potential Applications
Alexander A. Balandin; University of California, United States.

11:00 AM QN03.01.04
Single-Layer Neuromorphic MoS2 Memtransistors Fabricated by Helium Ion Beam Irradiation
Jakub P. Jadwiszczak1, 2; 1Centre for Research on Adaptive Nanostructures and Nanodevices, Ireland; 2Advanced Materials and BioEngineering Research Centre, Ireland.

11:15 AM *QN03.01.05
Recent Progress on 2D Monolayer Memory Devices
Deji Akinwande; The University of Texas at Austin, United States.

11:45 AM QN03.01.06
Power Dissipation at Interfaces in Monolayer Transition Metal Dichalcogenides
Akshay A. Murthy1, 2; 1Northwestern University, United States; 2Northwestern University, United States.

SESSION QN03.02: Synthesis and Scalable, Large Area Devices I
Session Chairs: Deep Jariwala and SungWoo Nam
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 129 A

1:30 PM *QN03.02.01
Tuning Physicochemical Properties of MoS2 by Mechanical Strain
Xiaolin Zheng; Stanford University, United States.

2:00 PM *QN03.02.02
Towards Unifying Principles in Liquid Exfoliation of Various Layered Crystals
Claudia Bueken; Heidelberg University, Germany.

2:30 PM BREAK
Germanium- and Tin Chalcogenides—Growth, Heterostructure Formation, Devices, Nanoscale Light-Matter Interactions

Exfoliation From Epitaxy to Science and Processing Technologies of Two-Dimensional Electromagnetic Response of Large-Area Graphene Films

Novel Two-Dimensional Materials from High-Throughput Computational Devices, Nanoscale Light-Matter Interactions

What Limits the Intrinsic Carrier Mobility of Two-Dimensional Metal Chalcogenides? A.W. Holleitner; Technical University-Munich, Germany.

High Throughput Computational Exfoliation Nicola Marrari, EPFL, Switzerland.

Enhancement and Control of Circularly Polarized Emission in Monolayer Heterogeneous WS2 with a Plasmonic Chiral Metasurface Wei-Hsiang Lin; California Institute of Technology, United States.

Photoluminescence Enhancement at Heterojunction in WS2-MoS2 Lateral Heterostructures Revealed by Tip Enhanced Optical Spectroscopy Andrey Kravey; Horiba Scientific, United States.

Optically Active Defects in Tunable 2D Materials A.W. Holleitner; Technical University-Munich, Germany.


Optically Active Defects in Tunable 2D Materials A.W. Holleitner; Technical University-Munich, Germany.

Double Indirect Interlayer Exciton in a MoSe2/WSe2 van der Waals Heterostructure Berend Jonker; Naval Research Laboratory, United States.

Sub 10nm Localized Thinning of Atomic Layers WS2 Through Sulfurization Using Precursor-Soluble Substrates Ravi K. Biroju; University of Oxford, United Kingdom.

Solution Processed Transition Metal Dichalcogenides for Printed Electronics Applications Joe Neilson; The University of Manchester, United Kingdom.

Deterministic Folding of 2D Materials for Electronic Device Applications Huan Zhai; University of Southern California, United States.

Graphene–Si–Graphene Bipolar Junction Transistor with Tunable Gain Zhe Liu; University of Michigan–Ann Arbor, United States.

2D Materials as Emerging Sensing Platforms Suman Singh; CSIR-CSIO, India; AcSR-CSIO, India.

An Investigation of Carrier Mobility in MoS2 Grown by Chemical Vapour Deposition in a 300mm Reactor Emma Coleman; Tyndall National Institute, Ireland.

Self-Limiting Growth of High-Quality 2D Monolayer MoS2 by Direct Sulfurization Using Precursor-Soluble Substrates Yang Lu; University of Oxford, United Kingdom.

Tunable Plasmons in Few-Layer Graphene Anti-Dot Lattices Kaci L. Kuntz; University of North Carolina at Chapel Hill, United States.

Tuesday Afternoon, April 23, 2019

Session Chairs: Deep Jariwala, SungWoo Nam and Ursula Wurstbauer

Session Chair: Xiaofeng Qian

2:00 PM *QN03.05.03
Light Emitting Optoelectronic Devices Based on van der Waals Heterostructures Gwan-Hyoung Lee; Yonsei University, Korea (the Republic of).

3:00 PM QN03.05.04
Emerging Photoluminescence from MoS2–MoSe2, MoS2–MoSe2 and MoS2–WS2 Layered Semiconductor Atomic Layers Davi K. Birgou; University of Birmingham, United Kingdom.

4:15 PM QN03.05.07
High Photoreponsivity Ultrathin Lateral Stacking WS2—Graphene Photodetectors Made by Direct CVD Growth Tongxin Chen; University of Oxford, United Kingdom.

4:30 PM *QN03.05.08
Double Indirect Interlayer Exciton in a MoSe2/WSe2 van der Waals Heterostructure Berend Jonker; Naval Research Laboratory, United States.

Tuesday Morning, April 23, 2019

Session Chairs: Victor Brar, Deep Jariwala, SungWoo Nam and Ursula Wurstbauer

SESSION Chair: Xiaofeng Qian

10:30 AM *QN03.03.01
From Epitaxy to Science and Processing Technologies of Two-Dimensional InSe van der Waals Crystals D.A. Patane; University of Nottingham, United Kingdom.

11:00 AM QN03.03.02
Hexagonal Boron Nitride as a Buffer Layer in Monolayer Molybdenum Disulfide Transistors Alexander L. Mazzoni; University of Maryland, United States; U.S. Army Research Laboratory, United States.

11:15 AM QN03.03.03
What Limits the Intrinsic Carrier Mobility of Two-Dimensional Metal Dichalcogenides? Yuanyue Li; The University of Texas at Austin, United States.

SESSION QN03.04: Keynote: Joint Session: Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation

11:30 AM *QN03.04.01/QN01.02.01/QN02.02.01
Novel Two-Dimensional Materials from High-Throughput Computational Exfoliation Nicola Marrari, EPFL, Switzerland.

SESSION QN03.05: Photonic Properties and Devices I

1:30 PM QN03.05.01
Enhancement and Control of Circularly Polarized Emission in Monolayer Heterogeneous WS2 with a Plasmonic Chiral Metasurface Wei-Hsiang Lin; California Institute of Technology, United States.

SESSION QN03.06: Poster Session I: 2D Materials-Tunable Physical Properties, Heterostructures and Device Applications

1:30 PM QN03.06.01
Sub 10nm Localized Thinning of Atomic Layers WS2: Through In Situ STEM/TEM Yi-Tang Tseng; National Chiao Tung University, Taiwan.

1:30 PM QN03.06.02
Solution Processed Transition Metal Dichalcogenides for Printed Electronics Applications Joe Neilson; The University of Manchester, United Kingdom.

2:00 PM *QN3.06.03
Deterministic Folding of 2D Materials for Electronic Device Applications Huan Zhai; University of Southern California, United States.

2:00 PM *QN3.06.04
Graphene–Si–Graphene Bipolar Junction Transistor with Tunable Gain Zhe Liu; University of Michigan–Ann Arbor, United States.

2:00 PM *QN3.06.05
2D Materials as Emerging Sensing Platforms Suman Singh; CSIR-CSIO, India; AcSR-CSIO, India.

2:00 PM *QN3.06.06
An Investigation of Carrier Mobility in MoS2 Grown by Chemical Vapour Deposition in a 300mm Reactor Emma Coleman; Tyndall National Institute, Ireland.

2:00 PM *QN3.06.07
Self-Limiting Growth of High-Quality 2D Monolayer MoS2 by Direct Sulfurization Using Precursor-Soluble Substrates Yang Lu; University of Oxford, United Kingdom.

2:00 PM *QN3.06.08
Tunable Plasmons in Few-Layer Graphene Anti-Dot Lattices Kaci L. Kuntz; University of North Carolina at Chapel Hill, United States.
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QN03.10.18
Achieving High Open-Circuit Voltage and Temporal Stability in Graphene/Silicon Photovoltaic Cells with h-BN Tunneling Layer  
Chen Wang; University of Illinois at Chicago, United States.

QN03.10.19
2D MoS2—Rapid Growth and Advanced Opto-Electronic Devices  
Kazi Islam; Tulane University, United States.

QN03.10.20
Passivation of Black Phosphorus using Plasma-Enhanced Atomic Layer Deposition High-k Dielectrics  
Katherine Price1, 2; 1Duke University, United States; 2U.S. Army Research Laboratory, United States.

QN03.10.21
Anomalous Valley-Selective Optical Stark Effect in Monolayer WS2; Paul D. Cunningham; U.S. Naval Research Laboratory, United States.

QN03.10.22
Investigation of Reduced Graphene Oxide Reduced by Fruit Peel Extracts for Conductive Ink Applications  
Tasitake Ohta; Sandia National Laboratories, United States.

QN03.10.23
Converse Flexoelectric MoS2 Thin-Film Actuator  
Hyung Jong Bae; University of Illinois at Urbana-Champaign, United States.

QN03.10.24
Sub-Surface Imaging of Atomically-Thin Semiconductors Beneath Dielectrics Based on Optical Standing Wave Using Photoemission Electron Microcopy with Deep-Ultraviolet Photoexcitation  
Vitchayas Niyomnaitham; International School of Engineering (ISE), Faculty of Engineering, Chulalongkorn University, Thailand.

QN03.10.25
Study of the Electrical Disorder Sources in Transferred CVD Graphene  
Oun Se; University of Minnesota, United States.

QN03.10.26
Unique Stacking Configurations in Bilayer Ribbons Grown on Monolayer Grain Boundaries by Chemical Vapor Deposition  
Yiling Yu; Oak Ridge National Laboratory, United States.

QN03.10.27
2D Electrides and Their Use in Atomically Thin Heterostructures  
Daniel Drukl; University of North Carolina at Chapel Hill, United States.

QN03.10.28
Fabricating Waveguide Patterns for Rapid Optoelectronic Evaluation of TMD Material Integration  
Michelle Wurch; University of California, Riverside, United States.

QN03.10.29
Structure and Properties of High-Mobility MoTe2-x Phases  
Anumma Singha; Arizona State University, United States.

QN03.10.30
Novel Memories with Graphene Ferroelectric Field-Effect Transistors—Up-Scaling and Practicality  
Kamal Asadi; Max-Planck Institute for Polymer Research, Germany.

QN03.10.31
Spatially Resolved Solid-State Reduction of Graphene Oxide Thin Films  
Kamal Asadi; Max-Planck Institute for Polymer Research, Germany.

QN03.10.32
Effects of Conductive Polymer Composite Layering on EMI Shielding During Additive Manufacturing  
Eugene Zakhar; U.S. Army Research Laboratory, United States.

QN03.10.33
Disentangling the Effects of Curvature and Interlayer Spacing on Na Storage in Rippled Multilayered Graphene  
Weivi Zhang; University of California, Riverside, United States.

QN03.10.34
Piezoelectric Energy Harvesting by Large-Area Two-Dimensional Nanomaterials  
Ann R. Sebastian; The University of Texas at San Antonio, United States.

QN03.10.35
Large Conductivity Increase in Strained MoS2 via MEMS Actuation  
Aldo I. Vidana; The University of Texas at El Paso, United States.

QN03.10.36
Investigating the Assembly of 2D Crystals from Amorphous Nanoparticles with In Situ Laser Processing within the TEM  
Chenze Liu1, 2; 1Oak Ridge National Laboratory, United States; 2University of Tennessee, United States.

QN03.10.37
Excellent Metal-Free SERS Platforms  
Yue-Chi Wang; Department of Chemical and Materials Engineering, Taiwan.

QN03.10.38
Temperature Dependent Current-Voltage Characteristics of Pt/MoS2 Schottky Junction  
Neetika; Indian Institute of Technology Roorkee, India.

QN03.10.39
The Evidence of Phase Transition from 1T Phase to 2H Phase of Vanadium Diselenide  
Dian Li; University of Hong Kong, Hong Kong.

QN03.10.40
Synthesis of High-Crystalline Bulk MoS2 Controlling the Gas Flow  
Jeonghun; Sungkyunkwan University, Korea (the Republic of).

QN03.10.41
Gate-Controlled Photovoltaic Effect of Black Phosphorus/WS2 Heterojunction  
Dohyun Kwak; Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea (the Republic of).

SESSION QN03.11: Synthesis and Scalable Large Area Devices II
Session Chairs: Deep Jariwala and SungWoo Nam
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 A

8:00 AM QN03.11.01
Ultrahard Diamond Film from Epitaxial Two-Layer Graphene  
Filippo Cellini; New York University, United States.

8:15 AM QN03.11.02
High-Bias Characterization of Single-Crystalline WTe2 Nanobelts for Future Nanoscale Interconnects  
Seunguk Song; Ulsan National Institute of Science and Technology (UNIST), Korea (the Republic of).

8:30 AM QN03.11.03
Suppressing the Growth of Out-of-Plane 3D Structures During Plasma Enhanced Atomic Layer Deposition of 2D WS2  
Shashank Balasubramaniam; Eindhoven University of Technology, Netherlands.

8:45 AM QN03.11.04
Layered Perovskite Nanofiber Heterojunctions with Tailored Diameter to Enhance Photocatalytic Water Splitting Performance  
Roland Marschall; University of Bayreuth, Germany.

9:00 AM *QN03.11.05
Designer Synthetic 2D Materials—The Cases of Xenes and Anisotropic MoS2  
Alessandro Molle; CNR-IMM, Italy.

9:30 AM *QN03.11.06
Vapor-Phase Anneal Intercalation for the Rational Design of Photonic Nanosheet Sensors  
Bettina V. Lotsch1, 2; 1Max Planck Institute for Solid State Research, Germany; 2University of Munich (LMU), Germany.

10:00 AM BREAK

10:30 AM QN03.11.07
Pulsed Laser Deposition Conversion of 2D Transition Metal Dichalcogenides to Form Alloys and Vertical Heterojunctions  
Yu-Chuan Lin; Oak Ridge National Laboratory, United States.

10:45 AM *QN03.11.08
Enabling Flexible 2D Materials Through Laser Transformation  
Nicholas Glavin; Air Force Research Laboratory, United States.

11:15 AM QN03.11.09
Band Gap and Interface Engineering of Atomic Layered Semiconductors  
Anlian Pan; Hunan University, China.
11:30 AM *Q03.12.01/Q03.11.01/Q02.10.01 Materials Science with Two-Dimensional Atomic Layers Pulickel Ajayan; Rice University, United States.

SESSION Q03.13: Photonic Properties and Devices II
Session Chair: Victor Brar
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 129 A

1:30 PM *Q03.13.01 Electronic, Thermal, and (Some) Unusual Applications of 2D Materials Eric Pop; Stanford University, United States.

2:00 PM *Q03.13.02 Emerging Device Applications of 2D Materials Lake Sweatlock; Northrop Grumman Aerospace Systems, United States.

2:30 PM BREAK

3:00 PM Q03.13.03 Colloidal β-InSe, Monolayer Nanosheets and Their High Photoresponsivity Sandeep Ghosh; The University of Texas at Austin, United States.

3:15 PM *Q03.13.04 Advanced Optoelectronics Based on Active Metasurfaces Yu Yao; Arizona State University, United States.

3:45 PM Q03.13.05 Heterogeneous Exciton Engineering of Two-Dimensional Materials on 3D Wrinkle Architectures Jin Myung Kim; University of Illinois at Urbana-Champaign, United States.

4:00 PM *Q03.13.06 Anisotropic 2D Layered Materials: Photonic, Plasmonic and Phononic Properties from Visible to Infrared Frequencies Koray Aydin; Northwestern University, United States.

4:30 PM Q03.13.07 Pressure Dependence of Direct Optical Transitions in Layered ReS2 and ReSe2; Magdalena Laurien; McMaster University, Canada.

4:45 PM Q03.13.08 Mechanically Crumpled All-2D Material Photosensor for Enhanced Photosensitivity Juyoung Leem; University of Illinois at Urbana-Champaign, United States.

SESSION Q03.14: Electronic Properties and Devices II
Session Chairs: Mandar Deshmukh and Deep Jariwala
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 129 A

8:00 AM Q03.14.01 Two-Dimensional Elemental Materials—Fundamentals to Applications Sumeet Walia; RMIT Univ, Australia.

8:15 AM Q03.14.02 Ionic Substrate Effects on Graphene Karen Long; Naval Surface Warfare Center, United States.

8:30 AM Q03.14.03 Scanning Tunneling Microscopy and Spectroscopy of Wet Chemically Synthesized Porous Graphene Nanoribbons Kathryn Parsons; University of Illinois at Urbana-Champaign, United States.

8:45 AM Q03.14.04 Barkhausen Effects in the First Order Structural Phase Transition in Type-II Weyl Semimetal MoTe2 Jian-Hao Chen; Peking University, China.

SESSION Q03.15: Mechanical Properties and Opto-Electromechanical Effects
Session Chairs: Deep Jariwala and SungWoo Nam
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 129 A

1:30 PM Q03.15.01 Strain Tuning of Band Alignments in van der Waals Heterostructures Chulkee Cho; University of Illinois at Urbana-Champaign, United States.

1:45 PM Q03.15.02 Capillary Origami with Atomically Thin Sheets Maritha A. Wang; University of Chicago, United States.

2:00 PM Q03.15.03 4D STEM Study of Au-Induced Epitaxial Strain in Few- and Monolayer MoS2 Clarissa M. Towle1, 2; 1Lawrence Berkeley National Laboratory, United States; 2University of California, Berkeley, United States.

2:15 PM Q03.15.04 Photoreponse in h-BN Encapsulated Bilayer Graphene Field-Effect Phototransistor Teerayut Uwanno1, 2; 1The University of Tokyo, Japan; 2King Mongkut's Institute of Technology Ladkrabang, Thailand.

2:30 PM Q03.15.05 Fast Graphene Photodetector with Responsivity >106 A/W Kausik Majumdar; Indian Institute of Science, Bangalore, India.
The tutorial will give an overview of some unresolved theoretical and experimental problems in the field of nanoscale thermal transport. Particular attention will be devoted to the outstanding questions and techniques aimed at understanding non-diffusive transport regimes at the nanoscale where the Fourier law breaks down. The main goal of this tutorial is to present our current understanding of these issues, and give some ideas how to move forward.

In the first part of the tutorial, Prof. Philip B. Allen will discuss when and why the Boltzmann transport theory for phonons fails, and present its possible extensions to the nanoscale. He will also discuss the outstanding issue of defining and measuring the local temperature.

In the second part, Prof. David G. Cahill will provide an overview of what is known and not known in the physics of thermal transport at the nanoscale with an emphasis on experimental studies of materials and their interfaces at temperatures near ambient. In particular, he will discuss the breakdown of the diffusion equation at small spatial and temporal scales.

8:30 AM
Heat Transport – Fundamentals and Theory for Nanoscale Philip B. Allen; Stony Brook University, The State University of New York

Crystals have quasiparticle excitations: electrons, holes, phonons, magnons, etc. These particles are “normal modes” of excitation. They have energy $E_k$, where $k$ “labels” the mode (wave vector $k$, branch index $n$, and possibly other indices like spin). They also have velocities, $v_k=v_fk/dk$. In equilibrium, the number of particles in mode $k$ is given by the Fermi-Dirac or Bose-Einstein distribution $n_k$. If the system is out of equilibrium, the number of particles in mode $k$ is $N_k$. These modes all transport heat if the system is out of equilibrium. The heat current is the sum of $v_kn_k$. Therefore, the fundamental object of study is the nonequilibrium distribution $N_k-n_k$. The usual method for studying this is the Boltzmann transport equation (BTE). What are the important issues? (1) When and why can the BTE fail? (2) How should the BTE be extended to work for nanoscale heat sources? (3) How is the local temperature defined and measured? None of these questions is fully answered. Partial answers will be discussed. The discussion will focus on heat carried by vibrations in insulators. There are three reasons motivating this choice. (A) Phonons have very diverse mean free paths. Many insulators have lower frequency phonon modes with long mean free paths which can exceed the dimensions of heating elements or measuring probes. These provide interesting challenges to theory and experiment. (B) Phonon quasiparticle modes are easier to deal with in one important sense. At higher temperatures, quantum aspects fade out, and classical ideas, including classical molecular dynamics simulation, become powerful tools. (C) Amorphous and other disordered insulators have vibrational normal modes of diverse character that can be modeled theoretically (for example, in the “propagan/diffuson/locon” picture). Heat conduction in metals is also important, but the dominant electron and hole carriers of heat are less diverse. They are easy to treat in “conventional” crystalline metals, and hard to treat in “exotic” metals.

10:00 AM BREAK

10:30 AM
Current Understanding and Unsolved Problems in Thermal Transport at the Nanoscale David G. Cahill; University of Illinois at Urbana-Champaign

On length scales large compared to the mean-free-paths and equilibration lengths of the excitations that carry heat, the diffusion equation is an accurate description of the relationship between temperature fields and heat fluxes. On small spatial and temporal scales, this simple description fails due to i) scattering and finite transmission of excitations at boundaries; ii) out-of-equilibrium distributions of heat carriers that are induced by heat flow across material interfaces; and iii) non-equilibrium between phonons, electrons, and magnons. In this tutorial lecture, I will provide an overview of what is known and not known in the physics of thermal transport at the nanoscale with an emphasis on experimental studies of materials and their interfaces at temperatures near ambient.

11:00 AM
A Multi-Temperature Model for Non-Equilibrium Thermal Transport Xiulin Ruan; Purdue University, United States.

11:15 AM
Specular Reflection Creates Lowest Thermal Phonon Conductivity Martin Maldovan; Georgia Institute of Technology, United States.

11:30 AM
Phonon Heat Conduction and Nanoscale Disorder—from Scattering to Localizations Sebastian Volz; CNRS–University of Tokyo, Japan.

1:30 PM
Far-Field Submicron Thermoreflectance Imaging Ali Shakouri; Purdue University, United States.

2:00 PM
Pre-Interface Phonon Scattering Effect in Thermal Transport Across Solid Interfaces Ruiyang Li; University of Notre Dame, United States.

2:15 PM
Predicting the Phonon Mode-Resolved Specularity Parameter Using the Atomistic S-Matrix Method Zhun-Yong Ong; Institute of High Performance Computing, Singapore.
Imaging of Magnetic Materials Using Picosecond Heat Pulses
Jiayue Yang; Shandong University, China.

Transport Properties

Quasiparticle Thermometry in Nonequilibrium Systems

Time-Resolved Magneto-Thermal Microscopy—High-Resolution Dynamic Imaging of Magnetic Materials Using Picosecond Heat Pulses
Gregory Fuchs; Cornell University, United States.

3:30 PM *QN04.03.01
Time-Resolved Magneto-Thermal Microscopy—High-Resolution Dynamic Imaging of Magnetic Materials Using Picosecond Heat Pulses
Gregory Fuchs; Cornell University, United States.

3:30 PM *QN04.03.02
Spin-Lattice Dynamics Calculations of Phonon-Magnon Coupling in Bulk Magnetic Materials
Joseph Cooke; University of Pennsylvania, United States.

4:00 PM QN04.03.03
Effect of External Magnetic Field on Electron-Phonon Coupling and Transport Properties
Xiaoye Yang; Shandong University, China.

4:30 PM *QN04.03.04
Quasiparticle Thermometry in Nonequilibrium Systems
Xiaoqin E. Li; University of Texas at Austin, United States.

SESSION QN04.04: Poster Session: Nanoscale Heat Transport
Session Chairs: Olivier Delaire and Ivana Savic
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN04.04.01
Thermal Conductivity Characterization by Means of Scanning Thermal Microscopy—Impact of Sample Properties
Pierre-Olivier Chapuis; Univ Lyon, CNRS, INSA-Lyon, Université Claude Bernard Lyon, France.

QN04.04.02
Characterization of 2D Surface Acoustic Waves in Silicon Gratings via Time-Domain Thermoreflectance (TDTR)
Yee Rui Koh; University of Virginia, United States.

QN04.04.03
Effects of Ultrafast Structural Dynamics on the Accuracy of Transient Debye-Waller Temperature Measurements
Elisha VandenBussche; University of Minnesota, United States.

QN04.04.04
Correlating Coherent Structural Dynamics to Photoexcited Charge-Carrier Behaviors Using Femtosecond Electron Imaging
Daniel Du; University of Minnesota Twin Cities, CEMS, United States.

QN04.04.05
Thermal Transport in Holey Silicon Membranes Investigated with Optically-Induced Transient Thermal Gratings
Ryan A. Duncan; Massachusetts Institute of Technology, United States.

QN04.04.06
Theory of Anisotropic Thermal Interface Resistance in Nanocomposite Materials
Jarwerth O. Thomas; University of Exeter, United Kingdom.

QN04.04.07
Impact of Irradiation Induced Nanoscale Defects on Thermal Conductivity of Cerium Dioxide
Vinay S. Chauhan; The Ohio State University, United States.

QN04.04.08
Multiscale Thermal and Electrical Modeling of CMOS Devices and Circuits
Robin L. Daugherty; Arizona State University, United States.

QN04.04.09
Graphene Composites for Thermal and Electromagnetic Shielding Applications—Performance Below and Above Percolation Thresholds
Fariborz Kargar; Phonon Optimized Engineered Materials (POEM) Center, Department of Electrical and Computer Engineering, Materials Science and Engineering Program, Bourns College of Engineering, University of California, Riverside, United States.

QN04.04.10
Fine-Tuning the Acoustic Phonon Spectrum in Bulk Crystals via Incorporation of the Size-Dissimilar Substitutional Dopant Atoms—Brillouin—Mandelstam Spectroscopy Study
Jiayue Yang; Shandong University, China.

QN04.04.11
Electron-Phonon Coupling in Metal Contacts—Two-Temperature Molecular Dynamics Simulations
Henry Aller; Carnegie Mellon University, United States.

QN04.04.12
Extending the Lattice Boltzmann Phonon Transport Towards the Ballistic Regime
Natalia Bedoya Martinez; Materials Center of Leoben, Austria.

QN04.04.13
Thermal Conductivity of CuSn
Scott N. Schiffles; Binghamton University, United States.

QN04.04.14
Uncovering Phonon Transport Mechanisms Underneath Nanoscale Heat Sources
Hossein Homayar1, 2; 1University of Colorado Boulder, United States; 2University of Colorado Boulder, United States.

QN04.04.15
Thermal Conductivity of Perovskite-Structured Superlattices from First-Principles Calculations
Qi Zhang; Missouri University of Science and Technology, United States.

QN04.04.16
Controlling Thermal and Electrical Properties of Composites Using Percolating Network of Nanowires with Fusible Tips
Konrad Rykaczewski; Arizona State University, United States.

QN04.04.17
Magnon and Phonon Dispersion, Lifetime and Thermal Conductivity of Iron from Spin-Lattice Dynamics Simulations
Zeyu Liu; University of Notre Dame, United States.

QN04.04.18
Normal Modes for Thermal Transport
Anant Raj; North Carolina State University, United States.

QN04.04.19
Implementation of the Hydrodynamic Heat Transport Model for Complex Geometries Using Finite Elements
Albert Beardo Ricol; Universitat Autònoma de Barcelona, Spain.

QN04.04.20
Effect of Intrinsic and Extrinsic Defects on Phonon Heat Transfer in Nanostructured Metals
Peter V. Sushko; Pacific Northwest National Laboratory, United States.

QN04.04.21
Thermal Transport Across Rough Interfaces—A Finite-Difference Time-Domain Study
Laleh Avazpour; University of Wisconsin-Madison, United States.

QN04.04.22
Thermal Conductivity of Small-Angle Misoriented Bilayer Graphene
Chenyang Li; University of California, Riverside, United States.

QN04.04.23
Spatial Mapping of Thermal Boundary Conductance at Interfaces of Metal and 2D Materials
Satish Kumar; Georgia Institute of Technology, United States.

QN04.04.24
The Influence of Interfacial Structure and Strain Energy on Phonon Transport
Riley C. Hanus; Northwestern University, United States.

QN04.04.25
Study of Phonon Transport in GaN Thin Films Using Boltzmann Transport Equations
Nitish Kumar; Georgia Tech, United States.
Session Chairs: Patrick Hopkins and Barry Zink
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 A

8:00 AM *QN04.05.01
Emergence of Hydrodynamic Phenomena in Collective and Kinetic Regimes
F. Xavier Alvarez; Universitat Autonoma de Barcelona, Spain.

8:30 AM QN04.05.02
Role of Normal Scattering for Thermal Resistance in Phonon Hydrodynamics
Sanjeev Lee; University of Pittsburgh, United States.

8:45 AM QN04.05.03
Hydrodynamic Transport and Thermal Energy Dissipation
Fabian Menges; University of Colorado Boulder, United States.

9:00 AM *QN04.05.04
Phonon Dynamics in Disordered Nanostructures—A Chaos Perspective
Irena Knezevic; University of Wisconsin-Madison, United States.

9:30 AM BREAK

10:00 AM QN04.05.05
Engineering Heat Transport in Nanoparticle-in-Alloy Composites—The Role of Mie Scattering
Joseph P. Feser; University of Delaware, United States.

10:15 AM QN04.05.06
Prominent Localization of Phonons and Strong Deviation to Matthiessen's Scattering Rule Introduced by Dislocation
Ben Xu; Tsinghua University, China.

Session Chairs: F. Xavier Alvarez and Irena Knezevic
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 A

10:30 AM *QN04.06.01
In-Plane Heat and Charge Transport in sub-100 nm Thin Films—Surprises from Nanotubes to Magnetic Alloys
Jolly Zink; University of Denver, United States.

11:00 AM QN04.06.02
Unexpected High Inelastic Phonon Transport Across Solid-Solid Interface—Modal Nonequilibrium Molecular Dynamics Simulations and Landauer Analysis
Tianli Feng; Purdue University, United States.

11:15 AM QN04.06.03
Interfacial Scattering in Boltzmann Transport Simulations of Phonons
Alex Greeney; University of California, Riverside, United States.

11:30 AM *QN04.06.04
Ultrafast Electron-Phonon and Plasmon Scattering Effects in Metals, Non-Metals and Interfaces Probed with Tunable Wavelength Sub-Picosecond Pulses
Patrick Hopkins; University of Virginia, United States.

Session Chairs: George Fytas and Austin Minnich
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 A

1:30 PM *QN04.07.01
Chiral Phonons in Two-Dimensional Materials
Liya Zhang; Nanjing Normal University, China.

2:00 PM QN04.07.02
Symmetry-Driven Phonon Chirality and Transport in 1D Materials
Lucas Lindsay; Oak Ridge National Laboratory, United States.

2:15 PM QN04.07.03
Topological Origins of the Inverse Dependence of the Thermal Conductivity on Temperature of Crystalline and Non-Crystalline Solid States Above Approximately 50 K
Caroline S. Gorham; Carnegie Mellon University, United States.
3:30 PM *QN04.08.01

Exploring the Upper Limits of Thermal Conductivity in Molecular Crystals

Austin J. Minnich; California Institute of Technology, United States.

4:00 PM QN04.08.02

Phonon Lifetimes in the Molecular Crystal α-RDX

Gaurav Kumar; University of Maryland, United States.

4:15 PM QN04.08.03

Chain Rotation Significantly Reduces Thermal Conductivity of Single-Chain Polymers

Hao Ma; Cornell University, United States.

4:30 PM *QN04.08.04

Recent Applications of Brillouin Light Scattering Spectroscopy to the Study of Thermomechanical Properties of Nanostructured Soft Materials

George Fytas1, 2; 1Max Planck Institute for Polymer Research, Germany; 2IESL-FORTH, Greece.

8:30 AM *QN04.09.01

Visualizing Coherent Phonon Dynamics with Femtosecond Electron Imaging

David Flannigan; University of Minnesota Twin Cities, United States.

9:00 AM QN04.09.02

Temperature-Dependent Thermal Diffuse Scattering Measurements Using Scanning Transmission Electron Microscopy

Geoffrey Wehmeier1, 2; 1University of California, Berkeley, United States; 2Rice University, United States.

9:15 AM QN04.09.03

Nanoscale Thermal Transport Through Silicon Nanoengineered Metalattices Probed Using Coherent EUV Beams

Begona Abad Mayor; JILA - CU Boulder, United States.

9:30 AM *QN04.09.04

Ultrafast X-Ray Scattering Measurements of Electron-Phonon and Phonon-Phonon Coupling

David Reis; Stanford University, United States.

10:00 AM BREAK

10:30 AM *QN04.10.01

Accurate Thermal Conductivities of Complex, Strongly-Anharmonic Solids from First Principles

Christian Carbogno; Fritz-Haber-Institute of the Max-Planck-Society, Germany.

11:00 AM QN04.10.02

Selective Breakdown of Phonon Quasiparticles Across Superionic Transition in CuCrSe2 and AgCrSe2

Olivier Delaire; Duke University, United States.

11:15 AM QN04.10.03

New Thermal Transport Regime for Partial-Crystalline Partial-Liquid Materials

Ming Hu; University of South Carolina, United States.

11:30 AM QN04.10.04

Influence of Ferroelectric Phase Transition on Thermal Properties of GeTe

Djordje Dangic3, 1; 1Tyndall National Institute, Ireland; 3University College Cork, Ireland.
9:15 AM QN04.13.03
Uncertainty Quantification of First-Principles Predictions of Phonon Dispersion and Harmonic Vibrational Properties Holden Parks; Carnegie Mellon University, United States.

9:30 AM QN04.13.04
Monitoring Heat Generation and Dissipation in Semiconductor Nanocrystals Using Femtosecond Stimulated Raman Spectroscopy Samantha Harvey; Northwestern University, United States.

9:45 AM QN04.13.05
Phonon Properties of Confined Thin Films Predicted from a Two-Dimensional Lattice Dynamics Framework Hyun-Young M. Kim; Carnegie Mellon University, United States.

10:00 AM BREAK

SESSION QN04.14: Quasi-Ballistic and Super-Diffusive Transport
Session Chairs: Ivana Savic and Ilaria Zardo Friday Morning, April 26, 2019 PCC North, 100 Level, Room 124 A

10:30 AM *QN04.14.01
Advanced Characterisation of Quasiballistic/Superdiffusive Semiconductor Thermal Transport with Random Flight Frameworks Bjorn Vermeersch; imec, Belgium.

11:00 AM QN04.14.02
Unraveling a New Heat Transport Regime at the Nanoscale Giuseppe Barbalinardo; University of California, Davis, United States.

11:15 AM QN04.14.03
Sub-Continuum Air Conduction Measurement Between Si Plates with Surface Features Mohammad Ghashami; University of Utah, United States.

11:30 AM *QN04.14.04

SESSION QN04.15: Near- and Far-Field Radiation
Session Chairs: Renkun Chen and Bjorn Vermeersch Friday Afternoon, April 26, 2019 PCC North, 100 Level, Room 124 A

1:30 PM *QN04.15.01
Scanning Thermal Microscopy—Probing Temperature and Heat Dissipation Down to the Few-Nanometers Scale Pierre-Olivier Chapuis; CNRS - INS A Lyon, France.

2:00 PM QN04.15.02
Thermal Transport Across Nanoscale Vacuum Gaps—Insights From Lattice Dynamics Calculations Combined with Ab Initio Force Constants Merahvia Sammy; *Univer sité de Lyon, CNRS, UCBL, ILM, France; †CNRS, France.

2:15 PM QN04.15.03
Far-Field Coherent Thermal Emission from Polaritonic Resonance in Individual Anisotropic Nanoribbons Sunmi Shin; University of California, San Diego, United States.

2:30 PM QN04.15.04

2:45 PM QN04.15.05
Near-Field Radiative Heat Transfer Measurements Between a Sphere and a Substrate—Large Temperature Differences, Geometrical Effects and Materials Christophe Lucchesi; CNRS, CETHIL, INS A Lyon, France.

3:00 PM BREAK
This two-part (theoretical and experimental) afternoon tutorial will dive into topics related to: (1) lattice dynamics and phonon thermal transport calculations and (2) measurements of thermal transport that inform our understanding of underlying phonon behaviors. This tutorial is meant to provide background of state-of-the-art theoretical and experimental techniques used to describe thermal transport in materials.

1:30 PM
Theoretical and Numerical Aspects of Phonon and Lattice Transport Calculations
Lucas R. Lindsay; Oak Ridge National Laboratory

Dr. Lucas Lindsay will cover some of the underlying techniques and challenges of describing lattice thermal transport via Peierls-Boltzmann equation methods coupled with density functional theory. A brief discussion of the development and application of these tools will be given, followed by a deeper dive into the numerics involved and highlights of progress toward addressing current challenges (e.g., temperature and disorder).

3:00 PM BREAK

3:30 PM
Techniques and Challenges Associated with Thermal Transport Measurements Spanning Different Length and Time Scales
Amy Marconnet; Purdue University

Dr. Amy Marconnet will provide an introduction to thermal transport measurement techniques spanning a range of length and time scales. A brief discussion of recent key experimental results that have guided our understanding of phonon transport will be emphasized. Open challenges in the field will be highlighted.
SESSION QN05.04: Thermal Management—High Thermal Conductivity Materials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 124 B

1:30 PM *QN05.04.01
Molecular Engineered Polymer with High Thermal Conductivity Gang Chen; Massachusetts Institute of Technology, United States.

2:00 PM *QN05.04.02
Unconventional Thermal Transport David Broide; Boston College, United States.

2:30 PM QN05.04.03
Four-Phonon Scattering-Dominated Linewidth of Optical Phonons Xiulin Ruan; Purdue University, United States.

2:45 PM QN05.04.04
Developing Ultrahigh Thermal Conductivity Materials—Boron Arsenide and Boron Phosphide Yongjie Hu; University of California, Los Angeles, United States.

3:00 PM BREAK

SESSION QN05.05: Thermal Management—Nanostructures and Phase-Change Cooling
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 124 B

3:30 PM *QN05.05.01
Inverse Opal Nanostructures for Thermal Management Kenneth Goodson; Stanford University, United States.

4:00 PM QN05.05.02
Phase Change Heat Transfer Augmentation Using Soft Materials Konrad Bykaczewski; Arizona State University, United States.

4:15 PM QN05.05.03
Spectral Selective Rigid Cover for Integrated Solar Heating and Radiative Cooling System Gang Pei; University of Science and Technology of China, China.

4:30 PM *QN05.05.04
Nanoeengineered Materials for Enhancing Liquid Vapor Phase Change Evelyn Wang; Massachusetts Institute of Technology, United States.

SESSION QN05.06: Poster Session: Emerging Thermal Materials—From Nanoscale to Multiscale Thermal Transport, Energy Conversion, Storage and Thermal Management
Session Chair: Yongjie Hu
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

Q05.06.01
A Framework for Continuum Simulations of Interfacial Phase Change Processes Anirban Chandra; Rensselaer Polytechnic Institute, United States.

Q05.06.02
High-Performance Solution-Processed TiN/SiO2 Selective Absorbers for Solar Thermophotovoltaic Energy Conversion Yang Li; The Hong Kong University of Science and Technology, Hong Kong.

Q05.06.03
Tunable Thermal Transport and Reversible Thermal Conductivity Switching in Topologically Networked Bio-Inspired Materials John A. Tomko; University of Virginia, United States.

Q05.06.04

Q05.06.05
A Multi-Scale and Multi-Physics Simulation of the Thermal Runaway in Large-Format Lithium-Ion Batteries Jiajun Xu; University of the District of Columbia, United States.

Q05.06.06
Lone-Pair Electrons Induced Anomalous Enhancement of Thermal Transport in Strained Planar Two-Dimensional Materials Ming Hu; University of South Carolina, United States.

Q05.06.07
Effect of Functionalized Boron Nitride on Mechanical and Thermal Properties for Thermoplastic Polyurethane Composites Md Golam Rashed; University of Illinois at Chicago, United States.

Q05.06.08
RF Magnetron Sputtered AZO/Ag/AZO Multilayer Electrode for Transparent and Flexible Thin-Film Heater Sangram K. Pradhan; Norfolk State University, United States.

Q05.06.09
Synergetic Effects of Boron Nitride Alignment and Xylitol Crystals in a Thermally Conductive Composite Marjan Kashifipour; University of Akron, United States.

Q05.06.10
Van der Waals Confinement Enhances Phonon Transport by Reducing Atomic Thermal Displacement Magnitudes Xiaoxiang Yu; Huazhong University of Science and Technology, China.

Q05.06.11
Effect of Pressure on Thermal Conductivity of Oxide Glasses Jihui Nie; Rensselaer Polytechnic Institute, United States.

Q05.06.12
Electrical, Optical and Thermal Properties of Different Metal Doped Zinc Oxide Thin Film for Flexible Transparent Heater Jasmine Beckford; Norfolk State University, United States.

Q05.06.13
Thermal Conductivity Tuning in Drilling Fluid by Bentonite Functionalization SungHyeon Hong; Chung-Ang University, Korea (the Republic of).

Q05.06.14
Thermal Properties of Binary Filler Composites with Graphene and Boron Nitride Sahar Nadjibi; University of California, United States.

Q05.06.15
Phononic Topological Insulators Based on Six-Petal Holey Silicon Ziqi Yu; University of California, Irvine, United States.

Q05.06.16
Reconfigurable Emissivity Control by Crumpled Graphene for Radiative Thermal Management Anirudh Krishna; University of California, Irvine, United States.

Q05.06.17
Understanding Thermal Transport of Gold Nanorods In Vitro for Photothermal Cancer Therapy Andrew P. Kelliher; University of Virginia, United States.
Anisotropic Thermal Conductivity in the Polycrystalline Environmental Barrier Coating γ-Y2Si2O7: David Olson; University of Virginia, United States.

Tunable Functionality of High Entropy Carbide Thin Films via Carbon Stoichiometry: Christina Root; University of Virginia, United States.

Observation of Second Sound in Graphite At Temperatures Up to 100 K: Ryan A. Duncan; Massachusetts Institute of Technology, United States.

Mitigation of Point-Contact Thermal Boundary Resistance in Elastomeric Composites Through Liquid Metal-Bridged Tungsten Fillers: Wilson Kong; Arizona State University, United States.

Nanoscale Thermal Transport in Lithiated Si Anode Films: Azat Abdullaev; Nazarbayev University, Kazakhstan.

Solid-Solid Phase Change Composite for Thermal Energy Harvesting and Storage: Waseem Aftab; Peking University, China.

Radiative Cooling Device Design Boosted by Machine Learning: Guo Jiang; The University of Tokyo, Japan.

Modeling Thermal Resistance Across Contacting Interfaces Including Surface Characteristics: Seshu Nimmala; Lam Research Corporation, United States.

Formation of Three-Dimensional Segregated Network of Nanofillers for Epoxy Composites of High Thermal Conductivity: Sung-Ryong Kim; Korea National University of Transportation, Korea (the Republic of).

Reducing Thermal Conductivity Through Lattice Softening: Riley C. Hanus; Northwestern University, United States.

Design of Microporous Copper Inverse Opal Wicks for Capillary-Driven Boiling: Chi Zhang; Stanford University, United States.

Role of Gallium Oxide on Thermal Performance of Liquid Metal Droplet Based Thermal Interface Materials: Wilson Kong; Arizona State University, United States.

Modeling of a Water-Harvesting Thermal Battery with a NIPAAm Hydrogel Sorbent: Jordan Kocher; Arizona State University, United States.

Advanced Building-Envelope Component Materials for Optimal Energy Retrofitting Measures of Office Building Facades: Tiyasa Ray; Arizona State University, United States.

Design and Optimization of the Advanced Silica Nanofiber Insulator Material Properties via Coarse-Grain Molecular Dynamics Simulation Method: Gorakh Pawar; Idaho National Laboratory, United States.

Energy Conversion Using Ferroelectric Properties of Barium Titanate: Mariana Verdugo1, 2; 1University of California, Berkeley, United States; 2University of Minnesota Twin Cities, United States.

Effects of Chemical Intercalation, Strain and Phase Transition on Thermal Transport in Bulk and Single-Layer MoS2: Shunda Chen; University of California Davis, United States.

Magneto-Thermal Transport Behavior in Ferromagnetic and Semiconductor Thin Films: Anand Katailiha; University of California, United States.

Quasi-Ballistic Thermal Transport in Amorphous Silicon Using Transient Grating Spectroscopy: Taeyong Kim; California Institute of Technology, United States.

Investigation on Thermal Conductivity of BaS Monolayer—A First-Principles Study: Zhongyong Wang; Arizona State University, United States.

Thermal Conductivity Mapping of High-Entropy Carbides and Diborides: Jeffrey Braun; University of Virginia, United States.

Measuring Ballistic Thermal Resistance within a Nanoslot-Patterned Si Thin Film: Fabian Medina; University of Arizona, United States.

Ab Initio and Multiscale Simulations of Phonon Spectral Transport in High Thermal Conductivity Materials and Interfaces: Huuduy Nguyen; University of California, Los Angeles, United States.

Experimental Study of Solar Thermophotovoltaic Energy Conversion Enhanced with Selective Metafilm Coatings: Ryan McBurney; Arizona State University, United States.

In Situ Thermal-Mechanical Diagnostics and Extreme-Condition Transport for Battery Thermal Management: Huuduy Nguyen; University of California, Los Angeles, United States.

Metasurface Filter Made of Plasmonic Nanodisk Array for Enhancing Thermophotovoltaic Energy Conversion: Rajagopalan Ramesh; Arizona State University, United States.

Experimental Observation of Ultrahigh Thermal Conductivity in Boron Arsenide: Joon Sang Kang; University of California, Los Angeles, United States.

Tunable Metafilms and Metasurfaces Based on Thermochromic VO2 for Dynamic Control of Infrared Thermal Emission: Linshuang Long; Arizona State University, United States.

Phonon Scattering Effects in the Thermal Conductivity Reduction of Ion Irradiated Diamond: Ethan A. Scott; University of Virginia, United States.
SESSION QN05.08: Novel Thermal Functionalities in Materials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 124 B

10:15 AM *QN05.08.01
Conveyor-Belt Entropy Transport In Weyl Semimetals—A New Concept for All-Solid-State Heat Switches Joseph P. Heremans; The Ohio State University, United States.

10:45 AM QN05.08.02
Two-Channel Thermal Transport in Ordered-Disordered Superionic Ag2Te and Its Traditionally Contradictory Enhancement by Nanotwin Boundary Ming Hu; University of South Carolina, United States.

11:00 AM QN05.08.03
Giant Caloric Effects in Fast-Ion Conductors—A Promising Route for Ambient Solid-State Cooling Claudio Cazorla; The University of New South Wales, Australia.

11:15 AM QN05.08.04
High Switching Ratio Thermal Switch Using a Peltier Couple Mark A. Verosky; The Ohio State University, United States.

11:30 AM QN05.08.05
Cross Interface Model for Thermal Transport through Cross Contact Xiaoxi Yu; Huazhong University of Science and Technology, China.

11:45 AM QN05.08.06
Re-Thinking the Rules for Negative Thermal Expansion from First Principles—The Case Of PbTiO3 Ethan T. Ritz; Cornell University, United States.

SESSION QN05.09: Ultrafast Thermometry and Metrology
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 B

1:30 PM *QN05.09.01
Ultrafast Thermometry by the Magneto-Optic Kerr Effect David Cahill; University of Illinois at Urbana-Champaign, United States.

2:00 PM QN05.09.02
Thermal Transport Across Organic-Inorganic Heterojunctions Through Supercritical- and Atomically-Resolved Temperature Monitoring of Vibration Modes Yee Kan Koh; National University of Singapore, Singapore.

2:15 PM QN05.09.03
Anisotropic Thermal Conductivity Measurement Using a New Asymmetric-Beam Time-Domain Thermoreflectance (AB-TDTR) Method Man Li; University of California, Los Angeles, United States.

2:30 PM BREAK

3:30 PM QN05.09.04
Fully Non-Contact Measurement of Thermal Transport in Novel Nanomaterials Measured by Extreme Ultraviolet Beams Travis D. Frazer¹, ²; JILA, United States; ²University of Colorado Boulder, United States.

3:45 PM QN05.09.05
Record-Low and Anisotropic Thermal Conductivity of Quasi-1D Bulk ZrTes Single Crystal Tianli Feng; Oak Ridge National Laboratory, United States.

SESSION QN05.10: Thermal Properties of 2D Materials and Nanostructures
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 124 B

4:00 PM *QN05.10.01
Lattice and Electronic Thermal Transport in h-BN/graphene/h-BN Heterostructures, Boron Arsenide Bulk Crystals, and Silicon Germanium Nanowires Li Shi; The University of Texas at Austin, United States.

4:30 PM QN05.10.02
Electrical and Thermal Transport Properties of Micron-Size Crystals Of Topological Kondo Insulator, Samarium Hexaboride (SmB6) Narayan Poudel; Idaho National Laboratory, United States.

4:45 PM QN05.10.03
Giant Enhancement in Rashba Spin-Seebeck Effect in NiFe/p-Si Thin Films Ravindra G. Bhardwaj; University of California, Riverside, United States.

SESSION QN05.11: Thermal Interface Materials, Multi-Carrier Transport and Couplings
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 124 B

8:00 AM QN05.11.01
Nanoscale Simulation of Self Heating and Thermal Crosstalk in 3D finFET Architectures Bjorn Vermeersch; imec, Belgium.

8:15 AM QN05.11.02
Understanding the Lattice Thermal Conductivity and Lorenz Number in Tungsten from First Principles Wu Li; Shenzhen University, China.

8:30 AM QN05.11.03
Non-Cured Thermal Interface Materials with High Graphene Loading Sahar Naghibi; University of California, United States.

8:45 AM QN05.11.04
Strong Phonon Anharmonicity of Type-I Clathrate Compounds Masato Ohnishi; The University of Tokyo, Japan.

9:00 AM QN05.11.05
Coherent Acoustic Phonon Generation, Propagation and Application on Imaging Grain Boundary via Time-Domain Brillouin Spectroscopy Yuzhe Wang; Ohio State University, United States.

9:15 AM QN05.11.06
Giant Effect of Spin-Lattice Coupling on the Thermal Transport in Two-Dimensional Ferromagnetic CrI3 Ming Hu; University of South Carolina, United States.

9:30 AM *QN05.11.07
Multi-Carrier Thermal Coupling at Heterogeneous Interfaces Timothy S. Fisher; University of California, Los Angeles, United States.

10:00 AM BREAK

10:30 AM *QN05.12.01
Sensitivity Analysis and Property Computation in Nanoscale Thermal Transport Jayathi Y. Murthy; University of California, Los Angeles, United States.

11:00 AM QN05.12.02
Deducing Phonon Modes from Atomistic Simulations Jacob Eapen; North Carolina State University, United States.

11:15 AM QN05.12.03
Unconventional Impact of Thermal Phonon Coupling in Film-On-Substrate Systems Kartik S. Kothari; Georgia Institute of Technology, United States.

11:30 AM QN05.12.04
3D Silicon Meta-Lattices with Low Thermal Conductivity and Bulk Electrical Transport Disha Talreja; The Pennsylvania State University, United States.

11:45 AM QN05.12.05
Engineered Particle-Particle Contacts for High Thermal Conductivity Soft Polymer Composites Konrad Rykaczewski; Arizona State University, United States.
SESSION QN05.13: Laser Processing and Ultrafast Diagnostics
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 124 B

1:30 PM *QN05.13.01
Laser Processing and Ultrafast Probing of Atomic Layer Films Costas Grigoropoulos; University of California, Berkeley, United States.

2:00 PM QN05.13.02
Studying Nanoscale Thermal Transport with Extreme Ultraviolet Transient Gratings Alexei Maznev; University of Trento, Italy.

2:15 PM QN05.13.03
Thermal Nano-Imaging and Spectroscopy with Local Scanning Probes Fabian Menges; University of Colorado Boulder, United States.

2:30 PM QN05.13.04
Measuring Nanoscale Hotspots with Individual Luminescence Nanoparticles Andrea Pickel; University of California, Berkeley, United States.

2:45 PM QN05.13.05
Nanothermometry and Nanocharacterization in Scanning Thermal Microscopy—Approach Curves and Temperature Jumps at Contact Ali Alkwardi; CNRS - INS A Lyon, France.

3:00 PM BREAK

SESSION QN05.14: Thermal Materials for Batteries, Buildings and Wearable Applications
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 124 B

3:30 PM QN05.14.01
Decoupling Phononic and Electron Temperatures in Thermionic Power Converters Nicki Hogan; Texas A&M University, United States.

3:45 PM QN05.14.02
Efficient Thermolectric Module for Wearable Application Amin Nozarashmaz; The Pennsylvania State University, United States.

4:00 PM QN05.14.03
Nanoporous Metal Films by Electrodeposition Through Partially Disordered Block Copolymer Templates Joseph S. Katz; Stanford University, United States.

4:15 PM QN05.14.04
Interfacial Defect Vibrations Enhance Thermal Transport in Amorphous Multilayers with Ultrahigh Thermal Boundary Conductance Ashutosh Giri; University of Virginia, United States.

4:30 PM *QN05.14.05
Thermally Insulating and Optically Clear Mesoporous Silica Monoliths Laurent Flais; 1, 2, 3University of California, Los Angeles, United States; 4University of California, Los Angeles, United States; 5University of California, Los Angeles, United States.

9:00 AM QN05.15.03
Ultra-Narrowband Wavelength-Selective Thermal Emitter and Absorber with Multi-Layered Metamaterials Designed by Bayesian Optimization Atsushi Sakurai; 1, 2Niigata University, Japan; 3National Institute for Materials Science, Japan.

9:15 AM QN05.15.04
Poruous Polyethylene Coatings with Fluid-Mediated Optical Switching—A Diverse Platform for Optical and Thermal Regulation Jyotirmoy Mandal; Columbia University, United States.

9:30 AM QN05.15.05
A Thermal and Mechanical Study of Pristine and Loaded Metal Organic Framework Thin Films Mallory E. DeCoster; 1, 2University of Virginia, United States; 3Johns Hopkins University Applied Physics Lab, United States.

9:45 AM QN05.15.06
Increasing Thermal Conductivity in Colloidal Nanocrystal Solids by Ligand Cross-Linking Zhenyong Wang; Arizona State University, United States.

10:00 AM BREAK

SESSION QN05.16: Thermal Management for Multi-Devices
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Morning, April 26, 2019
PCC North, 100 Level, Room 124 B

10:30 AM *QN05.16.01
Modeling and Measurement of Electrothermal Effects in Wide Bandgap Semiconductor Devices Samuel Graham; Georgia Institute of Technology, United States.

11:00 AM QN05.16.02
Thermal Boundary Conductance Across Heteroepitaxial GaN Interfaces—Scattering Mechanisms and Assessment of the Phonon Gas Model Patrick Hopkins; University of Virginia, United States.

11:15 AM QN05.16.03
Nanostructured Interfaces by Random Nanopillars Enhance Interfacial Thermal Transport Tengfei Luo; University of Notre Dame, United States.

11:30 AM QN05.16.04
Thermal Management in Silicon Integration Fabric (Si-IF) Umesha Mogera; University of California, Los Angeles, United States.

11:45 AM QN05.16.05
Thermal Conductance Across Heterogeneous GaO-Diamond Interfaces Zhe Cheng; Georgia Institute of Technology, United States.

SESSION QN05.17: Thermal Transport in Nanomaterials
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 124 B

1:30 PM QN05.17.01
Random Patterned, Imperceptible Copper Mesh Transparent Electrode by Thermal Conducting Layer Assisted Laser Sintering Process Jinwook Jung; Seoul National University, Korea (the Republic of).

1:45 PM QN05.17.02
Energy Sensitivity Studies of Charge-Carrier Scattering in Graphene Antidot Lattices Dongchao Xu; University of Arizona, United States.

2:00 PM QN05.17.03
Substrate Effects on Thermal Transport in Single-Layer MoS2 Alexander J. Gabourie; Stanford University, United States.

2:15 PM QN05.17.04
Heat at the Nanoscale—A Comprehensive Experiment Testing Specific Thermal Behavior from Nanoparticles Antonio Benayas; 1, 3CICECO, Portugal; 4Stanford School of Medicine, United States.
2:30 PM QN05.17.05
Tuning the Phonon Transport in PbTiO3 Thin Films Through Strain-Engineered Domain Wall Configurations  
Eric Langenberg\textsuperscript{2, 1}; 1Cornell University, United States; 2CiQUS, Universidade de Santiago de Compostela, Spain.

2:45 PM QN05.17.06
Enhancing the Thermal Transport Properties of Soft Materials Using Nanoparticles  
Merabia Samy\textsuperscript{1, 2}; 1Universite de Lyon, CNRS, UCBL, ILM, UMR5506, France; 2CNRS, France.

3:00 PM QN05.17.07
Shape Dependence of the Thermal Conductivity in Deformable Porous Media and Layered Mesoporous Systems  
Angela Camacho; UNAM, Mexico.

3:15 PM BREAK

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SESSION QN05.18: Phonon Modeling II
Session Chairs: Yongjie Hu, Yee Kan Koh, Lucas Lindsay and Amy Marconnet
Friday Afternoon, April 26, 2019
PCC North, 100 Level, Room 124 B

3:45 PM QN05.18.01
\textit{Ab Initio}, Multiscale Thermal Modeling with OpenBTE  
Giuseppe Romano; Massachusetts Institute of Technology, United States.

4:00 PM QN05.18.02
Phonon Scattering by an Atomic Vacancy in IV-VI Semiconductors from an \textit{Ab Initio} Green’s Function Method  
Sangyeop Lee; University of Pittsburgh, United States.

4:15 PM QN05.18.03
Unified First Principles Theory for the Thermal Properties of Semiconductors  
Navaneetha Krishnan Ravichandran; Boston College, United States.

4:30 PM QN05.18.04
Origin of High Thermal Conductivity in Complex Molecular Crystals—An \textit{Ab Initio} Study of Polythiophene  
Peishi Cheng; California Institute of Technology, United States.

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SYMPOSIUM QN06
Emerging Materials for Quantum Information
April 23 - April 25, 2019

Session Chairs: Peter Kroogstrup and Javad Shabani
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 B

10:30 AM *QN06.01.01
Majorana in Atomic Chains and Topological Hinge States  
Ali Yazdani; Princeton University, United States.

11:00 AM *QN06.01.02
Majorana and Andreev Bound States in Proximitized Rashba Quantum Wires  
Daniel Loss; University of Basel, Switzerland.

11:30 AM *QN06.01.03
Emergence of Majorana States in Engineered Atomic-Scale Hybrid Systems  
Roland Wiesendanger; University of Hamburg, Germany.

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SESSION QN06.02: Topological II
Session Chairs: James Williams and Joseph Yuan
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 B

1:30 PM QN06.02.01
Selective Area Grown Hybrid InSb/Al In-Plane Nanowire Networks as an Emerging Platform for Topological Qubits  
Pavel Aseev\textsuperscript{1, 2}; 1Delft University of Technology, Netherlands; 2Microsoft Corporation, Station Q Delft, Netherlands.

1:45 PM QN06.02.02
Josephson Junctions with Weak Links of Topological Crystalline Insulator Nanowires  
James Williams; University of Maryland, United States.

2:00 PM *QN06.02.03
Development of Superconductor/Semiconductor Heterostructures for Topological Quantum Computation  
Chris Palmstrom; University of California, Santa Barbara, United States.

2:30 PM BREAK

3:00 PM *QN06.02.04
Bottom-Up Grown Nanowire Quantum Devices  
Erick Bakkers; Eindhoven University of Technology, Netherlands.

3:30 PM *QN06.02.05
Hybrid Nanowire Based Quantum Networks at Atomic Scale—From Growth Mechanisms to Properties  
Candice Thomas\textsuperscript{1, 2}; 1Department of Physics and Astronomy and Station Q Purdue, Purdue University, United States; 2Birck Nanotechnology Center, Purdue University, United States.

4:00 PM QN06.02.06
Planar Al-InSb Hybrid Heterostructures for Topological Quantum Computation  
Joseph O. Yuan; New York University, United States.

4:15 PM QN06.02.07
Epitaxial Growth of Superconducting Thin Aluminum Films on InAs for Topological Quantum Computing  
Geoffrey C. Gardner\textsuperscript{1, 3}; 1Microsoft Corporation, United States; 3Purdue University, United States.

4:30 PM QN06.02.08
Resonator Cavities Compatible with Epitaxial InAs-Al Heterostructures  
Joseph O. Yuan; New York University, United States.
4:45 PM QN06.02.09
Semiconductor/Ferromagnetic Insulator InAs/EuS Epitaxy Yu Liu; University of Copenhagen, Denmark.

SESSION QN06.03: Poster Session: Emerging Materials for Quantum Information Science
Session Chair: Christopher Richardson
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN06.03.01
Overlap Junctions for High Coherence Superconducting Qubits David Pappas; National Institute of Standards and Technology, United States.

QN06.03.02
Molecular Dynamics Study of Electric Field Noise in Ion Traps From Electrode Adsorbate Dipole Fluctuations Ben Foulon; Brown University, United States.

QN06.03.03
Long-Term Stability in Single-Electron Transistors Using Aluminum Oxide Yanxue Hong1, 2; 1University of Maryland, United States; 2National Institute of Standards and Technology, United States.

QN06.03.04
Defects in Wide Band Gap Semiconductors for Quantum Computing Rana Biswas1, 2; 1Iowa State University, United States; 2Ames Laboratory, United States.

QN06.03.05
Coherent Single Photon Emission from Colloidal Lead Halide Perovskite Quantum Dots Hendrik Utzat; Massachusetts Institute of Technology, United States.

8:30 AM *QN06.04.01
Development of a Fermi-Hubbard Quantum Simulator with LaAlO3/SrTiO3 Nanostructures Jeremy Levy1, 2; 1University of Pittsburgh, United States; 2Pittsburgh Quantum Institute, United States.

9:00 AM QN06.04.02
Realization of Hybrid Superconductor-Semiconductor Systems by Homoepitaxial Growth of Non-Equilibrium P-Doped Si(111) Mehdi Hatlepour; New York University, United States.

9:15 AM QN06.04.03
Characterization of Er Defect Centers in Epitaxially Grown Er Doped Y2O3 Manish Kumar K. Singh; University of Chicago, United States.

9:30 AM *QN06.04.04
Hybrid Superconducting Circuits Made with Graphene-Based van der Waals Heterostructures Jan Wang; Massachusetts Institute of Technology, United States.

10:00 AM BREAK

SESSION QN06.05: Superconductors I
Session Chairs: Javad Shabani and I-Jan Wang
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 B

10:30 AM QN06.05.01
A Density-Functional Theory Study on Al/AIO/Al Tunneling Junction Chang-Fun Kim; Lawrence Livermore National Laboratory, United States.

10:45 AM QN06.05.02
Superconductive Rhenium Thin Films Electrodeposited from Water-in-Salt Electrolytes Qiang Huang; The University of Alabama, United States.

11:00 AM QN06.05.03
Reducing Two-Level State Defects in Superconducting Resonators and Qubits Matteo Mariantoni; University of Waterloo, Canada.

11:15 AM QN06.05.04
MBE Grown Nitride Heterostructures for Superconducting Quantum Circuits Christopher Richardson1, 2; 1University of Maryland, United States; 2Laboratory for Physical Sciences, United States.

11:30 AM *QN06.05.05
Materials and Device Challenges for Near Term Superconducting Quantum Processors Martin Sandberg; IBM T.J Watson Research Center, United States.

3:00 PM **QN06.06.01**
Accurate Measurement of Microwave Dielectric Loss in Epitaxial Trilayers Corey Rue H. McRae1, 2; 1National Institute of Standards and Technology, United States; 2University of Colorado Boulder, United States.

3:45 PM QN06.06.02
Determining Interface Dielectric Losses in Superconducting Coplanar Waveguide Resonators Greg Calusine; MIT Lincoln Laboratory, United States.

4:00 PM QN06.06.06

4:15 PM QN06.06.07
The Role of Fields, 2D Stacking and Long-Range Order in the Search of Majorana Fermions in a Honeycomb Kitaev Candidate Arnab Banerjee; Oak Ridge National Laboratory, United States.

8:30 AM QN06.07.01
Electrical Transport Measurements of Quantum Structures with Atomically Precise Probes Brandon Giles; Scienta Omicron GmbH, United States.

8:45 AM *QN06.07.02
First Principles Atomistic Modeling of Decoherence Sources in Qubit Devices Vincenzo Lordi; Lawrence Livermore National Laboratory, United States.

9:15 AM QN06.07.03
Influence of Cryogenic Mounting on Thermal Stress Measurements Margaret H. Samuels1, 2; 1Laboratory for Physical Sciences, United States; 2University of Rochester, United States.

9:30 AM *QN06.07.04
Correlating Material Structure to Properties with High Spatial Resolution Using In Situ and High Precision Electron Microscopy Eva Olsson; Chalmers University of Technology, Sweden.
**Symposium QN07**

**Tutorial: Quantum Phenomena in Oxide Materials**

*April 22 - April 22, 2019*

**Symposium Organizers**

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*Invited Paper*

**Tutorial**

**Quantum Phenomena in Oxide Materials**

Monday Morning, April 22, 2019

PCC North, 100 Level, Room 127 C

Quantum phenomenon is at the heart of current condensed matter physics and materials science. Quantum oxide materials are one of promising candidates to study the quantum phenomena, owing to the strong coupling between various degrees of freedom. With more recent attention being paid to the topological state of matter, it is important to understand how this state influences different physical properties of oxides and how it is coupled to the conventional degrees of freedom in oxides.

In this tutorial we will cover various aspects of quantum behavior of oxides. The tutorial will focus on the transport properties and electronic structures of quantum oxide materials, and novel imaging techniques and theoretical approaches for characterization of the materials.

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**8:30 AM**

**Electrical and Thermal Transport Properties of Quantum Materials (From Basics to Dirac and Oxide Systems)**

Benoît Fauqué, ESPCI

In this tutorial I will give an introduction to the electrical and thermoelectric transport in solids. After an introduction on their experimental implementation I will show how these properties can be used to characterize the electronic ground states of the matter. I will particularly focus on the effect of a magnetic field on semi-metals which allows you to determine the Fermi surfaces (by the study of quantum oscillations) and can even generate new electronic state of the matter.

**10:00 AM BREAK**

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**10:30 AM**

**Electronic Structure of Quantum Oxides (Angle and Spin-Resolved Photoemission)**

Phil King, University of St Andrews

Angle-resolved photoemission spectroscopy (ARPES) is arguably one of the most direct momentum-resolved probes of the electronic structure of solids and their surfaces. The spectral function measured by ARPES encodes information on the many-body interactions of importance to determining a material’s properties, and, with recent developments in spin-resolved detection, can now additionally yield key insights on the momentum-resolved spin-polarisation of electronic states. As such, ARPES has proved a powerful probe of the quantum many-body states and phases of oxide quantum materials. In this tutorial, we will cover the basics of ARPES and its operation, and review some recent key results from surface and interface studies of oxide crystals and thin films.
**SYMPOSIUM QN07**

**Emergent Phenomena in Oxide Quantum Materials**
April 23 - April 25, 2019

**Symposium Organizers**
Manuel Bihes, CNRS
Woo Seok Choi, Sungkyunkwan University
Jobu Matsuno, Osaka University
Julia Mundy, Harvard University

**Symposium Support**
Pascal Co., Ltd.
Rocky Mountain Vacuum Tech, Inc.

* Invited Paper

SESSION QN07.01: Spin-Orbit Coupling Phenomena in Quantum Oxides I
Session Chairs: Ho Nyung Lee and Kei Takahashi
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 127 C

10:30 AM *QN07.01.01*
**Exotic Phases in Correlated Oxide Materials with Strong Spin-Orbit Coupling**
Hae-Young Kee; University of Toronto, Canada.

11:00 AM QN07.01.02
**Following Spin Currents in Oxide Materials**
Eike Arenholz; Lawrence Berkeley National Laboratory, United States.

11:15 AM QN07.01.03
**A Theoretical Outlook on the Properties of Spin Ice and Other Magnetic Pyrochlore Thin Films**
Michel Gingras; Department of Physics and Astronomy, University of Waterloo, Canada.

11:30 AM *QN07.01.04*
**Interacting and Spin-Orbit Coupled Electronic States of Delafossite Oxide Natural Superlattices**
Phil King; University of St Andrews, United Kingdom.

SESSION QN07.02: Low-Dimensional Behavior
Session Chairs: Susanne Stemmer and Hua Zhou
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 C

1:30 PM *QN07.02.01*
**Freestanding Crystalline Oxide Membranes and Heterostructures**
Harold Hwang1, 2; 1Stanford University, United States; 2SLAC National Accelerator Laboratory, United States.

2:00 PM QN07.02.02
**Novel Epitaxial Strain Effects on the Hybrid Improper Ferroelectrics from First-Principles**
Xuezeng Lu; Northwestern University, United States.

2:15 PM QN07.02.03
**Realization of Room-Temperature Ferroelectric Ferromagnet via 1D Tetragonal Network**
Kyeong Tae Kang; Sungkyunkwan University, Korea (the Republic of).

2:30 PM *QN07.02.04*
**Artificial 1D Quantum Stripes of Complex Oxides**
Ambrose Seo; University of Kentucky, United States.

3:00 PM BREAK

SESSION QN07.03: Magnetic Properties of Oxide Quantum Materials
Session Chairs: Woo Seok Choi, Jaekwang Lee and Jobu Matsuno
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 127 C

**3:30 PM QN07.03.01**
**Strain-Induced Magnetic Transitions in SrMn2O6 Structure**
Yongjin Shin; Northwestern University, United States.

**3:45 PM QN07.03.02**
**Engineering and Monitoring Spin Orientation in Anti-Ferromagnetic Oxide Multilayers Using X-Ray Spectroscopy**
Aloha T. NDivie; Advanced Light Source, Lawrence Berkeley National Laboratory, United States.

**4:00 PM QN07.03.03**
**Spatially Resolving Spin Textures in Epitaxial Oxide Ferromagnet-Antiferromagnet Heterostructures**
Rajesh V. Chopdekar; Lawrence Berkeley National Laboratory, United States.

**4:15 PM QN07.03.04**
**Partial Magnetic Order in Fe3PO4**
Colin Sarkis; Colorado State University, United States.

**4:30 PM *QN07.03.05**
**Complex Magnetic Domain Structures in Oxides—Physical Origin and Device Application**
Jin Shen; Fudan University, China.

SESSION QN07.04: Poster Session: Emergent Phenomena in Quantum Oxide Heterostructures
Session Chairs: Manuel Bihes, Woo Seok Choi, Jobu Matsuno and Julia Mundy
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

**QN07.04.01**
**Promoting Carriers Separation in Broadband Photodetection by Dual Inversion Layers and Fowler-Nordheim Tunneling**
Haoyang Zou; Georgia Institute of Technology, United States.

**QN07.04.02**
**Performance Improvement REBCO Multilayers by Means of Surface/Interface Quantum Modulation**
Yijie Li; Shanghai Jiao Tong University, China.

**QN07.04.03**
**YBa2Ca3Fe10O26 Nano-SQUIDs Based on Tunnel Nano-Junctions Fabricated by Focused Helium Ion Beam Direct Writing**
Hao Li; University of California, Riverside, United States.

**QN07.04.04**
**Electronic Structure and Transport Properties in Bi1-xCaxFeO3-δ with Control of Oxygen Vacancy Content**
Ji Soo Lim1, 2; 1KAIST, Korea (the Republic of); 2Center for Lattice Defectronics, Korea (the Republic of).

**QN07.04.05**
**Temperature Dependent Exchange Bias in EuOx−y/Si**
Syed Qamar Abbas Shah; University of Nebraska-Lincoln, United States.

**QN07.04.06**
**Synthesis of Core-Shell Rutile/Anatase Heterojunction Titanium Dioxide for Efficient Photocarrier Separation and Enhanced Photocatalytic Performance**
Yin-Hsaun Chang; Chang Gung University, Taiwan.

**QN07.04.07**
**New Types of Magnetic Two-Dimensional Electron Gases**
Xi Yan1, 2; 1Beijing National Laboratory for Condensed Matter & Institute of Physics, China; 2University of Chinese Academy of Sciences, China.

**QN07.04.08**
**Relaxational Ferroelectricity of (111)-BaTiO3 Epitaxial Films**
Junsik Mun; Seoul National University, Korea (the Republic of).

**QN07.04.09**
**Synthesis and Characterization of Freestanding Sr2IrO4 Epitaxial Thin-Films**
Sujan Shrestha; University of Kentucky, United States.

SESSION QN07.05: Emergent Phenomena in SrTiO3 at Low Temperature
Session Chair: Woo Seok Choi
Wednesday Morning, April 24, 2019
PCC North, 100 Level, Room 127 C

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Tuning the Superconducting States of SrTiO₃
Susanne Stemmer; University of California, Santa Barbara, United States.

Magnetoresistance of Semi-Metals and Lightly Doped Semi-Conductors
Benoit Fauque; ESPCI Paris, France.

Quantum Phenomena in Interfacial 3d-5d Oxide Heterostructures
Ho Nyung Lee; Oak Ridge National Laboratory, United States.

FERRO MAGNETIC ORDER ABOVE 1000 K IN A DOUBLE PEROVSKITE OSMATE
Synthesized by Molecular Beam Epitaxy
Yuki K. Wakabayashi; NTT Basic Research Laboratories, Japan.

Discovery of a New Quantum Dimer Magnet on a Strongly Spin-Orbit Coupled Honeycomb Lattice—Yb₂Si₂O₇
Gavin L. Hester; Colorado State University, United States.

Efficient and Tunable Spin-to-Charge Conversion Through Rashba Coupling
at Oxide Interfaces
Laurent Vila; Spintec, Inac, Univ. Grenoble Alpes, France.

First-Principles Study of the Origin of N-Type 2DEG in LaAlO₃/SrTiO₃
Films
Andrea Caviglia; Kavli Institute of Nanoscience, TU Delft, Netherlands.

Electric Field Control of Magnetism Through Proton Evolution
Pu Yu; Tsinghua University, China.

Reversible Control of Oxygen Vacancy Ordering in 2D and 3D Lattices Using Active Strain and Voltage Pulses
Sebastiaan van Dijken; Aalto University, Finland.

Tuning Electron Correlation in Low-Dimensional Vanadium Oxides—Implications for Multivalent-Ion Cathode Materials and Next-Generation Computing Materials
Justin L. Andrews; Texas A&M University, United States.

Demystifying the Growth of Superconducting Sr₂RuO₄ Thin Films
Hari P. Nair; Cornell University, United States.

Metal-Insulator Transition in High Transition Temperature Superconductor Josephson Junction Barriers
Ethan Cho; University of California, Riverside, United States.

Synthesis and Electronic Configuration of Infinite-Layer Nickelate Thin Films
Manuel Bibes; Stanford University, United States; 5SLAC National Accelerator Laboratory, United States.

Coexistence and Competition Between Ferromagnetism, Rashba Spin-Orbit Coupling and Superconductivity in Oxide 2DES
Daniela Stornaiuolo1, 2; 1University of Naples Federico II, Italy; 2CNR, Italy.

Berry Phase Engineering at Oxide Interfaces
Andrea Cavignola; Kavli Institute of Nanoscience, TU Delft, Netherlands.

Exotic Magnetic Interlayer Coupling in Atomically Designed SrRuO₃/SrTiO₃ Superlattices
Seung Gyo Jeong; Sungkyunkwan University, Korea (the Republic of).

Resonant X-Ray Diffraction Study of Chiral Polar Skyrmions in PbTiO₃/SrTiO₃ Superlattices
Margaret McCarter; University of California, Berkeley, United States.
3:00 PM *QN07.12.01
Ultrafast Collective Oxygen-Vacancy Flow in Ca-Doped BiFeO₃ Chan-Ho Yang¹; ²KAIST, Korea (the Republic of); ³KAIST, Korea (the Republic of).

3:30 PM QN07.12.02
Dynamic Field Modulation of the Octahedral Framework in Perovskite Oxide Heterostructures Hua Zhou; Argonne National Laboratory, United States.

3:45 PM QN07.12.03
Atomic Dynamics in VO₂ Across the Metal-Insulator Transition—Ultrafast Transition and Equilibrium Thermodynamics Olivier Delaire; Duke University, United States.

4:00 PM QN07.12.04
Ultrafast Control of Material Properties Through Non-Linear Lattice Dynamics from First Principles Guru Khalsa; Cornell University, United States.

4:15 PM QN07.12.05
Field Induced Phases of the XY Pyrochlore Er₂Sn₂O₇ Danielle Yahne; Colorado State University, United States.

SYMPOSIUM QN08
Colloidal Nanoparticles—From Synthesis to Applications April 22 - April 26, 2019

Symposium Organizers
Mei Cai, General Motors Corporation
Hongyou Fan, University of New Mexico/Sandia National Laboratories
Yi Han, King Abdullah University of Science and Technology
Han Htoon, Los Alamos National Laboratory

Symposium Support
Center for Integrated Nanotechnologies, Los Alamos National Laboratory
MilliporeSigma
Henan University

* Invited Paper

SESSION QN08.01: Nanoparticle Synthesis and Applications I
Session Chairs: Mei Cai and Hongyou Fan
Monday Morning, April 22, 2019
PCC North, 100 Level, Room 129 B

8:30 AM *QN08.01.01
Growth and Transformation of Colloidal Nanostructures in Confined Spaces Yadong Yin; University of California, Riverside, United States.

9:00 AM *QN08.01.02
On the Prenucleation Stage of Colloidal Semiconductor Quantum Dots Kui Yu; Sichuan University, China.

9:30 AM *QN08.01.03
Ultrafast Photophysics Dynamics In Situ Quantum Dot Devices Jianbo Gao; Clemson University, United States.

10:00 AM BREAK

10:30 AM *QN08.01.04
Whole Cell Pathogen and Small Molecule Analytical Detection with Aptamer-Functionalized Particles Lia Stanciu; Purdue University, United States.

11:00 AM QN08.01.05
Stoichiometric Preparations of Iron Oleate to Improve the Reproducibility of Iron Oxide Nanoparticle Syntheses Dale L. Huber; Sandia National Laboratories, United States.

11:15 AM QN08.01.06
Structural Transformations of Functional Nanoparticles Zewei Quan; Southern University of Science and Technology, China.

11:30 AM QN08.01.07
High ON-Current Vertical Field-Effect Transistors Based on Environmentally-Benign Quantum Dots Jeongkyun Roh; Los Alamos National Laboratory, United States.

11:45 AM QN08.01.08
The Importance of ‘Beneficial Impurities’ in Surfactant Assisted Synthesis of Colloidal Nanoparticles Yuval Golan; Ben Gurion University of the Negev, Israel.

SESSION QN08.02: Nanoparticle, Synthesis, Assembly and Applications I
Session Chairs: Mei Cai and Han Htoon
Monday Afternoon, April 22, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.02.01
Fabrication of Arrays of Highly Complex Noble Metal Nanostructures Using Nanoimprint Lithography in Combination with Liquid-Phase Epitaxy Svetlana Neretina; University of Notre Dame, United States.

2:00 PM *QN08.02.02
Si Microparticle Based Electrode for Effective Stress Relaxation and Stable Electrochemical Cycling Seung Min Han; Korea Advanced Institute of Science and Technology, Korea (the Republic of).
SESSION QN08.03: Nanoparticle Synthesis and Applications II
Session Chair: Hongyou Fan
Tuesday Morning, April 23, 2019
PCC North, 100 Level, Room 129 B

10:30 AM *QN08.03.01
Surface Chemistry of Colloidal Cesium Lead Halides Nanocrystals
Maryna Bodnarchuk; Empa-Swiss Federal Laboratories for Materials Science and Technology, Switzerland.

11:00 AM *QN08.03.02
Shape and Surface Patchiness Directed Nanoparticle Superlattice Assembly Revealed by Liquid-Phase Transmission Electron Microscopy
Qian Chen; University of Illinois at Urbana-Champaign, United States.

11:30 AM *QN08.03.03
New Routes for Broadband Spectral Tuning of Infrared Plasmon Resonances in Doped Metal-Oxide Nanocrystals
Xingchen Ye; Indiana University, United States.

SESSION QN08.04: Synthesis, Characterizations and Applications II
Session Chairs: Mei Cai and Han Htoon
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.04.01
Exciton Dynamics and Photochemistry of Water in 1D and 2D Semiconductor/Metal Nanoheterostructures
Tranquan Lian; Emory University, United States.

2:00 PM *QN08.04.02
Enabling Tailorable Optical Properties and Markedly Enhanced Stability of Perovskite Quantum Dots by Permanently Ligating with Polymer Hairs
Zhiqun Lin; Georgia Institute of Technology, United States.

2:30 PM *QN08.04.03
In Situ Liquid TEM Study of the Deballing of Pd-M Particles Reveals Intricate Strain and Ordering Effects
Huolin L. Xin; University of California, Irvine, United States.

3:00 PM BREAK

3:30 PM *QN08.04.04
Superresolution-Vapor-Phase Decoding of Both Structure and Driving Force of Nanocrystal Assembly
Zhongwu Wang; Cornell University, United States.

SESSION QN08.05: Poster Session I: Colloidal Nanoparticle Supercrystallography-Based Decoding of Both Structure and Driving Force of Semiconductor/Metal Nanoheterostructures
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

QN08.05.01
Molecular Control over the Composition of Solid/Solid Interfaces within Nanocrystal Solids Obtained from Colloidal Nanocrystals
Julia J. Chang; Iowa State University of Science and Technology, United States.

QN08.05.02
Fluorescent Silver Nanoclusters for Rapid Detection of Pathogenic DNA
Yuxiang Chen; Los Alamos National Laboratory, United States.

QN08.05.03
Ink Formulation, Surface Tension Control, and Optimal Microscale Printing of CdSe Quantum Dot Dispersion for Efficient Light Emitting Diode
Byung Doo Chin; Dankook University, Korea (the Republic of).

QN08.05.04
Controlled Fragmentation of Quasi-Infinite Particle Chains into Oligomeric Subchains Under the Influence of External Strain
Anna Maria Steiner; Leibniz-Institut für Polymerforschung Dresden e.V., Germany.

QN08.05.05
Non-Classical Crystallization Mechanisms During the Synthesis of PbS Colloidal Nanocrystals
Bin Yue; Iowa State University of Science and Technology, United States.

QN08.05.06
Maximizing the Cerium (III) in Ceria Particles for Improved Glass and Thermal Oxide Polishing
Christopher Netzband; SUNY Polytechnic Institute, United States.

QN08.05.07
Using Gold Nanoparticles as the Colorimetric Sensor for Monitoring the Salt Concentrations
Min Hsiao; National Cheng Kung University, Taiwan.

QN08.05.08
Tunable Luminescence in Rare Earth Doped Core-Shell Nanophosphors via Adaptive Absorption of the Transition Metal Ions
Pragathi Darapaneni; Louisiana State University, United States.

QN08.05.09
Structure and Formation Mechanism of Large-Grain Epitaxially-Fused PbSe Quantum Dot Superlattices
Alex Abelson; University of California, Irvine, United States.

QN08.05.10
Sinter-Free Inks of Metal-Polymer Hybrid Particles for Flexible and Robust Inkjet Printed Electronics
Juraj Drzic; INM - Leibniz Institute for New Materials, Germany.

QN08.05.11
Controllable Self-Assembly of Porphyrin by Hydrogen Bonds and Application of Photocatalytic Water Splitting
Roughliu Cao; Key Laboratory for Special Functional Materials of the Ministry of Education, Henan University, Kaifeng, China, China.
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<td>Clinton Davis; University of North Carolina at Greensboro, United States.</td>
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<td>Taegon Oh; Northwestern University, United States.</td>
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<td>Logan Keating; University of Illinois at Urbana-Champaign, United States.</td>
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<td>Emmanuel M. Rodriguez; Universidad Autonoma de Ciudad Juarez, Mexico.</td>
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<td>Jinhan Wang; Key Laboratory for Special Functional Materials of the Ministry of Education, China.</td>
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<td>Potassium-Doped Titanium Oxide Nanostructures Prepared via Wet</td>
<td>Na Young Ha; Ajou University, Korea (the Republic of).</td>
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**Footnotes:****

1. City College of New York, United States; 2The Graduate Center of the City University of New York, United States.

**References:**

- **QN08.08.03**
  - Monodisperse, Phase-Pure MgFe₂O₄ Nanoparticles in Aqueous and Nonaqueous Media and Their Photocatalytic Behavior

- **QN08.08.04**
  - Rapid Detection of Inorganic Arsenic—A Real-Time Screening Method Based on De-Aggregation of Gold Nanoparticles

- **QN08.08.05**
  - Cost Effective Bandgap Tunability Through Ordered Doped Zinc Oxide Nanostructure Films

- **QN08.08.06**
  - Matrix-Free Stabilization of DNA-Engineered Colloidal Crystals with Silver Ions

- **QN08.08.07**
  - Control Over Colloidal Supercrystal Formation with Density Layers

- **QN08.08.08**
  - CuGaS₃ Nanorods with Unusual Bent Morphologies

- **QN08.08.09**
  - Synthesis and Characterization of the Solid Solution of Sodium Bismuth Titanate, Potassium Bismuth Titanate and Barium Titanate (bnkt-ht) Perovskite Type

- **QN08.08.10**
  - Next Generation Liquid-Crystal-Display Using Eco-Friendly InP Based Quantum-Dot Functional Color-Filters Ultra High Resolution LCD

- **QN08.08.11**

- **QN08.08.12**
  - Metal-Free Phosphor Carbon Dots for Near UV Pumped White LEDs Through the Förster Resonance Energy Transfer

- **QN08.08.13**
  - Synthesis, Characterization and Thermoluminescence Response of Graphitic Carbon Nitride Quantum Dots

- **QN08.08.14**
  - Fabrication of Porphyrin Assemblies and Biological Applications

- **QN08.08.15**
  - Surface-Engineered Carbon Quantum Dots for High Quantum Yields and Their Photonic Applications

- **QN08.08.16**
  - Characterization and Analysis of Photocatalytic Performance of Potassium-Doped Titanium Oxide Nanostructures Prepared via Wet Corrosion of Titanium Microspheres

- **QN08.08.17**
  - Sustainable and Low-Cost Synthesis of Sulfide Nanocrystals by an Ionic Liquid Precursor

- **QN08.08.18**
  - Numerical Modeling of Growth of Faceted Gold Nanoparticles by Chemical Salt Reduction Method

- **QN08.08.19**
  - Imaging Magnetic and Non-Magnetic Nanostructures Using a Field Emission Scanning Electron Microscope Including STEM Mode

- **QN08.08.20**
  - Optical Gain Modulation of a Colloidal Quantum Dot Film in an Electrical Device

- **QN08.08.21**
  - Doped Lanthanum Hafnate Pyrochlore Nanoparticles as Promising Candidate of Multicolor NUV Phosphors for Warm White Lighting

- **QN08.08.22**
  - Cadmium Chloride Induced Synthesis of CdSe Nanoplatelets with Increased Thickness

- **QN08.08.23**
  - The Development of Novel Multimodal Magnetic Plasmonic Nanocomposites for Applications in Biosensing and Theranostics

- **QN08.08.24**
  - Identification and Semi-Quantification of Porphyrin-Silica Composite Nanoparticles Using Atmospheric Solids Analysis Probe Mass Spectrometry

- **QN08.08.25**
  - Block Copolymer Templated Nanostructured Metal Oxides Through Atomic Layer Deposition

- **QN08.08.26**
  - Increasing Magnetization in a Hollandite Multiferroic by Fe Doping—Structural, Magnetic and Dielectric Characterization of Nanocrystalline BaMn₄₋ₓFeₓTiOs₂₄

- **QN08.08.27**
  - Device Lifetime Study of Colloidal Quantum Dot Light-Emitting Diodes

- **QN08.08.28**
  - Binary and Ternary Metal Chalcogenide Nanoplates with Jaanus Structural Motif via Asymmetric Cation Exchange

- **QN08.08.29**
  - Detection Limit of a Portable Raman Spectrophotometer for SERS Detection of GunShot Residue

- **QN08.08.30**
  - General Synthetic Strategy for the Fabrication of Cu-Based Bimetallic Two-Dimensional Hollow Nanostructures

- **QN08.08.31**
  - Stable Au-Pd Heterostructures for High Refractive Index Sensitivity

- **QN08.08.32**
  - A Method for Quantification of Particle Shape in CMP Slurry and the Investigation for the Relationship Between the Polishing Behaviors and These Shapes

- **QN08.08.33**
  - Investigation of CdS Thin-Films Deposition and Nanoparticles Formation by The Continuous Flow Microreactor

- **QN08.08.34**
  - Revisiting Heat Conversion Frontiers—Copper Sulfide Vectors of High Photothermal Efficiency

- **QN08.08.35**
  - Clustered Magneto-Plasmonic Nanoparticles for Amplified Surface Enhanced Raman Scattering Bio-Imaging

- **QN08.08.36**
  - Optimization of Various EHD-Jet Spray Modes for QD Thin Films in Quantum Dots Light-Emitting-Diodes
SESSION QN08.09: Nanoparticle Synthesis and Applications IV
Session Chairs: Zaicheng Sun and Guifu Zou
Thursday Morning, April 25, 2019
PCC North, 100 Level, Room 129 B

8:30 AM *QN08.09.01
Sub-20nm Ultra-Thin Hybrid CO2 Membrane Made by Plasma-Defined Atomic Layer Deposition by Ying-Bing Jiang1, 2; 1Angstrom Thin Film Technologies LLC, United States; 2University of New Mexico, United States.

9:00 AM *QN08.09.02
Polymer-Assisted Solution Strategy—From Nanoparticles/Thin Films/Patterns To Applications by Guifu Zou; Soochow University, China.

9:30 AM *QN08.09.03
Tunable Emission and Their Application of Fluorescent Carbon Dots by Zaicheng Sun; Beijing University of Technology, China.

10:00 AM BREAK

10:30 AM *QN08.09.04
Functional Material Design by Colloidal Nanocrystal Assembly by Angang Dong; Fudan University, China.

11:00 AM QN08.09.05
Aqueous Synthesis of Cu2ZnSnS4 and Cu2ZnSnS4 Nanoparticles for use in Next-Generation Solar Cells by Jacek Jasiennik; Monash University, Australia.

SESSION QN08.10: Nanoparticle Synthesis, Assembly and Applications III
Session Chairs: Ying-Bing Jiang and Guifu Zou
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 129 B

1:30 PM *QN08.10.01
Towards the Design of Colloidal Nanocrystals for Photonic and Catalytic Applications by Jianfeng Huang; École Polytechnique Fédérale de Lausanne (EPFL), Switzerland.

2:00 PM *QN08.10.02
Colloidal Nanoparticles for Ultrasensitive Biosensing by Molly Stevens; Imperial College London, United Kingdom.

2:30 PM *QN08.10.03
Driving Forces for Oriented Attachment Based Crystallization and Assembly by Xin Zhang; Pacific Northwest National Laboratory, United States.

3:00 PM BREAK

3:30 PM *QN08.10.04
Synthesis of Porphyrin Nanocrystals and Applications by Feng Bai; Henan University, China.

4:00 PM *QN08.10.05
Metal Nanoclusters and Nanoparticles Tethered by N-Heterocyclic Carbene-Capped Polymers by Jie He; University of Connecticut, United States.

4:30 PM QN08.10.06
Direct Patterning of Quantum Dots on the Nanoscale with E-Beam Lithography by Christian D. Dieleman; AMOLF, Netherlands.

4:45 PM QN08.10.07
Understanding the Synthetic Pathways and Developing Techniques to Probe the Rare Non-Radiative Events in CdSe/CdS Colloidal Quantum Dots with Photoluminescent Quantum Yields Approaching Unity by Brent A. Koscher1, 2; 1University of California, Berkeley, United States; 2Lawrence Berkeley National Laboratory, United States.
### SESSION QN08.11: Nanoparticle Synthesis, Assembly and Applications III

#### 10:30 AM QN08.11.07
*Competition of Charge and Energy Transfer Processes in Donor-Acceptor Fluorescence Pairs—Calibrating the Spectroscopic Ruler*  
Pavel Moroz; Bowling Green State University, United States.

#### 10:45 AM QN08.11.08
*Colloidally Synthesized Silicon Triplet Photosensitizers for Photon Upconversion*  
Tingting Huang; University of California, Riverside, United States.

#### 11:00 AM QN08.11.09
*Synthesis and Photophysical Properties of Complex Heterostructures Comprised of Epitaxially-Connected Domains of Materials with Disparate Lattice Structures*  
Vladimir Sayevich; Los Alamos National Laboratory, United States.

#### 11:15 AM QN08.11.10
*Reversible Polarized Optical Response of Stretched Shape Memory Polymers with Embedded Gold Nanoparticles*  
Joseph B. Tracy; North Carolina State University, United States.

#### 11:30 AM QN08.11.11
*Simple One-Pot Synthesis of Au Nanoclusters and the Application in Photothermal Therapy*  
Xiujuin J. Li; University of Texas at El Paso, United States.

#### 11:45 AM QN08.11.12
*Halide Ions as Morphology Descriptors and Dopants in Colloidal Nanocrystals of Binary Semiconductors and Metal Oxides*  
Sandeep Ghosh; The University of Texas at Austin, United States.

---

### SESSION QN08.12: Nanoparticle Synthesis, Assembly and Applications IV

#### 1:30 PM QN08.12.01
*Atomically Coherent Attachment of Wurtzite CdSe Nanocrystals—Considerations for Removing Dislocations from Imperfect Attachment*  
Justin Ondry; University of California, Berkeley, United States.

#### 1:45 PM QN08.12.02
*Mid-Infrared Silver Chalcogenide Colloidal Quantum Dots and Devices*  
Dong Kyun Ko; New Jersey Institute of Technology, United States.

#### 2:00 PM QN08.12.03
*Using Light to Manipulate, Assemble and Generate Novel Inorganic Heterostructures in Solution*  
Vincent C. Holmberg; University of Washington, United States.

#### 2:15 PM QN08.12.04
*Bright Colloidal Quantum Dot Light-Emitting Diodes Enabled by Efficient Chlorination*  
Xiyuan Li; University of Toronto, Canada.

#### 2:30 PM QN08.12.05
*Quantum Confinement Effects on the Photoconductivity of Nanocrystal Thin Films*  
James Cassidy; Bowling Green State University, United States.

#### 2:45 PM BREAK

#### 3:15 PM QN08.12.06
*Bright and Robust Heavy Metal-Free Quantum Dots*  
Donghyo Hahn\(^1, 2\); \(^1\)Seoul National Univ, Korea (the Republic of); \(^2\)Sungkyunkwan University Advanced Institute of NanoTechnology, Korea (the Republic of).

#### 3:30 PM QN08.12.07
*Surface Engineering to Achieve Water Dispersible Indium Phosphide/Zinc Sulfide Core/Shell Nanocrystals*  
Colin Hessel; Physical Sciences Inc, United States.

#### 3:45 PM QN08.12.08
*Nanoparticle-Based Hollow Microstructures Formed by Two-Stage Nematic Nucleation and Phase Separation*  
Sheida T Riahinasab; University of California, Merced, United States.

#### 4:00 PM QN08.12.09
*Strongly Polarized Light Generation from Isotropic Colloidal Quantum Dots Coupled to Fano Resonances*  
Kivanc Gungor\(^1, 2\); \(^1\)Bilkent University, Turkey; \(^2\)Los Alamos National Laboratory, United States.

#### 4:15 PM QN08.12.10
*Fe\(_{3-x}\)Cr\(_x\)O\(_4\) Nanocubes for Induction Heating Catalysis via Controlled Synthetic Routes*  
James A. Dorman; Louisiana State University, United States.

#### 4:30 PM QN08.12.11
*Stepwise Seed-Mediated Growth of Self-Registered Anisotropic Plasmonic Nanostructures*  
Fei Feng; University of California, Riverside, United States.

#### 4:45 PM QN08.12.12
*Fabrication of Large-Area Arrays of Vertically Aligned Gold Nanorods*  
Wenbo Wei; Henan University, China.
SYMPOSIUM SM01

Materials for Biological and Medical Applications
April 22 - April 26, 2019

Symposium Organizers
Wonmo Kang, Naval Research Laboratory
Laura Na Liu, University of Heidelberg
Jwa-Min Nam, Seoul National University
Seila Selimovic, National Institutes of Health

* Invited Paper

SESSION SM01.01: Materials for Biological and Medical Applications I
Session Chairs: Wonmo Kang and Marc Raphael
Monday Afternoon, April 22, 2019
PCC North, 200 Level, Room 229 A

1:30 PM SM01.01.01
Multivalent Glycosylated Nanoparticles for Specific Binding and Killing of Bacteria Shuai Hou; Nanyang Technological University, Singapore.

1:45 PM SM01.01.02
Multi-Color Electron Microscopy of Cellular Ultrastructure Benjamin Bannas; Direct Electron, LP, United States.

2:00 PM SM01.01.03
Fabrication and Characterization of Biodegradable Metal Based Microelectrodes for In Vivo Neural Recording Chaoxing Zhang1, 2; 1University of California, Riverside, United States; 2University of California, Riverside, United States.

2:15 PM SM01.01.04
A Sneak Peek into the Material Science of Active Pharmaceutical Ingredients—The Importance of Solid-State Characterization in Drug Development Paroma Chakravarty; Genentech Inc., United States.

2:30 PM SM01.01.05
Density Control and Patterning of Biosensor Surfaces Using Modified Poly-L-Lysine Polymers Jacopo Movilli; University of Twente, Netherlands.

2:45 PM SM01.01.06
An Antibiotic Free Approach for Topical Eradication of Dental Biofilm without Disturbing Microbiota Balance In Vivo Fatemeh Ostadhossein; University of Illinois at Urbana Champaign, United States.

3:00 PM BREAK

3:30 PM SM01.01.07
Self-Sterilizing Photodynamic Polymers for Anti-Infective Materials Bhavdip Srinat; Triumula Peddinti; North Carolina State University, United States.

3:45 PM SM01.01.08
Communication—Metabolites-Enhanced Antibacterial Activity of Self-Assembled Nano-Peptide Amphiphiles for Treating Antibiotic Resistant Bacteria Ming Gao; Northeastern University, United States.

4:00 PM SM01.01.09
Novel Polymeric Heart Valves Using Low-Fouling PEGDA and Fiber Composites Xing Zhang; Chinese Academy of Sciences, China.

4:15 PM SM01.01.11
Microfluidic Multilattice Electrodes for Recording and Drug Delivery Giulia Bruno1, 2; 1Italian Institute of Technology, Italy; 2Università di Genova, Italy.

4:30 PM SM01.01.12
Dialysate Regeneration by Efficient Urea decomposition with TiO2 Nanowire Photoelectrochemical Cell Guangzhong Shao1, 2; 1University of Washington, United States; 2University of Washington, United States.

4:45 PM SM01.01.13
Decorated GO Nanoroses—Iron Oxide Nanoparticle Decorated Graphene Oxide Nanocomposites for MRI Contrast Agents and Its Flow Behavior Shrut Sharma; Stony Brook University, The State University of New York, United States.

SESSION SM01.02: Materials for Biological and Medical Applications II
Session Chair: Wonmo Kang
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 229 A

10:30 AM *SM01.02.01
Microfluidic Devices for Cell Manipulation and Analysis Horacio Espinosa; Northwestern University, United States.

11:00 AM SM01.02.02
New Approach to Electrotaxis Experiments Utilizing Polyimide-Based PEDOT Electrodes in a PDMS Microfluidic Chip Jose A. Leal Ordonez; Electroactive Coatings Group, Department of Microsystems Engineering (IMTEK), Albert-Ludwigs Universität Freiburg, Germany.

11:15 AM SM01.02.03
New Oxygen Sensor for In Vitro Dissolved Oxygen Sensing and In Vivo Hypoxia Imaging Jun Li; Southern University of Science and Technology, China.

11:30 AM SM01.02.04
Non-Swellable, Cyto compatible Hydrogels with Enhanced Stiffness and Toughness Yong-Woo Kim; Seoul National University, Korea (the Republic of).

11:45 AM SM01.02.05
Effective Weight Control via an Implanted Self-Powered Vagus Nerve Stimulation Device Jun Li; University of Wisconsin–Madison, United States.

SESSION SM01.03: Materials for Biological and Medical Applications III
Session Chairs: Wonmo Kang and Marc Raphael
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 229 A

1:30 PM *SM01.03.01
Materials and Devices for Transient Electronic Implants John A. Rogers; Northwestern University, United States.

2:00 PM SM01.03.02
TiO2 Nanotube Arrays as Platform for Long-Term Organotypic Culture and Mechanical Characterization of Retina Explants—From Imaging to Mechanical Response Sabrina Friebe1, 2; 1Leibniz Institut für Oberflächenmodifizierung (IOM) e.V., Germany; 2University of Leipzig, Germany.

2:15 PM SM01.03.03
Study of Transparent Electrodes for 3D-Stacked Retinal Prosthesis Michael A. Profi1, 2; 1Tohoku University, Japan; 2Tohoku University, Japan.

2:30 PM SM01.03.04
Biomedical Applications of Wireless Surface Heater with Near-Field Communication Temperature Sensor Albert H.Y. Lau; The University of Hong Kong, Hong Kong.

2:45 PM SM01.03.05
Nanowire Sensor Devices for Lab-on-a-Chip Platform Laroya Baraban1, 2; 1Max Bergmann Center for Biomaterials Dresden, TU Dresden, Germany; 2Center for Advancing Electronics Dresden, Germany.

3:00 PM BREAK

3:30 PM SM01.03.06
Nanomaterial-Enabled Wearable Sensors for Healthcare Yong Zhu; North Carolina State University, United States.

4:00 PM SM01.03.07
Circulating Tumor Cell Microarrays Masoud S. Loeian; Worcester Polytechnic Institute, United States.

4:15 PM SM01.03.08
Design of Polyhydroxyalkanoate-Celecoxib Nanoparticles for Systemic Lupus Erythematosus Therapy with Enhanced Anti-Inflammatory Efficacy and Reduced Side Effects Jin Hu; Peking Union Medical College Hospital, China.

4:30 PM SM01.03.09
Externally Actuated Hydrogels for Biofilm Eradication Anna Cristina Saini; Case Western Reserve University, United States.
SESSION SM01.04: Materials for Biological and Medical Applications IV
Session Chair: Seila Selimovic
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 229 A

8:15 AM SM01.04.01
Multifunctional Carbon Dots as Therapeutic Nanoagents for Suppressing Alzheimer’s Amyloid-β Aggregation and Neurotoxicity you Jung Chang; KAIST, Korea (the Republic of).

8:30 AM *SM01.04.02
Cancer Nanotheranostics Based on Molecular Self-Assembly Process Xiaoyuan Chen; National Institute of Biomedical Imaging and Bioengineering, United States.

9:00 AM SM01.04.03
Re-Purposing of Frog-Skin Derived Collagen for Wound Healing Applications Cigdem Cimenoglu; Nanyang Technological University, Singapore.

9:15 AM SM01.04.04
A Biodegradable Hybrid Nanoplatform for Synergistically Overcoming Multidrug Resistance Shengqiang Wang1, *; 1Rutgers, The State University of New Jersey, United States; 2Northwestern Polytechnical University, China.

9:30 AM SM01.04.05
Top-Down Fabrication of Spatially Controlled Mineral Gradient Scaffolds for Interfacial Tissue Engineering Alexander Boys; Cornell University, United States.

9:45 AM SM01.04.06
Quantum Capacitance Based Amplified Graphene Phononics for Studying Neurodegenerative Diseases Bijentimala Keisham; University of Illinois at Chicago, United States.

10:00 AM BREAK

10:30 AM *SM01.04.07
Nanolithographically Patterned Surfaces for Quantifying Cellular Adhesion, Migration and Communication Marc Raphael; U.S. Naval Research Laboratory, United States.

11:00 AM SM01.04.08
In Vitro Study for Pressure- and Cavitation-Induced Cell Damage During Mechanical Impact Woonmo Kang; Naval Research Laboratory, United States.

11:15 AM SM01.04.09
Gum—Tragacanth-Alginate Beads as an Oral Nutraceutical Delivery System for Improving the Bioavailability of Nutraceuticals Anupam Apoorva; Indian Institute of Technology Kharagpur, India.

11:30 AM SM01.04.10
Diagnosis of Vitiligo Through Novel UV Camera Applying Eco-Friendly Blue-Light Emitting Zinc-Blended Quantum-Dot Jiho Choi; Hanyang University, Korea (the Republic of).

SESSION SM01.05: Materials for Biological and Medical Applications V
Session Chair: Seila Selimovic
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 229 A

1:30 PM SM01.05.01
Point-of-Care Device for Detection and Measurement of Biomarker Associated of Trauma Brain Injury Pedro J. Villalba; Universidad del Norte, Colombia.

1:45 PM SM01.05.02
Hydrogel-Based 3D Cell Culture Models of Neurological Diseases—Disease Progression and Experimental Therapeutics Sara Pedron; University of Illinois at Urbana-Champaign, United States.

2:00 PM SM01.05.03
Self-Powered Biosensors—Integration of p-n Junction Photodetectors with Colorimetric Reactions Kyheun Kim; Gwangju Institute of Science and Technology, Korea (the Republic of).

2:15 PM SM01.05.04
Anti-Adhesive Bio-Degradable Mg Alloy Assisted by Nano-SiO2 Particles Jaeyoung Son; Texas A&M University, United States.

2:30 PM BREAK

3:30 PM *SM01.05.05
Development of Tissue-Engineered, Disease-Mimicking Culture Platforms Kristyn Masters; University of Wisconsin, United States.

4:00 PM SM01.05.06
Radioluminescent Nanoparticles for Molecular Imaging and Theranostics Conroy Sun; Oregon State University, United States.

4:15 PM SM01.05.07
Bioengineered 3D Interpenetrating Collagen-Alginate Network to Elucidate the Effects of biomechanics on Cancer-Associated Fibroblasts (CAFs) Behaviour Huu Cao; Nanyang Technological University, Singapore.

4:30 PM SM01.05.08
Additively Manufactured Scaffolds with Selective Permeability for Biological Applications Yale Jeon; Hanyang University, Korea (the Republic of).

4:45 PM SM01.05.09
Magneto-Dielectric Hyperthermia Therapy for Adenocarcinoma Sovesh Mohapatra; Indian Institute of Technology, India.

SESSION SM01.06: Poster Session: Materials for Biological and Medical Applications
Session Chair: Wonmo Kang
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM01.06.01
Peroxidase-Mimicking Nanoassembly Mitigates Lipopolysaccharide-Induced Endotoxemia and Cognitive Damage in the Brain by Impeding Inflammatory Signaling in Macrophages In Kyu Park; Chonnam National University, Korea (the Republic of).

SM01.06.02
Magnetic Field-Inducible Drug-Eluting Nanoparticles for Image-Guided Thermo-Chemotherapy In Kyu Park; Chonnam National University, Korea (the Republic of).

SM01.06.03
Design and Fabrication of a Piezoelectric Microcantilever Sensor for Measurement of Cardiomyocyte and Skeletal Muscle Force Generation Elizabeth Cohn; University of Central Florida, United States.

SM01.06.04
Synthesis and Characterization of Biopolymer-Capped Mesoporous Silica Nanomaterials for Drug Delivery Cecelia Kinane; University of St. Thomas, United States.

SM01.06.05
Specific Interaction of Lactose Modified Graphene Oxide by the Hepatic Asialoglycoprotein Receptor Jose A. Sarabia-Sainz; Universidad de Sonora, Mexico.

SM01.06.06
Smart Chitosan Nanoparticles and Their Capacity as a Drug Delivery System Alexel J. Burgara-Estrella; Universidad de Sonora, Mexico.

SM01.06.07
Biocompatible Exchange-Coupled Core-Shell CoFe2O4@Fe3O4 Nanoparticles for Advanced Hyperthermia Elizabeth Fuller1, *; 1University of South Florida, United States; 2The Ohio State University, United States.

SM01.06.08
Dielectric Breakdown of Si3N4 and h-BN Used for Nanofluidic Devices Application Sungeun Lee; Sungkyunkwan University Advanced Institute of NanoTechnology, Korea (the Republic of).
In Vitro Evaluation of Silver Nanoparticles Extracted by Green Method on Pseudomonas aeruginosa Karla Paola Sanchez Guerrero; Instituto Politécnico Nacional-UPHIG, Mexico.

Hierarchical Nanocellulose Materials for Strong Photonic Chiral Nematic Films Rui Xiong; Georgia Institute of Technology, United States.

Zwitterionic Polyurethanes with Variable Carboxylate Content Huifeng Wang; University of Illinois at Chicago, United States.

Design of Chitosan Conjugated Bilirubin Nano-Theranostics System as a Platform for ROS Stimulus Response Liver Fibrosis Therapy Myeong Ju Moon; Hwasun Chonnam National University Hospital, Korea (the Republic of).

Unexpected Electroanalytical Activity of the Stainless 304 Needle Toward Blood Glucose Determination Haemin Lee; Soongsil University, Korea (the Republic of).

Excessive Magnesium Condensed DNA Nanoparticles for Tumor Targeted and Drug Delivery Li Lin; Sohthen University of Science and Technology, China.

Physico-Chemical Effects of Gelatin Addition in Carboxymethylcellulose and Calcium Phosphate Cement-Based Nanocomposites Fara Cuben; Bogazici University, Turkey.

Enhanced Water Dispersible Carbon Nitride Nanodots Using PEGylation—Application for Bioimaging Probes Sunghee Park; Inha University, Korea (the Republic of).

Microbial Carbohydrate Resource Bank Dahan Jeong; Konkuk University, Korea (the Republic of).

Investigation of the Mechanical and Rheological Properties of Graphene Oxide Incorporated Calcium Phosphate Cement-Based Injectable Bone Substitutes Duygu Ege; Boğaziçi University, Turkey.

Illuminating Bacterial Communities with Plasmonic Nanoantennas William J. Thrift; University of California, Irvine, United States.

A Microscopic and Mathematical Model for Tissue Maturation After Bioprinting Using Physics of Cellular Self-Assembly Ashkan Shafiei; Wake Forest University, United States.

Physical Properties of Calcium Phosphate (CaP) Cement-Based Nanocomposites Reinforced with Carboxylated Multi-Walled Carbon Nanotube (f-MWCNT) Sule Yetis; Bogazici University, Turkey.

A Disposable Electrocatalytic Sensor for Whole Blood NADH Monitoring Hi Gyu Moon; Korea Institute of Toxicology, Korea (the Republic of).

Hierarchical Structured Zinc Oxide Nanowires—Polyactic Acid Microfibers Composite for Cancer Immunotherapy Sang Won Byun; Korea University, Korea (the Republic of).

Shape Dependent Magnetic Resonance Imaging Performance and Drug Release Behavior of Iron Oxide Nanoparticles Bibek Thapa1, 2; 1University of Puerto Rico, United States; 2Molecular Sciences Research Center, United States.

Cavitation Bubbles in Biological Soft Materials Wonmo Kang; Naval Research Laboratory, United States.

Carbon Doping Mediated Active Trap Centres Formation in Porous Alumina for Ion Beam Dosimetry Sangita Bhownick; Shiv Nadar University, India.

Two-Tiered Platform for Sequence-Specific Identification of Nucleic Acid Biomarkers in Complex Biological Fluids Mashari N. Alangari; University of California, Davis, United States.

Biomedical Applications for Conducting Polymers—Modulating Axonal Outgrowth via Template-Free Nano-Engineered Surfaces Anthony M. Kisicky; University of Houston, United States.

Effect of Insertion of Trimetaphosphate Nanoparticles in Nylon 6,6 Nanofibrous for Dental Applications Francisco N. Souza Neto; State University of Sao Paulo, Brazil.

Bioresorbable Magnesium Screw Degradation in Goats and In Vitro Walter D. Tarr; University of Florida, United States.

Targeted Photodynamic Therapy with Hollow TiO2-ZnPc-FA Nanospheres Minerva U. Robles1, 2; 1University of California, Riverside, United States; 2College of Engineering - Center for Environmental Research and Technology, United States.

Bioresorbable Magnesium Screw Degradation in Goats and In Vitro Walter D. Tarr; University of Florida, United States.

Materials for Personalized Mechanomedicine Khalid Salaita; Emory University, United States.

Shape-Changing Hydrogels as Dynamic 3D Cell Culture Environments Andrea Kasko; University of California, Los Angeles, United States.

Engineering of Mature Human Induced Pluripotent Stem Cell Derived Cardiomyocytes Using Substrates with Multiscale Topography Parsa Pour Shahid Saeed Abadi1, 2; 1Michigan Technological University, United States; 2Brigham and Women’s Hospital, United States.

Evaluation of Dedifferentiation of Carbon Quantum Dots Sourced from Chitosan on Glioma Xin Cao1, 2; 1Jiangsu University, China; 2Harvard University, United States.

Oligodot Nanoparticles—A New Class of Fluorescent Nanoparticles for In Vitro and NIR In Vivo Imaging Fatemeh Ostadbhossein; University of Illinois at Urbana-Champaign, United States.
11:15 AM SM01.07.09
Active Delivery of Nanomedicine to Glioblastoma by Engineered Mesenchymal Stem Cell Spheroid Yeh-Hsing Liao, Columbia University, United States.

11:30 AM SM01.07.10
Tunable Polyelectrolyte Multilayers Interface for Cell Engineering Mo-Yuan Shen, Stanford University, United States.

11:45 AM SM01.07.11
Tunable Neuronal Scaffold Biomaterials Through Plasmonic Photo-Patterning of Aerogels Firoozeh Sabri, University of Memphis, United States.

SESSION SM01.08: Materials for Biological and Medical Applications VII
Session Chair: Seila Selimovic Thursday, April 25, 2019 PCC North, 200 Level, Room 229 A

2:00 PM SM01.08.02
Design of Artificial Exosomes for Cancer Diagnosis Hojun Kim, Korea Institute of Science and Technology, Korea (the Republic of).

2:15 PM SM01.08.03
Nanocopper and Copper(II)-Based Coatings for Inhibiting Bacterial Contamination via Droplets or Touch Koon Kee Neo, National University of Singapore, Singapore.

2:30 PM SM01.08.04
Diffusion-Mediated Redox Initiation for Micro-Scale Conformable Hydrogel Coatings Megan M. Wancura, University of Texas at Austin, United States.

2:45 PM SM01.08.05
Persistence of Traits Aquired from Micropillar Arrays—Mechanotransduction in A549 Human Lung Adenocarcinoma Geonhee Lee1, 2; 1Korea Research Institute of Chemical Technology, Korea (the Republic of); 2Sungkyunkwan University, Korea (the Republic of).

3:00 PM BREAK

3:30 PM *SM01.08.06
Large-Scale Neural Interface Devices Dion Khodagholy, Columbia University, United States.

4:00 PM SM01.08.07
Delivery of siRNA Against PCSK9 Using a Thermostable Exoshell Increases LDL Uptake in Liver Cancer Cells In Vitro Sameetha Swarna Lakshmi Krishnamurthy, NUS Medicine, Singapore.

4:15 PM SM01.08.08
Hyaluronate–Gold Nanorod/DR5 Antibody Complex for Noninvasive Theranosis of Skin Cancer JungHo Lee, Pohang University of Science and Technology, Korea (the Republic of).

4:30 PM SM01.08.09
Non-Invasive Oral Cancer Detection from Saliva Using ZnO-rGO Nanocomposite Based Bioelectrode Shilpi Verma1, 2, 3; 1CSIR - National Physical Laboratory, India; 2Academy of Scientific and Innovative Research (CSIR-NPL Campus), India.

4:45 PM SM01.08.10
Single Stranded DNA Encapsulated Two-Dimensional Metal Dichalcogenides for Combating Multi-Drug Resistant Bacteria Abhishek Debnath, Arizona State University, United States.

SESSION SM01.09: Materials for Biological and Medical Applications VIII
Session Chair: Wonmo Kang Friday, April 26, 2019 PCC North, 200 Level, Room 229 A

8:15 AM SM01.09.01
Fabrication of Vapor Crosslinked Hyaluronan-Polyethylene Interpenetrating Polymeric Network for Flexible Leaflet Heart Valve Replacements Hieu T. Bui, Colorado State University, United States.

8:30 AM *SM01.09.02
Application of DNA as a Programmable Molecular Glue for Bioconjugation and Assembly of Nanostructures Kurt Gothelf, Aarhus University, Denmark.

9:00 AM SM01.09.03
A Biosensor on the Nanoscale—About the Fate of Functionalized Inorganic Nanoparticles in Living Cells Sebastian Kollenda1, 2; 1University of Duisburg-Essen, Germany; 2Centre for Nanointegration Duisburg-Essen (CeNIDE), Germany.

9:15 AM SM01.09.04
Rapid Disease Detection Using Variation in Hydrodynamic Flow Parameters of Erythrocytes in Non-Photolithographic Micro-Channels Manikuntala Mukhopadhyay, Indian Institute of Technology, Kharagpur, India.

9:30 AM SM01.09.05
Atomically Thin Membranes with Nanoscale Pores for Dialysis Based Separations Piran Ravichandran Kidambi; Vanderbilt University, United States.

9:45 AM SM01.09.06
Ultrasonic Nanographene Oxide Biosensor on a Paper-Based Platform to Detect Bacterial Contamination in Water Stalin Karuppayil1, 2, 3; 1National Taiwan University, Taiwan; 2Academia Sinica, Taiwan; 3Academia Sinica, Taiwan.

10:00 AM BREAK

10:30 AM SM01.09.07
The Effect of the Surface Characteristics of 316L Stainless Steel on Cell-Substrate Interaction and Its Implications for Biomedical Applications Gemma Schneider1, 2; 1Roslyn High School, United States; 2Stony Brook University, United States.

10:45 AM SM01.09.08
Graphene Quantum Dots Prevent α-Synucleinopathy in Parkinson’s Disease Byung Hee Hong; Seoul National University, Korea (the Republic of).

11:00 AM SM01.09.09
Optoelectronic Upconversion Devices for Implantable Light Sources Xing Sheng; Tsinghua University, China.

11:15 AM SM01.09.10
Electrospinning Multi-Layered Core-Sheath Fiber Membranes for Long Term Local Treatment of Brain Tumors Daewoo Han; University of Cincinnati, United States.

11:30 AM SM01.09.11
Biodegradable Hollow Silica Capsules for Amphiphilic Transport and Sustained Delivery of Antibiotic and Anticancer Drugs Isabel Gessner; University of Cologne, Germany.

SESSION SM01.10: Materials for Biological and Medical Applications IX
Session Chairs: Abhinav Acharya and Wonmo Kang Friday, April 26, 2019 PCC North, 200 Level, Room 229 A

1:30 PM *SM01.10.01
Materials for Biological and Medical Applications Sharon Gerecht; John Hopkins University, United States.

2:00 PM SM01.10.02
Supramolecular Hydrogels Enabling Innovations in Drug Formulation and Delivery Eric A. Appel; Stanford University, United States.

2:15 PM SM01.10.03
Alloyed Upconverting Nanoparticles for Multiphoton Imaging and Lasing at Ultralow Fluences Bruce E. Cohen; Lawrence Berkeley National Laboratory, United States.

2:30 PM *SM01.10.04
Living Foundations: Programming Cells to Synthesize Hierarchically Ordered Materials Caroline Ajo-Franklin1, 2; 1Lawrence Berkeley National Laboratory, United States; 2Lawrence Berkeley National Laboratory, United States; 3Lawrence Berkeley National Laboratory, United States.

3:00 PM BREAK
Long-Term Biological Influence to Heart by Soft Ferroelectric Polymer Designed as Life-Long Cardiac Energy Harvester

Jun Li; University of Wisconsin-Madison, United States.

Roots on Paper Microfluidics—A Tool to Characterize Root Development on 2D Arrays of Water Sources

Ludovico Cademartiri; Iowa State University of Science and Technology, United States.

Hydrogel-Based “Transparent Soils” for Root Phenotyping In Vivo

Lin Ma; Iowa State University, United States.

Ligand Directed Hafnium Oxide Nanoparticles for the ‘Color’ Detection of Bone Microcracks In Vivo Using MARS Photon Counting CT

Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

Electrodeformation Studies of White Blood Cells Cultures Enriched with Gold Nanoparticles

Abdel F. Isakovic1, 2; 1KUST, United Arab Emirates; 2Cornell University, United States.

Self-Assembled Epigallocatechin Gallate-Metal Ion-Based Nanomaterials for Cancer Theranostics

Yanlu Dai; University of Macau, Macao.
SYMPOSIUM SM02
Spatial and Temporal Control of Stimuli-Responsive Theranostic Nanomaterials Using Caged Functional DNA Molecules
Yi Lu; University of Illinois at Urbana-Champaign, United States.

SYMPOSIUM SM03
Growing Next-Generation Materials with Synthetic Biology
April 24 - April 25, 2019

Symposium Organizers
Patrick Boyle, Ginkgo Bioworks
Mathew Chang, National University of Singapore
Rajesh Naik, Air Force Research Laboratory
Renee Wegrzyn, Defense Advanced Research Projects Agency

Symposium Support
Army Research Office
Office of Naval Research

SESSION SM02.03: Progress in Supramolecular Nanotheranostics III
Session Chairs: Xiaoyuan Chen and Jianjun Cheng
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 227 B

8:15 AM *SM02.03.01
Molecular Afterglow Imaging for Cancer Detection, Drug Screening and Imaging Guided Therapy
Kanyi Pu; Nanyang Technological University, Singapore.

8:45 AM *SM02.03.02
Theranostics Based on Supramolecular AIE Systems
Benzhong Tang1, 2; 1Hong Kong University of Science and Technology, Hong Kong; 2South China University of Technology, China.

9:15 AM SM02.03.03
Transition Metal Mediated Bioorthogonal Catalysis with Controlled Localization and Kinetics for Nanotheranostics
Riddha Das; University of Massachusetts Amherst, United States.

9:30 AM SM02.03.04
Enzymatic Assembling Cholesterol for Selective Cancer Therapy and Membrane Imaging
Huaimin Wang; Brandeis University, United States.

9:45 AM BREAK

10:15 AM SM02.03.05
Supramolecular Polymer-Based Nanomedicine—High Therapeutic Performance and Negligible Long-Term Immunotoxicity
Guocan Yu; National Institute of Health, United States.

10:30 AM SM02.03.06
Fluorescent Upconversion Nanoclusters for Theranostic Imaging and Photodynamic Therapy
Muthu Kumara Gnanasambandhan Jayakumar; National University of Singapore, Singapore.

10:45 AM SM02.03.07
Ultsrasmall Iron Oxide Nanoparticles for Imaging-Guided Drug Delivery
Yuping Bao; University of Alabama, United States.

11:00 AM *SM02.03.08
Employing Self-Assembly for Biomedical Imaging Applications
Gaoxin Liang; University of Science and Technology of China, China.

11:30 AM SM02.03.09
A Next Generation Theranostic Supra Molecular Nano-Platform for Sustained And Enhanced Inhibition of Cancer Stem Cells
Fatemeh Ostadhossein; University of Illinois at Urbana-Champaign, United States.

SESSION SM03.01: Synthetic Biology I
Session Chairs: Rajesh Naik and Renee Wegrzyn
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 B

1:30 PM *SM03.01.01
Genetic Encoding of Material Properties
Christopher Voigt; Massachusetts Institute of Technology, United States.

2:00 PM SM03.01.02
Synthetic Biology Toolkits for Bacterial Cellulose Production
Vishnu Vadanan Sundaravadanam; Nanyang Technological University, Singapore.

2:15 PM SM03.01.03
DNA-Based Attractor Patterns
Phillip J. Dorsey; Johns Hopkins University, United States.

2:30 PM BREAK

3:30 PM SM03.01.04
Toward Utilizing Bacterial Microcompartments as a Platform for Enhanced Catalysis
Matthew D. Yates; U.S. Naval Research Laboratory, United States.

3:45 PM SM03.01.05
Development of Microbial Cell Factories for Production of Aromatic Chemicals and Derivatives
Akihiko Kondo1, 2; 1Kobe University, Japan; 2RIKEN, Japan.

4:00 PM *SM03.01.06
Accessing Novel Materials Through Biology
Sunil Chandran; Amyris, United States.

4:30 PM SM03.01.07
Design of Silica Structures Using Peptides from Diatoms
Andrea Wallace; Massachusetts Institute of Technology, United States.

4:45 PM SM03.01.08
Polydopamine-Gold Nanoparticle Composite Material Synthesis by Engineered Cells
Isaiah Weidmann; University of Massachusetts Dartmouth, United States.

SESSION SM03.02: Poster Session: Growing Next-Generation Materials with Synthetic Biology
Session Chairs: Patrick Boyle, Mathew Chang, Rajesh Naik and Renee Wegrzyn
Wednesday Afternoon, April 24, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM03.02.01
Synthetic Biology for the Synthesis of Silicon-Containing Materials
Maria J. Sanford1, 2; 1Air Force Research Laboratory, United States; 2UES, Inc., United States.
SM03.02.02
Designing Diatoms—Characterization of Frustule Composition and Associated Optical Properties
Sasha Teymorian; U.S. Army Research Laboratory, United States.

SM03.02.03
Synthetic Biology Challenges for Army Materials Applications
Joshua A. Orlicki; Army Research Laboratory, United States.

SM03.02.04
Halogenases for Chemical Production
Rebecca M. Raji; 1Air Force Research Laboratory, United States; 2UES, Inc., United States.

SM03.02.05
Phloroglucinol Tri-Service Effort
Vanessa Varaljaj; 1UES, Inc., United States; 2Air Force Research Laboratory, United States.

SM03.02.06
Protein-Based Microcapsules as Alternative Way for Ruggedization of Functional RNA-Based Sensors
Irina Drachuk; 1UES, Inc., United States; 2711 Human Performance Wing, United States.

SM03.02.07
Gold Nanoparticle Assembled Gene Networks
Rajesh Naik; Air Force Research Laboratory, United States.

SM03.02.08
Hydrogel Encapsulated E. coli for Responsive Biomaterials
Drew Wagner; 1Air Force Research Laboratory, United States; 2UES, Inc., United States.

SM03.02.09
Will Synthetic Acorns Grow into Biobuildings—Comparing the Coding Complexity of Natural Materials with the Software of Man-Made Systems
Joseph Riddie; University of Cincinnati, United States.

SM03.02.10
In Situ NMR Experimental Study Design for Cell-Free Protein Synthesis
Angela Campo; 1Air Force Research Laboratory, Materials and Manufacturing Directorate, United States; 2Wright State University, United States.

11:30 AM SM03.03.08
The Design and Creation of an Oxygen Sensing Protein Kinase Regulator for Synthetic Biology Applications
Sanaz Farajollahi; Air Force Research Laboratory, United States.

SESSION SM03.03: Synthetic Biology II
Session Chairs: Patrick Boyle and Maneesh Gupta
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 227 B

8:30 AM *SM03.03.01
Synthetic Biology of Halomonas for Next Generation Industrial Biotechnology
George Guo-Qiang Chen; Tsinghua University, China.

9:00 AM SM03.03.02
Photocatalytic Oxidation in Metal-Organic Frameworks Using E. coli Synthesized Porphyrins Ligands
Jarod B. DeCoste; US Army Edgewood Chemical Biological Center, United States.

9:15 AM *SM03.03.03
Living Architecture—Synthetic Biology for Structural Building Materials
Will V. Srburak III; University of Colorado Boulder, United States.

9:45 AM SM03.03.04
Elucidation the Mechanism of Synthetic Riboswitches by Using Cell-Free Expression Systems
Nancy Kelley-Loughman; Materials and Manufacturing Directorate, United States.

10:00 AM BREAK

10:30 AM *SM03.03.05
Innovations in Performance Materials Enabled by Biology
Adam Safrir; Zymergen, United States.

11:00 AM SM03.03.06
Melanin Produced in the Fast-Growing Marine Bacterium Vibrio natriegens and Its Application in Chemical Protection
Zheng Wang; Naval Research Laboratory, United States.

11:15 AM SM03.03.07
Bacterially-Produced Melanin as Biomaterials
Chia Hung; Air Force Research Laboratory, United States.
SYMPOSIUM SM04

Translational Materials in Medicine—Prosthetics, Sensors and Smart Scaffolds
April 23 - April 25, 2019

Symposium Organizers
Lucy Di Silvio, King's College London
Pankaj Gupta, Abbott
Deepak Kalaskar, University of Manchester
Sudipta Seal, University of Central Florida

* Invited Paper

SESSION SM04.01: Smart Materials/Scaffolds I
Session Chairs: Lucy Di Silvio and Sudipta Seal
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 227 A

10:30 AM *SM04.01.01
In Situ Tissue Engineering with a Surprisingly Smart Scaffold Buddy Ratner; University of Washington, United States.

11:00 AM *SM04.01.02
Silk—From Textiles to Medical Products David L. Kaplan; Tufts University, United States.

11:30 AM *SM04.01.03
Supramolecular Hydrogels for Prevention of Post-Operative Adhesions Eric A. Appel; Stanford University, United States.

11:45 AM *SM04.01.04
3D Human Eye Model Using Soft and Rigid Materials Simon Regal; Ecole des Mines de Saint-Étienne, France.

SESSION SM04.02: Smart Materials/Scaffolds II
Session Chairs: Lucy Di Silvio and Sudipta Seal
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 A

1:30 PM *SM04.02.01
Designing 3D Scaffolds for Biomedical Applications Exploiting Peptide Self-Assembly Alberto Saiani; University of Manchester, United Kingdom.

2:00 PM *SM04.02.02
Designing Smart Materials for Cell Modulation Molly Stevens; Imperial College London, United Kingdom.

2:30 PM *SM04.02.03
Smart Bone Mimetic Scaffolds as Cancer Testbeds Kalpana Katti1, 2, 3; 1North Dakota State University, United States; 2North Dakota State University, United States; 3North Dakota State University, United States.

2:45 PM *SM04.02.04
Development of a Hybrid Hydroxyapatite-Baicelein Coating with Antibacterial Properties Estelle Palierse1, 2; 1Sorbonne Université, CNRS, France; 2Sorbonne Université, CNRS, France.

3:00 PM BREAK

SESSION SM04.03: 3D Printing
Session Chairs: Pankaj Gupta and Deepak Kalaskar
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 A

3:30 PM *SM04.03.01
3D Printing of Biomaterials for Bone Disorder—Opportunities, Challenges and Clinical Significance Susmita Bose; Washington State University, United States.

4:00 PM *SM04.03.02
Genomic DNA Functionalized 3D Printed Materials for Drug Capture Daryl Yee; California Institute of Technology, United States.

4:15 PM *SM04.03.03
Advanced Digital Prosthetic Technology Trevor Coward; King's College London, United Kingdom.

4:30 PM *SM04.03.04
Advances in Material Development and 3D Bioprinting Hector Martinez; Cellink, United States.

SESSION SM04.04: Poster Session: Translational Materials in Medicine—Prosthetics, Sensors and Smart Scaffolds
Session Chairs: Elizabeth Brisoibois, Kalpana Katti and Sudipta Seal
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM04.04.01
Scaffold-Mimicked Silk/Gelatin-Based Neural Microelectrode Arrays Fabricated by Aqueous-Phase Microtransfer Printing Zheng-Ting Tang; Taipei Medical University, Graduate Institute of Biomedical Materials and Tissue Engineering, Taiwan.

SM04.04.02
Osteoinductive Thermoresponsive Conducting Hydrogels Mayra C. Alcaraz; Northwestern University, United States.

SM04.04.03
Direct 3D Printing via Polyurethane Paint Based Composites Cheng-Wun Su; University of Missouri-Columbia, United States.

SM04.04.04
Optimizing Homogeneous Thin Solid Films (HTSFs) from µl-sized Blood Droplets via Hyper-Hydrophile Coatings (HemaDropTM) for Accurate Compositional Analysis via IBA, XRF and XPS Nikhil Suresh1, 2, 3; 1Arizona State University, United States; 2MicroDrop Diagnostics LLC, United States; 3AccuAngle Analytics LLC, United States.

SM04.04.05
Superelastic Ti-Based Alloys Scaffold Prepared by Fiber Metallurgy Tae-Hyun Nam; Gyeongsang National University, Korea (the Republic of).

SM04.04.06
Controlled Rupture of Magnetic-Sensitive Microcapsules for Selective Fluorescence off-on Detection of Trivalent Cations Rowey Dar; National Chiao Tung University, Taiwan.

SM04.04.07
Bio-Inspired Nanoreinforced Hydrogel for Advanced Stem Cell Therapy Shengjiang Wang1, 2, 3; 1Rutgers, The State University of New Jersey, United States; 2Northwestern Polytechnical University, China.

SM04.04.08
Effect of Photo-Initiators on Polymerisation of Thiol-eneClickable Gelatin Bioinks Kai-Hung Yang; North Carolina State University, New Zealand.

SM04.04.09
Bioprinted 3D Hybrid Nasal Cartilage with Integrated Functional Olfaction Yasamin Alghazafi Jodaei1, 2; 1Stevens Institute of Technology, United States; 2Harvard Medical School, United States.

SESSION SM04.05: 3D Printing Additive Manufacturing
Session Chairs: Melanie Cothup and Deepak Kalaskar
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 227 A

8:30 AM *SM04.05.01
Some Recent Progress in Bio-Integrated Electronics—From Prosthetic Control/Monitoring Systems to 3D Active Scaffolds John A. Rogers; Northwestern University, United States.
9:00 AM *SM04.05.02
Design of Neuroprosthetics and Virtual Training—Utilizing Additive Manufacturing and Gamified Simulation to Improve Pediatric Outcomes
Albert Manero; University of Central Florida, United States.

9:30 AM SM04.05.03
Design New Material Interface with Neurons for Neuron Stimulation and Regeneration
Chen Yang; Boston University, United States.

9:45 AM SM04.05.04
Ultracompliant Gelatin-Based Conductive Microelectrodes Applied For Mimicking Neural Microenvironment of Perineural Invasion
Yue-Xain Lin; Taipei Medical University, Taiwan.

10:00 AM BREAK

10:30 AM *SM04.05.05
Two Photon Polymerization-Based Additive Manufacturing of Microstructured Medical Devices
Roger Narayan; North Carolina State University, United States.

11:00 AM *SM04.05.06
3D Printable Bouncing Hybrids for Cartilage Regeneration
Julian Jones; Imperial College London, United Kingdom.

11:30 AM SM04.05.07
Rationally Designed Multifunctional Additively Manufactured Bone Implants
Ingmar van Hengel; Delft University of Technology, Netherlands.

11:45 AM SM04.05.08
Bioinspired Nitric Oxide (NO) Releasing Polymers to Reduce Infection and Improve Biocompatibility of Medical Devices
Elizabeth Brisbois; University of Central Florida, United States.

SESSION SM04.06: Smart Implants/Prosthetics/Scaffolds
Session Chairs: Elizabeth Brisbois and Julian Jones
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 A

1:30 PM *SM04.06.01
Conducting Polymer-Based Neuroprostheses
George Malliaras; University of Cambridge, United Kingdom.

2:00 PM SM04.06.02
Self-Assembled Capillary Alginate Hydrogel (Capgel™) Scaffolds Induce Preferential Cellular Elongation and Distinct Morphological Orientations in Defined Directions of Cultured Cells
Michael Kwan; University of Central Florida, United States.

2:15 PM SM04.06.05
Auxetic Meta-Biomaterials Towards Life-Lasting Implants
Helena M. Kolken; Delft University of Technology, Netherlands.

2:30 PM BREAK

3:30 PM *SM04.06.03
Augmenting the Fixation of Orthopedic Implants
Melanie J. Coathup; University of Central Florida, United States.

SESSION SM04.07: Biosensors/Therapeutics
Session Chairs: Pankaj Gupta and Sudipta Seal
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 227 A

8:30 AM *SM04.07.01
Cell on a Chip for Biosensing of Toxicity of Nanomaterials
Chenzhong Li1, 2; 1Florida International University, United States; 2National Science Foundation, United States.

9:00 AM SM04.07.02
Portable Surface Plasmon Resonance Sensor for the Detection of the Stroke Biomarker N-Terminal Pro-Brain Natriuretic Peptide
Dorin Harpaz1, 2, 3; 1Nanyang Technological University, Singapore; 2Ben-Gurion University of the Negev, Israel; 3Nanyang Technology University and Loughborough University, Singapore.
SYMPOSIUM SM05

Supramolecular Biomaterials for Regenerative Medicine and Drug Delivery
April 23 - April 25, 2019

Symposium Organizers
Eric Appel, Stanford University
Honggang Cui, Johns Hopkins University
Patricia Dankers, Technische Universiteit Eindhoven
Matthew Webber, University of Notre Dame

Symposium Support
3M
CEM Corporation
MilliporeSigma
Netherlands Society for Biomaterials and Tissue Engineering

* Invited Paper

SESSION SM05.01: Supramolecular Peptide Assemblies I
Session Chairs: Eric Appel and Honggang Cui
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 227 C

10:30 AM *SM05.01.01
Metabolite-Responsive Peptide Nanostructures
Rein Uljin1, 2; 1City University of New York, United States; 2Hunter College, United States.

11:00 AM SM05.01.02
Nucleopeptide Assemblies Selectively Sequester ATP in Cancer Cells and Target Cell Nucleolus
Huaimin Wang; Brandeis University, United States.

11:15 AM SM05.01.03
STINGel—A Biomaterial-Based Drug Delivery Vehicle for Enhanced Cancer Immunotherapy
David G. Leach; Rice University, United States.

11:30 AM *SM05.01.04
Self-Assembling MultiDomain Peptide Nanofibers for Immunotherapy, Wound Healing and Other Biomedical Applications
Jeffrey Hartgerink; Rice University, United States.

SESSION SM05.02: Supramolecular Peptide Assemblies II
Session Chairs: Patricia Dankers and Matthew Webber
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 227 C

1:30 PM *SM05.02.01
Supramolecular Peptide Immunotherapies—Effect of Material Structure on Immune Phenotype
Jordi Collier; Duke University, United States.

2:00 PM SM05.02.02
Molecular Mechanism of Alzheimer's Disease—Towards Prevention and Cure
Zoya Leonenko1, 2, 3; 1University of Waterloo, Canada; 2University of Waterloo, Canada; 3University of Michigan, United States.

2:15 PM SM05.02.03
Multidomain Peptide Hydrogel Accelerates Healing of Full-Thickness Wounds in Diabetic Mice
Nicole Carrejo; Rice University, United States.

2:30 PM *SM05.02.04
Supramolecular Peptide Nanotechnology for Antimicrobial Therapies
Helena S. Arzevedo1, 2; 1Queen Mary University of London, United Kingdom; 2Queen Mary University of London, United Kingdom.

3:00 PM BREAK

3:30 PM *SM05.02.05
Intracellular Delivery of Therapeutic Peptides Using Cleavable Peptide Amphiphiles
Matthew Tirrell; University of Chicago, United States.

4:00 PM SM05.02.06
Self-Assembling Prodrugs
Honggang Cui; Johns Hopkins University, United States.

4:15 PM SM05.02.07
Programmed Cell Death Instructed by Membrane-Interacting Supramolecular Assemblies
Shantanu Sur; Clarkson University, United States.

4:30 PM *SM05.02.08
Instructed-Assembly for Cell Morphogenesis and Mitochondrial Delivery
Bing Xu; Brandeis University, United States.

SESSION SM05.03: Poster Session: Supramolecular Biomaterials for Regenerative Medicine and Drug Delivery
Session Chairs: Eric Appel, Honggang Cui, Patricia Dankers and Matthew Webber
Tuesday Afternoon, April 23, 2019
5:00 PM - 7:00 PM
PCC North, 300 Level, Exhibit Hall C-E

SM05.03.01
A Lipid Raft Modified Multifunctional Nano Gene Delivery System in Brain Targeting
Ja-Hyoung Ryu; UNIST, Korea (the Republic of).

SM05.03.02
Coassembly of Enantiomeric Peptides Inside Mitochondria for Cancer Therapy
Koon Kee Neo; National University of Singapore, Singapore.

SM05.03.03
Receptor-Targeting Protein Nanocarriers for Potential Chemotherapy of Non-Muscle-Invasive Bladder Cancer
Akash Gupta; University of Massachusetts Amherst, United States.

SM05.03.04
Spatially Controlled Bioorthogonal Catalysis for Imaging and Drug Delivery
Riddha Das; University of Massachusetts Amherst, United States.

SM05.03.05
Nerve/Osteoblast/Endothelium Multicellular System Based on Ultralong Hydroxyapatite Nanowires/Celullose Multifunctional Biological Paper Promotes Bone Regeneration
Feng Liu; Shandong University, China.

SM05.03.07
Jet Printing Organic Cocrysalts from the Vapor Phase
Siddharth Borsadia; University of Michigan, United States.

SM05.03.08
Encapsulation of Flavonoids and Triterpenoids Extracted from Cranberries in Peptide-Based Spheres
Elvira Lou E. Evangelista; University of Massachusetts Dartmouth, United States.

SM05.03.09
Fluorophilic-Lipophilic-Hydrophilic Poly-2-Oxazolines Block Copolymers as MRI Contrast Agents—From Synthesis to Self-Assembly
Filipe dos Santos; 1Harvard University, United States; 2Institute of Macromolecular Chemistry, Czechia.

SM05.03.10
A Biosynthetic Platform to Deliver Neurotrophins to the Central Nervous System for Neural Regeneration
Xia Cao1, 2; 1Jiangsu University, China; 2Harvard Medical School, United States.

SM05.03.11
Polymer Supramolecular Chemistry Based on cucurbit[7]uril-PEG Copolymers
Han Wu; Tsinghua University, China.

SM05.03.12
pH-Induced Charge-Reversal Amphiphile with Cancer Cell-Selective Membrane-Destroying Activity
Yincheng Chang; Tsinghua University, China.

SM05.03.13
Multifunctional β-Cyclodextrin Macrocrosslinker-Based Self-Healable Hydrogels Showing High Mechanical Strength, Enhanced Stability and pH Responsiveness for Drug Delivery
Seunho Jung; Konkuk University, Korea (the Republic of).
SM05.03.14
Agar-Sericin Blend Antioxidant Hydrogel Dressing for Chronic Wounds Suhela I. Tyeb; Indian Institute of Technology Kanpur, India.

SM05.03.15
Multi-Functional and Bio-Responsive Electrospun Nanofiber Membranes Daewoo Han; University of Cincinnati, United States.

SM05.03.16
Adsorption Kinetics of Methylene Blue in Biocompatible Hydrogels for Drug Delivery Systems Lucas Ribeiro; Federal University of Sao Carlos, Brazil.

SM05.03.17

SESSION SM05.04: Supramolecular Engineering
Session Chairs: Honggang Cui and Matthew Webber
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 227 C

9:15 AM *SM05.04.01
Quantifying Spatial Organization in Functional Biomaterials Hale Bila; Ecole Polytechnique Federale Lausanne, Switzerland.

9:45 AM SM05.04.02
Enabling Long-Term Antibody Delivery with Polymer-Nanoparticle Supramolecular Hydrogels Anthony C. Yu; Stanford University, United States.

10:00 AM BREAK

10:30 AM SM05.04.03
Supramolecular Biomaterials for Engineering the Cell-Material Interface—From Design to High Throughput Screening Patricia Dankers; Eindhoven University of Technology, Netherlands.

10:45 AM SM05.04.04
Digestion Inspired Supramolecular Drug Delivery Materials Stefan Salentinig; University of Fribourg, Switzerland.

11:00 AM *SM05.04.05
The Design and Application of Dissipative Supramolecular Materials Job Boekhoven; TUM - Chemistry Department, Germany.

11:30 AM SM05.04.06
Highly Functionalized Water-Soluble Fullerene Derivatives—Cage Size Affects Hierarchical Self-Assembled Structures Ilija Rasovic1, 2; 1University of Birmingham, United Kingdom; 2University of Oxford, United Kingdom.

SESSION SM05.05: Macromolecular Therapeutics
Session Chairs: Eric Appel and Patricia Dankers
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 C

1:30 PM *SM05.05.01
Macromolecular Therapeutics James Hedrick; IBM Research, United States.

2:00 PM *SM05.05.02
Design of Dendronized Polypeptides and Dendritic Bolaamphiphiles for siRNA and mRNA Delivery Zhibin Guan; University of California, Irvine, United States.

2:30 PM BREAK

SESSION SM05.06: Supramolecular Hydrogels
Session Chairs: Eric Appel and Honggang Cui
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 227 C

3:30 PM *SM05.06.01
Overcoming the Blood-Brain Barrier—Post-Resection Drug Delivery to Glioblastoma Multiforme Using Supramolecular Hydrogels Oren A. Scherman; University of Cambridge, United Kingdom.

4:00 PM SM05.06.02
Dynamic and Responsive Supramolecular Biomaterials Matthew J. Webber; University of Notre Dame, United States.

4:15 PM *SM05.06.03
Bio-Inspired Metal-Coordination Crosslinking—Easy Access to Broad Dynamics When Engineering Polymer Gel Mechanics Niels Holten-Andersen; Massachusetts Institute of Technology, United States.

4:45 PM SM05.06.04
Hydrogel Using Cyclic Oligosaccharide-Based Supramolecular Complex System for Hydrophobic Drug Delivery to Enhance the Mechanical Strength, pH Responsiveness, Drug Loading Capacity and Self-Healing Property Dahan Jeong; Konkuk University, Korea (the Republic of).

SESSION SM05.07: Supramolecular Regenerative Medicine
Session Chairs: Patricia Dankers and Matthew Webber
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 227 C

9:00 AM SM05.07.01
Multi-Functional Supramolecular Hydrogels for Heart Regenerative Drug Release Mauke J. Schotman; Eindhoven University of Technology, Netherlands.

9:15 AM *SM05.07.02
Supra-Molecular Hydrogels as Custom Bioinks Sarah Heilshorn; Stanford University, United States.

9:45 AM BREAK

10:15 AM *SM05.07.03
Materials Science for Regenerative Biology Samuel Stupp; Northwestern University, United States.

10:45 AM SM05.07.04
Kidney Organoid Encapsulation in Static vs Dynamic Cross-Linked Supramolecular Hydrogels for Organoid Growth Floor A. Ruiter; Maastricht University, Netherlands.

11:00 AM SM05.07.05
Covalent-Supramolecular Polymer Hybrids for Cartilage Repair Jacob A. Lewis; Northwestern University, United States.

11:15 AM SM05.07.06
Evaluating and Designing BTA Supramolecular Hydrogels for Viscoelastic 3D Cell Culture Shahzad Hafeez; Maastricht University, Netherlands.

11:30 AM *SM05.07.07
From Dynamically Crosslinked Hydrogels to Tunable Bioinks for 3D-Printed Tissue Engineering Constructs Matthew Baker; Maastricht University, Netherlands.
SYMPOSİUM SM06

Nano- and Microgels  
April 23 - April 25, 2019

Symposium Organizers  
Dmitry Chigrin, RWTH Aachen University  
Alexander Kuehne, DWI - Leibniz Institute for Interactive Materials  
Valérie Ravaine, University of Bordeaux  
Joris Sprakel, Wageningen University and Research

* Invited Paper

SESSION SM06.01: Towards New Applications of Colloidal Gels I  
Session Chairs: Dmitry Chigrin and Alexander Kuehne  
Tuesday Morning, April 23, 2019  
PCC North, 200 Level, Room 228 A

10:30 AM *SM06.01.01  
A New Class of Soft Dendritic Colloidal Microgels with Extraordinary Adhesive and Gelation Capabilities  
Olirn Velev; North Carolina State University, United States.

11:00 AM *SM06.01.02  
Hydrogel Inks for 3D Printing  
Eugenia Kumacheva; University of Toronto, Canada.

11:30 AM *SM06.01.03  
Optically Camouflaged Microgel In Water—Prescribed Pattern Transformation in Swelling and Thermochromic Effects  
Nicholas Fang; Massachusetts Institute of Technology, United States.

SESSION SM06.02: Rheology and Nanomechanics of Microgels I  
Session Chairs: Valérie Ravaine and Joris Sprakel  
Tuesday Afternoon, April 23, 2019  
PCC North, 200 Level, Room 228 A

1:30 PM *SM06.02.01  
Jamming and Rheology of Microgels—The Role of Particle Architecture  
Michel Chotin; ESPCI, Paris, France.

2:00 PM *SM06.02.02  
Searching for Universal Features of Soft Deformable Colloids—A Comparison of the Rheology of Dense Microgel and Star Polymer Suspensions  
Dimitri Vlassopoulos; FORTH, Greece.

2:30 PM SM06.02.03  
Passive Microrheology Analysis of Sol-Gel Processes by Diffusing Wave Spectroscopy  
Matt Vanden Eynden; Formulaction, Inc., United States.

2:45 PM BREAK

3:15 PM *SM06.02.04  
Temperature-Volume Induced Glass-Liquid-Solid Transition of PNIPAM Microgels Probed by Single-Particle Microrheometry  
To Ngai; The Chinese University of Hong Kong, China.

3:45 PM SM06.02.05  
Elastic Properties and Effective Interactions of In Silico Realistic Microgels  
Lorenzo Rovigatti1, 2; 1Sapienza Università di Roma, Italy; 2CNR-ISC, Italy.

4:00 PM SM06.02.06  
Deswelling Effects on Structural and Dynamic Properties of Ionic Microgel Suspensions  
Mariano E. Brito; Forschungszentrum Juelich, Germany.

4:15 PM SM06.02.07  
Internal Structure and Shape Transformation of Microgels in the Concentrated Microgel Suspensions  
Andrey Rudov1, 2; 1DWI – Leibniz-Institut für Interaktive Materialien e. V., Germany; 2Lomonosov Moscow State University, Russian Federation.

SESSION SM06.03: Rheology and Nanomechanics of Microgels II  
Session Chairs: Christos Likos and Igor Potemkin  
Wednesday Morning, April 24, 2019  
PCC North, 200 Level, Room 228 A

8:30 AM *SM06.03.01  
Nanoscale Micelles of Diblock Copolymers with Multiple Patches for Network-Like Superstructures  
Jonghyuk Jeon; Seoul National University, Korea (the Republic of).

9:00 AM *SM06.03.02  
Ultra-Fast Microfluidic Droplet and Jet Gelation to Produce Rod-Shaped Microgels  
Andreas Krüger; DWI - Leibniz Institute for Interactive Materials, Germany.

9:30 AM SM06.03.03  
Coarse-Grained Models for Predicting Microstructure of Crosslinked Gels  
Monet Alberts; Boise State University, United States.

9:45 AM BREAK

10:30 AM *SM06.03.04  
Magnetic Microgels—From Properties of Single Particles to Those of Suspensions  
Elena Minina1, 2; 1University of Vienna, Austria; 2Ural Federal University, Russian Federation.

11:00 AM *SM06.03.05  
Light and Temperature Dual Responsive Microgels Based on Spiropyran and N-Vinylcaprolactam  
Chaolei Hu1, 2; 1Functional and Interactive Polymers, Institute of Technical and Macromolecular Chemistry, RWTH Aachen University, Germany; 2DfI-Leibniz Institute for Interactive Materials e.V., Germany.

11:30 AM *SM06.03.06  
Fed-Batch, Temperature-Programmed Synthesis of µm-Sized Microgels—Closing the Size Gap Between Batch and Microfluidic Synthesis  
Agnieszka N. Ksiazkiewicz1, 2; 1DfI - Leibniz Institute for Interactive Materials, Germany; 2RWTH Aachen University, Germany.

12:00 PM *SM06.03.07  
Ultrahigh-Throughput Production of Monodisperse and Multifunctional Janus Microgels via In-Air Microfluidics  
Claas W. Visser; University of Twente, Netherlands.

SESSION SM06.04: Gel Colloids at Interfaces I  
Session Chairs: Christos Likos and Igor Potemkin  
Wednesday Afternoon, April 24, 2019  
PCC North, 200 Level, Room 228 A

4:30 PM SM06.02.08  
Deswelling and Deformation of Concentrated Microgel Packings  
Ties van de Laar; Wageningen University and Research, Netherlands.

SESSION SM06.03: Poster Session: Nano- and Microgels  
Session Chairs: Dmitry Chigrin and Alexander Kuehne  
Tuesday Afternoon, April 23, 2019  
5:00 PM - 7:00 PM  
PCC North, 300 Level, Exhibit Hall C-E
SESSION SM06.06: Nanogels for Therapy, Diagnostics and Analytics
Session Chairs: Walter Richtering and Dimitri Vlassopoulos
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 228 A

10:15 AM *SM06.05.01
Micromorphology Resolved by Mesoscale Computer Simulations Roland G. Winkler; Forschungszentrum Juelich GmbH, Germany.

10:45 AM *SM06.05.02
Relation Between Structure, Swelling Ability and Nanomechanics of Multiresponsive Microgels Regine von Klitzing; TU Darmstadt, Germany.

11:15 AM *SM06.05.03
Composite Colloidal Materials Thomas E. Kodger; Wageningen University and Research, Netherlands.

11:45 AM SM06.05.04
Fragility and Strength in Nanoparticle Glasses Pieter van der Scheer; Wageningen University and Research Center, Netherlands.

1:30 PM *SM06.06.01
SERS-Active Microgels for Selective Molecular Analysis of Complex Biological Samples Shin-Hyun Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

2:00 PM *SM06.06.02
Expansile Nanoparticles, an Archetypal Functional Nano- to Microgel System, for the Treatment of Peritoneal Mesothelioma Mark Grinstaff; Boston University, United States.

2:30 PM BREAK

3:30 PM SM06.06.03
Effect of Binding Kinetics on Target Migration Pattern and Overall Swelling of DNA-Responsive Microgels Bjorn T. Stokke; NTNU, Norway.

SESSION SM06.07: Interactive Microgels and their Assembly I
Session Chairs: Walter Richtering and Dimitri Vlassopoulos
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 228 A

3:45 PM *SM06.07.01
Computer Synthesis of Ionic Microgels and Self-Assembly of Microgel Suspensions Under External Electric Fields Christos N. Likos; University of Vienna, Austria.

4:15 PM SM06.07.02
Understanding Mechanics of Microgels and Their Suspensions Using Mesoscale Simulations Alexander Alexeyev; Georgia Institute of Technology, United States.

4:30 PM SM06.07.03
Towards High Throughput Microfluidic Devices Alexander Jans; DWI-Leibniz Institute for Interactive Materials, Germany.

4:45 PM SM06.07.04
Strategies to Realize Precise Macroscopic Supramolecular Assembly Mengjiao Cheng; Beijing University of Chemical Technology, China.

SESSION SM06.08: Gel Colloids at Interfaces II
Session Chairs: Yu Hoshino and Regine von Klitzing
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 228 A

8:30 AM *SM06.08.01
Matter to Life—Light Driven Microgel Objects—Motion Out of Equilibrium Martin Möller; DWI - Leibniz Institute for Interactive Materials RWTH Aachen University, Germany.

9:00 AM *SM06.08.02
Features of Adsorbed Microgels Igor Potemkin1, 2; Lomonosov Moscow State University, Russian Federation; 3DWI-Leibniz Institute for Interactive Materials, Germany.

9:30 AM SM06.08.03
Pickering Emulsions Stabilized by Microgels—Link Between Microgel Adsorption at Model Interfaces and Emulsion Properties Marie-Charlotte Tatry1, 2, 3; Centre National de la Recherche Scientifique, France; 4Centre National de la Recherche Scientifique, France; 5University of Bordeaux, France.

9:45 AM BREAK

SESSION SM06.09: Interactive Microgels and their Assembly II
Session Chairs: Yu Hoshino and Regine von Klitzing
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 228 A

10:15 AM *SM06.09.01
Macroscopic Supramolecular Assembly and Its Applications Feng Shi; Beijing University of Chemical Technology, China.

10:45 AM *SM06.09.02
Simulating the Response of Liquid Crystalline Elastomer Microposts to Light Anna Baiyese; University of Pittsburgh, United States.

11:15 AM SM06.09.03
2D Binary Microgel Alloys for Soft Nanotemplating Miguel Angel Fernandez Rodriguez; ETH-Zurich, Switzerland.

11:30 AM SM06.09.04
Field-Induced Reconfigurable Assembly of Spherical Ionic Microgels into Crystals and Microtubes Brijitta Joseph Honface1, 2, 3; Lund University, Sweden; 4Sathyabama Institute of Science and Technology, India.

11:45 AM SM06.09.05
Soft Material Programming Through the Spatiotemporal Release of Oligonucleotides Moshe Rubanov; Johns Hopkins University, United States.

SESSION SM06.10: Towards New Applications of Colloidal Gels II
Session Chairs: Michel Cloitre and Shin-Hyun Kim
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 228 A

1:30 PM *SM06.10.01
Why Microgels are Ideally Suited to Improve the Performance of Next Generation Solar Cells Brian Saunders; University of Manchester, United Kingdom.

2:00 PM *SM06.10.02
Preparation of Defectless Hydrogel Nanomembranes for CO2 Separation by Microgel Particles Yu Hoshino; Kyushu University, Japan.

2:30 PM SM06.10.03
Poroviscoelastic Characterization and Modeling of Non-Crystalline Glassy Superabsorbent Polymer Microparticles During Chemical Induced Swelling Akshay Phadnis; Arizona State University, United States.

2:45 PM SM06.10.04
Modelling of Cross-Flow Ultrafiltration of Non-Ionic Microgel Suspensions for a Cylindrical Membrane Pipe Gunwoo Park; Forschungszentrum Juelich, Germany.

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Adhesion
Bioinspired Elastin-Based Adhesives

Morphological Examination of the Adhesive Setae Across the Toepads of Anolis Lizards—Insights into the Fundamentals of Fibrillar Adhesives

Biomimetic “Gecko Leg” Soft Dendritic Colloids

Functional Superhydrophobic and Icophobic Coatings Made of New Sticking Like Barnacles—Unraveling and Mimicking a Natural Bio-Inspired Programmable Surfaces for Switchable Wetting and Adhesive Peptide Design and Solution Assembly

3:00 PM *SM07.02.06
Rational Engineering of Protein-Based Biomaterials Using Folded Globular Proteins—From Single Molecule Features to Macroscopic Traits Hongbin Li; University of British Columbia, Canada.

4:00 PM SM07.02.07
Biomimetic Dynamic Supramolecular Assembly of Peptide Nanostructures Erik D. Spoerke; Sandia National Laboratories, United States.

4:15 PM SM07.02.08
Vibrational Spectroscopy of Nanofibrillar Spider Silk Qijue Wang; The College of William & Mary, United States.

4:30 PM SM07.02.09
Nanoscale Structures and Morphological Phase Transitions in a Quaternary System of Fatty Alcohol and Cationic Surfactant Emily Wonder; University of California, Santa Barbara, United States.

4:45 PM SM07.02.10
Self-Assembly of Peptides Nanostructures, Characterization and Neuronal Proliferation Prathyushakrishna Macha; University of Massachusetts, United States.

SESSION SM07.03: Poster Session: Bioinspired Materials—From Basic Discovery to Biomimicry

Mechanically Manipulation Assisted Assembly of Monolithic 3D Structures from Elastomer Composites Jheng-Wun Su; University of Missouri-Columbia, United States.

Bioinspired Metal Recovery Using Tannin-Coated Porous Substrates Under Solar Irradiation Jeong Kim; Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).

Manufacturing Biomimetic Surface with Zinc Oxide-Silver Hierarchical Nanostructures for High Efficiency Water Harvesting Na Kyong Kim; Chonnam National University, Korea (the Republic of).

Bioengineered Magnetic Bacterial Cellulose Membrane Vishnu Vadanan Sundaravadanam; Nanyang Technological University, Singapore.

Bioinspired Ionic Diode Membrane with High Ionic Selectivity Jachun Jeong; NextE&M Research Institute, Korea (the Republic of).

Inducing Fluidity in Short Chain, Amphiphilic Block Copolymer Bilayer Membranes via Polymer Functionality Gabriel A. Montano; Northern Arizona University, United States.

Dynamic Wetting of a Droplet on Striped Surfaces Liang Hu1,2; 1Harbin Engineering University, China; 2Bioresource Engineering, Canada.

Bioinspired Self-Morphing Hydrogel Programmed by Periodical Stiff Patterns Heng Deng; University of Missouri, United States.

 Extraction and Characterization of Ferulated and High-Methoxyl Pectins from Sugar Beet Agustin Rascon Chu; Centro de Investigacion en Alimentacion y Desarrollo, Mexico.

Highly Ferulated Arabinoxylans as Gelling Agents Presenting Antioxidant Activity—The Central Role of Ferulic Acid Content Elizabeth Carvajal-Millan; CIAD, Mexico.

SESSION SM07.01: Bioinspired Materials—From Basic Discovery to Biomimicry I

From Basic Discovery to Biomimicry I
Session Chair: Ali Miserez
Tuesday Morning, April 23, 2019
PCC North, 200 Level, Room 226 C

10:30 AM *SM07.01.01
Mussel Adhesion Needs a Battery Herbert Waite; University of California, Santa Barbara, United States.

11:00 AM SM07.01.02
Bio-Inspired Programmable Surfaces for Switchable Wetting and Adhesion Kurtis A. Lasqua; University of Toronto, Canada.

11:15 AM SM07.01.03
Sticking Like Barnacles—Unraveling and Mimicking a Natural Adhesive Christopher Sev; U.S. Naval Research Laboratory, United States.

11:30 AM SM07.01.04
Functional Superhydrophobic and Icophobic Coatings Made of New Biomimetic “Gecko Leg” Soft Dendritic Colloids Austin Williams; North Carolina State University, United States.

11:45 AM SM07.01.05
Morphological Examination of the Adhesive Setae Across the Toepads of Anolis Lizards—Insights into the Fundamentals of Fibrillar Adhesives Michael C. Wilson; University of Akron, United States.

SESSION SM07.02: Bioinspired Materials—From Basic Discovery to Biomimicry II

Session Chair: Bartosz Gabryelczyk
Tuesday Afternoon, April 23, 2019
PCC North, 200 Level, Room 226 C

1:30 PM SM07.02.01
Bioinspired Elastin-Based Adhesives Julie C. Liu; Purdue University, United States.

2:00 PM SM07.02.02
Extremely Tough Cyclic Peptide Nanopolymers Manoi K. Kolel-Veetil; U.S. Naval Research Laboratory, United States.

2:15 PM SM07.02.03

2:30 PM SM07.02.04
Solution-Free Fabrication of Robust Silk Materials Chengchen Guo; Tufts University, United States.

2:45 PM SM07.02.05
Natural Materials for Daytime Radiative Cooling—An Example of Regenerated Silk Fibroin Film Yu-Hsuan Chen; National Tsing Hua University, Taiwan.

3:00 PM BREAK
SM07.03.11
Ultrasound-One-Step Coating of Antimicrobial Peptides via DOPA Incorporation Young Eun Hwang; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

SM07.03.12
Production Conditions to Control Mechanical Properties of BC Membrane Florentina Sederavicute; Kaunas University of Technology, Lithuania.

SESSION SM07.04: Bioinspired Materials—From Basic Discovery to Biomimicry III
Session Chair: Matthew Harrington
Wednesday Morning, April 24, 2019
PCC North, 200 Level, Room 226 C

8:45 AM  *SM07.04.01
Sequence Control—From Biology to Coacervates Sarah Perry; University of Massachusetts Amherst, United States.

9:15 AM SM07.04.02
Tunichrome-Inspired Metal-Enrichment Dispersion Matrix Sanosik Kim; Pohang University of Science and Technology, Korea (the Republic of).

9:30 AM SM07.04.03
(Multi)Functional Structured Hydrogels Inspired by ECM Andreas Lendlein1, 2, 3, 4, 5, 6; 1Heinrich-Hertz-Institut für Elektronengeschweißtete, Berlin, Germany; 2Leibniz-Institut für Polymerforschung Dresden, Germany; 3Leibniz-Institut für Materialwissenschaft, Berlin, Germany; 4Helmholtz-Center für Materialien, Berlin, Germany; 5Potsdam, Germany.

9:45 AM SM07.04.04
Understanding of Liquid-Liquid Phase Separation of Histidine-Rich Squid Beak Proteins—First Step Towards Development of Bioinspired Functionally Graded Composite Materials Bartosz Gabryelczyk2, 1; 1Aalto University, Finland; 2Nanyang Technological University, Singapore.

10:00 AM BREAK

10:30 AM  *SM07.04.05
Dynamic Transition from α-helices to β-sheets in Polypeptide Superhelices Valeri Barsegov; University of Massachusetts, United States.

11:00 AM SM07.04.06
Higher-Order Assembly of Coiled-Coil Peptides for Biomaterial Applications Monesha Nambiar; Purdue University, United States.

11:15 AM SM07.04.07
Cytoskeleton-Inspired Biopolymer Design to Reduce Topological Defects in Polymer Networks David S. Knoff; University of Arizona, United States.

11:30 AM SM07.04.08
Human Aorta Under Tensile Stress Sabrina Friebe1, 2, 3; 1University of Leipzig, Germany; 2Leibniz-Institut für Oberflächenmodifizierung (IOM) e.V., Potsdam, Germany.

11:45 AM SM07.04.09
Wrinkling 2.0—Methods for Defect and Crack Prevention, Variation of Employed Materials and Upscaling Bernhard Glätz; Leibniz Institute of Polymer Research Dresden, Institute of Physical Chemistry and Polymer Physics, Germany.

SESSION SM07.05: Bioinspired Materials—From Basic Discovery to Biomimicry IV
Session Chair: Niels Holten-Andersen
Wednesday Afternoon, April 24, 2019
PCC North, 200 Level, Room 226 C

1:30 PM SM07.05.01
Formation of Nanopillar Structures in Bacterial Cellulose Hydrogel by Directed Plasma Nanosynthesis for Bioinspired Antimicrobial Interfaces Sandra L. Aras; University of Illinois at Urbana-Champaign, United States.

1:45 PM SM07.05.02
Engineered Polymer Nanoparticles with Unprecedented Antimicrobial Efficacy and Therapeutic Indices Against Multidrug-Resistant Bacteria and Biofilms Akshay Gupta; University of Massachusetts Amherst, United States.

2:00 PM SM07.05.03
Biomimetic Moisture Responsive Fabrics Lihong Lao; Cornell University, United States.

2:15 PM SM07.05.04
Deposition Control of LC Polysaccharide at Evaporative Interface to Design Quickly Swelling Oriented Hydrogels Garaj Joshi; Japan Advanced Institute of Science and Technology, Japan.

2:30 PM BREAK

3:30 PM SM07.05.05
Effects of Nanoparticle Composition and Size on the Crosslinking and Mechanical Behavior of Nanoparticle Hydrogels Joseph B. Tracy; North Carolina State University, United States.

4:00 PM SM07.05.07
Mussel-Inspired Composites of Mesoporous Polymer Particles for Photo-Enhanced Gold Recovery from Electronic Wastes Kyeong Rak Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:15 PM SM07.05.08
Hairi Graphenes—Assembling Nanocellulose Nets Around Graphene Oxide Sheets Rui Xiong; Georgia Institute of Technology, United States.

4:30 PM SM07.05.09
Bio-Inspired Water Oxidation Photoelectrode Based on Photonic Moth-Eye Architecture Artur Braun; Empa, Switzerland.

SESSION SM07.06: Bioinspired Materials—From Basic Discovery to Biomimicry V
Session Chair: Matthew Harrington
Thursday Morning, April 25, 2019
PCC North, 200 Level, Room 226 C

9:00 AM  *SM07.06.01
Biological and Bio-Inspired Fiber-Reinforced Materials Systems with Adaptive Shape, Stiffness and Additional Functions Thomas Speck1, 2, 3, 4; 1Botanic Garden, University of Freiburg, Germany; 2Freiburg Center for Interactive Materials and Bioinspired Technologies, Germany; 3Cluster of Excellence Im4, Germany.

9:30 AM SM07.06.02
Enhancing Tensile Properties by Bio-Inspired Porous Arrangement—Modeling, 3D Printing, Mechanical Testing and Optimization Cheng-Chung Tung; National Tsing Hua University, Taiwan.

9:45 AM SM07.06.03
Bamboo-Inspired Tubular Scaffolds with Functional Gradients Kaiyang Yin; Dartmouth College, United States.

10:00 AM BREAK

10:30 AM  *SM07.06.04
Materials Mechanics for Impulsive Movement Alfred J. Crosby; University of Massachusetts Amherst, United States.

11:00 AM SM07.06.05
Shape-Morphing Living Composites Laura K. Rivera-Tarazona; The University of Texas at Dallas, United States.

11:15 AM SM07.06.06
Designing for Disorder—The Mechanical Behaviour of Bioinspired, Stochastic Honeycomb Materials Derek Aranguren van Esmonde; University of Toronto, Canada.

11:30 AM SM07.06.07
Dynamic Structural Color from Iridescent Bacteria Clarettia J. Sullivan; Air Force Research Laboratory, United States.

11:45 AM SM07.06.08
Facile Fabrication of Dry Adhesives Based on Hierarchical Fibrillar Structure of Poly (Dimethyl Siloxane) Sang-Ryong Kim; Korea National University of Transportation, Korea (the Republic of).
SESSION SM07.07: Bioinspired Materials—
From Basic Discovery to Biomimicry VI
Session Chair: Ali Miserez
Thursday Afternoon, April 25, 2019
PCC North, 200 Level, Room 226 C

1:30 PM SM07.07.01
Bioinspired Extrinsic Control of Freeze Casting Steven Naleway; University of Utah, United States.

1:45 PM SM07.07.02
Effects of Flow and Other Forces on Structure Formation, Self-assembly and Mechanical Properties in Freeze-Cast Biopolymer Scaffolds Ulrike G. Wegst; Dartmouth College, United States.

2:00 PM SM07.07.03
Freeze Casting Using a Tri-Axial Nested Helmholtz Coil to Fabricate User-Specific Porous Scaffolds Isaac Nelson; University of Utah, United States.

2:15 PM SM07.07.04
Fabrication of Anisotropic Polyvinyl Alcohol Scaffold with Structural Recoverability Through a New Type of Polymeric Freeze-Casting Method Haw-Kai Chang; National Tsing Hua University, Taiwan.

2:30 PM SM07.07.05
Regulation of Apatite Biomineralization in the Mantis Shrimp Dactyl Club by a Newly Discovered Protein, CMP-1 Hortense Le Ferrand; Nanyang Technological University, Singapore.

SYMPOSIUM X

Frontiers of Materials Research
April 23 - April 25, 2019

Symposium Organizers
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* Invited Paper

SESSION X.01
Tuesday Afternoon, April 23, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.01.01
Designing Bio-Responsive Hybrid Materials Molly Stevens; Imperial College London, United Kingdom.

SESSION X.02
Wednesday Afternoon, April 24, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.02.01

12:40 PM *X.02.02

SESSION X.03
Thursday Afternoon, April 25, 2019
PCC North, 100 Level, Room 120 D

12:15 PM *X.03.01
AUTHOR and SESSION CHAIR INDEX

Presenter will have the symposium two-letter code followed by the session number, then paper number in bold type. (eg. ET15.06.01)

Invited speaker will have an * (asterisk) before the symposium two-letter code, session number and paper number in bold type. (eg. *ET15.06.09)

Co-author will have the symposium two-letter code followed by the session number, then paper number in regular type. (eg. CM02.02.03, *CM08.03.01)

Session chair will have the symposium two-letter code followed by the session number. (eg. EP09.02)

Joint sessions presentation will have a / (slash) dividing the two paper numbers. (eg. CM04.05.06/CM03.04.06 – presenter; CM04.05.06/CM03.04.06 – co-author)

NOTE: This program is current as of April 11, 2019. For the most up-to-date program information, refer to the online program located at https://www.mrs.org/spring2019/symposium-sessions.