SYMPOSIUM NM8

2D Materials—Macroscopic Perfection vs. Emerging Nanoscale Functionality
April 18 - April 20, 2017

Symposium Organizers
Nasim Alem, The Pennsylvania State University
Arkady Krasheninnikov, Helmholtz-Zentrum Dresden-Rossendorf
Peter Sutter, University of Nebraska-Lincoln
Alexander Weber-Bargioni, Lawrence Berkeley National Laboratory

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* Invited Paper

SESSION NM8.1: 2D Materials Synthesis and Processing
Session Chairs: Peter Liljeroth and Peter Sutter
Tuesday Morning, April 18, 2017
PCC West, 100 Level, Room 101 A

10:30 AM *NM8.1.01 Predictive Modeling of 2D Materials, Growth and Properties Boris I. Yakobson; Rice University, United States.

11:00 AM NM8.1.02 Synthesis, Characterization and Property Tuning of Two-Dimensional Mo,C (MXene) Rahele Meshkian; Thin Film Division, Linkoping University, Sweden.

11:15 AM NM8.1.03 Deterministic Patterned Growth of High-Mobility Large-Crystal Graphene—A Path towards Wafer Scale Integration Vadotas Misiekis1,2,4; ‘Istituto Italiano di Tecnologia, Italy; ‘Istituto Italiano di Tecnologia, Italy; ‘Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy.

11:30 AM NM8.1.04 Fabrication of Sub-30nm Period Graphene Antidot Lattices by Electron Beam Lithography Lene Gammelgaard; Technical University of Denmark, Denmark.

11:45 AM NM8.1.05 Scalable and Versatile Liquid-Phase Production and Patterning of Two-Dimensional Nanomaterials Ethan B. Secor; Northwestern University, United States.

SESSION NM8.2: Functional 2D Materials and Devices
Session Chairs: Arkady Krasheninnikov and Boris Yakobson
Tuesday Afternoon, April 18, 2017
PCC West, 100 Level, Room 101 A

1:30 PM *NM8.2.01 Functional 2-Dimensional Materials—From Photo Detectors to Molecular and Strain Sensors Mauricio Terrones1,2; The Pennsylvania State University, United States; Shinshu University, Japan.

2:00 PM NM8.2.02 Utilizing Atom by Atom Doping Approach to Tune Electronic Properties of 2D Materials Vidya Kochat; Rice University, United States.

2:15 PM NM8.2.03 Photoluminescence Enhancement and Carrier Type Modulation in Monolayer Transition Metal Dichalcogenides Using Isoelectronic Substitution Xufan Li; Oak Ridge National Laboratory, United States.

2:30 PM NM8.2.04 Controllable Doping of Ultrathin MoS2, by Conventional Ion-Implantation Kang Xu; The Hong Kong Polytechnic University, China.

2:45 PM NM8.2.05 Engineering the Structural and Electronic Phases of MoTe2 through W Substitution Daniel Rhodes; Columbia University, United States.

3:00 PM BREAK

SESSION NM8.3: Graphene
Session Chairs: Alexander Weber-Bargioni and Oleg Yazyev
Tuesday Afternoon, April 18, 2017
PCC West, 100 Level, Room 101 A

3:30 PM *NM8.3.01 Atomically Precise Graphene Nanostructures through On-Surface Synthesis Peter Liljeroth; Aalto University, Finland.

4:00 PM NM8.3.02 Bottom-Up Synthesis and Self-Assembly of Atomically Precise Pristine and Nitrogen-Doped Graphene Nanoribbons Alexander Sinitskii; University of Nebraska–Lincoln, United States.

4:15 PM NM8.3.03 Atomically Thin Nanoporous Graphene Membranes for Size Selective Membrane Applications Piran Ravichandran Kidambi; Massachusetts Institute of Technology, United States.

4:30 PM NM8.3.04 Lateral Superlattices and Anisotropic Optoelectronic Behaviour of Monolayer Semiconducting TMDCs via Large-Scale, Heterogeneous Elastic Strain Engineering Michael Cai Wang; University of Illinois at Urbana-Champaign, United States.

4:45 PM NM8.3.05 Growth Processes of Graphene on Ni(111) Surface Hakim Amara; ONERA-CNRS, France.

SESSION NM8.4: Poster Session I: Graphene and Carbon Materials
Tuesday Afternoon, April 18, 2017
8:00 PM - 10:00 PM
Sheraton, Third Level, Phoenix Ballroom

NM8.4.01 Exploring Surface Diels-Alder Adducts on Silica as a Controllable Carbon Precursor for Pristine Graphene Hossein Sojoudi; University of Toledo, United States.
NM8.4.02 Simple Step Growth of Graphene Nitrogen-Doped Graphene Hybrid Bilayer System in the Hot Filament Chemical Vapor Deposition Marrid Rios; University of Puerto Rico - Rio Piedras, United States.

NM8.4.03 Nondestructive Optical Visualisation of Graphene Domains and Boundaries Xinwei Wu; University of Cambridge, United Kingdom.

NM8.4.04 Continuous Single Crystal Growth of Two Dimensional Materials—The Case of Graphene Ivan Vlassiouk; Oak Ridge National Lab, United States.

NM8.4.05 Probing the Gas-Phase Dynamics of Graphene Chemical Vapour Deposition Using In Situ UV Absorption Spectroscopy Abhay Shivavogomath; Technical University of Denmark, Denmark.

NM8.4.06 Modelling the Effect of Electron Beam Irradiation on the Thermal Conductivity of Graphene Srilok Srinivasan; Iowa State University, United States.

NM8.4.07 Investigation of Spin Current Absorption through a Transparent Ferro Magnet Junction on Graphene Cemal S. Ozyar; University of California Riverside, United States.

NM8.4.08 A Novel Electrochemical Sensor Based on Gold/Reduced Graphene Oxide Hollow Microspheres Modified Glass Carbon Electrode for Sensitive Detection of Nitrite Shifeng Hou; Shandong University, China.

NM8.4.09 Synthesis of Bernal-Stacked Multilayer Graphene on Cu Surface via Chemical Vapor Deposition Minseok Yoo; POSTECH, Korea (the Republic of).

NM8.4.10 Role of Extra Cu Vapors in the Growth of Graphene on Cu via Chemical Vapor Deposition Hye Chan Lee; POSTECH, Korea (the Republic of).

NM8.4.11 Selective Separation of Large Graphene Oxide in Liquid Crystal Phase and Its Application on Electrochemical Catalysis Kyungun Lee; KAIST, Korea (the Republic of).

NM8.4.12 Dynamic Observation of Atomic-Scale Evolution in Graphene Layer under High Current Density Chun-Wei Huang; National Chiao Tung University, Taiwan.

NM8.4.13 Catalyst-Free Bottom-Up Growth of Graphene Nanostructures along with Molecular Templates on Dielectric Substrates Soweon Seo; Sungkyunkwan University, Korea (the Republic of); Center for Integrated Nanostructure Physics, Korea (the Republic of).

NM8.4.14 Comparative Study on Graphene Growth by Chemical Vapor Deposition on Cu foil and Textured Ni-W Metal YiJie Li; Shanghai Jiao Tong University, China.

NM8.4.15 Viscosity Increase of Graphene Oxide Aqueous Suspension after Electrophoretic Deposition Seong G. Park; Kamoh National Institute of Technology, Korea (the Republic of).

NM8.4.16 In Situ RBS, Raman and Ellipsometry Study of Nickel-Catalyzed Amorphous Carbon Graphitization Daniel Janke; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

NM8.4.17 Large-Area Aligned Pentagonal Graphene Domains on Copper Foils Kaihan Xia; Tsinghua University, China.

NM8.4.18 Lattice Transparency of Graphene Sieun Choo; Korea Research Institute of Chemical Technology, Korea (the Republic of); Seoul National University, Korea (the Republic of).

NM8.4.19 Dopant-Specific Unzipping of Carbon Nanotube for Intact Crystalline Graphene-Carbon Nanotube Complexes Joonwon Lim; KAIST, Korea (the Republic of).

NM8.4.20 Hybrid Zero-Dimensional C60 Clusters with Graphene—Synthesis, Fabrication and Transport Characteristics Sriishi Chaudhary; University of Texas El Paso, United States.

NM8.4.21 Versatile Water-Based Transfer of Large-Area Graphene Films onto Flexible Substrates Maria Kim; Aalto University, Finland.

NM8.4.22 Stacked Graphene as an Electrode for ITO-Free Solar Cells Ehsan Kevvani-Someh; Northeastern University, United States.

NM8.4.23 Graphene Moiré Pattern Ultra-High Resolution Atomic Force Microscopy Byong Kim; Park Systems Corporation, United States.

NM8.4.24 Preparation of Metal Nanoparticles-Decorated Graphene via a Physical Route Chi Z. Wang; WuHan University, China.

NM8.4.25 Solvothermal Exfoliation of Graphite—A Greener Method to Produce Few-Layered Graphene Paulo Duarte; Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Portugal; Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Portugal.

NM8.4.26 Low Concentration Nanofluid of Graphene-Based Amphiphilic Janus Nanosheets for Oil Recovery—High Performance by Its Unique Interfacial Behavior Dan Luo; University of Houston, United States.

NM8.4.27 Xenon Flash Lamp-Induced Multilayer Graphene Growth for Roll-to-Roll Application Tae Hong Im; KAIST, Korea (the Republic of).

NM8.4.28 A PDMS-Based, Semi-Dry Technique for Transferring CVD-Grown Graphene to SiO2 Surfaces Kyle Slusarski; U.S. Army Research Laboratory, United States.

NM8.4.29 Unraveling the Role of Nitrogen Bonding Configurations on the Electrical Transport Properties of N-Doped Twisted Bilayer Graphene Tei B. Limbu; Institute for Functional Nanomaterials, United States; University of Puerto Rico at Rio Piedras, United States.

NM8.4.30 Growth of Graphene on FIB Patterned 3C-SiC Nanostructures by UHV Annealing Mojtaba AmjadiPour; Queensland University of Technology, Australia.

NM8.4.31 Boosting the Electrical Conductivity and 3D Nanostructuring of Inkjet Printed Graphene with Pulsed Laser Irradiation Suprem R. Das; Iowa State University, United States; Ames Laboratory, United States.

NM8.4.32 Photodynamic Response of a Bilayer Graphene p-n Junction Using a Combination of Electrostatic and Electrolytic Gating Anupama Joshi; Tata Institute of Fundamental Research, India; Indian Institute of Technology Bombay, India.

NM8.4.33 Characterization of Smart Polymer-Graphene Hybrid Systems: Atomistic Insights into Adsorption and Stimuli-Responsive Behaviors Mahdi Moshref-Javadi; Monash University, Australia.
8:00 AM NM8.5.01
Strain Engineering of 2D Materials via Dielectric Nanosphere Assemblies **Yingjie Zhang;** University of Illinois at Urbana-Champaign, United States.

8:15 AM NM8.5.02
From Liquid Metals Down to Two-Dimensional Semiconductors **Kourosh Kalantar-Zadeh;** RMIT, Australia.

8:30 AM NM8.5.03
Layer Structured Gallium Chalcogenides—Controlled Synthesis and Engineering of Their Bandgap and Optical Properties **Hui Cai;** Arizona State University, United States.

8:45 AM *NM8.5.04
Properties and Device Applications of Two-Dimensional Charge Density Wave Materials **Alexander A. Balandin;** University of California, Riverside, United States.

9:15 AM NM8.5.05
Synthesis of Large Area MoS₂, Few Layers by RF Sputtering Process **Jeon Kook Lee;** Korea Institute of Science and Technology, Korea (the Republic of).

9:30 AM NM8.5.06
Quasi-2D Monolayers of Plasmonic Nanocrystals Cross-Linked by Phthalocyanines—a New Playing Field for Molecular Electronics **Marcus Scheele;** University of Tubingen, Germany.

9:45 AM BREAK

10:15 AM *NM8.6.01
Novel Quantum Phenomena in Atomically Thin Two-Dimensional Materials **Steven Louie;** University of California, Berkeley, United States; ²Lawrence Berkeley National Laboratory, United States.

10:45 AM NM8.6.02
One-Dimensional Photonic Crystals for Touchless Finger Motion Tracking Based on 2D Nanosheets with Ultrahigh Moisture Sensitivity **Katsuyuki Sendo;** ¹, ²LMU Munich, Germany; ³Max Planck Institute for Solid State Research, Germany; ⁴Nanoinitiative Munich and Center for Nanosciences, Germany.

11:00 AM NM8.6.03
Towards Single-Photon LEDs by FRET from Metal Nanoparticles to 2D Monolayers **John Lupton;** University of Regensburg, Germany.

11:15 AM NM8.6.04
Large Scale Commercial Fabrication of High Quality Graphene-Based Assays for Biomolecule Detection **Mitchell Lerner;** Nanomedical Diagnostics, United States.

11:30 AM *NM8.6.05
Rational Design of 2-Dimensional Magnetic Materials for the Quantum Anomalous Hall Effect and Spintronic Applications **Vivek B. Shenoy;** University of Pennsylvania, United States.

3:30 PM *NM8.8.01
Excitons in van der Waals Heterostructures **Xiaodong Xu;** Washington, United States.

4:00 PM *NM8.8.02
The Effect of Substrates on Optical, Thermal and Catalytic Functionalities of 2D TMDC Materials **Linyou Cao;** North Carolina State University, United States.

4:30 PM NM8.8.03
The Hot Pick-up Technique for Batch Assembly of van der Waals Heterostructures **Bjarke Jessen;** Technical University of Denmark, Denmark.

4:45 PM NM8.8.04
Epitaxial Growth and Characterisation of Graphene Heterostructures on SiC **Jonathan Bradford;** Queensland University of Technology, Australia.

SESSION NM8.9: Poster Session II: 2D Materials Beyond Graphene

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SESSION NM8.9.01
Defect-Mediated Photoluminescence Up-Conversion in Cadmium Sulfide Nanobelts **Yuriy Morozov;** University of Notre Dame, United States.

SESSION NM8.9.02
Stacking of CVD-Grown Single Layer MoS₂ to Graphene for the Reduction of Schottky Barriers **Chun-Yu T. Huang;** University of California, Riverside, United States.

SESSION NM8.9.03
Aging Effects and Environmental Stability of Anisotropic GaTe Nanomaterials **Sijie Yang;** Arizona State University, United States.

SESSION NM8.9.04
Synthesis of Wafer Scale with Phase-Controlled 1T’ and 2H Atomic Molybdenum Ditelluride Layers **Juhong Park;** University of North Texas, United States.
Synthesis of Black Phosphorous Crystals
Understanding the Role of Novel Mineralizers and Dopants in Improving Material Properties
Facile Synthesis of TiO₂ QDS Decorated on Monolayer WS₂ Nanohybrids with Enhance Gas Sensitive for Ammonia Detection at Room Temperature
Rotational Superstructure in Self-Assembled C₆₀ Monolayer on WSe₂
Spectroscopic Ellipsometry of Large-Area Tungsten Disulfide
Understanding the Role of Novel Mineralizers and Dopants in Improving Synthesis of Black Phosphorous Crystals
Formation and Properties of Nanoscale Origami Features on 2D Surfaces
Intrinsic Photoconductivity of Few-Layered Transition Metal Dichalcogenides Phototransistors via Multi-Terminal Measurements
Precise, Layer-by-Layer Control of MoS₂ Thickness and Properties via Thermal Vapor Sulfurization
Exfoliation of Quasi-Stratified Bi₂S₃ Crystals into Micron-Scale Ultrathin Corrugated Nanosheets
Self-Assembly of 2D Phase-Selected Peptide Layers on MoS₂ Surfaces
Phase Transformation in Thin Films under Surface Heating and Convective Boundary Conditions
Atomically-Layer Precision Controlled Synthesis and Characterization of cm-Scale Hexagonal Boron Nitride
High-Performance Hybrid Capacitors Based on Graphene and Carbon Sphere/Polyaniline/MnO₂ Ternary Nanocomposites
Cavity Ring-Down Spectroscopy Monitoring of Photochemistry in Monolayer 2D Polymer Films

Large-Scale High Quality Single Crystal Growth of BiSbTeSe₂, by Zone Melting with Bridgman
Three-Dimensional Electron Beam Microscopy of BSTS Topological Insulator
Flexible 2D Organic–Inorganic Hybrid Thin Films for Band-Selective Photodetection
Characterization of Mechanical Properties of Polycrystalline 2D Materials with Interfacial Phases
Light Emission from InP/Graphene Hybrid Epitaxial Structures
Hierarchical Assembly of Molybdenum Trioxide 2D Sheets and Aluminum Nanoparticles
Conjugated Polyelectrolyte/Graphene Heterobilayer Nanocomposites
Understanding How Spatial Heterogeneity of Nanostructures Impacts the Optical and Electronic Properties of 2D Materials
Designing Novel 2D Materials and Heterostructures for Next-Generation Ultra Energy-Efficient Electronics

SESSION NM8.10: Defects and Grain Boundaries in 2D Materials
Session Chairs: Mauricio Terrones and Alexander Weber-Bargioni
Thursday Morning, April 20, 2017
PCC West, 100 Level, Room 101 A

8:15 AM NM8.10.01
Unraveling Hidden Defects and Unexpected Properties of Graphene—How Advanced TEM Contributes to Materials Development
Benjamin Bart²,³,⁴,...
Friedrich-Alexander-Universität Erlangen Nürnberg, Germany;¹ Stanford University, United States.

8:30 AM NM8.10.02
Chemical and Electronic Repair Mechanism of Sulfur Vacancies in MoS₂ Monolayers
Sibylle Gemming¹,²,³,⁴,°... Helmholtz-Zentrum Berlin, Germany;¹ Technische Universität Chemnitz, Germany.

9:15 AM NM8.10.04
Pushing the Performance Limit of 2D Semiconductor Transistors
Xiaoye Dong¹,²... University of California, Los Angeles, United States.

9:45 AM BREAK
10:15 AM *NM8.11.01
Grain Boundaries and Dislocations in Graphene and other 2D Materials Oleg Yazyev; Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland.

10:45 AM NM8.11.02
Highly Sensitive and High-Speed Imaging of Grain Boundaries in Graphene by Transient Absorption Microscopy Chen Yang; Purdue University, United States.

11:00 AM NM8.11.03
Joule Heating in Phase Change SnS$_2$ Nanoflakes Yu-Kai Wu; National Taiwan University of Science and Technology, Taiwan.

11:15 AM NM8.11.04
Defects by Design—Molecular Engineering for Flexible Electronics Christopher Muratore; University of Dayton, United States.

11:30 AM NM8.11.05
Directing Interlayer Exciton and Photocurrent Dynamics by Twisting and Stacking van der Waals Materials Matt W. Graham; Oregon State University, United States.

11:45 AM NM8.11.06
Long-Term Stability of Mechanically Exfoliated MoS$_2$ Flakes Prachi Budania; Queen’s University, United Kingdom.

3:30 PM *NM8.13.01

4:00 PM *NM8.13.02
Atomic Resolution Imaging and Spectroscopy of Low-Dimensional Materials with Interrupted Periodicities Kazutomo Suenaga; AIST, Japan.

4:30 PM NM8.13.03
Probing Interfaces, Hidden Charges and ns Time-Scale Nanoelectromechanics of 2D Materials via Ultrasonic SPM Oleg Kolosov; Lancaster University, United Kingdom.

4:45 PM NM8.13.04
Nanoscale Heterogeneity in Exfoliated WSe$_2$, Probed by Correlated TERS, SKM and Photocurrent Mapping Andrey Krayev; AIST-NT Inc, United States.