

REPORT DOCUMENTATION PAGE			Form Approved OMB NO. 0704-0188		
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA, 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</p>					
1. REPORT DATE (DD-MM-YYYY) 29-05-2018		2. REPORT TYPE Final Report		3. DATES COVERED (From - To) 22-Dec-2017 - 21-Jun-2018	
4. TITLE AND SUBTITLE Final Report: 2017 Materials Research Society (MRS) Fall Meeting Symposia			5a. CONTRACT NUMBER W911NF-18-1-0059		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER 611102		
6. AUTHORS			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAMES AND ADDRESSES Materials Research Society 506 Keystone Dr. Warrendale, PA 15086 -7573			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES) U.S. Army Research Office P.O. Box 12211 Research Triangle Park, NC 27709-2211			10. SPONSOR/MONITOR'S ACRONYM(S) ARO		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) 71909-MS-CF.12		
12. DISTRIBUTION AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.					
13. SUPPLEMENTARY NOTES The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON J. Ardie Dillen
a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU			19b. TELEPHONE NUMBER 724-779-2711

RPPR Final Report

as of 24-Jul-2018

Agency Code:

Proposal Number: 71909MSCF

Agreement Number: W911NF-18-1-0059

INVESTIGATOR(S):

Name: J. Ardie Dillen
Email: dillen@mrs.org
Phone Number: 7247792711
Principal: Y

Organization: **Materials Research Society**

Address: 506 Keystone Dr., Warrendale, PA 150867573

Country: USA

DUNS Number: 107328510

EIN: 311037979

Report Date: 21-Sep-2018

Date Received: 29-May-2018

Final Report for Period Beginning 22-Dec-2017 and Ending 21-Jun-2018

Title: 2017 Materials Research Society (MRS) Fall Meeting Symposia

Begin Performance Period: 22-Dec-2017

End Performance Period: 21-Jun-2018

Report Term: 0-Other

Submitted By: Donna Gillespie

Email: gillespie@mrs.org

Phone: (724) 779-2732

Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 0

STEM Participants: 0

Major Goals: The 2017 Fall Meeting of the Materials Research Society (MRS) was held from November 26 to December 1, 2017, in Boston, Massachusetts. The world's foremost international scientific gathering for materials research, the MRS meeting showcases leading interdisciplinary research in both fundamental and applied areas, coordinated by over 200 scientists from both academia and industry in many countries around the world. ARO support was provided for the following three Symposia:

BM1: Multi-scale Mechanobiology and Biomechanics: Theory, Experiments, Computations. The focus was to bring together a strong cohort of modelers and experimentalists from many areas of mechanics, materials, cell biology and medicine to investigate the response of biological and bio-inspired systems due to mechanical loading at various length scales. In addition, the symposium provided a platform for experts in the field to connect with one another and develop synergistic research that would advance the field further.

NM03: Progress in Developing and Applications of Functional One-Dimension Nanostructures. The aim was to provide to the materials science community a unique forum to discuss current research activities focused on undoped, doped and surface functionalized one-dimensional (1D) nanostructures. The symposium brought together an interdisciplinary group of researchers and engineers working on both fundamental 1D materials research and device-related materials engineering topics in an effort to help them appreciate the breadth of the field, address current challenges, promote collaboration, generate ideas and identify future applications.

NM08: Defect-Induced Phenomena and New States of Matter at the Nanoscale.

The goal of the symposium was to identify and understand which types of defects can lead to the creation of new states of matter at the nanoscale. Through the ARO grant, 11 invited speakers from 6 countries came together to deliberate on the topic of defects in materials science and engineering. Rich discussions ensued following all invited talks, and in some cases, fresh collaborations were initiated.

Accomplishments: Symposium BM1: Besides conventional oral and poster presentations, this symposium had one session in a panel discussion format with four panelists representing the modeling and experimental avenues of mechanobiology in particular. Invited keynote lectures and the panel discussion were the highlights of the symposium and were given by leading experts in the field.

Symposium NM03: There were 14 invited talks, 44 contributed presentations and 103 posters distributed among different research areas. The symposium offered researchers a forum out of their routines to critically examine and cross-fertilize each other's work, which might not be so straightforward otherwise. It is the organizers' firm belief

RPPR Final Report as of 24-Jul-2018

that the ideas and collaborations fostered by this symposium will drive the successful adoption of 1D materials for new applications in energy, sensing, photonics, health and others.

Symposium NM08: The symposium enhanced our fundamental understanding of defects at the nanoscale and informed the materials community on how to use defects as a “tuning knob” for manipulating the electronic structure, charge flow, and spin coupling in 2D materials (e.g., graphene, surface states of topological insulators, and transition metal dichalcogenides) for applications in catalysis, energy storage, high-mobility electronic devices, and quantum information technology. Accordingly, the symposium brought together materials scientists from different sub-fields with both academic and geographic diversities. The symposium will presented new breakthroughs in controlling defects to realize superior properties and observe novel fundamental phenomenon with applications directly relevant to the Materials Science Division at ARO.

Training Opportunities: Nothing to Report

Results Dissemination: 2017 MRS Fall Meeting technical program and abstracts are posted:
www.mrs.org

Submitted and accepted papers will be published in MRS Advances:
<https://www.cambridge.org/core/journals/mrs-advances>

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: Co PD/PI

Participant: Wojciech M. Jadwisieniczak PhD

Person Months Worked: 1.00

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Funding Support:

Participant Type: Co PD/PI

Participant: Apparao M. Rao PhD

Person Months Worked: 1.00

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Funding Support:

Participant Type: Co PD/PI

Participant: Dinesh Katti PhD

Person Months Worked: 1.00

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Funding Support:

RPPR Final Report as of 24-Jul-2018

Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 1-Published

Journal: MRS Advances

Publication Identifier Type: DOI

Publication Identifier: 10.1557/adv.2018.195

Volume: 3

Issue:

First Page #: 803

Date Submitted: 5/15/18 12:00AM

Date Published: 2/1/18 12:00AM

Publication Location: Warrendale PA USA

Article Title: From 2-D Nanocrystalline Films to 1-D Nanomaterials: An Overview

Authors: Chunxu Pan, Jun Wu, Gongsheng Song, Chengzhi Luo, Delong Li, Yueli Liu, Qiang Fu

Keywords: oxide nanostructure thin film

Abstract: In the past few years, our group worked on the area of transformation from the two-dimensional (2-D) nanocrystalline films to one-dimensional (1-D) nanomaterials by using thermal oxidation. In this paper, we overview the research work on the controllable growth processes, transformation phenomena, growth mechanisms and applications. In general, the preparation process includes the following steps: 1) prepare a pure metal nanocrystalline film via a pulse electro – deposition; 2) grow variant 1-D nanomaterials, such as carbon nanotubes (CNTs), carbon nanofibers (CNFs), and 1-D metal oxide nanoneedles involving ZnO, CuO and Fe₃O₄, etc. by using this film as catalyst. This process exhibits the following features: 1) the 1-D nanomaterials grow according to “base growth” model and no residual catalyst exists at the tip of the products; 2) the diameter of the 1-D nanomaterials can be controlled by controlling grain sizes of the 2-D films through adjusting pulse electro-deposition parameters;

Distribution Statement: 1-Approved for public release; distribution is unlimited.

Acknowledged Federal Support: **N**

Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 1-Published

Journal: MRS Advances

Publication Identifier Type: DOI

Publication Identifier: 10.1557/adv.2018.30

Volume: 3

Issue:

First Page #: 849

Date Submitted: 5/15/18 12:00AM

Date Published: 1/1/18 12:00AM

Publication Location: Warrendale PA USA

Article Title: Preparation of Metal Nanoparticle Decorated Graphene Hybrid Composites: A Review

Authors: Zhongchi Wang, Yunjie Ping, Qiang Fu, Chunxu Pan

Keywords: C metal nanostructure

Abstract: In recent years, the graphene/metal nanoparticles (NPs) hybrids have sparked burgeoning interest in varied application fields due to its unique physicochemical properties. In this paper, we present an overview of preparation methods of the graphene/metal NPs hybrids, which includes some common routes as well as other particular strategies. In addition, we introduce a novel physical route to decorate metal NPs upon graphene sheets. Our expectation is that this review will provide references for the exploitation of emerging preparation technologies, and expand application fields for graphene/metal NPs hybrids in the future.

Distribution Statement: 1-Approved for public release; distribution is unlimited.

Acknowledged Federal Support: **N**

RPPR Final Report as of 24-Jul-2018

Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 1-Published

Journal: MRS Advances

Publication Identifier Type: DOI

Publication Identifier: 10.1557/adv.2018.139

Volume: 3

Issue:

First Page #: 855

Date Submitted: 5/15/18 12:00AM

Date Published: 1/1/18 12:00AM

Publication Location: Warrendale PA USA

Article Title: Carbon Nanofiber Aerogel Converted from Bacterial Cellulose for Kilohertz AC-Supercapacitors

Authors: Nazifah Islam, Md Nadim Ferdous Hoque, Yujiao Zu, Shu Wang, Zhaoyang Fan

Keywords: aerogel nanostructure energy storage

Abstract: Compact-size kilohertz (kHz) AC-supercapacitors are being pursued for ripple current filtering and pulsed energy storage. However, their development is limited by a small areal capacitance density due to very thin electrode used for meeting frequency requirement. In our work, crosslinked carbon nanofiber aerogel (CCNFA) was investigated as freestanding electrode for kHz AC-supercapacitors with an areal capacitance density as large as 4.5 mF cm⁻² at 120 Hz, 5-10 times larger than most reports. The CCNFA was obtained in a rapid plasma carbonization process of bacterial cellulose. The fabrication route adopted here is simple and straightforward, and the produced CCNFA electrode was found to be very suitable for high-frequency AC-supercapacitors. The operating voltage range of CCNFA based AC-supercapacitors can be expanded to 3 V by utilizing an organic electrolyte.

Distribution Statement: 1-Approved for public release; distribution is unlimited.

Acknowledged Federal Support: **N**

Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 1-Published

Journal: MRS Advances

Publication Identifier Type: DOI

Publication Identifier: 10.1557/adv.2018.306

Volume: 3

Issue: 14

First Page #: 767

Date Submitted: 5/16/18 12:00AM

Date Published: 3/1/18 5:00AM

Publication Location: Warrendale PA USA

Article Title: Review of the Stability/Capacity Trade-off in Silver Hollandite Lithium Battery Cathodes

Authors: Paul F. Smith, Diana M. Lutz, Esther S. Takeuchi, Kenneth J. Takeuchi, Amy C. Marschilok

Keywords: energy storage Mn Li

Abstract: Highly detailed structural characterization is required to understand the discharge mechanism in order to effectively investigate δ -MnO₂ structured lithium battery cathode materials. This paper discusses recent findings which elucidate the lithiation mechanism of silver-hollandite, Ag_xMn₈O₁₆. For Ag_{1.2}Mn₈O₁₆, the structure is not significantly perturbed during the first 2 equivalents of lithiation and the electrochemistry is highly reversible. Upon 4 equivalents of lithiation, the structure becomes highly distorted, in correlation with capacity fade observed over 40 cycles. Notably, regarding capacity fade, modifications to Ag/Mn ratio are less impactful than modifications to the δ -MnO₂ crystallite size. This is shown in comparisons of two materials with the same stoichiometry (Ag_{1.4}Mn₈O₁₆) and differing crystallite size (10 and 15 nm).

Distribution Statement: 1-Approved for public release; distribution is unlimited.

Acknowledged Federal Support: **N**

RPPR Final Report
as of 24-Jul-2018

Publication Type: Journal Article Peer Reviewed: Y **Publication Status:** 1-Published

Journal: MRS Advances

Publication Identifier Type: DOI

Publication Identifier: 10.1557/adv.2018.305

Volume: 3

Issue: 14

First Page #: 773

Date Submitted: 5/16/18 12:00AM

Date Published: 3/1/18 5:00AM

Publication Location: Warrendale PA USA

Article Title: A Combined Experimental and Theoretical Study of Lithiation Mechanism in ZnFe₂O₄ Anode Materials

Authors: Lei Wang, Alison McCarthy, Kenneth J. Takeuchi, Esther S. Takeuchi, Amy C. Marschilok

Keywords: Zn Fe energy storage

Abstract: ZnFe₂O₄ (ZFO) represents a promising anode material for lithium ion batteries, but there is still a lack of deep understanding of the fundamental reduction mechanism associated with this material. In this paper, the complete visualization of reduction/oxidation products irrespective of their crystallinity was achieved experimentally through a compilation of in situ X-ray diffraction, synchrotron based powder diffraction, and ex-situ X-ray absorption fine structure data. Complementary theoretical modelling study further shed light upon the fundamental understanding of the lithiation mechanism, especially at the early stage from ZnFe₂O₄ up to Li_xZnFe₂O₄ (x = 2).

Distribution Statement: 1-Approved for public release; distribution is unlimited.

Acknowledged Federal Support: **N**

WEBSITES:

URL: www.mrs.org

Date Received: 16-May-2018

Title: Materials Research Society

Description: Materials Research Society where program and abstract documents are maintained

URL: <https://www.cambridge.org/core/>

Date Received: 16-May-2018

Title: Cambridge University Press

Description: Cambridge University Press where MRS Advances articles are maintained.

Final Report

Symposium Title: BM01: Multiscale mechanobiology and biomechanics: theory – experiments – computations

Symposium Abstract:

Mechanisms of mechanical forces acting on biological tissues are difficult to understand due to the complexity and hierarchical organization of structures. Thus, both experimental evaluation, as well as modeling and predictive methodologies for biological systems, are unique. This is also true for engineered materials used at the interface with biology or used for replacement of biological tissues such as in regenerative medicine. The focus of this symposium is to bring together a strong cohort of modelers and experimentalists from many areas of mechanics, materials, cell biology, and medicine to investigate the response of biological and bio-inspired systems due to mechanical loading at various length scales. This symposium will also target the role of mechanics at the cellular and tissue level for applications in medicine and biomimetics. Besides conventional oral and poster presentations, this symposium will have one session in a panel discussion format with four panelists representing the modeling and experimental avenues of mechanobiology in particular.

Contributed papers and posters were solicited in the following areas, but were not limited to these areas:

- Multiscale modeling of biological nanocomposites.
- Novel characterization of mechanical response from nano to macro scale for biological materials through experiments such as nanoindentation, Biochemical characterization, spectroscopies, electron microscopy, etc.
- Molecular mechanics of proteins and protein-protein interactions for cellular adhesion and cell-cell signaling
- Mechanics of tissue-engineered material interfaces through experiments and modeling
- Cellular and tissue mechanics and its role in the disease.
- Poromechanics of biological systems and tissue engineered scaffolds
- Mechanical behavior of nanoporous biological and bio-inspired materials

Symposium Details:

The symposium was organized as part of the Materials Research Society Fall 2017 meeting. The symposium was spread out over four days and divided into 17 session blocks. These sessions included one poster session and one panel discussion session.

Invited keynote lectures and the panel discussion were the highlights of the symposium and were given by leading experts in the field:

Mohan Edirisinghe
Michael Sacks
Kalpana Katti
Surya Kalidindi
Susmita Bose
Michelle Oyen
Nora de Leeuw
Markus Buehler
Candan Tamerler
Rajesh Naik
Roger Narayan
Elisa Budyn
Jeffry Nyman
Amit Bandyopadhyay
Alex Robling
Ming Dao

All sessions had an invited speaker, and as much as possible, the contributory papers were aligned to the topic area of the invited speaker to maximize the impact and interest in the session. The panel discussion was very successful with good discussion between the panelists and the audience about the potentially important contributions the field of mechanobiology will make in the future. The interest in the field of mechanobiology based on the strong participation and high quality presentations clearly shows the importance of the field and its positive impact on the Army.

The symposium organizers were,
Dinesh Katti
Christian Hellmich
Ko Okumura

Report to Army Research Office (ARO)

2017 MRS Fall Meeting and Exhibit, Boston MA, November 26 – December 1, 2017

Symposium NM03: Progress in Developing and Applications of Functional One-Dimensional Nanostructures

Grant Number: **W911NF-18-1-0059**

Amount: **\$5,000**

Symposium Organizers

PI: **Juan Beltran-Huarac**, Harvard University, Department of Environmental Health, USA,

Tel.: 617-432-7990, Email: jbeltran@hsph.harvard.edu

Co-PI: **Wojciech M. Jadwisienczak**, Ohio University, School of EECS, USA,

Tel.: 740-593-2067, Email: jadwisie@ohio.edu

Co-PI: **Alessandro Ponti**, National Research Council, Institute of Molecular Scie. & Tech., Italy,

Tel.: 39-02-5031-4280, Email: alessandro.ponti@istm.cnr.it

Co-PI: **Bo Zou**, Jilin University, State Key Laboratory of Superhard Materials, China,

Tel.: 86-431-85168882, Email: zoubo@jlu.edu.cn

Summary

There was a strong interest to attending the NM03 Symposium focused on development of *1D* materials at nanometric precision with controlled intrinsic properties, including agglomerate and aggregate state, phase, crystallinity, shape, morphology, composition, size and stoichiometry. Attendees included academic, governmental, and industrial researchers, allowing the symposium to showcase a breadth of work that encompassed from the most exploratory fundamental research to the pragmatic industrial product-focused development. Emphasis was on the aspect ratio related characteristics, where *1D* nanostructures play a pivotal role as innovative building blocks for energy harvesting, storage, conversion, sensing, transmission, light detection & emission and theranostics. The mixing of *1D* structures into *2D* and *3D* higher-order architectures with rational design and biomimetic principles was considered as a feasible and highly efficient strategy to obtain enhanced optical, electrical, and mechanical properties. Furthermore, growth and integration of *1D* nanostructures into *3D* spatially high-dimensional architectures were considered as to bridge the gap between the nano- and the micro- and macro-scales, and form the basis for an assembly of *1D* materials into higher hierarchy domains. Talks went across three days including three poster sessions. MRS will be publishing the proceedings of the meeting in *MRS Advances*, which is a peer-reviewed journal published through Cambridge University Press.

Objectives

The aim of this three-day symposium titled “*Progress in Developing and Applications of Functional One-Dimensional Nanostructures*” was to provide to the materials science community a unique forum to discuss current research activities focused on undoped, doped and surface functionalized one-dimensional (*1D*) nanostructures (including tubes, wires, rods, saws and belts), whose lateral dimensions fall within the 1-100 nm range. The functional quality of *1D* nanostructures is based on their structure-property relationship, whose determination begins at an atomic level, and their ultimate utilization in novel smart devices and biological platforms. Furthermore, symposium aimed to foster fundamental research in materials science and both symposium topics and presentation bearing strong relevance to the ARO campaign, especially in the taxonomy level 2 subjects *Photonics, Electronics, and Energy & Power*. Symposium presentations closely related to warfighter performance with regard to, *e.g.*, self-powered wearable physiological monitoring, fracture-tough CNT/GNP composites, stress-transfer nanofiber composites, and flame-retardant MoS₂ nanoplatelet/GNP composites. The symposium, in particular, was linked to the *BAA Research Programs* of the *ARL Material Science*

Division programs: *Material Design (1.1)*: several contributions related to the directed assembly of 1D NMs (CNT, metal oxides, GaN, GaAs, Si) was presented; *Physical Properties (1.3)*: several contributions were presented describing perovskite and III-V nanowires for optoelectronics, TiO₂ nano-belts and NMs for photo-catalysis, Mn, V, and Hf oxide nanowires and doped CNTs for energy storage; *Synthesis & Processing (1.4)*: several contributions were presented describing the large-scale production of 3D nanofibers and the production of superconducting cables from superconducting nanofibers. Finally, several contributions have addressed the health impact of 1D NMs on workers and end-users, the necessity of personalized toxicological risk assessment to human health, and the need of cost-effective predictive risk management as an integral part of 1D NMs and manufacture.

Research Highlights

The presentations were divided into several areas:

1. Synthesis and Fabrication (2 sessions)
2. Theory and Modeling
3. Energy Storage and Photocatalysis
4. Electronics and Photonics (2 sessions)
5. Sensors
6. Devices and Applications
7. Health Effects of 1D Nanomaterials (2 sessions)
8. Characterization
9. Poster Session I: Synthesis (37 poster papers)
10. Poster Session II: Electronics and Photonics and Sensing (15 poster papers)
11. Poster Session III: Energy, Devices & Applications, Health Effects and Characterization (50 poster papers).

Invited Speakers

Nessim Gilbert (Bar Ilan University, Ramat Gan, Israel), title: *Patterned Growth of 3D Forests of Carbon Nanotubes Using Reservoirs and Overlayers*

Pan Chunxu (Wuhan University, Wuhan, China), title: *From 2D Nanocrystalline Films to 1D Nanomaterials—An Overview*

Dongseok Suh (Sungkyunkwan University, Suwon-Si, Korea), title: *Macroscopic Superconducting NbN Yarn Templated by Carbon Nanotubes*

Prem Pandey (IIT BHU, Varanasi, India), title: *3-Aminopropyltrimethoxysilane Mediated Controlled Synthesis of Functional Noble Metal Nanoparticles and Its Multi-Metallic Analogues in the Presence of Small Organic Reducing Agents for Selective Applications*

Marco Gibertini (École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland), title: *Engineering One-Dimensional Wires of Free Carriers through Polar Discontinuities*

Marco Altomare (Friedrich-Alexander University of Erlangen-Nürnberg, Germany), title: *Highly Aligned Oxide Nanotube Arrays—1D Geometry and Applications*

Hong Liu (Shandong University, China), title: *Construction of TiO₂ Nanobelt Heterostructures—A Powerful Tool for Building High-Performance Photocatalysts*

Lars Samuelson (Lund University, Sweden), title: *Nanowires as Means to Realize High-Performance III-V and III-Nitride Materials*

Il Doo Kim (Korea Advanced Institute of Science & Technology, Daejeon, Korea), title: *Tailoring Nanoscale Fibers—From Fundamental to Practical Use*

Leitian Dou (Purdue University, West Lafayette, Indiana USA), title: *Recent Development of 1D Inorganic Halide Perovskite Nanostructures*

Georgios A. Sotiriou (Karolinska Institutet, Sweden), title: *Flame Nanomaterial and Device Engineering for Biomedicine*

Diana Boraschi (Consiglio Nazionale delle Ricerche, Italy), title: *Oxidative Stress and Inflammation Induced by Nanomaterials—Discriminating between Defensive Reactions and Health Risk*

Ivana Fenoglio (Università di Torino, Italy), title: *Physico-Chemical Properties of Carbon Nanotubes Driving Molecular Initiating Events (MIEs) of Adverse Outcome Pathways (AOPs)*

Keld A. Jensen (National Research Centre for the Working Environment, Denmark), title: *Human Health Risks of 1D Nanomaterials and Innovation Risk Management by Control Banding*.

Selected Symposium Highlights

Session Title: NM03.01: Synthesis and Fabrication I, Paper: 2788940, Title: Patterned Growth of 3D Forests of Carbon Nanotubes Using Reservoirs and Overlayers by Gilbert Nessim

Despite the massive progress achieved in the growth of carbon nanotube (CNT) forests on substrate, little has been done to selectively (locally) control CNT height. By combining patterns of reservoirs (thin films positioned below the alumina underlayer) and overlayers (patterned foils positioned above the catalytic surface), forests of CNTs with areas of different heights, with a wide gamut of heights could be produced. This modulation of the CNT height moves us closer to building 3D architectures of CNTs.

Session Title: NM03.01: Synthesis and Fabrication I, Paper: 2803220, Title: Macroscopic Superconducting NbN Yarn Templated by Carbon Nanotubes by Dongseok Suh

Nanofiber superconducting NbN yarn was formed using the free-standing carbon nanotube (CNT) sheets as a template for the deposition of superconducting niobium nitride (NbN) thin-film. The superconducting properties of NbN nanofiber yarn was comparable to that of NbN thin-film on the normal solid substrate. The reduction of normal state resistance for the application as a superconducting cable was successfully achieved by the addition of a gold layer inside the nanoporous structure of the CNT-templated NbN yarn. This technique can open the possibility of the development of superconducting cables having much higher flexibility compared with other normal superconducting cable.

Session Title: NM03.05: Energy Storage and Photocatalysis, Paper: 2793183, Title: Construction of TiO₂ Nanobelt Heterostructures—A Powerful Tool for Building High Performance Photocatalysts by Hong Liu.

Semiconductor photocatalysis is a promising approach to combat both environmental pollution and the global energy shortage. The 1D ribbon-like morphology of TiO₂ nanobelts (NBs) is ideal for constructing heterostructures. By assembling oxide/sulfide/noble-metal nanoparticles on the surface of the NBs, the photocatalytic efficiency is boosted. A photocatalytic water-remediation pilot plant able to purify 5 ton/day of water was demonstrated.

Session Title: NM03.05: Energy Storage and Photocatalysis, Paper: 2788148, Title: One-Dimensional Vanadium Oxide Nanowires—Experimental Synthesis and Investigations of the Electrochemical Behaviors for Energy Storage by Tianyu Liu et al.

The excellent electrochemical behavior as supercapacitors of 1D vanadium oxide nanowires with mixed oxidation state of vanadium (tV^{5+} and V^{4+}) was presented. The 1D vanadium oxide nanowires deposited on an exfoliated and functionalized carbon cloth substrate exhibit record-high stability in the aqueous electrolyte with no capacity loss in 100,000 charge-discharge cycles without any protective coating thanks to (i) the tuning of the V^{4+}/V^{5+} ratio via electron injection to suppress the dissolution of vanadium oxide and (ii) the binding of the vanadium oxide nanowires to the exfoliated carbon cloth suppresses structural damage to the oxide during the charge discharge cycles.

Session Title: NM03.06: Electronics and Photonics I, Paper: 2793152, Title: High Intensity Light-Nanowire Interaction Phenomena—From Tunnel Excitation to Hard X-Ray Generation by Robert Roeder et al.

It was shown that irradiating single nanowires and nanowire arrays with very intense, ultrashort laser pulses with sub-band gap photon energies offers hard X-ray generation (gamma-ray energy regime) above of 100 keV with efficiencies more than one order of magnitude higher than in bulk samples. Nanowire targets open up a new exciting field in high intensity light-matter interactions.

Session Title: NM03.07: Electronics and Photonics II, Paper: 2800289, Title: Luminescent rare-earth nanorods as a three-dimensional orientation marker by Jongwook Kim et al.

An optical method to determine the unknown three-dimensional orientation of a nanorod was presented. This method, in principle, allows to precisely monitor the rotational motion of nanorod-tagged objects such as micro-biosystems (cells, genes, enzymes, etc.) of which the study of complex dynamic motion is of utmost importance.

Session Title: NM03.08: Sensors, Paper: 2798941, Title: Tailoring Nanoscale Fibers: From Fundamental to Practical Use by Il Doo Kim et al.

Recent progress and advances of electrospun nanofibers for suitability of 3D nanofibers for colorimetric sensors, exhaled breath gas analyzing sensors for early stage disease diagnosis, and nanocatalysts for next generation energy storage devices were presented.

Session Title: NM03.11: Health Effects of 1D Nanomaterials I, Paper: 2796225, Title: Oxidative Stress and Inflammation Induced by Nanomaterials—Discriminating between Defensive Reactions and Health Risk by Diana Boraschi et al.

The increasing exposure to nanomaterials generates concerns on their possible toxicity. A model to describe the inflammatory response of living systems to nanomaterials as either inconsequential, defensive, or persistent was proposed where the latter case only can be eventually harmful to the organism.

Session Title: NM03.12: Health Effects of 1D Nanomaterials II, Paper: 2802167, Title: Human health risks of 1D nanomaterials and innovation risk management by control banding by Keld Alstrup Jensen et al.

The potential risk of 1D nanomaterials as being strongly dependent on the nature and likelihood of the potential exposure was discussed. The general hazard properties and exposure characteristics are reviewed and specific 1D nanomaterials was analyzed to demonstrate recommended risk management levels using the NanoSafer Risk Assessment and Management webtool platform.

Session Title: NM03.13: Characterization, Paper: 2799023, Title: Advanced Functionalization of Carbon Surfaces by Antonio Setaro et al.

Technological applications of single walled carbon nanotubes (CNTs) are thwarted by the big functionalization dilemma: Either one works in the noncovalent approach, which preserves the quantum optoelectronic features of the tubes but is intrinsically weak and can easily disassemble, or one covalently attaches the desired functionality, ensuring strong and stable attachment but disrupting the emission and transport quantum features of the tubes. It was shown how to overcome these limitations, introducing a new covalent functionalization that even improves the optoelectronic features of the tubes by avoiding the conversion of sp^2 carbon atoms to sp^3 carbon atoms into ones,

which disrupts the extended π -network of the CNTs. The presented functionalization method based on the use of functionalized triazine preserves and even regenerates the π -conjugation in the CNTs: Emission from covalently functionalized tubes, even at high degree of functionalization, was demonstrated proving that the quantum features of the tubes are retained. The issue that covalent functionalization disrupts the quantum features of CNTs has been overcome.

The poster **NM03.09.11**, Title: *Single-Crystalline Tungsten Ditelluride (WTe_2) Nanobelts Grown from Eutectic Alloy Reservoir* presented by Seunguk Song *et al.* during *NM03.09: Poster Session II: Electronics and Photonics and Sensing* received the **MRS Best Poster Award**.

Contributions to the Discipline

The Symposium NM03 was a relatively sizable program compared to other symposia with much broader scopes. There was a total of 201 submissions received from around the world, which were well distributed among different research areas. In a rigorous selection process, the rejection rate was close to 20%, 14, 44 and 103 out of these submissions were selected as invited talks, contributed talks, and posters, respectively. Symposium undoubtedly brought together an interdisciplinary group of researchers and engineers working on both fundamental *ID* materials research and device-related materials engineering topics, in an effort to help them appreciate the breadth of the field, address current challenges, promote collaboration, generate ideas, and identify future applications. The symposium offered researchers a forum out of their routines to critically examine and cross-fertilize each other's work, which might not be so straightforward otherwise. It is the organizers' firm belief that the ideas and collaborations fostered by the Symposium NM03 will drive the successful adoption of *ID* materials for new applications in energy, sensing, photonics, health and others.

Future Directions (selected)

Nanowires are currently produced by several epitaxial methods such as MBE, CBE, CVD and MOVPE. However, these methods are slow and not amenable to continuous production. Of course, epitaxy is highly beneficial to strictly control the structural, electrical, and optical properties of nanowires but the low growth rate, high cost, and limited nanowire length hinder the commercial development of epitaxial nanowire production. A new nanowire production method (called aerotaxy) is under development featuring a low cost, efficient, continuous, and scalable gas phase process by which high-quality GaAs nanowires can be produced in large numbers and with high growth rate. With further advancement in the equipment design and optimal growth conditions, aerotaxy could solve both cost and material quality issues of III–V nanowires for future optoelectronic and other device applications at industrial scale.

Another aspect to be considered, it is the exposure degree of researchers to nanowires or direct contact from consumer products. New methodologies such as “Safer-by-Design” are emerging to shed more light upon the comprehensive understanding of the relationship between the physicochemical properties of nanowires and their biological activity in “pristine” phase and relevant physiological and environmental media. Such integrated methodologies could mitigate toxicity of nanowires and their potential hazard, and avoid environmental health, and safety risks from inevitable exposures across the life cycle of nanowire-enabled products.

Expenditure of the ARO Funds

The bulk of the money (**\$4,100**) was used to reimburse partial travel expenses of ALL invited speakers attending the symposium. There were also monetary awards (three 1st awards of **\$200** each and three 2nd awards of **\$100** each) for the best student papers/presentations nominated by the *ad hoc* judge panel

during symposium poster sessions. The posters were evaluated against the following criteria: scientific content and merit, integrity and coherence of the presentation, and esthetics.

The Symposium NM03 winning posters:

- NM03.04: Poster Session I: Synthesis
1st prize, poster NM03.04.08, Tuncay Ozel, Harvard University, US, title: *Electrochemical deposition of Conformal and Functional Layers on High Aspect Ratio 1D Substrates*
2nd prize, poster NM03.04.05, Ji Yong Kim, Seoul National University, The Republic of Korea, title: *Thermodynamically Predicted Synthesis to Control Stoichiometry and Structure of Ni Phosphide/C Nanofibers for Hydrogen Evolution Reaction*
- NM03.09: Poster Session II: Electronics and Photonics and Sensing
1st prize, poster NM03.09.06, Kyung Hee Cho, Seoul National University, The Republic of Korea, title: *Fabrication of Aptamer-Modified Electropolymerized Polypyrrole Nanowires for Highly Sensitive FET HBsAg Biosensor*
- NM03.14: Poster Session III: Energy, Devices and Applications, Health Effects and Characterization
1st prize, poster NM03.14.45, Ki Ro Yoon, Korea Advanced Institute of Science and technology (KAIST), The Republic of Korea, title: *Brush-Like Cobalt Nitride Nanorods Anchored Carbon Nanofiber Membrane: 3D Current Collector-Catalyst Integrated Cathode for Long Cycle Li-O₂ Batteries*
2nd prize, poster NM03.14.11, Liwen Zhang, Shenzhen Graduate School, Harbin Institute of technology, China, title: *Performance Enhancement for Silver nanowire-Based Flexible Transparent Conductive Films*
2nd prize, poster NM03.14.12, Kohei Chiba, Graduate School of Information Science and technology, and Research Center for Integrated Quantum Electronics (RCIQE), Hokkaido University, Japan, title: *Vertical InGaAs Nanowire Photodiode Array on Si*.

Acknowledgments

Symposium organizers gratefully appreciate the support from the Army Research Office (ARO), which was critical to the success of this symposium. We also want to thank MRS staff for supporting the application of this ARO grant.

Final report for the ARO Grant issued to F17 MRS NM8 symposium

The organizers of F17 MRS NM8 symposium deeply appreciate receiving the ARO grant (Number: W911NF-18-1-0059) which made NM8 symposium very successful. Through this grant, 11 invited speakers from 6 countries came together to deliberate on the topic of defects in materials science and engineering. While any material can be perfect, or defect-free, in only one way it can have many different types of defects, for example, missing atoms, or presence of an impurity atom, etc. The goal of this symposium was to identify and understand which types of defects can lead to the creation of new states of matter at the nanoscale. A brief synopsis of the NM8 session is as follows:

Prof. Jagadish Narayan and his team presented an invited talk plus ~5 contributory talks expounding on the new form of carbon, called Q-Carbon, and its novel physical properties. They also demonstrated the versatility of their synthesis method by presenting a preliminary study of Q-BN.

Prof. Jani Kotakoski enthralled the audience with videos of high resolution electron microscopy to demonstrate how defect engineering at the atomic scale can be accomplished in 2D materials using electron and ion beams. He also provided a peek into the characterization tools that his team is developing to study samples with specific defects without exposing them to the ambient.

Prof. Ramakrishna Podila presented an interesting case study in which vacancies created through nitrogen doping, or through Ar ion bombardment of graphene led to the realization of high performance electrodes for energy storage devices such as supercapacitors, Li-ion and Al-ion batteries.

Dr. Dorri Halbertal discussed the development of a thermal imaging tool to elucidate dissipation in encapsulated graphene. The sensitivity of his tool is spectacular, and is now seeking samples from the graphene community in which highly controlled amounts of nitrogen atoms are present in the honeycomb lattice.

Prof. Thomas Pichler elaborated on another new form of carbon, viz., a chain of carbon atoms confined inside the core of carbon nanotubes. He expounded on the experimental data collection, analysis and properties of carbon chains as function of their local structure.

Prof. Jean Christophe Charlier provided an apt follow-up talk to Pichler's talk on the theoretical modeling of electronic transport through atomic carbon chains.

Dr. Rahul Rao and Prof. Ado Jorio focused on creation and spectroscopic evaluation of defects in both 1D and 2D materials. While Rao laid more emphasis on *in situ* creation of defects, Ado elucidated the influence of defect dimensionality on Raman scattering in graphene.

Prof. Liming Dai presented the findings of his recent studies in which he leveraged defects in carbon nanomaterials for efficient catalysis.

Prof. Sriparna Bhattacharya presented her studies involving thermoelectric materials in which her team was able to decouple electrical and thermal transport properties for realizing high figure of merit thermoelectrics.

In summary, role of defects on electric, thermal, catalytic, and optical properties were discussed in detail. Rich discussions ensued following all invited talks and in some cases fresh collaborations were initiated.

As a token of gratitude, this ARO grant allowed the organizers to treat all invited speakers with lunch at a local restaurant and waive their MRS registration fees.

Sincerely,

Organizers of NM8

2017 MRS Fall Meeting - Symposia	
Supported with ARO Grant	
Symposium BM1 - Invited Speaker Travel Reimbursement	
Bandyopadhyay	Amit
Bose	Susmita
Budyn	Elisa
Buehler	Markus
Dao	Ming
Edirisinghe	Mohan
Kalidindi	Surya
Katti	Kalpana
Leeuw	Nora de
Molla	Md
Naik	Rajesh
Narayan	Roger
Nyman	Jeffry
Oyen	Michelle
Robling	Alex
Sacks	Michael
Sumanta	Kar
Tamerler	Candan
Symposium NM03 - Invited Speaker Travel Reimbursement	
Altomare	Marco
Boraschi	Diana
Dou	Letian
Fenoglio	Ivana
Gilbertini	Marco
Jensen	Keld A
Kim	Il-Doo
Liu	Hong
Nessim	Gilbert
Pan	Chunxu
Pandey	Prem
Samuelson	Lars
Sotiriou	Georgious
Suh	Dongseok
Symposium NM08 - Invited Speaker Registration Payment	
Bhattacharya	Sriparna
Charlier	Jean-Christophe
Chou	Mei-Yin
Dai	Liming
Halbertal	Dorri
Jorio	Ado
Kotakoski	Jani
Narayan	Jagdish
Pichler	Thomas
Podila	Ramakrishna
Rao	Rahul

SYMPOSIUM BM01

Multiscale Mechanobiology and Biomechanics—Theory,
Experiments, Computations
November 27 - November 30, 2017

Symposium Organizers

Christian Hellmich, TU Wien - Vienna University of Technology
Dinesh Katti, North Dakota State University
Ko Okumura, Ochanomizu University
Peter Pivonka, University of Melbourne

MRS Invitation to Publish

All authors are invited to submit articles based on their 2017 MRS Fall Meeting presentations to journals in the MRS portfolio. (www.mrs.org/publications-news) Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as symposium collections. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more, including MRS Advances print options available at special rates during the meeting week only.

* Invited Paper

SESSION BM01.01: Session I

Session Chairs: Christian Hellmich, Dinesh Katti and Kalpana Katti
Monday Morning, November 27, 2017
Sheraton, 2nd Floor, Constitution B

8:30 AM *BM01.01.01

Cell Biomechanics and Human Diseases—Multiscale Experiments and Computations [Subra Suresh](#); Nanyang Technological University, Singapore.

9:00 AM BM01.01.02

Tissue Engineering Approaches to Evaluate Prostate and Breast Cancer Metastasis to Bone [Kalpana Katti](#); North Dakota State University, United States.

9:15 AM BM01.01.03

Effect of Cytotoxicity of Ag Nanoparticles on Cytoskeletal Structure and Mechanical Behavior of Red Blood Cells [Kuan-Ting Chou](#); National Tsing Hua University, Taiwan.

9:30 AM *BM01.01.04

A Macro-Micro Modeling Approach to Determine *In Situ* Heart Valve Interstitial Cell Contractile Behaviors in Native and Synthetic Environments [Michael Sacks](#); University of Texas at Austin, United States.

10:00 AM BREAK

10:30 AM *BM01.01.05

Tuning Mechanical Properties of Marine Biopolymers [Rajesh Naik](#); Air Force Research Laboratory, United States.

11:00 AM BM01.01.06

Engineering Mechanics in Medicine and Biology—Multiscale Elastoplasticity and News on the Cement Line in Osteonal Bone [Christian Hellmich](#); TU Wien - Vienna University of Technology, Austria.

11:15 AM BM01.01.07

Influence of the Mutation on Chemo-Mechanical properties of Osteogenesis Imperfecta Children Bones [Agathe A. Ogier](#); Ecole Centrale de Lyon- LTDS, France.

11:30 AM BM01.01.08

A Structural-Based Computational Model of Tendon-to-Bone Insertion [Sergey Kuznetsov](#); North Carolina State University, United States.

11:45 AM BM01.01.09

Structural, Tribological, and Mechanical Properties of the Hind Leg Joint of a Jumping Insect—Using Katydid to Inform Bioinspired Lubrication Systems [Jun Kyun Oh](#); Texas A&M University, United States.

SESSION BM01.02: Session II

Session Chairs: Christian Hellmich, Dinesh Katti, Kalpana Katti and Ulrike Wegst
Monday Afternoon, November 27, 2017
Sheraton, 2nd Floor, Constitution B

1:30 PM *BM01.02.01

Clinical Significance of 3D Printing in Treatment of Bone Disorders [Susmita Bose](#); Washington State University, United States.

2:00 PM BM01.02.02

3D Printed Polyurethane Nanocomposite and Biocompatible Materials and Their Thermo-Mechanical Properties [Rigoberto C. Advincula](#); Case Western Reserve University, United States.

2:15 PM BM01.02.03

Three-Dimensional Computational Model of Self-Reinforcing Polymer Gels Containing Biomimetic Cryptic Bonds [Santidan Biswas](#); University of Pittsburgh, United States.

2:30 PM BM01.02.04

Fluidic Non-Hydrogel Scaffolds for Cell Aggregates Formation [Masashi Maruyama](#); Hitachi Ltd, Japan.

2:45 PM BM01.02.05

Interfacial Shear Strength and Adhesive Behavior of Layer-by-Layer (LbL) Silk Ionomer Microcapsules [Sunghan Kim](#); Georgia Institute of Technology, United States.

3:00 PM BREAK

3:30 PM *BM01.02.06

Freeze Casting, a Review—Structure-Property-Processing Correlations of Self-Assembled Polymers, Ceramics, Metals and Hybrid Materials with Complex, Hierarchical Architectures from the Nano- to the Macroscale [Ulrike G. Wegst](#); Dartmouth College, United States.

4:00 PM BM01.02.07

Measuring Viscoelastic Mechanical Properties of Highly Compliant Materials by Impact Indentation [Aleksandar S. Mijailovic](#); Massachusetts Institute of Technology, United States.

4:15 PM BM01.02.08

Promoting Proliferation and Elongation of Bone Marrow-Derived Stem Cells via Nano-Grain Deposited Periodic Nanostructures [Mayuko Shiozawa](#); Waseda University, Japan.

4:30 PM BM01.02.09

Understanding Artificial Touch—Modeling Friction for a Novel Classification of Surfaces in Haptic Devices [Charles Dhong](#); University of California, San Diego, United States.

4:45 PM BM01.02.10

The Investigation of Bacteria—Hydrogel Interactions During Different Mechanical Stimuli [Nehir Kandemir](#); Newcastle University, United Kingdom.

SESSION BM01.03: Poster Session

Session Chairs: Christian Hellmich and Dinesh Katti
Monday Afternoon, November 27, 2017
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

BM01.03.01

A New Class of Mechanoluminescent Material for Near-Infrared Imaging in the Second Optical Window of Biological Tissue [Sunao Kamimura](#)^{1,3}; ¹Kyushu Institute of Technology, Japan; ³JST-PRESTO, Japan.

BM01.03.02

Effects of Misfit Strain on Energy States of Zinc-Blende Spherical Core/Shell Quantum Dots [Youjung Seo](#); Advanced Institutes of Convergence Technology, Korea (the Republic of).

BM01.03.03

Computational Study of Selective Adsorption of Peptides on MoS₂ Surface with Biomining Applications [Maral Aminpour](#)^{1,2}; ¹University of Alberta, Canada; ²Ingenuity Lab, Canada.

BM01.03.04

Towards Plant-Inspired Tactile Sensors—Biomechanics of the Tactile Blep [Afroditi Astreinidi Blandin](#)^{1,2}; ¹Istituto Italiano di Tecnologia, Italy; ²Scuola Superiore Sant'Anna, Italy.

BM01.03.05

Electromechanical Fatigue Behavior of Human Red Blood Cells [Sarah Du](#); Florida Atlantic University, United States.

BM01.03.06

Intracranial Shock Wave Interactions with Nanofibrillar Implants [Haozhi Dong](#); Michigan State University, United States.

BM01.03.07

Evaluation of Mechanical Property of Intermediate Filament Related with Stiffness of Breast Cancer Cell by Use of Nanoneedle and AFM [Ayana Yamagishi](#)^{1,2}; ¹National Institute of Advanced Industrial Science and Technology, Japan; ²Tokyo University of Agriculture and Technology, Japan.

SESSION BM01.04: Session III

Session Chairs: Nora de Leeuw, Christian Hellmich, Kalpana Katti and Hannes Schniepp
Tuesday Morning, November 28, 2017
Sheraton, 2nd Floor, Constitution B

8:30 AM *BM01.04.01

The Effect of Crosslinks from Advanced Glycation End-Products on the Mechanical Properties of Collagen Type I [Nora H. de Leeuw](#)^{1,2}; ¹Cardiff University, United Kingdom; ²University College London, United Kingdom.

9:00 AM BM01.04.02

The Biomechanical Impact of Keratin Dispersants on Human Stratum Corneum [Jacob R. Bow](#); Stanford University, United States.

9:15 AM BM01.04.03

Toughness-Enhancing Looped Nanoribbon Silk of the Recluse Spider [Hannes C. Schniepp](#); College of William & Mary, United States.

9:30 AM BM01.04.04

Elastic Hysteresis and Plastic Strain Recovery in Individual Mammalian Collagen Nanofibrils [Ioannis Chasiotis](#); University of Illinois at Urbana-Champaign, United States.

9:45 AM BM01.04.05

Synovial Fluid as a Biomarker of Meniscus Alteration in an ACLT Rabbit Model [Catherine Bosser](#); Ecole Centrale de Lyon, France.

10:00 AM BREAK**10:30 AM *BM01.04.06**

Poroelastic Properties of Biomimetic Cartilage-Like Scaffolds [Michelle L. Oyen](#); University of Cambridge, United Kingdom.

11:00 AM BM01.04.07

Finite Element Modeling and Simulations of Cancer Cell Behavior under Mechanical Loading [Dinesh R. Katti](#); North Dakota State University, United States.

11:15 AM BM01.04.08

Cytoskeletal Dynamics of Neurons Measured by Combined Fluorescence and Atomic Force Microscopy [Cristian Staii](#); Tufts University, United States.

11:30 AM BM01.04.09

Investigation of Viscoelastic Properties of Malignant Human Breast Cells Using a Shear Assay Technique [Jingjie Hu](#); Princeton University, United States.

11:45 AM BM01.04.10

Stimulation of Cell Adhesion by Mechanosensing—From Single Molecules to 3D Materials [Christine Selhuber-Unkel](#); University of Kiel, Germany.

SESSION BM01.05: Panel Discussion

Session Chairs: Christian Hellmich and Dinesh Katti
Tuesday Afternoon, November 28, 2017
Sheraton, 2nd Floor, Constitution B

1:30 PM BM01.05.01**Panel Discussion****Panelists:**

Ming Dao, Massachusetts Institute of Technology
Nora De Leeuw, Cardiff University
Michelle Oyen, Cambridge University
Kalpana Katti, North Dakota State University
Markus Buehler, Massachusetts Institute of Technology

Moderator:

Christian Hellmich, TU Wien - Vienna University of Technology, Austria.

3:00 PM BREAK

SESSION BM01.06: Session IV

Session Chair: Dinesh Katti
Tuesday Afternoon, November 28, 2017
Sheraton, 2nd Floor, Constitution B

3:30 PM BM01.06.01

Protein-mediated Diffuse Damage Formation and Nanoscale Energy Dissipation in Bone [Zehai Wang](#); Rensselaer Polytechnic Institute, United States.

3:45 PM BM01.06.02

Multiscale Characteristics of Bone Toughness [Sabah Nobakhti](#); Northeastern University, United States.

4:00 PM BM01.06.03

Wear Modeling of HDPE/CNF Nanocomposites under Lubricated Conditions [Songbo Xu](#); Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences, China.

SESSION BM01.07: Session V

Session Chairs: Christian Hellmich, Dinesh Katti, Kalpana Katti and Candan Tamerler
Wednesday Morning, November 29, 2017
Sheraton, 2nd Floor, Constitution B

8:30 AM *BM01.07.01

Multiscale Smart Materials by Design—Connecting Simulation, Design, Synthesis across Multiple Scales [Markus J. Buehler](#); Massachusetts Institute of Technology, United States.

9:00 AM BM01.07.02

Nacre-Inspired Alumina with a Nickel Compliant-Phase Fabricated Using Spark Plasma Sintering [Amy Wat](#)^{1,2}; ¹Lawrence Berkeley National Laboratory, United States; ²University of California, Berkeley, United States.

9:15 AM BM01.07.03

The Achilles Heel of Nacre [Ting Tan](#); Univ of Vermont, United States.

9:30 AM BM01.07.04

Smart Architectural Design Identified in Biological Nanocomposites [Vesna Strot](#); Max Planck Institute for Solid State Research, Germany.

9:45 AM BM01.07.05

Mechanics and Toughening Mechanisms of Nacreous Materials [Sina Askarinejad](#); Worcester Polytechnic Institute, United States.

10:00 AM BREAK

10:30 AM *BM01.07.06

Guided Engineering of Bio-Nano Interfaces by Biomolecular Self-Assembly Candan Tamerler^{1,2}; ¹University of Kansas, United States; ²University of Kansas, United States.

11:00 AM BM01.07.07

The Effects of Materials on the Development of Long-Term Implants with High Fracture Resistance Fatma Bayata; Istanbul Bilgi University, Turkey.

11:15 AM BM01.07.08

Cancer Progression in Prostate Cancer Metastasis to Bone MD Shahjahan Molla; North Dakota State University, United States.

11:30 AM *BM01.07.09

Analyzing Composition-Property Linkages in Bone Using Nanoindentation and Raman Spectroscopy Surya R. Kalidindi; Georgia Institute of Technology, United States.

SESSION BM01.08: Session VI

Session Chairs: Mohan Edirisinghe, Christian Hellmich, Kalpana Katti and Ko Okumura
Wednesday Afternoon, November 29, 2017
Sheraton, 2nd Floor, Constitution B

1:30 PM *BM01.08.01

Hierarchical Integration of Repeating Units Toughens Enamel Bioceramic Composite Malcolm L. Snead; University of Southern California, United States.

2:00 PM BM01.08.02

Tracing the Nanoscale Chemical Mapping of Enamel-Crystallite through Human Tooth Decay Fan Yun^{1,2,3}; ¹The University of Sydney, Australia; ²The University of Sydney, Australia; ³The University of Sydney, Australia.

2:15 PM BM01.08.03

Nature's Multiscale Design Strategies and Smart Manufacturing Xiaodong Li; University of Virginia, United States.

2:30 PM BREAK

3:30 PM *BM01.08.04

Innovative Manufacturing Research to Enable Biomechanical Engineering Mohan J. Edirisinghe; University College of London, United Kingdom.

4:00 PM BM01.08.05

Forces and Interfaces—Structural Damage to Biomolecules During Droplet Generation Susannah E. Evans; University of Cambridge, United Kingdom.

4:15 PM BM01.08.06

Monitoring the Stiffness Distribution of Engineered Tissues—A Preliminary Study Sevan Goenezen; Texas A&M University, United States.

4:30 PM BM01.08.07

Long-Term Imaging of Cellular Forces with High Precision by Elastic Resonator Interference Stress Microscopy (ERISM) Nils M. Kronenberg; University of St Andrews, United Kingdom.

4:45 PM BM01.08.08

Scaling Views on the Strength and Toughness of Bio-Composites Consisting of Soft and Hard Elements Ko Okumura; Ochanomizu University, Japan.

SESSION BM01.09: Session VII

Session Chairs: Elisa Budyn, Christian Hellmich, Roger Narayan and Ko Okumura

Thursday Morning, November 30, 2017
Sheraton, 2nd Floor, Constitution B

8:30 AM *BM01.09.01

Mechanical Properties of 3D Printed Structures Roger Narayan; North Carolina State University, United States.

9:00 AM BM01.09.02

Dynamic Interaction between Cultivated Cells and Liquid on Cell Differentiation Nobuyuki Tanaka; RIKEN, Japan.

9:15 AM BM01.09.03

Mechanotargeting of Nanoparticles Sulin Zhang^{1,3}; ¹The Pennsylvania State University, United States; ³The Pennsylvania State University, United States.

9:30 AM BM01.09.04

Angiogenicity, Invasiveness and Chemoresistance of Breast Cancer—An In Vitro Engineering Test Bed Sumanta Kar; North Dakota State University, United States.

9:45 AM BM01.09.05

Solitary Waves in Morphogenesis—Determination Fronts as Strain-Cued Strain Transformations Brian Cox; Arachne Consulting, United States.

10:00 AM BREAK

10:30 AM *BM01.09.06

Human Stem Cell Derived Osteocytes in Bone-on-Chip Elisa R. Budyn^{1,2}; ¹Ecole Normale Supérieure Cachan, France; ²University of Illinois at Chicago, United States.

11:00 AM BM01.09.07

Damage Accumulation and Failure in Tissue Sai S. Deogekar; Rensselaer Polytechnic Institute, United States.

11:15 AM BM01.09.08

Influence of Donor Age on Stem Cell-Based Tissue-Engineered Cartilage Ophélie Pollet^{4,1}; ¹VetAgro Sup, France; ⁴Ecole Centrale de Lyon, France.

11:30 AM BM01.09.09

Janus-Like Behavior and Charge Inversion in Negatively Charged Semi-Permeable Plasma Membrane Shayandev Sinha; University of Maryland, United States.

11:45 AM BM01.09.10

Molecular Muscle Based on pH-Driven Stretching-Shrinking of Peptides Grazia M. Messina; University of Catania, Italy.

SESSION BM01.10: Session VIII

Session Chairs: Amit Bandyopadhyay, Dinesh Katti, Jeffrey Nyman and Alex Robling

Thursday Afternoon, November 30, 2017
Sheraton, 2nd Floor, Constitution B

1:30 PM *BM01.10.01

Assessing the Matrix Quality of Human Cortical Bone Jeffrey S. Nyman; Vanderbilt University Medical Center, United States.

2:00 PM BM01.10.02

Atomistic Study of Wet-Heat Resistance of Calcium Dipicolinate (Ca-DPA) in the Core of Spores Ankit Mishra; University of Southern California, United States.

2:15 PM *BM01.10.03

3D Printed Porous Metals for Load-Bearing Implants Amit Bandyopadhyay; Washington State University, United States.

2:45 PM BREAK

3:15 PM *BM01.10.04

The Biology of Wnt-Regulated Mechanical Signaling in Bone Tissue Alex Robling^{1,2}; ¹Indiana University School of Medicine, United States; ²Roudebush VAMC, United States.

3:45 PM BM01.10.05

Microstructural Origins of Creep and Fatigue Behaviour of Arundo Donax L Using Nanoindentation, XRD and Internal Friction Measurements Connor Kemp^{1,2}; ¹McGill University, Canada; ²Centre for Interdisciplinary Research in Music Media and Technology, Canada.

4:00 PM BM01.10.06

Self-Organized Structural Calcites, Aragonites and Organic Networks within the White-Pearl Oyster and Its Dynamic Fracture Behaviors Guowei Chen; Beihang University, China.

4:15 PM BM01.10.07

Multimodal Surface Instabilities in Curved Film-Substrate Structures Ruike Zhao; Massachusetts Institute of Technology, United States.

4:30 PM BM01.10.08

Mechanically Interfacing with Biology Using Piezoelectric Poly-L-lactic Acid Nanowires Michael Smith; University of Cambridge, United Kingdom.

SYMPOSIUM BM02

Multiphase Fluids for Materials Science—Droplets, Bubbles and Emulsions

November 27 - November 30, 2017

Symposium Organizers

Esther Amstad, Ecole Polytechnique Federale de Lausanne
Paul Clegg, University of Edinburgh
Daeyeon Lee, University of Pennsylvania
Paul Millett, University of Arkansas

MRS Invitation to Publish

All authors are invited to submit articles based on their 2017 MRS Fall Meeting presentations to journals in the MRS portfolio. (www.mrs.org/publications-news) Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as symposium collections. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more, including MRS Advances print options available at special rates during the meeting week only.

* Invited Paper

SESSION BM02.01: Colloids I

Session Chairs: Joseph Carmack and Paul Millett
Monday Morning, November 27, 2017
Sheraton, 2nd Floor, Back Bay A

8:30 AM *BM02.01.01

Synthesis, Assembly and Applications of Nanoemulsions Patrick S. Doyle; MIT, United States.

9:00 AM *BM02.01.02

Strategies for Making Smart Foams, Emulsions and Multiphase Gels Stabilized by Functional Particles Orlin D. Velev; North Carolina State University, United States.

9:30 AM BM02.01.03

Hyperuniformity of Bidisperse Droplet Jammed Assemblies Joshua Ricouvier; ESPCI Paris, France.

9:45 AM BM02.01.04

Particles, Droplets and Bubbles Together—Particle Adsorption and Fluid-Fluid Wetting in Colloidal Four-Phase Systems and Ensuing Opportunities for New Materials and Separation Processes Sven H. Behrens; Georgia Institute of Technology, United States.

10:00 AM BREAK

SESSION BM02.02: Microfluidics I

Session Chairs: Joseph Carmack and Paul Millett
Monday Morning, November 27, 2017
Sheraton, 2nd Floor, Back Bay A

10:30 AM *BM02.02.01

Drop Microfluidics—A Versatile and Promising Approach for Fabricating Functional Granular Materials Liang-Yin Chu; Sichuan University, China.

11:00 AM *BM02.02.02

Order and Chaos—Collective Behavior of Crowded Drops in Microfluidic Systems Sindy K. Tang; Stanford University, United States.

11:30 AM BM02.02.03

Flow-Induced Chemistry within Inkjet Droplets Providing Tunable Materials Properties Niamh Willis-Fox; University of Cambridge, United Kingdom.

11:45 AM BM02.02.04

High-Precision Modular Microfluidics for Reconfigurable Droplet Production Systems Crystal E. Owens; Massachusetts Institute of Technology, United States.

SESSION BM02.03: Particles at Fluid Interfaces

Session Chairs: Esther Amstad and Katherine Pulsipher
Monday Afternoon, November 27, 2017
Sheraton, 2nd Floor, Back Bay A

1:30 PM *BM02.03.01

Bijels—A Unique Platform for Materials Synthesis, from Energy Systems to Biomaterials Ali Mohraz; University of California, United States.

2:00 PM BM02.03.02

Bijels Prepared by Direct Mixing at Fixed Temperature Paul Clegg; University of Edinburgh, United Kingdom.

2:15 PM BM02.03.03

Multifunctional Nanocomposite Membranes and Biphasic Liquid-Liquid Microreactors Based on Bijels Martin F. Haase; Rowan University, United States.

2:30 PM BM02.03.04

Tuning Thin-Film Bijel Morphologies Using External Electric Fields Joseph Carmack; University of Arkansas, United States.

2:45 PM BM02.03.05

Understanding the Effect of Particle Charge, Solution Viscosity and Mass Fraction on Bicontinuous Interfacially Jammed Emulsion Gels Rachel Malone; University of Calgary, Canada.

3:00 PM BREAK

SESSION BM02.04: Colloids II

Session Chairs: Esther Amstad and Katherine Pulsipher
Monday Afternoon, November 27, 2017
Sheraton, 2nd Floor, Back Bay A

3:30 PM *BM02.04.01

All Water Emulsion-Bodies (AWE-somes) with Permeable Shells and Selective Compartments Kathleen J. Stebe; Univ of Pennsylvania, United States.

NM02.11.42

Improving Ge Nanomembranes via Surface Cleaning and Graphene Passivation [Xiaorui Cui](#); University of Wisconsin-Madison, United States.

NM02.11.43

Uniform Plasmon Hybridization and Volumetric Field Enhancements in Graphene Nanocubes [Kriti Agarwal](#); University of Minnesota, United States.

SESSION NM02.12: Session IX
Session Chairs: Sarah Hesse and William Yu
Friday Morning, December 1, 2017
Hynes, Level 3, Room 302

8:15 AM *NM02.12.01

Carbon Nanomaterials for Single-Phase White Light-Emitting Diodes
[X. Bai](#); Jilin University, China.

8:45 AM NM02.12.02

Heterogeneous Natural Carbon for Electronic Applications [Owen Morris](#); Massachusetts Institute of Technology, United States.

9:00 AM NM02.12.03

Graphene Formation on Dome-Like Spherical Cu Particles [Ilker Kaygusuz](#); TOBB University of Economics and Technology, Turkey.

9:15 AM NM02.12.04

Modifying the Graphene-Like Surface of Carbon-Coated Magnetic Metal Nanoparticles—Synthesis of a Broad Variety of Magnetic Reagents
[Elia M. Schneider](#); ETH Zürich, Switzerland.

9:30 AM NM02.12.05

Highly Sensitive Co-Resonant Cantilever Sensors for Materials Research—Application to Magnetic Nanoparticle Characterization
[Julia Koerner](#)^{1,2}; ¹University of Utah, United States; ²Leibniz Institute for Solid State and Materials Research, Germany.

9:45 AM BREAK

10:15 AM NM02.12.06

On Evidence of Polymer-Nanotube Blending [Heng Li](#); Northeastern University, United States.

10:30 AM NM02.12.07

Stereolithography 3D Printing of Composites Filled with Anisotropic Carbon Nanomaterials [Alejandro Baptista](#); Harvey Mudd College, United States.

10:45 AM NM02.12.08

Graded, Hierarchically Macro- and Mesoporous Carbon Materials from the Co-Assembly and Heat-Treatment of Block Copolymer and Carbon Precursor [Sarah A. Hesse](#)^{1,2}; ¹Cornell University, United States; ²Cornell University, United States.

11:00 AM NM02.12.09

Synthesis, Characterization of Elastic and Electrical Properties of Diamond-Like BC_x Nano-Phases Synthesized under High and Low Pressures [Zinin Pavel](#)^{1,3}; ¹Scientific and Technological Center of Unique Instrumentation, Russian Federation; ³University of Hawaii, United States.

11:15 AM NM02.12.10

Novel Engineered Polymer Composites with Modified Carbon Nanotube Interphases [Po-Hsiang Wang](#); Georgia Institute of Technology, United States.

11:30 AM NM02.12.11

Optical Hall Effect in Strained Graphene [Jean-Christophe Charlier](#); University of Louvain, Belgium.

SYMPOSIUM NM03

Progress in Developing and Applications of Functional One-Dimensional Nanostructures
November 27 - November 29, 2017

Symposium Organizers

Juan Beltran-Huarac, Harvard T. H. Chan School of Public School
Wojciech Jadwisieniczak, Ohio University
Alessandro Ponti, National Research Council
Bo Zou, Jilin University

Symposium Support

Ohio University—Nanoscale and Quantum Phenomena Institute (NQPI)

MRS Invitation to Publish

All authors are invited to submit articles based on their 2017 MRS Fall Meeting presentations to journals in the MRS portfolio. (www.mrs.org/publications-news) Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as symposium collections. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more, including MRS Advances print options available at special rates during the meeting week only.

* Invited Paper

SESSION NM03.01: Synthesis and Fabrication I
Session Chairs: Juan Beltran-Huarac, Gilbert Nessim and Dongseok Suh
Monday Morning, November 27, 2017
Hynes, Level 3, Room 310

8:00 AM WELCOME INTRODUCTION

8:15 AM *NM03.01.01

Patterned Growth of 3D Forests of Carbon Nanotubes Using Reservoirs and Overlayers [Gilbert D. Nessim](#); Bar Ilan University, Israel.

8:45 AM *NM03.01.02

From 2D Nanocrystalline Films to 1D Nanomaterials—An Overview
[Chunxu Pan](#); Wuhan University, China.

9:15 AM NM03.01.03

Development of Reference Engineered Nanomaterials for Toxicology Research [Juan Beltran-Huarac](#); Harvard University, United States.

9:30 AM NM03.01.04

Rapid Open-Air Deposition of Uniform, Nanoscale, Functional Coatings on Nanorod Arrays via Atmospheric Pressure Spatial Deposition [Kevin Musselman](#); University of Waterloo, Canada.

9:45 AM NM03.01.05

Controlled Molecular Beam Epitaxial Growth of 2D to 1D MoSe₂ [Sock Mui Poh](#)^{1,2}; ¹National University of Singapore, Singapore; ²NUS Graduate School for Integrative Sciences and Engineering, Singapore.

10:00 AM BREAK

10:30 AM *NM03.01.06

Macroscopic Superconducting NbN Yarn Templated by Carbon Nanotubes [Dongseok Suh](#)^{1,2}; ¹Sungkyunkwan University, Korea (the Republic of); ²Center for Integrated Nanostructure Physics, Institute for Basic Science, Korea (the Republic of).

11:00 AM NM03.01.07

Large Scale Production of Silver Nanowire Ink for Paper Based Electronics Application [Amol A. Kulkarni](#); CSIR-National Chemical Laboratory, India.

11:15 AM NM03.01.08

The Role of Wetting and Contact Angle in the Growth of III-As Nanowires [Lea Ghisalberti](#); EPFL, Switzerland.

11:30 AM NM03.01.09

Playing with Impurities in Oxide Nanowires to Get Complex Nanostructures [Bianchi Mendez](#); Univ of Complutense, Spain.

11:45 AM NM03.01.10

Si-Ge Nanowire Heterostructures Prepared on TiN/Metal Layers [Jinkyong Yoo](#); Los Alamos National Laboratory, United States.

SESSION NM03.02: Synthesis and Fabrication II
Session Chairs: Wojciech Jadwisienczak and Chunxu Pan
Monday Afternoon, November 27, 2017
Hynes, Level 3, Room 310

1:30 PM *NM03.02.01

3-Aminopropyltrimethoxysilane Mediated Controlled Synthesis of Functional Noble Metal Nanoparticles and Its Multi-Metallic Analogues in the Presence of Small Organic Reducing Agents for Selective Applications [Prem C. Pandey](#)^{1,2}; ¹IIT BHU, India; ²BRD Medical College, India.

2:00 PM NM03.02.02

Nucleation, Growth and Thermal Stability of Ge_xSn_{1-x} Nanowires and Nanorods [Michael S. Seifner](#); Vienna University of Technology, Austria.

2:15 PM NM03.02.03

Radial InAs/GaSb Heterostructure Nanowires on Si Substrates Grown by Metal-Organic Chemical Vapor Deposition [Xianghai Ji](#); Institute of Semiconductors CAS, China.

2:30 PM NM03.02.04

Flow-Directed Synthesis of 1D ZnO Nano/Mesostructures with Controlled Morphology and Composition [Abhiteja Konda](#); University of Nebraska-Lincoln, United States.

2:45 PM NM03.02.05

Hydrothermal Synthesis and Modification of Undoped Silver and Zinc Oxide Nanostructures [Faith Bamiduro](#); University of Leeds, United Kingdom.

3:00 PM BREAK

SESSION NM03.03: Theory and Modeling
Session Chair: Alessandro Ponti
Monday Afternoon, November 27, 2017
Hynes, Level 3, Room 310

3:30 PM *NM03.03.01

Engineering One-Dimensional Wires of Free Carriers through Polar Discontinuities [Marco Gibertini](#)^{1,2}; ¹École Polytechnique Fédérale de Lausanne, Switzerland; ²National Centre for Computational Design and Discovery of Novel Materials (MARVEL), Switzerland.

4:00 PM NM03.03.02

Structure Prediction of One-Dimensional Nanostructures [Scott M. Woodley](#); University College London, United Kingdom.

4:15 PM NM03.03.03

Engineering the Shape and Size Distributions of Ordered GaAs Nanowires on Silicon [Anna Fontcuberta i Morral](#); Ecole Polytechnique Federale de Lausanne, Switzerland.

4:30 PM NM03.03.04

Effect of Nanowire Curviness on the Resistivity Scaling in One-Dimensional Metal Nanowire Networks for Transparent Conductors [Junying Li](#); University of Florida, United States.

4:45 PM NM03.03.05

Kinetically Limited Composition of VLS Grown Ternary III-V Nanowires [Jonas Johansson](#); Lund University, Sweden.

SESSION NM03.04: Poster Session I: Synthesis
Monday Afternoon, November 27, 2017
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

NM03.04.02

Self-Sensitization and Photo-Polymerization of Diacetylene Molecules Self-Assembled on a Hexagonal-Boron Nitride Nanosheet [Elisios Verveniotis](#); NIMS, Japan.

NM03.04.03

Low Temperature Synthesis of Germanium Nanorods and Nanowires [Sven Barth](#); Vienna University of Technology, Austria.

NM03.04.04

Influence of Growth Limiting Factors on the Morphology and Sn Incorporation of GeSn Alloy Nanowires [Jessica Doherty](#); University College Cork, Ireland.

NM03.04.05

Thermodynamically Predicted Synthesis to Control Stoichiometry and Structure of Ni Phosphide/C Nanofibers for Hydrogen Evolution Reaction [Ji Yong Kim](#); Seoul National University, Korea (the Republic of).

NM03.04.06

Production and Mechanical Characterization of Electrospun Ceramic Nanofiber for Future High Power Targets [Sujit Bidhar](#); Fermilab, United States.

NM03.04.07

Synthesis of Ultra-long Zinc Antimonide Nanowires [Advika Marneni](#); Texas A&M University, United States.

NM03.04.08

Electrochemical Deposition of Conformal and Functional Layers on High Aspect Ratio 1D Substrates [Tuncay Ozel](#); Harvard University, United States.

NM03.04.09

Synthesis of Pd and Pt Microtubes with Square Cross-Section Using Square Planar Ion Salt Templates [John Burpo](#); United States Military Academy, United States.

NM03.04.10

Self-Catalyzed Vapor-Liquid-Solid Growth of Single-Crystalline Lead Halide Nanowires and Conversion to Perovskite [Jonathan K. Meyers](#); University of North Carolina at Chapel Hill, United States.

NM03.04.11

AAO Template-Assisted Growth of PEDOT:PSS Nanowires [Hyejeong Lee](#); GIST, Korea (the Republic of).

NM03.04.12

Microreactors for the Morphological "Shaping" of Zinc Oxide Nanocrystals [Michael A. Stoller](#); University of Nebraska-Lincoln, United States.

NM03.04.13

Filamentary Growth of Metal Nanowhiskers [Gunther Richter](#); Max Planck Institute Intelligent Systems, Germany.

NM03.04.14

Ideal Carbon Nanotube Conductors—Beyond Carbon Nanotube Fibres [Agnieszka Lekawa-Raus](#); Warsaw University of Technology, Poland.

NM03.04.15

Stable, Hexagonal Non-Close-Packed Gold Nanowires [Seonhee Lee](#); Sungkyunkwan University, Korea (the Republic of).

NM03.04.16

Self-Assembly and Magnetic Property of MnTe/Cr₂Te₃ Composite Nanorods [Fang Wang](#); Shanxi Normal University, China.

- NM03.04.17**
Production and Characterization of Boron Nitride Nanotubes from Reaction of Ammonia with Mixture of Boron and Iron Powders Naima A. Sezgi; Middle East Technical University, Turkey.
- NM03.04.18**
Enhancing Fracture Toughness and Stress Energy Release Rate of Vinyl Ester Matrix Using Dual Reinforcement of CNT and GNP Christopher Gapstur; Florida Atlantic University, United States.
- NM03.04.19**
Inducing Porosity and Growing Carbon Nanofibers in Ferrous Perchlorate—An Example of Morphological Transitions in Coordination Complexes Efrat Shawat Avraham; Bar Ilan University, Israel.
- NM03.04.20**
Synthesis and Assembly of Ni and NiFe Micro/Nano Wires Yan Liu^{2,1}; ¹State University of New York at Binghamton, United States; ²Northeastern University, China.
- NM03.04.21**
Complementary Metal Oxide Semiconductor Compatible, High-Mobility, (111)-Oriented GaSb Nanowires Enabled by Vapor–Solid–Solid Chemical Vapor Deposition Ziyao Zhou; City University of Hong Kong, China.
- NM03.04.22**
Spectral Tuning of the Photoconductivity of Semiconductor Nanowires with Carbon Nanodots Kseniia Zimmermann; University of Technology Braunschweig, Germany.
- NM03.04.23**
Development of a Portable Electrospinning System for a Durable UV Protection Coating Seong Jin Cho; Chungnam National University, Korea (the Republic of).
- NM03.04.24**
Synthesis and Characterization of Boron Nitride Nanotubes on Ceramic Nanofibrous Materials Aysemir Top; Istanbul Technical University, Turkey.
- NM03.04.25**
Selective Electrothermal Growth of ZnO Nanowire on ZnO Nanoparticle Functionalized Ag Nanowire Network Habeom Lee; Seoul National University, Korea (the Republic of).
- NM03.04.26**
Fabrication of Ordered Array of ZnO Nanorods Using Anodic Porous Alumina Toshiaki Kondo; Tokyo Metropolitan University, Japan.
- NM03.04.27**
Improving Production Yield for Laser Vaporization Synthesis of Single-Wall Carbon Nanotubes Stephen Polly; Rochester Inst of Technology, United States.
- NM03.04.28**
Structural Study of Randomly Oriented β -MoO₃ Nano-Ribbons Grown by Molecular Beam Epitaxy Technique Paramita Maiti; Institute of Physics, India.
- NM03.04.29**
Fabrication of Ordered Porous Alumina Through-Hole Membranes by Two-Layer Anodization Takashi Yanagishita; Tokyo Metropolitan University, Japan.
- NM03.04.30**
Improving Stability of Silver Nanowire Networks with ZnO Thin Coatings by Atmospheric Pressure Spatial Atomic Layer Deposition (AP-SALD) Technique Afzal Khan^{2,1}; ¹University Grenoble Alpes, France; ²University of Peshawar, Pakistan.
- NM03.04.31**
Polarity-Dependent Formation Mechanisms and Physical Properties of Selective Area Grown ZnO Nanorods Vincent Consonni; Université Grenoble Alpes, CNRS, Grenoble INP, LMGP, France.
- NM03.04.32**
Tunable Morphology and pH-Dependent Doping of ZnO Nanowires by Chemical Bath Deposition Using Aluminium Nitrate Vincent Consonni; Université Grenoble-Alpes, CNRS, Grenoble INP, LMGP, France.
- NM03.04.33**
M13 Virus Aerogels as Scaffold for Functional Inorganic Materials Sung Mi Jung^{2,1}; ¹Korea Institute of Toxicology, Korea (the Republic of); ²Massachusetts Institute of Technology, United States.
- NM03.04.34**
One-Step Synthesis of Large Diameter Complex Multipodal Nanotubes—Insights on Their Formation Mechanism and Light Scattering Samar Fawzy and Nageh K. Allam; American University in Cairo, Egypt.
- NM03.04.35**
Indium Assisted Indium Gallium Arsenide Nanowires Growth on Silicon Substrate by Metal Organic Chemical Vapor Deposition Sisir Chowdhury; Indian Institute of Technology Kharagpur, India.
- NM03.04.36**
ZnO Nanorod Synthesis and Their Applications in Chemical Sensors Ying Tu; Queen Mary University of London, United Kingdom.
- NM03.04.37**
Fabrication and Physicochemical Properties of Chiral Nano-Fibrillar Materials Including Rhenium Complexes with a Glutamide Molecular Assembling Tool Yutaka Kuwahara; Kumamoto University, Japan.
- NM03.04.38**
Synthesis of Boron Nitride Nanotubes on Silicon Carbide Fibers and Investigation of the Mechanical Properties Deniz Koken; Sabanci University, Turkey.
- NM03.04.39**
Fabrication of Nano-Micro Composite Structure Using Nanowires and Surface Treatments on the Structure Yeonho Jeong; Changwon National University, Korea (the Republic of).
- NM03.04.40**
Nanoscale Spirals by Directed Self-Assembly Hongkyoon Choi^{1,2}; ¹Kongju National University, Korea (the Republic of); ²Massachusetts Institute of Technology, United States.
- NM03.04.41**
Branched Aramid Nanofibers Jian Zhu; Nankai University, China.

SESSION NM03.05: Energy Storage and Photocatalysis
 Session Chairs: Juan Beltran-Huarac and Il-Doo Kim
 Tuesday Morning, November 28, 2017
 Hynes, Level 3, Room 310

8:30 AM *NM03.05.01
Highly Aligned Oxide Nanotube Arrays—1D Geometry and Applications
Patrik Schmuki; University of Erlangen-Nuremberg, Germany.

9:00 AM *NM03.05.02
Construction of TiO₂ Nanobelt Heterostructures—A Powerful Tool for Building High-Performance Photocatalysts Hong Liu^{1,2}; ¹University of Jinan, China; ²Shandong University, China.

9:30 AM NM03.05.03
Tunnel Manganese Oxide Nanowires for High-Performance Electrochemical Energy Storage and Water Desalination Bryan W. Byles; Drexel University, United States.

9:45 AM NM03.05.04
One-Dimensional Vanadium Oxide Nanowires—Experimental Synthesis and Investigations of the Electrochemical Behaviors for Energy Storage Tianyu Liu; University of California, Santa Cruz, United States.

10:00 AM BREAK

10:30 AM NM03.05.05
Carbon Nanofiber Aerogel from Bacterial Cellulose for Kilohertz AC-Supercapacitors Zhaoyang Fan; Texas Tech University, United States.

SESSION NM03.06: Electronics and Photonics I
Session Chairs: Wojciech Jadwisieniczak and Jongwook Kim
Tuesday Morning, November 28, 2017
Hynes, Level 3, Room 310

10:45 AM *NM03.06.01

Nanowires as Means to Realize High-Performance III-V and III-Nitride Materials Lars Samuelson^{1,2,3}; ¹Lund University, Sweden; ²Glo AB, Sweden; ³Sol Voltaics AB, Sweden.

11:15 AM NM03.06.02

High Intensity Light-Nanowire Interaction Phenomena—From Tunnel Excitation to Hard X-Ray Generation Robert Roeder; University of Jena, Germany.

11:30 AM NM03.06.03

Optical and Structural Properties of Zinc Germanate Nanowires Bianchi Mendez; Univ of Complutense, Spain.

11:45 AM NM03.06.04

Radial Modulation-Doped Nanowire Channel for Millivolt Switch Katsuhiko Tomioka; Hokkaido University, Japan.

SESSION NM03.07: Electronics and Photonics II
Session Chairs: Alessandro Ponti and Lars Samuelson
Tuesday Afternoon, November 28, 2017
Hynes, Level 3, Room 310

1:30 PM NM03.07.01

Luminescent Rare-Earth Nanorods as a Three-Dimensional Orientation Marker Jongwook Kim; Ecole Polytechnique, France.

1:45 PM NM03.07.02

Electronic and Morphological Superlattices in Silicon Nanowires through Non-Equilibrium Doping David J. Hill; University of North Carolina at Chapel Hill, United States.

2:00 PM NM03.07.03

Electronics Functionalized DNA Origami Nanostructures for Molecular Electronics Turkan Bayrak; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

2:15 PM NM03.07.04

Ballistic One-Dimensional Transport in InAs Nano-Structures Siegfried F. Karg; IBM Research, Switzerland.

2:30 PM NM03.07.05

Charge Carrier Dynamics in GaAs/(In,Ga)As/(Al,Ga)As Core-Multishell Nanowire Heterostructures Hanno Küppers; Paul-Drude-Institut für Festkörperelektronik, Germany.

2:45 PM NM03.07.06

Electrical Transport Properties of Single MnAs/InAs Hybrid Nanowires Grown by Selective-Area Metal-Organic Vapor Phase Epitaxy Patrick Uredat¹; ¹Justus Liebig University, Germany; ²Justus Liebig University, Germany.

3:00 PM BREAK

SESSION NM03.08: Sensors
Session Chairs: Juan Beltran-Huarac and Patrik Schmuki
Tuesday Afternoon, November 28, 2017
Hynes, Level 3, Room 310

3:30 PM *NM03.08.01

Tailoring Nanoscale Fibers—From Fundamental to Practical Use Il-Doo Kim; Korea Advanced Institute of Science and Technology, Korea (the Republic of).

4:00 PM NM03.08.02

Solution Processable Carbon Nanotube Biosensing Devices: a Nanoscale Multi-Sensing Platform Pierrick Clement; Queen Mary University of London, United Kingdom.

4:15 PM NM03.08.03

Site-Specific Growth and *In Situ* Integration of Nanowire Networks for Sensing Applications Sven Barth; Vienna University of Technology, Austria.

4:30 PM NM03.08.04

Vertical Nanodevice Array for Flexible High-Spatial-Resolution Sensors Youngbin Tehoe; Seoul National University, Korea (the Republic of).

4:45 PM NM03.08.05

An Array of Metal Oxides Nanoscale Hetero p-n Junctions toward Designable and Highly-Selective Gas Sensors Hyunah Kwon; POSTECH, Korea (the Republic of).

SESSION NM03.09: Poster Session II: Electronics and Photonics and Sensing
Tuesday Afternoon, November 28, 2017
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

NM03.09.01

Copper Nanowire Based Transparent Electrodes with Improved Oxidation Stability Sevim Polat Genlik; Middle East Technical University, Turkey.

NM03.09.02

Direct On-Chip Integration of Metal Oxide Nanowires for Gas Sensing Applications Using a Modified CVD Technique Thomas Fischer; University of Cologne, Germany.

NM03.09.03

Omnidispersible Spiky Hedgehog Particles as a SERS Probe Douglas G. Montjoy; University of Michigan, United States.

NM03.09.04

Fabrication of Interconnected Silicon Nanowire Networks and Their Photovoltaic Properties Emmet D. Sheerin; CRANN Trinity College Dublin, Ireland.

NM03.09.05

Light Absorption in Axially Heterostructured Semiconductor NWs Juan Jimenez; University of Valladolid, Spain.

NM03.09.06

Fabrication of Aptamer-Modified Electropolymerized Polypyrrole Nanowires for Highly Sensitive FET HBsAg Biosensor Kyung Hee Cho; Seoul National University, Korea (the Republic of).

NM03.09.07

Copper Nanowire Network Transparent Thin-Film Heaters Bilge Imer; Middle East Technical University, Turkey.

NM03.09.08

Ozone Gas Sensor Based on One-Dimensional V₂O₅/TiO₂ Heterostructures Waldir J. Avansi; Univ de Sao Carlos, Brazil.

NM03.09.09

Localized Optical Sensing Based on Single Silicon Nanowire Probes Steffen Strehle; Ulm University, Germany.

NM03.09.10

In₂O₃ Ceramic Nanofibers as Gas Sensor Platform [Rafaella d. Andre](#); Embrapa Instrumentation, Brazil.

NM03.09.11

Single-Crystalline Tungsten Ditelluride (WTe₂) Nanobelts Grown from Eutectic Alloy Reservoir [Seunguk Song](#); Ulsan National Institute of Science and Technology (UNIST), Korea (the Republic of).

NM03.09.12

1D Copper Nanowires for Flexible Printable Electronics and High Ampacity Conductive Wires [Tan Zhang](#); Texas A&M University, United States.

NM03.09.13

Preparation and Characterization of Thermal Conducting Films Containing Boron Nitride Nanotubes (BNNT) [Jaewoo Kim](#); Naieel Technology, Korea (the Republic of).

NM03.09.14

Individual (In_xGa_{1-x})₂O₃ Nanowire-Based Gas Sensor [Guillem Domènech-Gil](#)^{1,2}; ¹Universitat de Barcelona, Spain; ²Universitat de Barcelona, Spain.

NM03.09.15

Fabrication of Asymmetrically Functionalized Silica Nanotube for Smart Nanocarrier [Young Deok Seo](#); Seoul National University, Korea (the Republic of).

SESSION NM03.10: Devices and Applications
Session Chairs: Letian Dou, Hong Liu and Bo Zou
Wednesday Morning, November 29, 2017
Hynes, Level 3, Room 310

8:00 AM NM03.10.01

Nanowires of Metal Halide Perovskites for Optoelectronic Applications and Fundamental Photophysical Studies [Yongping Fu](#); University of Wisconsin-Madison, United States.

8:15 AM NM03.10.02

Brush-Like ZnO Nanorods for Enhanced Efficiency in Dye-Sensitized Solar Cells [Joe Briscoe](#); Queen Mary University of London, United Kingdom.

8:30 AM NM03.10.03

High-Voltage Quintuple-Junction (and Higher) p-i-n Silicon Nanowires for Solar Energy and Optoelectronics [Taylor Teitworth](#); University of North Carolina, United States.

8:45 AM NM03.10.04

Vertical Nanowire Based Single Electron Transistor Self-Assembled by Ion Beam Mixing and Phase Separation [Karl-Heinz Heinig](#); Helmholtz-Zentrum Dresden-Rossendorf, Germany.

9:00 AM *NM03.10.05

Recent Development of 1D Inorganic Halide Perovskite Nanostructures [Peidong Yang](#)^{1,2}; ¹University of California, Berkeley, United States; ²Lawrence Berkeley National Laboratory, United States.

9:30 AM BREAK**10:00 AM NM03.10.06**

Direct Observation of Current-Induced Domain Wall Motion in 1D Cylindrical Nanowires as a Next Step towards 3D Magnetic Memory Devices [Sergei Lopatin](#); King Abdullah University of Science and Technology (KAUST), Saudi Arabia.

10:15 AM NM03.10.07

High Temperature Limit of Semiconductor Nanowire Lasers [Maximilian Zapf](#); Friedrich Schiller University Jena, Germany.

10:30 AM NM03.10.08

Toward Flexible Actuator Films by Super-Aligned VO₂ Nanobelts [Pengcheng Chen](#); Southern University of Science and Technology, China.

10:45 AM NM03.10.09

Silicon Nanowire Electron Ratchets as High-Frequency Morphological Diodes [James Custer](#); University of North Carolina at Chapel Hill, United States.

SESSION NM03.11: Health Effects of 1D Nanomaterials I
Session Chair: Juan Beltran-Huarac
Wednesday Morning, November 29, 2017
Hynes, Level 3, Room 310

11:00 AM *NM03.11.01

Flame Nanomaterial and Device Engineering for Biomedicine [Georgios A. Sotiriou](#); Karolinska Inst, Sweden.

11:30 AM *NM03.11.02

Oxidative Stress and Inflammation Induced by Nanomaterials—Discriminating between Defensive Reactions and Health Risk [Diana Boraschi](#); National Research Council (CNR), Italy.

SESSION NM03.12: Health Effects of 1D Nanomaterials II
Session Chairs: Juan Beltran-Huarac and Alessandro Ponti
Wednesday Afternoon, November 29, 2017
Hynes, Level 3, Room 310

1:30 PM *NM03.12.01

Physico-Chemical Properties of Carbon Nanotubes Driving Molecular Initiating Events (MIEs) of Adverse Outcome Pathways (AOPs) [Ivana Fenoglio](#); University of Torino, Italy.

2:00 PM *NM03.12.02

Human Health Risks of 1D Nanomaterials and Innovation Risk Management by Control Banding [Keld Alstrup Jensen](#); National Research Centre for the Working Environment, Denmark.

2:30 PM BREAK

SESSION NM03.13: Characterization
Session Chair: Wojciech Jadwisienczak
Wednesday Afternoon, November 29, 2017
Hynes, Level 3, Room 310

3:30 PM NM03.13.01

Band Alignment and Thermalization Dynamics of Photoexcited Single GaAs_{0.7}Sb_{0.3} and GaAs_{0.7}Sb_{0.3}/InP Nanowires [Iraj A. Shojaei](#); University of Cincinnati, United States.

3:45 PM NM03.13.02

Advanced Functionalization of Carbon Surfaces [Antonio Setaro](#); Freie Universität Berlin, Germany.

4:00 PM NM03.13.03

Strong UV and Blue-Violet Electroluminescence from RS-ZnO Based Nanorod LED [Lei Wang](#)^{1,2}; ¹School of Physical and Mathematical Sciences, Nanjing Tech University, China; ²The Chinese University of Hong Kong, China.

4:15 PM NM03.13.04

Advanced Synthesis and High Resolution Transmission Electron Microscopy Characterization of Nanomaterials Confined Inside Nanotubes [Thang Pham](#); University of California, Berkeley, United States.

4:30 PM NM03.13.05

Dopant Distribution Analysis Core-Shell Nanowires by Atom Probe Tomography [Yasuo Shimizu](#); The Oarai Center, Institute for Materials Research, Tohoku University, Japan.

4:45 PM NM03.13.06

Mapping the Built-In Potential at InGaP/InP Nanowire Tunnel Diodes [Karen L. Kavanagh](#); Simon Fraser University, Canada.

SESSION NM03.14: Poster Session III: Energy, Devices and Applications,
Health Effects and Characterization
Wednesday Afternoon, November 29, 2017
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

NM03.14.01

Design of Block Co-Polymers for Sub-10 nm Directed Self-Assembly Lithography [Natsuko Ito](#)^{1,2}; ¹The University of Texas at Austin, United States; ²JSR Corp., Japan.

NM03.14.02

One-Dimensional Nanomaterials for Energy Storage [Liqiang Mai](#); Wuhan University of Technology, China.

NM03.14.03

Surface Treatments for CMOS Compatible InAs Nanowires on Si(111) by [MBE Daya S. Dhungana](#); CNRS, LAAS-CNRS, Université de Toulouse, France.

NM03.14.04

Metal-Transition in NdNiO_{3-δ} Nanowires [Marcia T. Escote](#); UFABC, Brazil.

NM03.14.05

Magnetic Assembly and Soldering of Multi-Segment Metallic Nanowires [Jirui Wang](#); University of Massachusetts Lowell, United States.

NM03.14.06

Physical Properties of Hydrogen-Bonded Nonawires Based on an Alternating Metal-Sulfur Framework [Mikihiro Hayashi](#); Kyoto University, Japan.

NM03.14.07

Wafer-Scale Growth of Close-Packed Single Crystalline Ferroelectric Nanorod Arrays on Silicon [Min Gyu Kang](#); Virginia Tech, United States.

NM03.14.08

Confined Crystallization of α-Fe₂O₃ and TiO₂ Nanotubes for Application to Energy Storage Devices [Hochul Nam](#); Sungkyunkwan University, Korea (the Republic of).

NM03.14.09

Structural and Mechanical Properties of Boron Nitride Nanotubes in High Temperature Environment [Changhong Ke](#); State University of New York at Binghamton, United States.

NM03.14.10

Sb@Nitrogen-Doped Carbon Coaxial Nanotubes as a High-Rate and Long-Life Anode Material for Na-Ion Batteries [Wen Luo](#)^{1,2}; ¹Wuhan University of Technology, China; ²Université de Lorraine, France.

NM03.14.11

Performance Enhancement for Silver Nanowire-Based Flexible Transparent Conductive Films [Liwen Zhang](#); Shenzhen Graduate School, Harbin Institute of Technology, China.

NM03.14.12

Vertical InGaAs Nanowire Photodiode Array on Si [Kohei Chiba](#); Graduate School of Information Science and Technology, and Research Center for Integrated Quantum Electronics (RCIQE), Hokkaido University, Japan.

NM03.14.13

Silver Nanowire Decorated Antibacterial Fabrics [Husnu E. Unalan](#); Middle East Technical University, Turkey.

NM03.14.14

Magnetic Field Effect on a Single Dopant States in Silicon Cylindrical Truncated Nanowire [Gen Long](#); Saint John's University, United States.

NM03.14.15

Rutile TiO₂ Nanowire-Array Integrated 3D Honeycomb Monoliths for Catalysis Applications [Son T. Hoang](#); University of Connecticut, United States.

NM03.14.16

Visible Light Driven Nanowire Motor in Ionic Solution with Chemical Modification [Xiaojun Zhan](#); The University of Hong Kong, Hong Kong.

NM03.14.17

Control of Bending Structures in MnAs/InAs Heterojunction Nanowires [Ryutaro Kodaira](#); Hokkaido University, Japan.

NM03.14.18

Fabrication of Ferroelectric HfO₂ Nanowire Capacitors by MOCVD [Hironori Fujisawa](#); University of Hyogo, Japan.

NM03.14.19

Nanobelt-Like One-Dimensional Silver/Nanocarbon Hybrid Materials for Flexible and Wearable Electronics [Joong Tark Han](#)^{1,2}; ¹Korea Electrotechnology Research Institute, Korea (the Republic of); ²University of Science and Technology, Korea (the Republic of).

NM03.14.20

An Investigation into the Effects of POSS Functionalization of CNTs on Microstructure and Thermo-Mechanical Behavior of CNT/Polymer Nanocomposites [Seyed Morteza Sabet](#); Florida Atlantic University, United States.

NM03.14.21

Silver-Coated Gold Nanorods as a Promising Agent in Treating Cancer-Related Infections [Junyan Zhang](#); Northeastern University, United States.

NM03.14.22

Biodegradable and Stretchable Triboelectric Nanogenerator Based on Conductive Nanocomposite [Ha Ryeon Hwang](#); Graduate School of Converging Science and Technology, Korea University (KU-KIST), Korea (the Republic of).

NM03.14.23

One Dimensional Rare Earth Metal Pyrochlores as Efficient Photocatalysts—Molecular Precursor to Nd₂Sn₂O₇ Nanofibres [David Graf](#); University of Cologne-Inorganic Chemistry, Germany.

NM03.14.24

Fabrication of ZnO Quantum Dots-Decorated CNF Using Electrospun ZIF-8/PVA Nanofibers for High-Performance Electrochemical Capacitors [Gyeongseop Lee](#); Seoul National University, Korea (the Republic of).

NM03.14.25

Transformation of Pt-Cu Nanowires into “Crack-Tips” Enriched Pt-Cu Superlattice Nanoflakes for High-Performance Methanol Electrooxidation [Lijun Zheng](#); Nankai University, China.

NM03.14.26

Assembly of Novel Complex Li₂SnO₃ 1D-Nanostructures by a Vapor-Solid Growth [Ana Cremades](#); Univ Complutense de Madrid, Spain.

NM03.14.27

Al Doped TiO₂ 1-Dimensional Nanostructures [Ana Cremades](#); University Complutense de Madrid, Spain.

NM03.14.28

Synthesis of Core-Shell Rutile/Anatase Heterojunction Titanium Dioxide Nanofiber and Its Photocatalytic Performance [Kia-Chi Hsiao](#); National Taiwan University, Taiwan.

NM03.14.29

Systematic Study of Interdependent Relationship on Gold Nanorod Synthesis Assisted by Electron Microscopy Image Analysis [Seokyoung Yoon](#); Sungkyunkwan University, Korea (the Republic of).

NM03.14.30

Doping Effect of Cobalt into Tungsten Sulfide and Tungsten Oxide Core/Shell Nanotubes on Hydrogen Evolution [Xinjian Shi](#); Stanford University, United States.

NM03.14.31

Fabrication of Microcapacitors from Single Walled Carbon Nanotube Films Using Laser Ablation Technique [Mete Batuhan Durukan](#); Middle East Technical University, Turkey.

- NM03.14.32**
Multiwall Carbon Nanotubes Filled with Al_4C_3 —Electron-Phonon Coupling and Doping Process [Newton M. Barbosa](#); Universidade Federal do Pará, Brazil.
- NM03.14.33**
Influence of the Flanking Residues in a Tripeptide Library in Sorting Out Metallic and Semiconducting Carbon Nanotubes [Andine Carine](#); University of Bridgeport, United States.
- NM03.14.34**
Silver Nanowires and Carbon Nanotubes for Application in Flexible and Transparent Electrodes [Carlos E. Cava](#); Technological Federal University of Paraná (UTFPR), Brazil.
- NM03.14.35**
High Photocatalytic Performance of Ag/TiO_2 Nanofibers Prepared by Combining the Hydrothermal Synthesis and Simple Heat-Treatment [Ming-Chung Wu](#); Chang Gung University, Taiwan.
- NM03.14.36**
One-Dimensional Nanostructured Photoanodes with Staggered Bandgap for Efficient Solar Energy Conversion [Nageh K. Allam](#); American University in Cairo, Egypt.
- NM03.14.37**
Pure and Hierarchical Metallic MoS_2 Nanotubes for Lithium-Ion Batteries [Yucong Jiao](#); Northeastern University, United States.
- NM03.14.38**
Confinement Induced Ordering and Miniaturization in Dewetting of Thin Polymer Bilayers on Nano-Patterned Substrates with Complex Geometry [Rabibrata Mukherjee](#); Indian Institute of Technology Kharagpur, India.
- NM03.14.39**
Spectral Variation Analysis for Silicon-Wire-Based Microring Resonators [Tsuayoshi Horikawa](#)^{1,2}; ¹AIIST, Japan; ²PETRA, Japan.
- NM03.14.40**
Pre-Compression-Assisted Approach to Wavy Networks of Metal Nanowires Imparting Omnidirectional Stretchability and Transparency [Sang-Soo Lee](#); Korea Institute of Science and Technology, Korea (the Republic of).
- NM03.14.42**
Electromigration Behaviors of Single-Crystalline $\text{Ge}_2\text{Sb}_2\text{Te}_5$ Nanowire Evaluated by the Mean-Time-to-Failure Test [Shao-En Lo](#); National Chiao Tung University, Taiwan.
- NM03.14.43**
A Strategy to Fabricate Carbon Nanotube-Based Stretchable Electrodes for Wearable Energy Devices [Seungki Hong](#)^{1,2}; ¹Institute for Basic Science (IBS), Korea (the Republic of); ²Seoul National University, Korea (the Republic of).
- NM03.14.44**
Synergistic Coupling of Cobalt Nitrides and Iridium based Catalysts for Efficient Oxygen Evolution Reaction [Ki Ro Yoon](#); Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).
- NM03.14.45**
Brush-Like Cobalt Nitride Nanorods Anchored Carbon Nanofiber Membrane: 3D Current Collector-Catalyst Integrated Cathode for Long Cycle Li-O_2 Batteries [Ki Ro Yoon](#); Korea Advanced Institute of Science and Technology (KAIST), Korea (the Republic of).
- NM03.14.46**
Nano-Transplantation Printing of Crystallographic-Orientation-Controlled, Highly Ordered Single-Crystal Si Nanowires Applicable for Diverse Surfaces [Hyeuk Jin Han](#); KAIST, Korea (the Republic of).
- NM03.14.47**
Fabrication of $(\text{Hf,Zr})\text{O}_2$ Nanowire Capacitors with a Multilayered Core-Shell Structure [Masaru Shimizu](#); University of Hyogo, Japan.
- NM03.14.48**
Nanoparticle Crawling and Asymmetrically-Shaped Morphologies in Wurtzite GaP Nanowire Growth [Monica A. Cotta](#); UNICAMP, Brazil.
- NM03.14.49**
Confinement and Surface Effects on the Itinerant Ferromagnetism in Ni and Ni-Fe Nanowire Arrays—An *Ab Initio* Study [Ikram Ziti](#)^{1,2}; ¹Universidad Nacional Autónoma de México, Mexico; ²National School of Applied Sciences, Abdelmalik Esaadi University, Morocco.
- NM03.14.51**
Probing the Wurtzite Band Structure and Carrier Dynamics in Single $\text{In}_{0.65}\text{Ga}_{0.35}\text{As}$ and $\text{In}_{0.65}\text{Ga}_{0.35}\text{As}/\text{InP}$ Nanowires [Samuel M. Linser](#); University of Cincinnati, United States.
- NM03.14.52**
Enhancement of the Catalytic Activity of 1D Sodium Titanate Nanotubes in Biodiesel Production [Tatiana Klimova](#); Universidad Nacional Autónoma de México (UNAM), Mexico.
- NM03.14.53**
Preparation of ZnO Based One-Dimensional Heteroarchitecture via Non-Solvent Method for High Performance Photocatalysis [Chi Z. Wang](#); Wuhan University, China.
- NM03.14.54**
Growth, Structural and Visible Emission Studies of InGaN Nanostructures on p-Si by Molecular Beam Epitaxy [Kiran Dasari](#); University of Puerto Rico at Río Piedras, United States.

9:45 AM BREAK

10:15 AM NM07.14.04/NM06.13.04

Investigation of the Use of Nanocrater-Decorated Anodic Aluminum Oxide Membranes as Substrates for Reproducibly Enhanced SERS Signals
Merve Celik; TOBB University of Economics and Technology, Turkey.

10:30 AM NM07.14.05/NM06.13.05

Multiplexed Surface-Enhanced Raman Immunoimaging *In Vivo* with Gold Nanoantennas Yu-Chuan Ou; Vanderbilt University, United States.

10:45 AM NM07.14.06/NM06.13.06

STED Nanoscopy Assisted by Small Metal Nanoparticles—New Advances
Yonatan Sivan; Ben-Gurion University, Israel.

11:00 AM NM07.14.07/NM06.13.07

Overcoming the Diffraction Limit—Visualizing Absorption at the Nanometer Scale Lea Nienhaus^{1,2}; ¹Massachusetts Institute of Technology, United States; ²University of Illinois at Urbana-Champaign, United States.

11:15 AM NM07.14.08/NM06.13.08

Metal Hybrid Co-Based Nanorods for Biosensing, Hyperthermia and Catalytic Properties Marta Estrader; Laboratoire de Physique et Chimie des Nano-objets (LPCNO), France.

11:30 AM NM07.14.09/NM06.13.09

Tunable Nanoparticles for Light-Triggered Drug Release Irene Andreu^{1,2}; ¹Simon Fraser University, Canada; ²BC Cancer Agency, Canada.

11:45 AM NM07.14.10/NM06.13.10

Synthesis of Fluorescent CuInS₂/ZnS Quantum Dots—Porphyrin Conjugates for Photodynamic Therapy Samuel Oluwatobi S. Oluwafemi^{1,2}; ¹University of Johannesburg, South Africa; ²University of Johannesburg, South Africa.

SYMPOSIUM NM08

Defect-Induced Phenomena and New States of Matter
at the Nanoscale
November 27 - November 29, 2017

Symposium Organizers

Paola Ayala, University of Vienna
Yang-Yaun Chen, Academia Sinica
Apparao Rao, Clemson University
Nai-Chang Yeh, California Institute of Technology

MRS Invitation to Publish

All authors are invited to submit articles based on their 2017 MRS Fall Meeting presentations to journals in the MRS portfolio. (www.mrs.org/publications-news) Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as symposium collections. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more, including MRS Advances print options available at special rates during the meeting week only.

* Invited Paper

SESSION NM08.01: Synthesis and Defect Characterization
Session Chairs: Mei-Yin Chou and Thomas Pichler
Monday Morning, November 27, 2017
Hynes, Level 3, Room 309

8:15 AM NM08.01.01

Doped Amorphous TiO₂ as a Photocatalyst for Water Splitting Kulbir K. Ghuman; International Institute for Carbon-Neutral Energy Research, Kyushu University, Japan.

8:30 AM *NM08.01.02

Discovery of Q-Carbon and Q-BN and Direct Conversion of Carbon into Diamond and h-BN into c-BN Jagdish Narayan^{1,2}; ¹North Carolina State University, United States; ²North Carolina State University, United States.

9:00 AM NM08.01.03

Defect-Mediated Nanopore Formation in Single-Layer Transition Metal Dichalcogenides Jian-An Ke; Massachusetts Institute of Technology, United States.

9:15 AM NM08.01.04

Dislocations in 2D—Mechanisms of Mismatch Strain Relief and Strengthening Harley T. Johnson; University of Illinois at Urbana-Champaign, United States.

9:30 AM NM08.01.05

Synthesis and Characterization of Nanocarbon-Infused Metal Alloys Beihai Ma; Argonne National Laboratory, United States.

9:45 AM NM08.01.06

Superhard Q-Carbon Nanostructures Formed via Nanosecond Laser Melting and Ultrafast Quenching Siddharth Gupta; North Carolina State University, United States.

10:00 AM BREAK

10:30 AM NM08.01.07

Novel Q-Carbon Coatings on Tool Steel and WC Alexander Niebrocki; North Carolina State University, United States.

10:45 AM NM08.01.08

Investigation of Self-Assembled Nanostructure in ZnSnN₂ and ZnGeN₂, and Their Alloys with GaN [Paul Quayle](#)^{1,2}; ¹Kyma Technologies, Inc., United States; ²Case Western Reserve University, United States.

11:00 AM NM08.01.09

New State of Condensed Matter Revealed by TEM—“Transrotational” Crystals in Nanolith Films [Vladimir Y. Kolosov](#); Ural Federal University, Russian Federation.

11:15 AM NM08.01.10

Mobile Nanoparticles for Autonomous Exploration of Surface Structural Defects on Nano- and Micro-Scales [Irina Zvonkina](#); University of Akron, United States.

SESSION NM08.02: Electron and Ion Beam Induced Defects—Imaging and Dynamics

Session Chairs: Ado Jorio and Apparao Rao
Monday Afternoon, November 27, 2017
Hynes, Level 3, Room 309

1:30 PM *NM08.02.01

Atomic-Scale Defect-Engineering of 2D Materials with Electron and Ion Beams [Jani Kotakoski](#); University of Vienna, Austria.

2:00 PM NM08.02.02

Engineering Nanoscale Functionalities in Ceramics Using Energetic Ions [William J. Weber](#)^{1,2}; ¹University of Tennessee, United States; ²Oak Ridge National Laboratory, United States.

2:15 PM NM08.02.03

Controlled Crystallization and Amorphization of Silicon Using Electron Beams with Atomic Layer Precision [Stephen Jesse](#); Oak Ridge National Lab, United States.

2:30 PM NM08.02.04

Single Atom Spectroscopy and the Dynamics of Phosphorous Dopant in Graphene [Cong Su](#); Massachusetts Institute of Technology, United States.

2:45 PM BREAK

3:15 PM *NM08.02.05

Defects and Interface Engineered Electrodes for High Energy and High Power Li and Al Ion Batteries [Ramakrishna Podila](#); Clemson University, United States.

3:45 PM NM08.02.06

Defective Graphene and Graphene Allotropes as High-Capacity Anode Materials for Mg Ion Batteries [Dequan Er](#); University of Pennsylvania, United States.

4:00 PM NM08.02.07

Ionic Transport and Structural Evolution in One-Dimensional Manganese Oxide Nanorods [Jianping Huang](#); Stony Brook University, United States.

4:15 PM NM08.02.08

Dislocation Density Prediction Model for GaN-Based Electronic Devices [Dhaneshwar Mishra](#); Advanced Institutes of Convergence Technology, Korea (the Republic of).

4:30 PM *NM08.02.09

Nanoscale Thermal Imaging of Dissipation in Encapsulated Graphene [Dorri Halberal](#); Weizmann Institute of Science, Israel.

SESSION NM08.03: Poster Session
Monday Afternoon, November 27, 2017
8:00 PM - 10:00 PM
Hynes, Level 1, Hall B

NM08.03.01

Tailoring the Silver Content within the Tunnels and on the Exposed Surfaces of Manganese Oxide Nanowires—Impact on Impedance and Electrochemistry [Bingjie Zhang](#); Stony Brook University, United States.

NM08.03.02

Long and Short Range Crystalline Order Effects on the Photoresponse of Titanium Dioxide Nanotubes [Michael Eric Lubrin](#); University of the Philippines, Philippines.

NM08.03.03

A Novel Approach to Study of the Conductivity Behaviour of CaCu₃Ti₄O₁₂ Using Scanning Probe Microscopy Technique [Maxim S. Ivanov](#); Universidade de Coimbra, Portugal.

NM08.03.04

Tuning Both Bandedge Exciton Dynamics and Energy Transfer Dynamics in Mn-Doped QDs via Doping of Ag Co-Dopants [Wonseok Lee](#); POSTECH, Korea (the Republic of).

NM08.03.05

Revealing the Charge Carrier Trapping Process in Silicon Nanowire Photoconductors by Hall Effect Measurements [Kaixiang Chen](#); Shanghai Jiao Tong University, China.

NM08.03.06

Device Instability Behaviors on MoTe₂ Thin-Film Transistors under Bias Temperature Stress [Seung Jae Yu](#); Incheon National University, Korea (the Republic of).

NM08.03.07

Layer Thickness Dependent Thermal Stability in Metallic Multilayers at Nanoscale [Zhenhua Cao](#); Nanjing University, China.

NM08.03.09

Exploring Substitutional Doping in Nickel Oxide Employing *Ab Initio* Models [Janakiraman Balachandran](#); Oak Ridge National Laboratory, United States.

SESSION NM08.04: Electronic Properties of 1D and 2D Materials
Session Chairs: Jani Kotakoski and Nai-Chang Yeh
Tuesday Morning, November 28, 2017
Hynes, Level 3, Room 309

8:45 AM *NM08.04.01

Experimental Analysis of the Properties of Graphene, Carbon Nanotubes and Carbon Chains as Function of Their Local Structure [Thomas Pichler](#); University of Vienna, Austria.

9:15 AM *NM08.04.02

Electronic Transport through Atomic Carbon Chains [Jean-Christophe Charlier](#); University of Louvain, Belgium.

9:45 AM NM08.04.03

Dopant Morphology as the Factor Limiting Graphene Conductivity [Mario Hoffmann](#); National Taiwan University, Taiwan.

10:00 AM BREAK

10:30 AM *NM08.04.04

Tunable Electronic and Topological Properties of BN-Embedded Monolayer Graphene Mei-Yin Chou^{1,2}; ¹Academia Sinica, Taiwan; ²Georgia Institute of Technology, United States.

11:00 AM NM08.04.05

Effect of Carbon-Doping on Electrical Properties of Cubic Boron Nitride Grown by Pulsed Laser Annealing Technique Ariful Haque; North Carolina State University, United States.

11:15 AM NM08.04.06

High-Temperature Carbon-Based Superconductors—B-Doped Q-Carbon Anagh Bhaumik; North Carolina State University, United States.

11:30 AM NM08.04.07

Opening Electronic Properties in Graphene by Exploiting Defects Dingyi Sun; Brown University, United States.

11:45 AM NM08.04.08

Length Scale and Dimensionality of Defects in Epitaxial SnTe Topological Crystalline Insulator Films Omur E. Dagdeviren; Yale University United States.

SESSION NM08.05: Spectroscopic and Magnetic Properties
Session Chairs: Sriparna Bhattacharya and Jagdish Narayan
Tuesday Afternoon, November 28, 2017
Hynes, Level 3, Room 309

1:30 PM *NM08.05.01

Defect Engineering in 1D and 2D Materials—In Situ Spectroscopy Rahul Rao^{1,2}; ¹Air Force Research Laboratory, United States; ²UES, Inc., United States.

2:00 PM *NM08.05.02

The Influence of Defect Dimensionality in the Raman Scattering from Graphene Ado Jorio; Universidade Federal de Minas Gerais, Brazil.

2:30 PM NM08.05.03

Unraveling Electronic Structures of Confined Linear Carbon Chains by Resonance Raman Scattering Lei Shi; University of Vienna, Austria.

2:45 PM NM08.05.04

Defect-Induced Multiferroics with Atomic Dimensions in Nonmagnetic Ferroelectrics Takahiro Shimada; Kyoto University, Japan.

3:00 PM BREAK

3:30 PM NM08.05.05

Large Thermal Hysteresis in Verwey Transition of Mono-Domain Fe₃O₄ Nanoparticles Taehun Kim^{1,2}; ¹Seoul National University, Korea (the Republic of); ²Institute for Basic Science, Korea (the Republic of).

3:45 PM NM08.05.06

Extraordinary Hall Effect, Electrochromic Effect and Room-Temperature Ferromagnetism in Q-Carbon Anagh Bhaumik; North Carolina State University, United States.

4:00 PM NM08.05.07

Shape-Induced Magnetism in Non-Magnetic Materials Ilan Goldfarb; Tel Aviv University Israel.

4:15 PM NM08.05.08

Nitrogen Vacancy Induced Room-Temperature Ferromagnetism in TiN Epitaxial Thin Films via Ultrafast Laser Melting Siddharth Gupta; North Carolina State University, United States.

4:30 PM NM08.05.09

Role of Electronic Structure on Superconductivity and Ferromagnetism of Q-Carbon Ritesh Sachan^{1,2}; ¹Army Research Office, United States; ²North Carolina State University, United States.

SESSION NM08.06: Influence of Defects on Catalytic and Thermoelectric Properties

Session Chairs: Paola Ayala and Rahul Rao
Wednesday Morning, November 29, 2017
Hynes, Level 3, Room 309

9:00 AM *NM08.06.01

Defect-Induced Catalytic Activities for Carbon Nanomaterials Liming Dai; Case Western Reserve University, United States.

9:30 AM NM08.06.02

Investigation of the Electrical Properties of Photocatalytic TiO₂-Y₂O₃ Nanorod Combinatorial Libraries Neon Vicente B. Rosell; National Cheng Kung University, Taiwan.

9:45 AM NM08.06.03

Hydroxyl Dependent Evolution of Oxygen Vacancies in Bismuth Oxychloride Sujuan Wu^{1,2}; ¹Chongqing University, China; ²Oak Ridge National Laboratory, United States.

10:00 AM BREAK

10:30 AM *NM08.06.04

Role of Defects in the Electron Phonon Transport of Layered Chalcogenides Sriparna Bhattacharya; Clemson University, United States.

11:00 AM NM08.06.05

Resonant Thermoelectric Transport in Semiconducting Nanowires with Fano Defects Chumin Wang; Universidad Nacional Autonoma de Mexico, Mexico.