

SYMPOSIUM NM6

Mechanical Behavior of Nanostructured Composites
April 18 - April 20, 2017

Symposium Organizers

Arief Budiman, Singapore University of Technology and Design
Seung Min Han, Korea Advanced Institute of Science and
Technology (KAIST)
Amit Misra, University of Michigan–Ann Arbor
Ruth Schwaiger, Karlsruhe Institute of Technology

Proceedings Statement

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* Invited Paper

SESSION NM6.1: 3D Hierarchical Structures
Session Chair: Shefford Baker
Tuesday Morning, April 18, 2017
PCC West, 100 Level, Room 106 C

10:30 AM *NM6.1.01

Resilient 3-Dimensional Nanocomposites—From Nano-Architected Meta-Materials to Human Bone [Julia R. Greer](#); California Institute of Technology, United States.

11:00 AM NM6.1.02

Biomimetic, Strong Yet Tough Composites through 3D Printing [Arief Budiman](#); Singapore University of Technology and Design, Singapore.

11:15 AM NM6.1.03

Nanomechanical Behavior of 3D Silicon-Based Kirigami Structures Using Flat Punch Indentation [Mohammad Humood](#); Texas A&M University, United States.

11:30 AM NM6.1.04

Manipulation of Nanomaterials Using Ion Beams—Toward Scalable Fabrication of Solid-State Nanopores [Morteza Aramesh](#)^{1,3}; ¹ETH Zurich, Switzerland; ²Queensland University of Technology (QUT), Australia.

11:45 AM NM6.1.05

Additive Nanoparticle Assembly for Hierarchical 3D Micro-Architected Materials and their Mechanical Behavior [Mohammad S. Saleh](#); Washington State University, United States.

SESSION NM6.2: Biocomposites
Session Chair: Arief Budiman
Tuesday Afternoon, April 18, 2017
PCC West, 100 Level, Room 106 C

1:30 PM *NM6.2.01

Molecular Design and Mechanical Behavior of Low-Density Hyper-Confinement Molecular Hybrids [Reinhold H. Dauskardt](#); Stanford University, United States.

2:00 PM NM6.2.02

Effect of Additives on the Mechanical Properties of Calcite [Shefford P. Baker](#); Cornell University, United States.

2:15 PM NM6.2.03

Embedded Sensing of Damage Mechanics in a Composite Structure [Asha Hall](#); U.S. Army Research Laboratory, United States.

2:30 PM NM6.2.04

Micro/Nanoscale Tribological and Mechanical Investigation of the Articular Surfaces of the Insect Species—Potential for Developing Bioinspired Lubrication Systems [Jun K. Oh](#); Texas A&M University, United States.

2:45 PM NM6.2.05

Bio-Inspired Single-Walled Carbon Nanotubes as a Spider Silk Structure for Ultra-High Mechanical Property [Chengzhi Luo](#); Wuhan University, China.

3:00 PM BREAK

SESSION NM6.3: Porous Metal Composites
Session Chair: Seokwoo Jeon
Tuesday Afternoon, April 18, 2017
PCC West, 100 Level, Room 106 C

3:30 PM *NM6.3.01

Mechanically Robust Nanocomposites via Liquid Metal Dealloying [Jonah D. Erlebacher](#); Johns Hopkins University, United States.

4:00 PM NM6.3.02

Nanomechanics and Testing of Core-Shell Composite Ligaments for High Strength, Light Weight Foams [David F. Bahr](#); Purdue University, United States.

4:15 PM NM6.3.03

Mechanical Properties of Ligand Free Nanocrystal Superlattices [Ludovico Cademartiri](#); Iowa State University, United States.

4:30 PM NM6.3.04

Micromechanical Compressive Behavior of Freestanding and Ceramic-Composite 3D Graphene Foams [Kenichi Nakanishi](#); University of Cambridge, United Kingdom.

4:45 PM NM6.3.05

Evolution of Geometrically-Self Similarity in Coarsened Nanoporous Gold [Hansol Jeon](#); UNIST (Ulsan National Institute of Science and Technology), Korea (the Republic of).

SESSION NM6.4: Poster Session I: Mechanical Behavior of Nanostructure Composites
Tuesday Afternoon, April 18, 2017
8:00 PM - 10:00 PM
Sheraton, Third Level, Phoenix Ballroom

NM6.4.01

Atomistic Simulation of Scratch Behavior of Ceramic/Metal Nanolaminates [Iman Salehinia](#); Northern Illinois University, United States.

NM6.4.02

A Continuum Model of Deformation and Damage in Metals Coated with Nanolaminate Metallic System for Applications in High Energy Environments [Mohammed H. Anazi](#); Washington State University, United States.

NM6.4.03

On Structure and Mechanical Properties of Friction Stir Welded AA5083 Nanocomposite Plates Produced by a Novel Two-Step Ultrasonic Casting Technique [Vishwanatha Hire Math](#); IIT Kharagpur, India.

NM6.4.04

Evaluation of the In-Plane Size of Crystal within Nanometric Thin Layers by Non Coplanar Grazing Incidence X-Ray Diffraction [Herve Montigaud](#)^{1,3}; ¹CNRS, France; ²Saint-Gobain, France.

NM6.4.05

Physical and Mechanical Properties of Luminescent Silicon Nanocrystal Layers on PDMS [Rebecca J. Anthony](#); Michigan State University, United States.

NM6.4.06

Mechanical Properties of Hard/Soft Copolymers Calculated by Coarse-Grained MD Simulations [Min Zhang](#); Northwestern University, United States.

NM6.4.07

Tuning Interfacial Energy of Nanodiamond Fillers for Property Reinforcement in Polymer Nanofiber Composites [Prajesh Adhikari](#); North Carolina State University, United States.

NM6.4.08

Self-Dispersed Crumpled Graphene Balls in Oil for Friction and Wear Reduction [Xuan Dou](#); Northwestern University, United States.

NM6.4.09

Is Measured Strength Dependent on Anvil Hardness? [Lucy Morgan](#); University of Kent, United Kingdom.

NM6.4.10

Nanomechanics of Osteogenesis Imperfecta Bone Using Molecular Dynamics Simulations [Devendra K. Dubey](#); Indian Institute of Technology Delhi, India.

NM6.4.11

Physicochemical and Mechanical Properties of Biomimetic Nanostructured Composite Materials [Susana Alonso-Sierra](#); Universidad Autonoma de Queretaro, Mexico.

NM6.4.12

Modification of Nafion Fuel Cell Membrane with Sulfonated Graphene Oxide and Ceria [In Sung Jeon](#); Seoul National University, Korea (the Republic of).

NM6.4.13

Mechanical Properties and Bioactivity of Polyetheretherketone Modified with Graphene, Carbon Fiber and Hydroxyapatite [Han-Seung Ko](#); Seoul National University, Korea (the Republic of).

SESSION NM6.5: Nanolayered Composites
Session Chairs: Amit Misra and Guang-Ping Zhang
Wednesday Morning, April 19, 2017
PCC West, 100 Level, Room 106 C

8:15 AM *NM6.5.01

Averting Flow Localization in Metal Nanocomposites by Tailoring Microstructure Morphology [Michael J. Demkowicz](#); Texas A&M University, United States.

8:45 AM *NM6.5.02

High Temperature Deformation Behavior, X-Ray Nanotomography and Modeling of Al/SiC Nanolaminates [Nik Chawla](#); Arizona State University, United States.

9:15 AM NM6.5.03

Synthesis and Mechanical Characterization of TiAl and TiNi Amorphous-Nanocrystalline Composite Films [Rohit Sarkar](#); Arizona State University, United States.

9:30 AM NM6.5.04

Laser Treatment of Fe-Si-B Metallic Glass—Microstructure Evolution and Tensile Behavior [Sameehan S. Joshi](#); University of North Texas, United States.

9:45 AM BREAK

10:15 AM *NM6.5.05

Understanding Interface Effects on Mechanical Behavior of Metallic Nanolayered Composites [Guang-Ping Zhang](#); Institute of Metal Research, Chinese Academy of Sciences, China.

10:45 AM *NM6.5.06

Microstructure and Mechanical Behavior of Bulk Nanolaminated Composites Produced by Accumulative Roll Bonding [Nathan Mara](#); Los Alamos National Laboratory, United States.

11:15 AM NM6.5.07

In Situ SEM Observation of Crack Growth in Metal-Metal Nanolayered Composites during Clamped Beam Bending [Ihor Radchenko](#); Singapore University of Technology and Design, Singapore.

11:30 AM NM6.5.08

Bending Fatigue Behavior of Cu/Graphene Nanolayered Composites [Wonsik Kim](#); Korea Advanced Institute of Science & Technology, Korea (the Republic of).

11:45 AM NM6.5.09

Mechanical Reliability of CVD Graphene-Covered Copper Nanocomposites [Bin Zhang](#); Northeastern University, China.

SESSION NM6.6: Simulation and Modeling of Nanocomposites
Session Chair: Gerold Schneider
Wednesday Afternoon, April 19, 2017
PCC West, 100 Level, Room 106 C

1:30 PM *NM6.6.01

Interface Engineering: Improve Mechanical Properties and Irradiation Tolerance of Materials by Tailoring Interfaces in Solids [Jian Wang](#); University of Nebraska-Lincoln, United States.

2:00 PM NM6.6.02

Computational Approach for Designing Heteroepitaxial Metamaterials with Novel Properties [Yang Wang](#); Purdue University, United States.

2:15 PM NM6.6.03

Mechanics-Driven Design of Crystalline-Amorphous Nanolaminated Composites [Bin Cheng](#); Stony Brook University, United States.

2:30 PM BREAK

SESSION NM6.7: Polymer and Amorphous Metal-Based Composites
Session Chair: David Bahr
Wednesday Afternoon, April 19, 2017
PCC West, 100 Level, Room 106 C

3:30 PM *NM6.7.01

Strong, Stiff and Hard Isotropic Iron Oxide Nanocomposites with Organic Matrix—The Role of Chemical Crosslinking, Filler Percolation and Geometrical Confinement [Gerold Schneider](#); Hamburg University of Technology, Germany.

4:00 PM *NM6.7.02

Laminar Bulk Metallic Glass/Metal Composites via Accumulative Roll Bonding [Suveen N. Mathaudhu](#); University of California, Riverside, United States.

4:30 PM NM6.7.03

Ultra-High Elastic Strain Energy Storage in AlO₃-Infiltrated SU-8 Photoresist Composites at Small Length Scales [Seok-Woo Lee](#); University of Connecticut, United States.

4:45 PM NM6.7.04

Modeling Viscoelasticity in CNT-Dispersed Epoxy Thermoset via Molecular Simulations [Nithya Subramanian](#); Arizona State University, United States.

SESSION NM6.8: Poster Session II: Mechanical Behavior of
Nanostructure Composites
Wednesday Afternoon, April 19, 2017
8:00 PM - 10:00 PM
Sheraton, Third Level, Phoenix Ballroom

SESSION NM6.9: Metal-Matrix Nanocomposites
Session Chair: Ruth Schwaiger
Thursday Morning, April 20, 2017
PCC West, 100 Level, Room 106 C

NM6.8.01

The Effect of the Aspect Ratio and Surface Chemistry of Functionalized Graphene Materials on Their Ability to Reinforce Epoxy Nanocomposites [Cristina Valles](#); University of Manchester, United Kingdom.

NM6.8.02

The Effect of Functionalization on Microstructure and Mechanical Properties of Multiwalled Carbon Nanotubes Reinforced Aluminium Nanocomposite Synthesized by Spark Plasma Sintering [Lavish Singh](#); IIT Kharagpur, India.

NM6.8.03

Fabrication and Mechanical Properties of Functionalized Graphene Nanoplatelets Reinforced Epoxy Matrix Nanocomposites [Joonhui Kim](#); Korea Institute of Science and Technology, Korea (the Republic of).

NM6.8.04

Mechanochemical Structural Relationship of Extruded Graphene/ Polysulfone Composite Films [Justin W. Hendrix](#); Rutgers University, United States.

NM6.8.05

Mechanical Properties of Metal Nanocomposite Embedded with One and Two-Dimensional Materials [Arun K. Nair](#); University of Arkansas, United States.

NM6.8.06

Mechanical and Thermal Properties of Graphene/Ultrahigh Molecular Weight Polyethylene Nanocomposites [Kumar S](#); Masdar Institute, United Arab Emirates.

NM6.8.07

Characteristics of Nylon 6,6 Composites Reinforced Carbon Fiber Grafted with Multi-Walled Carbon Nanotube [Eun Yeob Choi](#); Chung-Ang Univ, Korea (the Republic of).

NM6.8.08

Nanoparticle and Nanotube Composite Structures for Sensitive and Durable Strain Sensors [Do Hoon Lee](#); Korea University, Korea (the Republic of).

NM6.8.09

Chemically Linked Particles Networks [Gabriel Ifiime](#); Palo Alto Research Center, United States.

NM6.8.10

Mixed Mode Inter-laminar Fracture Properties of Electrospun Nanofiber Interlayered Carbon Fiber Composites [Ozge Kaynan](#); Istanbul Technical University, Turkey.

NM6.8.11

Investigation on Friction Properties of Diamond-Like Carbon against Alumina at High Temperature—A Tight-Binding Quantum Chemical Molecular Dynamics Simulation Approach [Yang Wang](#); Tohoku University, Japan.

NM6.8.12

Stretchability of Nanolaminates with Alternating Amorphous Aluminum Oxide and Polymer Layers [Ju-Young Kim](#); UNIST, Korea (the Republic of).

8:15 AM *NM6.9.01

The Promise of Nanotwins—Beyond Simple Alloys [Jessica Krogstad](#); University of Illinois, Urbana-Champaign, United States.

8:45 AM NM6.9.02

New Insights into Morphological Evolution during Shearing of Multicomponent Metallic Systems [Mohsen Pouryazdan Panah](#); Karlsruhe Institute of Technology, Germany.

9:00 AM NM6.9.03

Creep Behavior of a Stable Nanocrystalline Alloy [K. N. Solanki](#); Arizona State University, United States.

9:15 AM NM6.9.04

Sequential Electroforetic Depositions for Free-Standing Ni-SiO₂ Nanocomposite Inverse Opals with Enhanced Mechanical Properties [Pei Sung Hung](#); National Chiao Tung Univ, Taiwan.

9:30 AM NM6.9.05

Effect of Grain Size and Graphene Nanoplatelets on the Mechanical Properties and Fracture Behavior of Spark Plasma Sintered Aluminum Based Nanocomposite [Alok Bhadauria](#); Indian Institute of Technology, India.

9:45 AM BREAK

SESSION NM6.10: Graphene or CNT Containing Composites
Session Chair: Seung Min Han
Thursday Morning, April 20, 2017
PCC West, 100 Level, Room 106 C

10:15 AM *NM6.10.01

Recent Work of Proximity Field Nanopatterning toward Large Area, Three-Dimensional Nanostructures [Seokwoo Jeon](#); Korea Advanced Institute of Science and Technology, Korea (the Republic of).

10:45 AM NM6.10.02

Probing Interfacial Mechanics in Ceramic Nanocomposites Reinforced with 1D/2D Carbon Nanostructures [Yingchao Yang](#); Rice University, United States.

11:00 AM NM6.10.03

Investigation of Nanoscale Toughening Mechanism in MoS₂ Dispersed Epoxy Composite System [Dhriti Nepal](#); Air Force Research Laboratory, United States.

11:15 AM NM6.10.04

Mechanical and Morphological Investigation of TiO₂/Graphene Heterostructures [Changhong Cao](#); University of Toronto, Canada.

11:30 AM NM6.10.05

Hybrid Elastomer Nanocomposites with Improved Tensile Strength and Modulus [Rostyslav Dolog](#); Baker Hughes, United States.

11:45 AM NM6.10.06

Coaxial Carbon@Boron Nitride Nanotube Arrays with Enhanced Thermal Stability and Mechanical Response [Lin Jing](#)^{1,2}; ¹Nanyang Technological University, Singapore; ²Nanyang Technological University, Singapore.

SESSION NM6.11: *In Situ* SEM/TEM Analysis of the Deformation Behavior

Session Chair: Jason Trelewicz
Thursday Afternoon, April 20, 2017
PCC West, 100 Level, Room 106 C

1:30 PM *NM6.11.01

Nanotwin-Governed Toughening Mechanism in Hierarchically Structured Biological Materials Sang Ho Oh; Sungkyunkwan University, Korea (the Republic of).

2:00 PM NM6.11.02

Characterizing the Mechanical Properties of Individual Phases in Nanostructured Composites Ruth Schwaiger; Karlsruhe Inst of Technology, Germany.

2:15 PM NM6.11.03

***In Situ* Compression Testing of High-Strength Low-Weight Micro- and Nanolattices Using 3D Nano-Scale X-Ray Imaging** Almut Schroer; Institute for Applied Materials, Germany.

2:30 PM NM6.11.04

Competition of Surface Topography and Material Inhomogeneity—A Numerical Linear-Elastic Indentation Model Veruska Malave; National Institute of Standards and Technology, United States.

2:45 PM NM6.11.05

Investigation into the Deformation Twins in Pure Ti via *In Situ* and Ex Situ Microstructure Observation Jianghua Shen; Osaka University, Japan.