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 Mortaza Aramesh1, 2; 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. Salehi; 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-Confined 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 Montignad1; 1CNRS, France; 2Saint-Gobain, France.

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 Nakamishi; 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 Montignad1; 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 Xuang 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 Chowla; 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 Nanolaminate 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 Nanolaminate 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 AlOx-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 Nithva 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

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 Multilayered 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  
Fun 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 Iftime; 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  
Yung 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).

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

8:15 AM  
NM6.9.01  
The Promise of Nanotwins—Beyond Simple Alloys  
Jessica Krogsstad; 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  
Creep Behavior of a Stable Nanocrystalline Alloy  
K. N. Solanki; Arizona State University, United States.

9:15 AM  
Sequential Electrophoretic Depositions for Free-Standing Ni-SiO$_2$ Nanocomposite Inverse Opals with Enhanced Mechanical Properties  
Pei Sung Hung; National Chiao Tung Univ, Taiwan.

9:30 AM  
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  
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  
Probing Interfacial Mechanics in Ceramic Nanocomposites Reinforced with 1D/2D Carbon Nanostructures  
Yinghebao Yang; Rice University, United States.

10:45 AM  
Investigation of Nanoscale Toughening Mechanism in MoS$_2$ Dispersed Epoxy Composite System  
Dhriti Nepal; Air Force Research Laboratory, United States.

11:00 AM  
Mixed Mode Inter-laminar Fracture Properties of Electrospun Nanofiber Interlayered Carbon Fiber Composites  
Ozge Kaynan; Istanbul Technical University, Turkey.

11:15 AM  
Mechanical and Morphological Investigation of TiO$_2$/Graphene Heterostructures  
Changhong Cao; University of Toronto, Canada.

11:30 AM  
Hybrid Elastomer Nanocomposites with Improved Tensile Strength and Modulus  
Rostyslav Dolog; Baker Hughes, United States.

11:45 AM  
Coaxial Carbon@Boron Nitride Nanotube Arrays with Enhanced Thermal Stability and Mechanical Response  
Lin Jing; Nanyang Technological University, Singapore; Nanyang 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.