

# SYMPOSIUM I

Nanomaterials for Structural Applications

December 2 – 6, 2002

## Chairs

Christopher C. Berndt                      Stony Brook Univ  
Traugott E. Fischer                      Stevens Inst of Technology  
Ilya Ovid'ko                                  Russian Academy of Sciences  
Ganesh Skandan                              Nanopowder Enterprises Inc  
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\* Invited paper

## SESSION II: FRACTURE AND MECHANICAL PROPERTIES - I

Chairs: Asiru Vasudevan and Amiya K. Mukherjee  
Monday Morning, December 2, 2002  
Room 312 (Hynes)

**8:30 AM \*I1.1**  
DEFORMATION AND COBLE CREEP OF NANOCRYSTALLINE  
MATERIALS. C.S. Pande and R.A. Masumura, Materials Science and  
Technology Division, Naval Research Laboratory, Washington, DC.

**9:00 AM I1.2**  
RATE DEPENDENT DEFORMATION AND FAILURE IN  
NANOCRYSTALLINE MATERIALS. M. Dao, N. Chollacoop, Y.-N.  
Kwon and S. Suresh, Dept of Materials Science and Engineering,  
Massachusetts Institute of Technology, Cambridge, MA.

**9:15 AM I1.3**  
STRAIN INDUCED ELASTOMER BUCKLING INSTABILITY FOR  
MECHANICAL MEASUREMENTS (SIEBIMM). Christopher M.  
Stafford, Christopher Harrison, Alamgir Karim, and Eric J. Amis,  
Polymers Division, National Institute of Standards and Technology,  
Gaithersburg, MD.

**9:30 AM I1.4**  
TENSILE DEFORMATION AND FATIGUE CRACK GROWTH IN  
Al-7.5Mg BULK NANOCRYSTALLINE MATERIALS. P.S. Pao,  
H.N. Jones, S.J. Gill, and C.R. Feng, Naval Research Laboratory,  
Washington, DC.

**9:45 AM I1.5**  
ANALYTIC PREDICTION OF HALL-PETCH EXPONENT IN  
MULTILAYER COATINGS. Lawrence H. Friedman, Pennsylvania  
State University, Dept of Engineering Science and Mechanics, State  
College, PA.

## 10:00 AM BREAK

**10:30 AM \*I1.6**  
MEASURES OF INTERFACES IN NANOSTRUCTURES. G.  
Knöner, V. Barbe, K. Reimann, W. Sprengel, and H.-E. Schaefer,  
University of Stuttgart, Institut für Theoretische und Angewandte  
Physik, Stuttgart, GERMANY.

**11:00 AM I1.7**  
DEFORMATION OF CRYOMILLED NANOCRYSTALLINE Al-Mg  
ALLOY. Zonghoon Lee, Department of Materials Science, University  
of Southern California, Los Angeles, CA; Bing Q. Han, Farghalli A.  
Mohamed, Enrique J. Lavernia, Department of Chemical and  
Biochemical Engineering and Materials Science, University of  
California at Irvine, Irvine, CA; and Steven Nutt, Department of  
Materials Science, University of Southern California, Los Angeles, CA.

## 11:15 AM I1.8

HARDNESS AND ABRASION RESISTANCE OF NANO-  
CRYSTALLINE NICKEL ALLOYS NEAR THE HALL-PETCH  
BREAKDOWN REGIME. C.A. Schuh and T.G. Nieh, Materials  
Science and Technology Division, Lawrence Livermore National  
Laboratory.

## 11:30 AM I1.9

HYBRID NYLON-6/SILICA NANOCOMPOSITES WITH  
IMPROVED MECHANICAL PROPERTIES. M.M.L. Garcia Curiel,  
W.E. van Zyl, and H. Verweij, Faculty of Chemical Technology and  
MESA Research Institute, University of Twente, Enschede, THE  
NETHERLANDS.

## SESSION I2: FRACTURE AND MECHANICAL PROPERTIES - II

Chairs: Lawrence Kabacoff and Hans-Eckhardt Schaefer  
Monday Afternoon, December 2, 2002  
Room 312 (Hynes)

## 1:30 PM \*I2.1

NANOSTRUCTURED MATERIALS AND THE SIZE-  
DEPENDENCE OF PROPERTIES. Subra Suresh, Massachusetts  
Institute of Technology, Dept of Materials Science and Engineering,  
Cambridge, MA.

## 2:00 PM I2.2

FATIGUE AND FRACTURE BEHAVIOR OF NANOSTRUCTURED  
NICKEL. T.A. Venkatesh and S. Suresh, Dept. of Materials Science  
and Engineering, MIT, Cambridge, MA.

## 2:15 PM I2.3

MECHANICS OF NANOSTRUCTURES. Rod Ruoff, Northwestern  
University, Evanston, IL.

## 2:30 PM I2.4

THE DEPENDENCE OF INDENTATION CRACKING IN SILICON  
CARBIDE ON INDENTATION SPACING. R. Sarrafi-Nour, L.  
Tsakalakos, and M. Manoharan, GE Global Research Center,  
Niskayuna, NY.

## 2:45 PM I2.5

INFLUENCE ON AN ELECTROCHEMICALLY GENERATED  
NANO TOPOGRAPHY ON WEAR, CORROSION, AND FATIGUE  
OF AUSTENITIC STAINLESS STEELS. Robin Büscher, Ilya  
Tikhovskii, Anna Runiewicz, and Alfons Fischer, Werkstofftechnik,  
Universitaet Essen, Essen, GERMANY.

## 3:00 PM BREAK

## 3:30 PM \*I2.6

PLASTICITY IN NANOMATERIALS. Amiya K. Mukherjee,  
University of California, Dept of Chemical Engineering & Materials  
Science, Davis, CA.

## 4:00 PM I2.7

IN-SITU OBSERVATIONS OF THE DEFORMATION OF  
ELECTRODEPOSITED NANOCRYSTALLINE NICKEL.  
K.S. Kumar, Brown University, Division of Engineering, Providence,  
RI; M.F. Chisholm, J.A. Horton, Oak Ridge National Laboratory,  
Oak Ridge, TN; and S. Suresh, Massachusetts Institute of Technology,  
Dept of Materials Science and Engineering, Cambridge, MA.

## 4:15 PM I2.8

MICROSTRUCTURE AND MECHANICAL PROPERTIES OF  
COPPER-304 STAINLESS STEEL MULTILAYERS. X. Zhang, A.  
Misra, H. Kung, J.D. Embury, and M. Nastasi, Materials Science and  
Technology Division, Los Alamos National Laboratory, Los Alamos,  
NM.

## 4:30 PM I2.9

THE EFFECT OF LENGTH SCALE OF THE DEFORMATION  
BEHAVIOR OF METALLIC MULTILAYERS—PART I:  
EXPERIMENTS. A. Misra, J.F. Bingert, D.L. Hammon, J.P. Hirth,  
P.M. Anderson, R.G. Hoagland, J.D. Embury, N. Nastasi, and H. Kung.

SESSION I3: POSTER SESSION  
Monday Evening, December 2, 2002  
8:00 PM  
Exhibition Hall D (Hynes)

## I3.1

PROPERTIES OF HIGH-STRENGTH NANOCRYSTALLINE FeCo

INTERMETALLIC MATERIAL. A. Duckham, D. Zhang, C.H. Shang, R.C. Cammarata, C.L. Chien<sup>a</sup> and T.P. Weihs, Department of Materials Science and Engineering, <sup>a</sup>Department of Physics and Astronomy, The Johns Hopkins University, Baltimore, MD.

**13.2**  
SYNTHESIS OF TITANIA COATED ALUMINA PARTICLES BY A HYBRID SOL-GEL METHOD. A. Schmidt, Goshen College, Dept of Chemistry, Goshen, IN; S.B. Majumder, P.S. Dabal, and R.S. Katiyar, Univ. of Puerto Rico, Dept of Physics, San Juan, PR; and D.C. Agrawal, Indian Institute of Technology, Materials Science Program, Kanpur, INDIA.

**13.3**  
WAVE INDUCED NANOSTRUCTURES. A. ten Bosch, CNRS, Laboratoire de Physique de la Matière Condensée, Nice, FRANCE; E. Dehaudt, CEMEF, Ecole des Mines de Paris; and Sophia Antipolis, FRANCE.

**13.4**  
HYDROGEN STABILIZATION OF {111} NANODIAMOND. Amanda Barnard, Salvy Russo, Ian Snook, Dept of Applied Physics, RMIT University, VIC, AUSTRALIA; and Nigel Marks, Dept of Applied Physics, School of Physics, University of Sydney, NSW, AUSTRALIA.

**13.5**  
PREDICTING THE MORPHOLOGY AND MECHANICAL PROPERTIES OF DIBLOCK/NANO-ROD COMPOSITES. Zhenyu Shou, Gavin A. Buxton, and Anna C. Balazs Chemical Engineering Department, University of Pittsburgh, Pittsburgh, PA.

**13.6**  
CONTROLLED MORPHOLOGY AND CHARACTERIZATION OF NANOPARTICLES AND CONDUCTING SINGLE-CRYSTAL FILMS. Anna Godfrey, Norma Alcantar, Delphine Gourdon, and Jacob Israelachvili, University of California, Dept of Chemical Engineering and Dept of Materials Science, Santa Barbara, CA.

**13.7**  
SYNTHESIS OF NANOCLAY/EPOXY COMPOSITES WITH A THREE-ROLL MILL MACHINE. Asma Yasmin, Jandro L. Abot and Isaac M. Daniel, Center for Intelligent Processing of Composites, Northwestern University, Evanston, IL.

**13.8**  
THE GROWTH OF HOLLOW CARBON FIBRES USING A PURE COPPER CATALYST. Benjamin Farmer, Derek Holmes, Luc Vandeperre, Robert Stearn and William Clegg, University of Cambridge, Ceramics Laboratory, Department of Materials Science and Metallurgy, Cambridge, UNITED KINGDOM.

**13.9**  
STRUCTURAL CHARACTERISTICS OF ULTRATHIN SINGLE-WALL CARBON NANOTUBES. Changyong Xiao, Jianyi Lin, Department of Physics, National University of Singapore, SINGAPORE; Xiaowei Sun, Daohau Zhang, School of Electric and Electronic Engineering, Nanyang Technological University, Singapore, SINGAPORE; and Jikang Feng, Department of Chemistry, Jilin University, Changchun, P.R. CHINA.

**13.10**  
ELECTROSPINNING POLYSTYRENE FIBERS: THE EFFECT OF MOLECULAR WEIGHT ON SURFACE TEXTURE AND MORPHOLOGY. Cheryl L. Casper, Jean Stephens, Silke Megelski, John F. Rabolt, University of Delaware, Dept of Materials Science and Engineering, Newark, DE; and Bruce Chase, Central Research and Development, Dupont, Wilmington, DE.

**13.11**  
PREPARATION OF NANO-SCALE NOBLE-METAL POWDER BY SELF-REGULATED REDUCTION VIA REACTIVE MICELLES AS TEMPLATES. Chien-Liang Lee, Chi-Chao Wan, National Tsing Hua Univ, Dept of Chemical Engineering, Hsinchu, TAIWAN.

**13.12**  
USING GRAPHITE NANOFIBERS AND NANOTUBES AS CATALYST SUPPORT MEDIA. Chris Marotta, R. Terry, and K. Baker, Catalytic Materials Ltd, Holliston, MA.

**13.13**  
CHARACTERIZATION OF MECHANICAL DEFORMATION OF NANOSCALE VOLUMES. Christopher R. Perrey, William Mook, C. Barry Carter, and William W. Gerberich, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN.

**13.14**  
INTERACTION OF CARBON NANOTUBES WITH LIQUID POLYMER. D. Danailov, P. Keblinski, P.M. Ajayan, MS&E Department and S. Nayak, Physics, Applied Physics and Astronomy Department, Rensselaer Polytechnic Institute, Troy, NY.

**13.15**  
METALLIZED OPTICAL FIBER PREPARED BY MAGNETRON SPUTTERING. D. Deligiannis and K.-Y. Wang, Intelvac, Georgetown, ON, CANADA.

**13.16**  
SYNTHESIS AND CHARACTERIZATION OF METAL-CERAMIC THIN FILM NANOCOMPOSITES WITH IMPROVED MECHANICAL PROPERTIES. D. Kumar, N. Sudhir, S. Yarmolenko, and J. Sankar, Center for Advanced Materials and Smart Structures Department of Mechanical Engineering, North Carolina A&T State University, Greensboro, NC; J. Narayan, A. Tiwari, H. Zhou and G. Duscher, Center for Advanced Materials and Smart Structures, Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC; S.J. Pennycook and A. Lupini, Solid State Division, Oak Ridge National Laboratory, Oak Ridge, TN.

**13.17**  
Abstract Withdrawn

**13.18**  
MULTISCALE MODELING OF NONLINEAR RESPONSES IN NACRE, A MODEL BIO-NANOCOMPOSITE. Dinesh R. Katti, Kalpana Katti, Shashindra Man Pradhan, Arundhati Bhosle, North Dakota State University, Department of Civil Engineering, Fargo, ND; Hanson Fong, and Mehmet Sarikaya, University of Washington, Materials Science and Engineering, Seattle, WA.

**13.19**  
PLASMA DEPOSITION OF ULTRATHIN POLYMER FILMS ON CARBON NANOTUBES. Donglu Shi, Tony He, Mark Schulz, Wim van Ooij, and David Mast, Department of Materials Science and Engineering, University of Cincinnati, Cincinnati, OH; Jie Lian and Lumin Wang, Department of Nuclear Engineering and Radiological Science, University of Michigan, Ann Arbor, MI.

**13.20**  
GROWTH AND APPLICATIONS OF CARBON NANOTUBES ON A TUNGSTEN SUBSTRATE. Erik Einarsson, Jun Jiao, Portland State Univ, Dept of Physics, Portland, OR; George Coia, Portland State Univ, Dept of Chemistry, Portland, OR; Jeremy Petty and Logan Love, Portland State Univ, Dept of Physics, Portland, OR.

**13.21**  
TAYLORING THE SIZE DISTRIBUTION OF Al-Cu NANOPRECIPTATES IN Al VIA He IMPLANTATION. G. Feldmann, Dep. de Física, Estatística e Matemática UNIJUI, Ijuí, RS, BRAZIL; P.F.P. Fichtner, Escola de Engenharia UFRGS, Porto Alegre, RS, BRAZIL; and F.C. Zawislak, Instituto de Física, Porto Alegre, RS, BRAZIL.

**13.22**  
ARC PLASMA SYNTHESIS OF NANOSTRUCTURED Fe POWDER. Gil-Geun Lee and Sung-Duck Kim, Pukyong National University, Div of Materials Science and Engineering, Busan, KOREA.

**13.23**  
SIZE REDUCTION OF CLAY PARTICLES IN NANOMETER DIMENSIONS. Gopinath Mani, Qinguo Fan, Samuel C. Ugbolue, and Isabelle M. Eiff, Dept of Textile Sciences, Univ of Massachusetts Dartmouth, North Dartmouth, MA.

**13.24**  
STRUCTURAL CERAMIC NANOCOMPOSITES SYNTHESIZED THROUGH IN SITU REACTIONS. Guo-Jun Zhang, Synergy Ceramics Laboratory, Fine Ceramics Research Association, Nagoya, JAPAN; Jian-Feng Yang, Synergy Materials Research Center, National Institute of Advanced Industrial Science and Technology, Nagoya, JAPAN; Motohide Ando, Synergy Ceramics Laboratory, Fine Ceramics Research Association, Nagoya, JAPAN; and Tatsuki Ohji, Synergy Materials Research Center, National Institute of Advanced Industrial Science and Technology, Nagoya, JAPAN.

**13.25**  
DISLOCATION EMISSION FROM NANOSIZED GRAIN BOUNDARIES: AN ATOMIC PICTURE. H. Van Swygenhoven, P.M. Derlet, and A. Hasnaoui, Paul Scherrer Inst, Villigen, SWITZERLAND.

**13.26**  
TENSILE PROPERTIES OF NANOCRYSTALLINE Ni: A

COMPARISON BETWEEN CLUSTER ASSEMBLED, ELECTRODEPOSITED AND SEVERE PLASTIC DEFORMED SAMPLES. F. Dalla Torre, H. Van Swygenhoven, and M. Victoria.

### 13.27

PRODUCTION AND MECHANICAL PROPERTIES OF NANOCRYSTALLINE INTERMETALLICS BASED ON NiAl, TiAl-X AND TiAl<sub>3</sub>-X. A. Cabrera, O. Coreño<sup>a</sup>, V. Garibay-Febles<sup>b</sup>, J.G. Cabañas-Moreno, H.A. Calderon, Depto. Ciencia de Materiales, ESFM-IPN, Mexico D.F., MEXICO; and M. Umamoto, Dept. Prod. Systems Engineering, Toyohashi University of Technology, JAPAN. <sup>a</sup>Now at Univ. Aut. Edo. Hidalgo, Pachuca, Hgo, <sup>b</sup>Now at Inst. Mex. Petroleo, MEXICO.

### 13.28

THE EFFECT OF SOLID SOLUTION WITH ADDITIONS ON THE NANOSTRUCTURE OF ELECTRODEPOSITED Ni. Hajime Iwasaki, Himeji Inst. of Tech., Dept. of Materials Science and Engineering, Hyogo, JAPAN; Kenji Higashi, Osaka Prefecture Univ. Dept. of Metallurgy and Materials Science, Sakai, Osaka, JAPAN; and T.G. Nieh, Lawrence Livermore National Laboratory, Materials Science and Technology Division, Livermore, CA.

### 13.29

SHAPE-MEMORY OF CARBON NANOTUBES FILLED THERMOPLASTIC ELASTOMERS. Hilmar Koerner, Chyi-Shan Wang, University of Dayton Research Institute, Dayton, OH; Richard A. Vaia, Max D. Alexander, Nathan A. Pearce, and Heather Bentley, Air Force Research Laboratory, Wright-Patterson Air Force Base, OH.

### 13.30

SYNTHESES OF C<sub>60</sub> THIN FILMS WITH THICKNESS OF NANO-SCALE. Nobuyuki Iwata, Shinji Kuroda, Hiroki Okuyama and Hiroshi Yamamoto, Department of Electronics & Computer Science, College of Science & Technology, Nihon University, Chiba, JAPAN.

### 13.31

THE INFLUENCE OF ANNEALING ON GRAIN SIZE, LATTICE STRAIN, TEXTURE AND HARDNESS OF NANOCRYSTALLINE PERMALLOY. Hongqi Li and Fereshteh Ebrahimi, Materials Science and Engineering Department, University of Florida, Gainesville, FL.

### 13.32

GROWTH OF CARBON NANOTUBES IN PERIODIC ARRAYS. Z.P. Huang<sup>a</sup>, M. Giersig<sup>b</sup>, D.Z. Wang<sup>c</sup>, B. Campbell<sup>d</sup>, M. Sennett<sup>d</sup>, D.L. Carnahan<sup>a</sup>, K. Kempa<sup>c</sup>, J.G. Wen<sup>c</sup>, and Z.F. Ren<sup>c</sup>; <sup>a</sup>NanoLab, Inc., Brighton, MA; <sup>b</sup>Hahn-Meitner-Institute, Berlin, GERMANY; <sup>c</sup>Department of Physics, Boston College, Chestnut Hill, MA; <sup>d</sup>Material Science Team, US Army Soldier Biological & Chemical Command, Research, Natick Soldier Center, Natick, MA.

SESSION 14: FRACTURE AND MECHANICAL PROPERTIES - III  
Chair: Ganesh Skandan  
Tuesday Morning, December 3, 2002  
Room 312 (Hynes)

### 8:45 AM I4.1

THE RELEVANCE OF RESIDUAL STRESS DISTRIBUTIONS IN NANOSTRUCTURED MATERIALS. Thomas Tsakalakos, Igor Zakharchenko, Yuriy Gulak, Ceramics Dept, Rutgers University, Piscataway, NJ; Mark Croft, Department of Physics, Rutgers University, Piscataway, NJ; Zhong Zhong, National Synchrotron Light Source, Brookhaven National Laboratory, Upton, NY; Ronald Holtz, Naval Research Laboratory, Washington, DC; Subra Suresh, T.A. Venkatesh, MIT, Cambridge, MA; and Jeffrey A. Eastman, Argonne National Laboratory, Argonne, IL.

### 9:00 AM I4.2

HIGH-TENSILE DUCTILITY IN NANOSTRUCTURED MATERIALS. Yinmin Wang, Mingwei Chen, and Evan Ma, Department of Materials Science & Engineering, The Johns Hopkins University, Baltimore, MD.

### 9:15 AM I4.3

NANOINDENTATION STUDY OF THE HARDNESS AND STRAIN-RATE SENSITIVITY OF NANOCRYSTALLINE Fe FORMED BY MECHANICAL ATTRITION. D. Jang, Department of Materials Sciences and Engineering; and M. Atzmon, Department of Nuclear Engineering and Radiological Sciences & Department of Materials Sciences and Engineering, University of Michigan, Ann Arbor, MI.

### 9:30 AM I4.4

PLASTIC DEFORMATION OF NANOCRYSTALLINE NICKEL

AND NICKEL ALLOYS. Fereshteh Ebrahimi, Materials Science and Engineering Department, University of Florida, Gainesville, FL.

### 9:45 AM I4.5

CHARACTERIZATION OF NANOPARTICLE FILMS AND STRUCTURES PRODUCED BY HYPERSONIC PLASMA PARTICLE DEPOSITION. Christopher R. Perrey, Ryan Thompson, C. Barry Carter, Univ of Minnesota, Dept of Chemical Engineering and Materials Science, Minneapolis, MN; Ashok Gidwani, Rajesh Mukherjee, Thierry Renault, P.H. McMurry, J.V.R. Heberlein, and S.L. Girschick, Univ of Minnesota, Dept of Mechanical Engineering, Minneapolis, MN.

### 10:00 AM BREAK

SESSION 15: POLYMER-BASED NANOSTRUCTURED MATERIALS  
Chair: Traugott E. Fischer  
Tuesday Morning, December 3, 2002  
Room 312 (Hynes)

### 10:30 AM I5.1

A STRUCTURE-PROPERTY STUDY OF A NANOCOMPOSITE POLY(METHYL METHACRYLATE) BONE CEMENT. Mary Turell, Department of Orthopaedic Surgery, Brigham & Womens Hospital, Harvard Medical School, Boston, MA; Peter R. Jemian, Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL; Jan Ilavsky, National Institute of Standards and Technology, Gaithersburg, MD; and Anuj Bellare, Department of Orthopaedic Surgery, Brigham & Womens Hospital, Harvard Medical School, Boston, MA.

### 10:45 AM I5.2

APPLICATION OF SIEBIMM TO OPTIMIZE THE MECHANICAL PROPERTIES OF THIN POLYMER FILMS. Christopher Harrison, Christopher M. Stafford, Alamgir Karim, and Eric J. Amis, Polymers Division, National Institute of Standards and Technology, Gaithersburg, MD.

### 11:00 AM I5.3

BIODEGRADABLE POLYESTER-LAYERED SILICATE NANOCOMPOSITES. Pralay Maiti, Emmanuel P. Giannelis, Cornell University, Material Science and Engineering, Ithaca, NY; and Carl A. Batt, Cornell University, Department of Food Science, Ithaca, NY.

### 11:15 AM I5.4

DISPERSION CHARACTERIZATION OF METAL-OXIDE NANOPARTICLES IN POLYMERIC COATINGS. Li-piin Sung, Manna Baghai-Anaraki, Stephanie Scierka, Building Materials Division, NIST, Gaithersburg, MD; and Derek L. Ho, NIST Center for Neutron Research, Gaithersburg, MD.

### 11:30 AM I5.5

EFFECTS OF DISPERSION, ALIGNMENT AND PERCENT LOAD ON PROPERTIES OF NANOPARTICLES IN POLYCARBONATE. Elizabeth A. Welsh, J.B. Wright, Michael Sennett, John Song, David Zeigler, U.S. Army Soldier and Biological Chemical Command, Natick Soldier Center, Materials Science Team, Natick, MA; Z.F. Ren, W.Z. Li, and J.G. Wen, Department of Physics, Boston College, Chestnut Hill, MA.

### 11:45 AM I5.6

SYNTHESIS, PROCESSING, AND PHYSICAL PROPERTIES OF SINGLE WALL CARBON NANOTUBE REINFORCED POLYMER NANOCOMPOSITES. Cheol Park<sup>a</sup>, Kristopher E. Wise<sup>a</sup>, Zoubeida Ounaies<sup>b</sup>, Roy E. Crooks<sup>c</sup>, Dennis C. Working, Sharon E. Lowther, Peter T. Lilliehi, Emilie J. Siochi, and Joycelyn S. Harrison, <sup>a</sup>ICASE, <sup>b</sup>Virginia Commonwealth University, <sup>c</sup>Lockheed Martin, Advanced Materials and Processing Branch, NASA Langley Research Center, Hampton VA.

SESSION 16: NANOCOMPOSITES: SYNTHESIS AND PROPERTIES  
Chair: Horst W. Hahn  
Tuesday Afternoon, December 3, 2002  
Room 312 (Hynes)

### 1:30 PM I6.1

INFLUENCE OF FILLER-FILLER AND FILLER-MATRIX INTERACTIONS ON THE MECHANICAL BEHAVIOR OF POLYMER NANOCOMPOSITES. C. Gauthier, E. Chabert, J.Y. Cavaille, L. Chazeau, GEMPPM, UMR 5510 INSA/CNRS,

**1:45 PM I6.2**

INFLUENCE OF ORGANIC MODIFIERS ON THE ADHESION OF INORGANIC/ORGANIC HYBRID COATINGS. C.J. Barbe, D.J. Cassidy, B.A. Latella, J.R. Bartlett, Materials Division, Australian Nuclear Science and Technology Organisation, Menai, AUSTRALIA.

**2:00 PM I6.3**

NANOPHASE ALUMINA / POLY(L-LACTIC ACID) COMPOSITES: A NANOSTRUCTURED BIOMATERIAL FOR ORTHOPAEDIC APPLICATIONS. Aaron J. Dulgar<sup>a,c</sup>, Rena Bizios<sup>b,c</sup>, and Richard Siegel<sup>a,c</sup>; <sup>a</sup>Department of Materials Science and Engineering, <sup>b</sup>Department of Biomedical Engineering, and <sup>c</sup>Rensselaer Nanotechnology Center, Rensselaer Polytechnic Institute, Troy, NY.

**2:15 PM I6.4**

ON SYNTHESIS AND PROPERTIES OF NANOCOMPOSITES. Thomas Tsakalakos, James D. Idol, Richard Renfree, Richard L. Lehman, Thomas J. Nosker, Department of Ceramics and Materials Engineering, Rutgers University, Piscataway, NJ; Ilhan A. Aksay, Daniel M. Dabbs, Department of Chemical Engineering, Princeton University, Princeton, NJ; and Kenneth E. Van Ness, Department of Physics and Engineering, Washington and Lee University, Lexington, VA.

**2:30 PM I6.5**

OPTIMIZATION OF MECHANICAL PROPERTIES OF AMINE- AND ANHYDRIDE-CURED EPOXY/CLAY NANOCOMPOSITES. J.L. Abot, A. Yasmin and I.M. Daniel, Robert McCormick School of Engineering and Applied Science, Northwestern University, Evanston, IL.

**2:45 PM I6.6**

PREPARATION AND CHARACTERIZATION OF ALUMINA BASED TiN<sub>NANO</sub> COMPOSITES. Mats Carlsson, Mats Johnsson, Mats Nygren, Department of Inorganic Chemistry, Stockholm University, Stockholm, SWEDEN; and Eric Laarz, Institute for Surface Chemistry, Stockholm, SWEDEN.

**3:00 PM BREAK**

**3:30 PM I6.7**

REINFORCEMENT/MATRIX INTERFACE IN OXIDE NANOCOMPOSITES FOR ENHANCED FRACTURE TOUGHNESS. R.R. O'Keefe, R.W. Carpick, R.F. Cooper, W.J. Drugan, and D.S. Stone, Program in Mechanics and Materials, NSF Materials Research Science and Engineering Center for Nanostructured Materials, University of Wisconsin-Madison, Madison, WI.

**3:45 PM I6.8**

Abstract Withdrawn

**4:00 PM I6.9**

SURFACE PROPERTIES OF ION-IMPLANTED NANO-WC/Co COMPOSITES. S.-C. Liao, S.-W. Haung, G.W. Shuy, Materials Research Lab., Industrial Technology Research Institute, Chungung, TAIWAN; T. Vilaithong and L.D. Yu, Fast Neutron Research Facility, Chiang Mai University, Chiang Mai, THAILAND.

**4:15 PM I6.10**

SYNTHESIS AND CHARACTERIZATION OF METAL NANOPARTICLES AND THE FORMATION OF METAL-POLYMER NANOCOMPOSITES. Anshu A. Pradhan, University of Delaware, Dept. of Materials Science and Engineering, Newark, DE; S. Ismat Shah, University of Delaware, Dept. of Materials Science and Engineering, Newark, DE, Fraunhofer Center for Manufacturing and Advanced Materials, Newark, DE.

**4:30 PM I6.11**

THERMAL AND MECHANICAL PROPERTIES OF ALUMINA/POLYMETHYLMETHACRYLATE (PMMA) NANOCOMPOSITES. Benjamin Ash, Linda Schadler, and Richard Siegel, Dept of Materials Science and Engineering, Rensselaer Nanotechnology Center, Rensselaer Polytechnic Institute, Troy, NY.

**4:45 PM I6.12**

EFFECT OF NANOPARTICLE POLYMER INTERFACE AND MICROSTRUCTURAL CHARACTERISTICS ON THE MECHANICAL BEHAVIOR OF A COMPOSITE. Rajesh Raghavan, Craig Carter, Massachusetts Institute of Technology, Dept of Materials Science and Engineering, Cambridge, MA.

**I7.1**

EFFECT OF NANO-SIZED Pb(Zr<sub>1-x</sub>Ti<sub>x</sub>)O<sub>3</sub> POWDERS ON ENHANCING CRYSTALLIZATION KINETICS OF Pb(Zr<sub>1-x</sub>Ti<sub>x</sub>)O<sub>3</sub> THIN FILMS PREPARED BY METAL-ORGANIC DECOMPOSITION PROCESS. Mao-Ying Teng, National Tsing-Hua Univ, Dept of Materials Science and Engineering, Hsin-Chu, TAIWAN; I-Nan Lin, Yin-Chih Lin, National Tsing-Hua Univ, Materials Science Center, Hsin-Chu, TAIWAN; Yi-Ming Chen, Nyan-Hua Tai, National Tsing-Hua Univ, Dept of Materials Science and Engineering, Hsin-Chu, TAIWAN; and Hsiu-Fung Cheng, National Taiwan Normal Univ, Dept of Physics, Taipei, TAIWAN.

**I7.2**

MODELING MECHANICAL PROPERTIES OF CARBON MOLECULAR CLUSTERS AND CARBON NANOSTRUCTURAL MATERIALS. Iou S. Petroniuk, V.M. Levin, and I.V. Ponomareva, Lab. of Acoustic Microscopy, Inst. of Biochemical Physics, Russian Academy of Sciences, Moscow, RUSSIA.

**I7.3**

MODELING SELF-ASSEMBLY OF NANOPARTICLE STRUCTURES: SIMULATION OF NANOPARTICLE CHEMICAL POTENTIALS IN POLYMER-NANOPARTICLE MIXTURES. M. Krishna Tej and J. Carson Meredith, Georgia Tech, School of Chemical Engineering, Atlanta, GA.

**I7.4**

THE PROSPECT FOR NANOGRAINED STRUCTURAL STEEL. J.W. Morris Jr., University of California, Berkeley, CA.

**I7.5**

CONTRASTING BONDING BEHAVIOR OF ORGANIC MOLECULES ON CARBON FULLERENE STRUCTURES. J.C. Mixteco-Sánchez, Facultad de Física, Universidad Veracruzana, Xalapa, Veracruz, MEXICO; and R.A. Guirado-López, Universidad Autónoma de San Luis Potosí, San Luis Potosí, MEXICO.

**I7.6**

SINTERING OF NANOSIZED Y<sub>3</sub>Al<sub>5</sub>O<sub>12</sub> POWDERS OBTAINED BY LIQUID-FEED FLAME SPRAY PYROLYSIS. Julien Marchal, T.R. Hinklin, and R.M. Laine, University of Michigan, Dept. of Materials Science and Engineering, Ann Arbor, MI.

**I7.7**

DENSIFICATION AND SINTERING OF A MICROWAVE-PLASMA-SYNTHESIZED IRON NANOPOWDER. L.J. Kecskes, R.H. Woodman, and B.R. Klotz, U.S. Army Research Laboratory, Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD.

**I7.8**

AFM-SCRATCHING INDUCED SELECTIVE ELECTRO-CHEMICAL DEPOSITION OF PALLADIUM ONTO SEMICONDUCTOR SURFACES. Lionel Santinacci<sup>†</sup>, Thierry Djenizian, Helga Hildebrand and Patrik Schmuki, Dept. of Materials Science, LKO, University of Erlangen-Nuremberg, Erlangen, GERMANY. <sup>†</sup>On leave from: Swiss Federal Institute of Technology Lausanne (EPFL), Dept. of Materials Science, LTP, SWITZERLAND.

**I7.9**

NANOINDENTATION TECHNIQUE AT INVESTIGATING OF ALUMINA - CRC NANOPARTICLES COMPOSITES. Maksim V. Kireitseu, Ion Nemerenco, and Liudmila V. Yerakhavets, Institute of Machine Reliability, National Academy of Sciences, Minsk, BELARUS.

**I7.10**

MULTILAYERED STRUCTURES BY SELF-ASSEMBLY. M. Toprak, D.K. Kim, M. Mikhailova, and M. Muhammed, Dept. of Material Science and Engineering, Royal Institute of Technology, SWEDEN.

**I7.11**

ADHESION OF HVOF SPRAYED NANOSTRUCTURED POLYMER-DIAMOND CONTAINING COMPOSITES. Maksim Kireitseu, Ion Nemerenco, and A. Fedaravichus, Institute of Machine Reliability, National Academy of Sciences, Minsk, BELARUS.

**I7.12**

RHEOLOGICAL BEHAVIOUR AND MODEL OF METAL-POLYMER-CERAMIC NANOCOMPOSITE. Maksim Kireitseu,

Institute of Machine Reliability, National Academy of Sciences, Minsk, BELARUS.

**17.13**  
PROCESSING OF SWNT/EPOXY STRUCTURAL NANOCOMPOSITES. Margaret Roylance, Thomas Tiano, Briget Fay, Foster-Miller Inc., Waltham, MA; and Ken McElrath, CNI, Houston, TX.

**17.14**  
THE EFFECT OF ADAMANTANE UNIT ON THE CHARACTERISTICS OF POLYMERS CONTAINING THIS UNIT. Masami Inoue, Hiroshi Yanazawa, ASET, Yokohama, Kanagawa, JAPAN; Takashi Ishizone and Hiroyuki Tajima, Tokyo Institute of Technology, Tokyo, JAPAN.

**17.15**  
FORMATION AND ENTRAPMENT OF NOBLE METAL CLUSTERS IN SILICA AEROGEL MONOLITHS BY GAMMA-RADIOLYSIS. Jared F. Hund, Massimo F. Bertino, University of Missouri-Rolla, Dept of Physics, Rolla, MO; Guohui Zhang, Charklia Sotiriou-Leventis, Nicholas Leventis, University of Missouri-Rolla, Dept of Chemistry, Rolla, MO; and Akira T. Tokuhiro, University of Missouri-Rolla, Dept of Nuclear Engineering, Rolla, MO.

**17.16**  
SYNTHESIS OF ZEOLITE Y NANOCRYSTALS FROM CLEAR SOLUTIONS. Yunmei Shen, Michael P. Manning, Juliusz Warzywoda, and Albert Sacco Jr., Center for Advanced Microgravity Materials Processing, Chemical Engineering Department, Northeastern University, Boston, MA.

**17.17**  
IN SITU PREPARATION OF POLYMER COATED AND FUNCTIONALIZED CERAMIC NANOPARTICLES. Michael Schallehn, SusTech GmbH Co KG, Darmstadt, GERMANY; Horst Hahn, Institute of Material Science, Darmstadt University of Technology, GERMANY.

**17.18**  
GRAIN BOUNDARY STRUCTURE IN NANOCRYSTALLINE MATERIALS. Boris Demyanov and Mikhail Starostenkov, Altai State Technical Univ, Dept of General Physics, Barnaul, RUSSIA.

**17.19**  
YAG FIBER DERIVED FROM YAG NANOPOWDER/POLYMER PRECURSORS. Min Kim, Jose Azurdia, Julien Marchal, and Richard M. Laine, University of Michigan, Ann Arbor, MI.

**17.20**  
MOLECULAR DYNAMICS SIMULATIONS OF NANOCOMPOSITES FORMED BY INTERMETALLIC DISPERSOIDS OF  $Li_2$  TYPE AND ALUMINUM MATRIX. Min Namkung, Buzz Wincheski, NASA Langley Research Center, Hampton, VA; and Sun Mok Paik, Kangwon National University, Department of Physics, Chunchon, KOREA.

**17.21**  
MULTIPLE SOURCE FABRICATION OF ELECTROSPUN FIBER MATS. Ming Wei, Nantiya Viriyabanthorn, Julie Chen, Joey Mead, and Changmo Sung, University of Massachusetts-Lowell, Lowell, MA.

**17.22**  
THEORETICAL STUDIES OF THE THERMAL CONDUCTIVITY OF Si NANOWIRES. Natalio Mingo, Liu Yang, Eloret Corporation, NASA-Ames Research Center, Moffett Field, CA; Deyu Li and A. Majumdar, University of California at Berkeley, Dept. of Mechanical Engineering, Berkeley, CA.

**17.23**  
CONTROL OF THE MORPHOLOGY AND ORIENTATION OF ELECTROSPUN NANO-FIBERS. Navin Bunyan, Julie Chen, Samira Farboodmanesh, and Kari Stevens, University of Massachusetts, Department of Mechanical Engineering, Lowell, MA.

**17.24**  
BURSTING AND SPITTING COLLOIDAL DROPLETS. Nicolas Tsapis, Danielle Sanzone, Darren Link and Dave Weitz, DEAS, Department of Physics, Harvard University, Cambridge MA.

**17.25**  
CONDENSATION OF CARBON VAPOUR IN THE MICROWAVE OVEN. Oxana V. Kharissova, Israel Nieto Lopez, Facultad de Ciencias Fisico Matematicas, UANL; Juan A. Aguilar, Ubaldo Ortiz, and Moises Hinojosa Rivera, Facultad de Ingenieria Mecanica y Electrica.

**17.26**  
THE STRUCTURE AND PROPERTIES INVESTIGATION OF THE IMMISIBLE POLYOLETHENE BLEND. J.S. Petronioux and O.V. Priadilova, Inst. of Biochemical Physics, Russian Academy of Sciences, Moscow, RUSSIA.

**17.27**  
DEFORMATION-INDUCED CRYSTALLIZATION OF Al-BASED METALLIC GLASSES. Rainer J. Hebert and John H. Perepezko, Dept. of Mats. Sci. Engr., University of Wisconsin-Madison, Madison, WI.

**17.28**  
Abstract Withdrawn

**17.29**  
Abstract Withdrawn

**17.30**  
NANOINDENTATION OF ULTRATHIN FILMS OF SILICATE NANOPARTICLES AND POLYELECTROLYTES: DEPOSITION PARAMETERS AND MECHANICAL PROPERTIES. Rigoberto Advincula, Xiaowu Fan, Mi-kyoung Park, and Bob Brookins, University of Houston, Department of Chemistry, Houston, TX, and Department of Chemistry, University of Alabama at Birmingham, Birmingham, AL.

**17.31**  
CONSTRUCTION OF NANO-STEPPED GLASS SURFACES BY USING VISCOUS FLOW OF OXIDE GLASS FILMS DEPOSITED ON ULTRASMMOOTH SAPPHIRE SUBSTRATES. S. Akiba, S. Sato, A. Matsuda, T. Yamamoto, and M. Yoshimoto, Tokyo Inst of Tech, Materials and Structures Laboratory, Yokohama, JAPAN.

#### SESSION 18: MODELING, SIMULATIONS, AND INTERFACES

Chairs: Chandra Shekhar Pande and Subra Suresh  
Wednesday Morning, December 4, 2002  
Room 312 (Hynes)

**8:30 AM 18.1**  
ATOMISTICALLY INFORMED CONTINUUM MODEL OF POLYMER-BASED NANOCOMPOSITES. Catalin Picu, Alireza Sarvestani, and Murat Ozmusul, Rensselaer Polytechnic Institute, Dept of Mechanical Engineering, Troy, NY.

**8:45 AM 18.2**  
COMPUTER SIMULATION OF DISLOCATION PROPAGATION AND INTERACTION IN NANOSTRUCTURED METALLIC MULTILAYERS. Peter M. Anderson and Qizhen Li, Ohio State University, Dept. of Materials Science and Engineering, Columbus, OH.

**9:00 AM 18.3**  
CONTINUUM MECHANICS-DISCRETE DEFECT MODELING AND BUBBLE RAFT SIMULATION OF CRACKED SPECIMEN RESPONSE IN NANOSCALE GEOMETRIES. M.J. Starr, W.J. Drugan, Univ of Wisconsin-Madison, Dept of Engineering Physics, Mechanics and Materials Program, Madison, WI; D.S. Stone, Univ of Wisconsin-Madison, Materials Science and Engineering, Mechanics and Materials Program, Madison, WI; and M. Lopez-Garcia, Univ of Puerto Rico-Mayaguez, Dept of Chemical Engineering, Mayaguez, PR.

**9:15 AM 18.4**  
COOPERATIVE PROCESSES DURING PLASTIC DEFORMATION: A MOLECULAR DYNAMICS SIMULATION. A. Hasnaoui, H. Van Swygenhoven, and P.M. Derlet, Paul Scherrer Inst, Villigen, SWITZERLAND.

**9:30 AM 18.5**  
DEFORMATION MECHANISM FOR THE CROSSOVER IN HALL-PETCH BEHAVIOR IN NANOCRYSTALLINE MATERIALS BY MOLECULAR-DYNAMICS SIMULATION. Vesselin Yamakov, Dieter Wolf, Simon R. Phillpot, Materials Science Division, Argonne National Laboratory, Argonne, IL; Amiya K. Mukherjee, Department of Chemical Engineering and Materials Science, University of California, Davis, CA; and Herbert Gleiter, Institut für Nanotechnologie, Forschungszentrum Karlsruhe, Karlsruhe, GERMANY.

**9:45 AM 18.6**  
THE EFFECT OF LENGTH SCALE ON THE DEFORMATION BEHAVIOR OF METALLIC MULTILAYERS-PART II: MODELING. Peter M. Anderson, Ohio State University, Dept of

Materials Science and Engineering, Columbus, OH; A. Misra, and J.P. Hirth, Los Alamos National Laboratory, Materials Science and Technology Division, Los Alamos, NM.

**10:00 AM BREAK**

**10:30 AM 18.7**  
EFFECTS OF TRIPLE JUNCTIONS ON DEFORMATION BEHAVIOR OF NANOMATERIALS. Ilya Ovid'ko, Inst of Problems of Mechanical Engineering RAS, St. Petersburg, RUSSIA.

**10:45 AM 18.8**  
GRAIN BOUNDARY DISSOCIATION IN NANOCRYSTALLINE GOLD. D.L. Medlin, D. Cohen, and G. Lucadamo, Thin Film and Interface Science Dept., Sandia National Labs, Livermore, CA; S.M. Foiles, Materials and Process Modeling Dept., Sandia National Labs, Albuquerque, NM.

**11:00 AM 18.9**  
INTERFACE-CONTROLLED CREEP DEFORMATION IN TWO-PHASE TiAl WITH ULTRAFINE LAMELLAR MICROSTRUCTURES. Luke Hsiung, Lawrence Livermore National Laboratory, Chemistry and Materials Science Directorate, Livermore, CA.

**11:15 AM 18.10**  
ON THE SINK STRENGTH OF NANOSIZED GRAIN BOUNDARIES. M. Samaras, P.M. Derlet, H. Van Swygenhoven, and M. Victoria.

**11:30 AM 18.11**  
PARALLEL GLIDE OF DISLOCATIONS IN ULTRATHIN COPPER FILMS. T. John Balk, Gerhard Dehm and Eduard Arzt, Max-Planck-Institut für Metallforschung, Stuttgart, GERMANY.

**11:45 AM 18.12**  
THE ROLE OF GRAIN BOUNDARIES IN NANOCRYSTALLINE DEFORMATION. Krystyn Van Vliet, Sedina Tsikata, and Subra Suresh, Massachusetts Institute of Technology, Dept of Materials Science and Engineering, Cambridge, MA.

SESSION 19: CHARACTERIZATION OF NANOSTRUCTURED MATERIALS  
Chair: Gan-Moog Chow  
Wednesday Afternoon, December 4, 2002  
Room 312 (Hynes)

**1:30 PM \*19.1**  
(SUPER-)PLASTICITY OF NANOCRYSTALLINE MATERIALS. Horst Hahn and Karsten Albe, Technische Universität Darmstadt, Institute for Materials Science, Darmstadt, GERMANY.

**2:00 PM 19.2**  
STRUCTURE AND CHARACTERIZATION OF SOL-GEL AND AEROGEL MATERIALS AND OXIDATION PRODUCTS FROM THE REACTION OF  $(\text{CH}_3\text{O})_4\text{Si}$  AND  $\text{C}_{16}\text{H}_{33}\text{Si}(\text{OCH}_3)_3$ . Thomas M. Tillotson and John G. Reynolds, University of California, Lawrence Livermore National Laboratory, Livermore, CA.

**2:15 PM 19.3**  
STRAIN AND TEXTURE IN EQUAL-CHANNEL ANGULAR PRESSED ALUMINUM AND NICKEL. Sven C. Vogel, Irene J. Beyerlein, Mark A.M. Bourke, Donald W. Brown, Carlos Tomé, Los Alamos National Laboratory, Los Alamos, NM, Bjørn Clausen, and Ersan Ustündag, California Institute of Technology, Pasadena, CA.

**2:30 PM 19.4**  
RED SHIFT IN OPTICAL ABSORPTION TAIL AND SUPERPARAMAGNETISM OF GAMMA-Fe<sub>2</sub>O<sub>3</sub> NANOPARTICLES IN A POLYMER MATRIX. John K. Vassiliou<sup>a</sup>, J.W. Otto<sup>b</sup>, A. Pothireddy<sup>a</sup> and J.J. Davis<sup>a</sup>; <sup>a</sup>Department of Physics, Villanova University, Villanova, PA; <sup>b</sup>Joint Research Center for the European Commission, Brussels, BELGIUM.

**2:45 PM 19.5**  
NANOMECHANICAL CHARACTERIZATION ON ZINC AND TIN OXIDES NANOBELTS. Minhua Zhao, Scott Mao, Univ of Pittsburgh, Dept of Mechanical Engineering, Pittsburgh, PA; Fengting Xu, John A. Barnard, Univ of Pittsburgh, Dept of Materials Science & Engineering, Pittsburgh, PA; and ZhongLin Wang, School of Materials Science & Engineering, George Institute of Technology, Atlanta, GA.

**3:00 PM BREAK**

**3:30 PM \*19.6**  
ANOMALOUS X-RAY SCATTERING FOR DETERMINATION OF NANOSTRUCTURED ALLOY FORMATION AND SITE-SPECIFIC CHEMISTRY OF BRAGG PEAK. G.M. Chow, Dept of Materials Science, National University of Singapore, SINGAPORE.

**4:00 PM 19.7**  
INTERRELATIONSHIP BETWEEN ATOMIC SPECIES, BIAS VOLTAGE, TEXTURE AND MICROSTRUCTURE OF NANO-SCALE MULTILAYERS. D.B. Lewis, Q. Luo, Materials Research Institute, Sheffield Hallam University, Sheffield, UNITED KINGDOM; Z. Zhao, Department of Engineering Materials, The University of Sheffield, Sheffield, UNITED KINGDOM; G. Nayal, P. Eh. Hovsepian, and W.-D. Münz, Materials Research Institute, Sheffield Hallam University, Sheffield, UNITED KINGDOM.

**4:15 PM 19.8**  
CHARACTERIZATION OF LARGE DEFORMATION FIELD IN ULTRA-FINE GRAINED MACHINING CHIPS. Rena F. Kezar, Travis L. Brown, Srinivasan Swaminathan, W. Dale Compton and Srinivasan Chandrasekar, Center for Materials Processing and Tribology, School of Industrial Engineering, Purdue University, West Lafayette, IN.

**4:30 PM 19.9**  
ATOMIC-RESOLUTION Z-CONTRAST STEM STUDY OF A HIGH-STRENGTH NANOCRYSTALLINE Mg<sub>97</sub>Zn<sub>1</sub>Y<sub>2</sub> ALLOY. Eiji Abe, National Institute for Materials Science, Tsukuba, JAPAN; Y. Kawamura, Dept of Mechanical Engineering and Materials Science, Kumamoto University, Kumamoto, JAPAN; A. Inoue, Institute for Materials Research, Tohoku University, Sendai, JAPAN.

**4:45 PM 19.10**  
PLASTICITY OF EPITAXIAL Al THIN FILMS. Gerhard Dehm, T. John Balk, Max-Planck-Institut für Metallforschung, Stuttgart, GERMANY; and Beverley J. Inkson, Department of Materials, University of Oxford, UNITED KINGDOM.

SESSION 110: SYNTHESIS OF NANOSTRUCTURED MATERIALS - I  
Chair: Thomas Tsakalakos  
Thursday Morning, December 5, 2002  
Room 312 (Hynes)

**8:30 AM 110.1**  
A LOW-COST MANUFACTURING PROCESS FOR NANOSTRUCTURED MATERIALS. Srinivasan Swaminathan, Travis L. Brown, Srinivasan Chandrasekar, W. Dale Compton, Alexander H. King, and Kevin P. Trumble, Schools of Engineering, Purdue University, West Lafayette, IN.

**8:45 AM 110.2**  
A NOVEL FABRICATION METHOD TO GENERATE LARGE AREA PERIODIC NANOSTRUCTURES. Woo Lee, Won-Cheol Yoo, Mi-Kyoung Jin, and Jin-Kyu Lee, School of Chemistry and Molecular Engineering, Seoul National University, Seoul, KOREA.

**9:00 AM 110.3**  
FABRICATION OF FERROELECTRIC NANO-STRUCTURES. M. Alexe, S. Bhattacharyya and U. Gösele, Max Planck Institute of Microstructure Physics, Halle, GERMANY.

**9:15 AM 110.4**  
FORMATION, MECHANICAL AND ELECTRICAL PROPERTIES OF Ni-BASED AMORPHOUS ALLOYS AND THEIR NANOCRYSTALLINE STRUCTURE. Xiangcheng Sun, Center for Materials for Information Technology, The University of Alabama, Tuscaloosa, AL; Tiemin Zhao, Institute of Metal Research, Chinese Academy of Science, Shenyang, P.R. CHINA.

**9:30 AM 110.5**  
GROWTH AND ANOMALOUS LOW-TEMPERATURE ELECTRICAL CHARACTERISTICS OF NANO-STRUCTURED NiAl FILMS. Ashutosh Tiwari, A. Chugh, H. Wang, and J. Narayan, Department of Materials Science & Engineering, North Carolina State University, Raleigh, NC.

**9:45 AM 110.6**  
HIGH STRENGTH SILICON DIOXIDE AEROGELS. Benjamin L. Lawson, Taofang Zeng, North Carolina State University, Dept of Mechanical and Aerospace Engineering, Raleigh, NC.

**10:00 AM BREAK**

**10:30 AM I10.7**

NANO-STRUCTURED BULK POLYCRYSTALLINE CERAMICS FABRICATED BY RAPID SOLIDIFICATION OF EUTECTIC MELTS. Masahiro Yoshimura, Shunji Araki, and Jose M. Calderon-Moreno, Tokyo Institute of Technology, Center for Materials Design, Materials and Structured Laboratory, Yokohama, JAPAN.

**10:45 AM I10.8**

NOVEL NANOSTRUCTURED THIN FILMS. Igar Haurilay, Joint Stock Company "ALAMEX", Minsk, BELARUS; Alexander Govyadinov, Peter Mardilovich, recently Hewlett-Packard, Corvallis, OR; and Yuval C. Avniel, MicroPowder Solutions, LLC, Longmont, CO.

**11:00 AM I10.9**

SYNTHESES AND CHARACTERIZATION OF NOVEL VANADIUM OXIDE NANOTUBES AND NANOFIBERS. Samuel Lutta, Peter Y. Zavalij, and M. Stanley Whittingham, State University of New York at Binghamton, Institute for Materials Research and Dept of Chemistry, Binghamton, NY.

**11:15 AM I10.10**

PROCESSING OF HIGH-STRENGTH NANOCRYSTALLINE FeCo INTERMETALLIC MATERIAL. A. Duckham, D. Zhang, C.H. Shang, D. Liang<sup>a</sup>, R.C. Cammarata, R.L. Leheny<sup>a</sup>, C.L. Chien<sup>a</sup>, and T.P. Weihs, Department of Materials Science and Engineering; <sup>a</sup>Department of Physics and Astronomy, The Johns Hopkins University, Baltimore, MD.

**11:30 AM I10.11**

SILVER NANODISK: SYNTHESIS, CHARACTERIZATION AND SELF-ASSEMBLY. Sihai Chen, Zhiyong Fan, and David L. Carroll, Clemson Univ, School of Materials Science and Engineering, Clemson, SC.

**11:45 AM I10.12**

SYNTHESIS AND CHARACTERIZATION OF ALLYLESTER AND LAYERED SILICATE CLAY NANOCOMPOSITE. Wansoo Huh, Barry Farmer, Richard Vaia, Air Force Research Laboratory, MLBP, WPAFB, OH; Sang-Won Lee, and Se-Woong Pang, Dept of Chem & Environ Eng, Seoul, KOREA.

SESSION I11: SYNTHESIS OF NANOSTRUCTURED MATERIALS - II

Chairs: Sudipta Seal and Ganesh Skandan  
Thursday Afternoon, December 5, 2002  
Room 312 (Hynes)

**1:30 PM I11.1**

SYNTHESIS AND CONSOLIDATION OF NANOPARTICLES TO PREPARE NANOCOMPOSITE COMPONENTS. S. Wannaparhun, S.C. Kuiry, E. Megen, S. Patil and S. Seal, AMPAC and MMAE, University of Central Florida, Orlando, FL.

**1:45 PM I11.2**

SYNTHESIS OF HIGH ASPECT RATIO Ag/Pt NANOSTRUCTURES WITH THE RADIOLYSIS METHOD. C.M. Doudna, M.F. Bertino, University of Missouri-Rolla, Department of Physics; F. Blum, University of Missouri-Rolla, Department of Chemistry; A. Tokunishi, University of Missouri-Rolla, Department of Nuclear Engineering; P. Fraundorf, University of Missouri-St. Louis, Department of Physics and Astronomy; Debudutta Lahiri Dey, Bruce A. Bunker, University of Notre Dame, Physics Department; Jeff Terry, and Soma Chattopahyay, Illinois Institute of Technology, Biological, Chemical, and Physical Sciences.

**2:00 PM I11.3**

MECHANICAL AND STRUCTURAL INVESTIGATION OF HIGHLY ALIGNED SINGLE-WALLED CARBON NANOTUBES IN POLYMER COMPOSITES. Reto Haggenueller, Wei Zhou, John E. Fischer and Karen I. Winey, University of Pennsylvania, Dept of Materials Science and Engineering, Philadelphia, PA.

**2:15 PM I11.4**

DEFORMATION-STRUCTURE RELATIONSHIPS OF CARBON NANOTUBES FILLED THERMOPLASTIC ELASTOMERS. Hilmar Koerner, Chyi-Shan Wang, University of Dayton Research Institute, Dayton, OH; Richard A. Vaia, Max D. Alexander, Nathan A. Pearce, Heather Bentley, Air Force Research Laboratory, Wright-Patterson Air Force Base, OH; Benjamin S. Hsiao, Igor Sics, Department of Chemistry, State University of New York at Stony Brook, Stony Brook, NY; and Dale W. Schaefer, Materials Science and Engineering Department, University of Cincinnati, Cincinnati, OH.

**2:30 PM I11.5**

FABRICATION AND CHARACTERIZATION OF WATER-BORN

MULTIWALL NANOTUBE NANOCOMPOSITE FILMS AND COATINGS. Max D. Alexander, Jr., Chyi-Shan Wang, Heather J. Bentley, William Click and Hilmar Koerner, Air Force Research Laboratory, Wright-Patterson AFB, OH.

**2:45 PM I11.6**

FLUORINATED SINGLE WALL NANOTUBE/POLYETHYLENE COMPOSITES FOR MULTIFUNCTIONAL RADIATION PROTECTION. M.X. Pulikkathara, R. Wilkins, Center for Applied Radiation Research, Prairie View A&M University, Prairie View, TX; Meisha Shofner, Jerry Vera, Enrique V. Barrera, Department of Mechanical Engineering and Material Science, Rice University, Houston, TX; Fernando Rodriguez-Macias, Department of Chemistry, Rice University, Houston, TX; R. Vaidyanathan, C. Green, and C. Condon, Advanced Ceramics Research, Tucson, AZ.

**3:00 PM BREAK****3:30 PM I11.7**

GROWTH OF CARBON NANOTUBES ON CATALYST NANOPARTICLES PREPARED BY Ni ION IMPLANTATION INTO Si AND SiO<sub>2</sub>. A.R. Adhikari, M.B. Huang Department of Physics, University at Albany-State University of New York, Albany, NY; B.Q. Wei, R. Vajtai, and P.M. Ajayan, Department of Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, NY.

**3:45 PM I11.8**

LARGE SCALE SYNTHESIS OF NANOTUBES AND ONIONS BY ARC DISCHARGE IN LIQUIDS. Manish Chhowalla, Noriaki Sano, Haolan Wang, Ioannis Alexandrou and Gehan Amaratunga, Cambridge University, Engineering Dept, Cambridge, UNITED KINGDOM.

**4:00 PM I11.9**

MACROSCOPIC NEAT SINGLE WALL CARBON NANOTUBE FIBERS. Lars M. Ericson, Sivarajan Ramesh, Joseph Sulpizio, Hua Fan, Rajesh Saini, Virginia A. Davis, Nicholas Parra-Vasquez, Jason Longoria, Carter Kittrell, Matteo Pasquali, Robert H. Hauge, Richard E. Smalley, Center for Nanoscale Science and Technology, Rice University, TX; Juraj Vavro and John E. Fischer, Materials Science & Engineering, University of Pennsylvania, PA.

**4:15 PM I11.10**

MECHANICAL BEHAVIOR OF CERAMIC COATINGS REINFORCED WITH CARBON NANOTUBES. Zhenhai Xia, Brian W. Sheldon, W.A. Curtin, J. Xu, and B. Chang, Division of Engineering, Brown University, Providence, RI; Laura Riester, Metals and Ceramics Division, Oak Ridge National Lab, Oak Ridge, TN.

**4:30 PM I11.11**

MULTIFUNCTIONAL STRUCTURAL REINFORCEMENT FEATURING CARBON NANOTUBE FILMS. Eric A. Lass, Rensselaer Polytechnic Institute, Dept. of MS&E, Troy, NY; Nikhil A. Koratkar, Rensselaer Polytechnic Institute, Dept. of Aerospace Engineering, Troy, NY; Bingqing Wei and Pulickel M. Ajayan, Rensselaer Polytechnic Institute, Dept. of MS&E, Troy, NY.

## SESSION I12: POSTER SESSION

Thursday Evening, December 5, 2002  
8:00 PM  
Exhibition Hall D (Hynes)

**I12.1**

SIMULATION OF CARBON NANOTUBE PULL-OUT WHEN BONDED INTO A POLYMER MATRIX. S.J.V. Frankland, V.M. Harik, ICASE, NASA Langley Research Center, Hampton, VA.

**I12.1**

Transferred to I10.9

**I12.3**

A STUDY OF HYDROGEN ADSORPTION IN PRETREATED NANOCARBON. Sang Moon Lee, Japan Fine Ceramics Center, FCT Lab., Tsukuba, JAPAN; Satoshi Ohshima, Kunio Uchida, and Motoo Yumura, Research Center for Advanced Carbon Materials, AIST Tsukuba Central 5, Tsukuba, JAPAN.

**I12.4**

AN APPROACH TO NANOGASSES THROUGH ANODIC OXIDATION OF SPUTTERED ALUMINUM ON GLASS SURFACE. Satoru Inoue, Song-Zhu Chu, and Kenji Wada, National Institute for Materials Science, Advanced Materials Laboratory, Tsukuba, Ibaraki, JAPAN.

- 112.5**  
ELECTROSTATIC PRODUCTION OF NANOFIBERS (ELECTROSPINNING): WHIPPING INSTABILITY AND THE FIBER DIAMETER. Sergey V. Fridrikh<sup>a</sup>, Jian H. Yu<sup>a</sup>, Michael P. Brenner<sup>b</sup>, and Gregory C. Rutledge<sup>a</sup>; <sup>a</sup>Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA; <sup>b</sup>Division of Engineering and Applied Sciences, Harvard University, Cambridge, MA.
- 112.6**  
Abstract Withdrawn
- 112.7**  
DETECTION OF FREE VOLUME IN NANOCRYSTALLINE MATERIALS: EXPERIMENT VERSUS COMPUTER SIMULATIONS. Steven Van Petegem, Danny Segers, Ghent University, Dept of Subatomic and Radiation Physics, Ghent, BELGIUM; Helena Van Swygenhoven, Florian Dalla Torre, PSI, GFA/ASQ, Villigen, SWITZERLAND; and Jan Kuriplach, Charles University, Dept of Low Temperature Physics, Prague, CZECH REPUBLIC.
- 112.8**  
GROWTH OF CARBON NANOFIBERS ON ELECTROLESS Ni-P ALLOY CATALYST. T.K. Tsai, W.L. Liu, S.H. Hsieh, and W.J. Chen, Dept of Materials Science and Engineering, National Huwei Institute of Technology, Yunlin, TAIWAN.
- 112.9**  
MATERIAL PROPERTIES AND PROCESS COMPATIBILITY OF SPIN-ON NANO-FOAMED POLYBENZOXAZOLE FOR COPPER DAMASCENE PROCESS. Takashi Enoki, Kenzo Maejima, Hidenori Saito, and Akifumi Katsumura, Fundamental Research Laboratory, Research Department, Sumitomo Bakelite Co., Ltd., Kanagawa, JAPAN.
- 112.10**  
FERROMAGNETIC SHAPE MEMORY OF NANOSTRUCTURE Fe-Pd ALLOY. Teiko Okazaki, Takeshi Kubota, Yasubumi Furuya, Setuo Kajiwara<sup>a</sup> and Takehiko Kikuchi<sup>a</sup>, Faculty of Science and Technology, Hirosaki University, Hirosaki, JAPAN. <sup>a</sup>National Institute for Materials Science, Tsukuba, JAPAN.
- 112.11**  
BONE-SHAPE NANOMATERIALS FOR NANOCOMPOSITES APPLICATION. Terry Xu and Rod Ruoff, Department of Mechanical Engineering, Northwestern University, Evanston, IL.
- 112.12**  
NOVEL NANOSTRUCTURES FOR POTENTIAL INTEGRATION IN NANOCOMPOSITES. Terry Xu and Rod Ruoff, Dept of Mechanical Engineering, Northwestern University, Evanston, IL.
- 112.13**  
NEGATIVE PHOTORESIST BASED ON AN ACRYLATED POLY(ARYLENE ETHER). Timothy P. Bender, Richard A. Burt, Marko Saban, Paul F. Smith, Nancy Stoffel, Timothy Fuller, and Daniel Foucher, Xerox Research Centre of Canada, Mississauga, Ontario, CANADA.
- 112.14**  
IMPACT MODIFICATION OF NANOCOMPOSITES WITH AN EPOXY MATRIX. Isil Isik, Ulku Yilmazer, and Goknur Bayram, Department of Chemical Engineering, Middle East Technical University, Ankara, TURKEY.
- 112.15**  
NANOCOMPOSITES WITH EPOXY MATRIX. Cigdem Basara, Ulku Yilmazer, Goknur Bayram, Middle East Technical University, Dept of Chemical Engineering, Ankara, TURKEY.
- 112.16**  
RHEOLOGY & PHASE BEHAVIOR OF SINGLE WALL CARBON NANOTUBES IN STRONG ACIDS. V.A. Davis, L.E. Ericson, R. Sivarajan, R.K. Saini, C. Kittrell, W.E. Billups, R.H. Hauge, R.E. Smalley, and M. Pasquali, Rice University, Houston, TX.
- 112.17**  
STOICHIOMETRY, CRYSTALLINITY, AND NANO-STRUCTURED MORPHOLOGY OF A FUNCTIONALLY GRADED APATITE ON Ti-Al-V. J.D. Long, Ken Ostrikov, Shuyan Xu, Advanced Materials and Nanostructures Laboratory, Natural Sciences, Nanyang Technological University, SINGAPORE; and Valeri Ligatchev, School of Electrical and Electronic Engineering, Nanyang Technological University, SINGAPORE.
- 112.18**  
HOT-PRESSING OF ALUMINUM-BASED ALLOYS PRODUCED BY MECHANICAL ALLOYING. Vera Lúcia Arantes, Kátia Regina Cardoso, IP&D, Universidade do Vale do Paraíba, Sao José dos Campos, BRAZIL; and Carlos Alberto Cairo, Centro Tecnológico da Aeronáutica, Sao José dos Campos, BRAZIL.
- 112.19**  
INORGANIC-ORGANIC HYBRID MATERIALS: SAXS INVESTIGATIONS OF METAL-OXIDE NANOCCLUSERS IN AN ORGANIC POLYMER MATRIX. Viktoria Torma, Silvia Gross, Nicola Husing, U. Schubert, Technische Universität Wien, Institut für Materialchemie, Wien, AUSTRIA; Herwig Peterlik, Universität Wien, Institut für Materialphysik, Wien, AUSTRIA; and Peter Fratzl, Erich Schmid Institut der Österreichischen Akademie der Wissenschaften & Montanuniversität Leoben, Leoben, AUSTRIA.
- 112.20**  
HOT SUPERPLASTIC POWDER FORGING OF BULK NANOCRYSTALLINE CERAMICS. Adwaita Chaudhuri, Chiraporn Auechaltanukul and W. Roger Cannon, Rutgers University, Department of Ceramic and Materials Engineering, Piscataway, NJ.
- 112.21**  
PREFERRED ORIENTATION IN FIBERS OF HIPCO SINGLE WALL CARBON NANOTUBES FROM DIFFUSE X-RAY SCATTERING. W. Zhou, K.I. Winey, J.E. Fischer, Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia, PA; S. Ramesh, R.K. Saini, L.M. Ericson, V.A. Davis, and R.E. Smalley, Center for Nanoscale Science and Technology, Rice University, Houston, TX.
- 112.22**  
PREPARATION AND CHARACTERIZATION OF DOUBLE-WALL, FLATTENED MULTI-WALL AND COAXIAL-CABLE-LIKE CARBON NANOTUBES. W.Z. Li, J.G. Wen, and Z.F. Ren, Boston College, Physics Department, Chestnut Hill, MA.
- 112.23**  
SYNTHESIS OF CARBON NANOTUBE WITH CONTROLLED NANOSTRUCTURE AND APPLICATION. Wansoo Huh, Barry Farmer, Richard Vaia, Air Force Research Laboratory, MLBP, Wright-Patterson AFB, OH; and Don Shiffler, AFRL/DE, Kirtland AFB, NM.
- 112.24**  
POLYMER-ATTACHED FUNCTIONAL INORGANIC-ORGANIC HYBRID NANOCOMPOSITE AEROGELS. Xipeng Liu, Mingzhe Wang, and William M. Risen, Department of Chemistry, Brown University, Providence, RI.
- 112.25**  
NANOSCALE MODIFICATION OF THE SURFACE OXIDE OF GALLIUM ANTIMONIDE (GaSb) SUBSTRATES FOR DEVICE APPLICATIONS. Xianglin Li, Bongwoo Kang, Maria Ospina, Xin Liu, Changmo Sung, Center for Advanced Materials, University of Massachusetts, Lowell, MA; William Goodhue, Department of Physics and Applied Physics, Photonics Center, University of Massachusetts, Lowell, MA; Lisa P. Allen, Tom G. Tetreault, Epion Corporation, Billerica, MA; and David Bliss, Air Force Research Laboratory/SNHC, Hanscom AFB, MA.
- 112.26**  
Abstract Withdrawn
- 112.27**  
Transferred to I4.2
- 112.28**  
NANOCOMPOSITE FIBERS. Prabir Patra, Yong Kim, Armand Lewis, and Steven Warner, University of Massachusetts, Dartmouth, Dept of Textile Sciences, North Dartmouth, MA.
- 112.29**  
SIMULATION OF MORPHOLOGY AND SURFACE VIBRATION IN COPPER AND GOLD NANOPARTICLES. Yoshiaki Kogure, Yukie Kato, Tadatoshi Nozaki and Masao Doyama, Teikyo University of Science & Technology, Uenohara, Yamanashi, JAPAN.
- 112.30**  
EFFECTS OF CLAY DISPERSE MORPHOLOGY ON MELTS RHEOLOGY OF POLYSTYRENE/LAYERED-SILICATES COMPOSITES. Yuanming Zhang, Jin Zhu, Eric Anton Verploegen, Emmanuel P. Giannelis, and Ulrich B. Wiesner, Department of Materials Science and Engineering, Cornell University, Ithaca, NY.



**I12.31**

COMPRESSIVE BEHAVIOR FOR SURFACE-NANOCRYSTALLIZED ALUMINUM-ALLOY. Yueguang Wei, Chen Zhu, and Shan Tang, LNM, Institute of Mechanics, Chinese Academy of Sciences, Beijing, CHINA.

**I12.32**

SYNTHESIS OF Ag/Pd NANOPARTICLES BY CHEMICAL REDUCTION METHOD. Yu-Yu Lin, Huey-Ing Chen, Zhang-Yuan Wang, Yen-I Chou and Zong-Whie Shih, Department of Chemical Engineering, National Cheng Kung University, Tainan, TAIWAN; Chung-Shan Institute Science and Technology.

SESSION I13: SYNTHESIS OF NANOSTRUCTURED MATERIALS - III

Chairs: Ilya Ovid'ko and Christopher C. Berndt  
Friday Morning, December 6, 2002  
Room 312 (Hynes)

**8:30 AM \*I13.1**

DEFORMATION MECHANISMS OF CRYOMILLED NANOSTRUCTURED Al ALLOYS. E.J. Lavernia<sup>†</sup>, B.Q. Han, F.A. Mohamed, University of California, Irvine, Department of Chemical Engineering and Materials Science, Irvine, CA; <sup>†</sup>also at University of California, Davis, School of Engineering, Davis, CA.

**9:00 AM \*I13.2**

NANOSTRUCTURE AND FORMATION MECHANISMS IN CRYOMILLED FCC METALS AND ALLOYS. Fei Zhou, Enrique J. Lavernia, University of California at Davis, Dept of Chemical Engineering and Materials Science, Davis, CA; Steven R. Nutt, University of Southern California, Dept of Materials Science and Engineering, Los Angeles, CA.

**9:30 AM I13.3**

WEAR BEHAVIOR OF CrN BASED HARD PVD COATINGS DEPOSITED BY HIGH POWER PULSED MAGNETRON SPUTTERING AND COMBINED CATHODIC ARC/ UNBALANCED MAGNETRON SPUTTERING TECHNIQUES. A.P. Eghasarian, P. Eh. Hovsepian, W.-D. Münz, Materials Research Institute, Sheffield Hallam University, Sheffield, UNITED KINGDOM; L. Hultman and U. Helmersson, Thin Film Physics Division, Department of Physics and Measurement Technology, Linköping University, Linköping, SWEDEN.

**9:45 AM I13.4**

PLASTIC RELAXATION MECHANISMS IN SYSTEMS WITH A TWIST-BONDED LAYER. Catherine Priester UMR CNRS 8520/Dépt ISEN, Villeneuve d'Ascq, FRANCE and Geneviève Grenet, LEOM UMR CNRS 5512, Ecole Centrale de Lyon, Ecully, FRANCE.

**10:00 AM BREAK****10:30 AM \*I13.5**

POLYMER NANOCOMPOSITES: MANUFACTURING, STRUCTURES, THERMAL AND MECHANICAL PROPERTIES. Farzana Hussain, and Derrick Dean, Department of Mechanical Engineering and Center for Advanced Materials, Tuskegee University, Tuskegee, AL.

**11:00 AM PANEL DISCUSSION**

NANOMATERIALS AND NANOTECHNOLOGIES: A GLOBAL VIEW AND HOW TO ENHANCE INTERACTIONS AND APPLICATIONS.