

SYMPOSIUM H

Three-Dimensional Nanoengineered Assemblies

December 1 – 5, 2002

Chairs

Koji Ikuta
Lhadi Merhari
Thomas Orlando
David P. Taylor

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* Invited paper

TUTORIAL

**FT H: LITHOGRAPHIC AND
NONLITHOGRAPHIC METHODS FOR 3D
NANOFABRICATION**
Sunday, December 1, 2002
2:00 p.m. - 5:00 p.m.
Room 201 (Hynes)

Nanotechnology is considered the key technology of the 21st century and is expected to bring ultimate solutions to current problems. However, among the issues to address to ensure the industrial viability of nanotechnology is the selection of a 3D nanofabrication method that can be scaled up. This tutorial will describe state-of-the-art lithographic and nonlithographic methods and critically compare their performances in fields as diverse as 3D nanostructures, photonic crystals, and electronic devices.

Instructors:

Shinji Matsui, Himeji Institute of Technology
John A. Rogers, Bell Laboratories, Lucent Technologies

SESSION H1: NANOFABRICATION VIA
LITHOGRAPHIC TECHNIQUES
Chairs: Lhadi Merhari and David P. Taylor
Monday Morning, December 2, 2002
Room 309 (Hynes)

8:30 AM *H1.1
INTERFEROMETRIC LITHOGRAPHY AND NANOSCALE-
PATTERNED SEMICONDUCTOR GROWTH. S.R.J. Brueck, Center
for High Technology Materials, University of New Mexico,
Albuquerque, NM.

9:00 AM *H1.2
TECHNIQUES AND APPLICATIONS FOR NON-PLANAR
LITHOGRAPHY. John A. Rogers, Bell Laboratories, Murray Hill,
NJ.

9:30 AM *H1.3
ION PROJECTION DIRECT-STRUCTURING (IPDS) FOR
NANOTECHNOLOGY APPLICATIONS. Hans Loeschner, Elmar
Platzgummer, and Gerhard Stengl, IMS Nanofabrication GmbH,
Vienna, AUSTRIA.

10:00 AM BREAK

10:30 AM *H1.4
PROTON BEAM MICROMACHINING: A NEW 3D SUB-100 NM
DIRECT-WRITE TECHNIQUE. Frank Watt, Jeroen van Kan and
Andrew Bettiol, Research Centre for Nuclear Microscopy, Dept of
Physics, National University of Singapore, SINGAPORE.

11:00 AM *H1.5
RESIST REQUIREMENTS AND LIMITATIONS FOR NANOSCALE
ELECTRON-BEAM PATTERNING. J. Alexander Liddle, Lawrence
Berkeley National Laboratory, Berkeley, CA.

11:30 AM H1.6
NANOSCALE PATTERNING OF COBALT-COBALT OXIDE
INTERFACES. J.W. Lau, Y. Zhu, Brookhaven National Laboratory,
Upton, NY.

11:45 AM H1.7
CHEMICAL NANOLITHOGRAPHY WITH ELECTRON BEAMS.
Wolfgang Eck, Armin Götzhäuser, Wolfgang Geyer, Volker Stadler,
Alexander Küller, Michael Grunze, Angewandte Physikalische Chemie,
Universität Heidelberg, GERMANY; Thomas Weimann, Peter Hinze,
Physikalisch-Technische Bundesanstalt, Braunschweig, GERMANY.

SESSION H2: PLASMON PROCESSES ON
THE NANOSCALE
Chairs: David P. Taylor and Thomas Orlando
Monday Afternoon, December 2, 2002
Room 309 (Hynes)

1:30 PM *H2.1
SMALL IS DIFFERENT; SOME INTERESTING PROPERTIES OF
MATERIAL CONFINED IN TIME AND NANOMETER SPACE OF
DIFFERENT SHAPES. Mostafa A. El-Sayed, Georgia Institute of
Technology, Department of Chemistry and Biochemistry, Atlanta, GA.

2:00 PM *H2.2
TAILORING NANOPARTICLES WITH LASER LIGHT.
Frank Träger, Universität Kassel, Kassel, GERMANY.

2:30 PM *H2.3
SUBWAVELENGTH SCALE PHOTONIC STRUCTURES.
Harry A. Atwater, Stefan A. Maier, Pieter Kik, Andrea Martin,
Thomas J. Watson Laboratory of Applied Physics, California
Institute of Technology, Pasadena, CA.

3:00 PM BREAK

3:30 PM *H2.4
OPTICAL NANOLITHOGRAPHY USING EVANESCENT FIELDS.
Richard Blaikie, Maan Alkai, University of Canterbury, Department
of Electrical and Computer Engineering, Christchurch, NEW
ZEALAND.

4:00 PM H2.5
PLASMON PRINTING – NANOSCALE PATTERN REPLICATION
USING VISIBLE LIGHT. Andrea L. Martin, Pieter G. Kik, Stefan A.
Maier, Harry A. Atwater, California Institute of Technology, Thomas
J. Watson Laboratory of Applied Physics, Pasadena, CA.

4:15 PM H2.6
THE CONSTRUCTION OF SPHERICAL ASSEMBLIES BY GOLD
NANOPARTICLES MEDIATED WITH MULTI-DENTATE
THIOETHER LIGANDS. Mathew M. Maye, Li Han, Stephanie Lim,
Chuan-Jian Zhong, Department of Chemistry, State University of New
York at Binghamton, Binghamton, NY; Daniel Rabinovich,
Department of Chemistry, The University of North Carolina at
Charlotte, Charlotte, NC.

4:30 PM H2.7
DIRECTED SELF-ASSEMBLY OF ORDERED METAL
NANOCRYSTAL ARRAYS USING A FOCUSED ION BEAM
MICROSCOPE (FIB). M.D. McMahon, A.B. Hmelo, R. Lopez, R.F.
Haglund Jr., L.C. Feldman, Dept of Physics and Astronomy,
Vanderbilt University, Nashville, TN; R.A. Weller, Dept of Electrical
Engineering and Computer Science, Vanderbilt University, Nashville,
TN; R.H. Magruder III, Dept of Electrical Engineering and Computer
Science, Vanderbilt University, Nashville, TN, and Dept of Physics,
Belmont University, Nashville, TN.

4:45 PM H2.8
NEW PROCESSING TECHNIQUES FOR THE CREATION OF
MICRO-OPTO-ELECTRO-MECHANICAL MACHINES AND
PHOTONIC DEVICE IMBEDDED IN GLASS. Meg Abraham,
Oxford University, Dept of Materials, Oxford, UNITED KINGDOM.

SESSION H3: NANOFABRICATION VIA
NONLITHOGRAPHIC TECHNIQUES
Chairs: Thomas Orlando and Koji Ikuta
Tuesday Morning, December 3, 2002
Room 309 (Hynes)

8:30 AM *H3.1

SHAPE VARIATIONS AND CONTROL IN SELF-ASSEMBLED METAL NANOCLUSTERS. Rina Tannenbaum, Georgia Institute of Technology, School of Materials Science and Engineering, Atlanta, GA.

9:00 AM H3.2

SELF-ASSEMBLED HIERARCHICAL-STRUCTURES OF EMULSIONS AND FINE PARTICLES. Sachiko I. Matsushita, RIKEN Frontier Research System, Dissipative-Hierarchy Structures Lab, Saitama, JAPAN; Nobuhito Kurono, Masatsugu Shimomura, Hokkaido Univ, Research Institute for Electronic Science, Hokkaido, JAPAN.

9:15 AM H3.3

VAPOR PHASE DEPOSITED NANOCOMPOSITES OF POLYMER CONTAINING THREE DIMENSIONALLY DISPERSED METAL CLUSTERS. A. Biswas, J. Kanzow, J. Kruse, V. Zaporozhchenko, T. Strunskus[†] and F. Faupel, Lehrstuhl für Materialverbunde, Technische Fakultät der CAU, Kiel, GERMANY. [†]Lehrstuhl für Physikalische Chemie I, Ruhr-Universität, Bochum, GERMANY.

9:30 AM *H3.4

THE FORMATION, CHARACTERIZATION, AND INTEGRATION OF NANOSTRUCTURES: Ag AND Si. John H. Weaver, University of Illinois, Department of Materials Science and Engineering, Urbana, IL.

10:00 AM BREAK

10:30 AM *H3.5

WIND-DRIVEN WAVES AT A MOLECULAR SEASHORE. C. Mathew Mate, IBM Almaden Research Center, San Jose, CA.

11:00 AM *H3.6

RESOLUTION, FIDELITY, AND REGISTRATION OF DIRECTLY PRINTED PATTERNS OF MICROELECTRONIC MATERIALS. Sigurd Wagner, Scott M. Miller, Anton A. Darhuber, Samir Succar, and Sandra M. Troian, Depts of Electrical and of Chemical Engineering, Princeton University, Princeton, NJ.

11:30 AM H3.7

DIRECT IMPRINTING OF A LASER FEEDBACK STRUCTURE INTO A LIQUID-CRYSTALLINE ELECTROACTIVE CONJUGATED POLYMER. Erik Moderegger, Guenther Leising, AT&S AG, Science & Technology Scientific, Leoben, AUSTRIA; Emil J.W. List, Christian Doppler Laboratory for Advanced Functional Materials, Graz University of Technology & Joanneum Research, Graz, AUSTRIA; Roland Guentner, Ullrich Scherf, University of Potsdam, Institute for Physical and Theoretical Chemistry, Golm, GERMANY.

11:45 AM H3.8

NANOSCALE SCIENCE & TECHNOLOGY – A GATEWAY TO NEW PRODUCTS, PROCESSES AND PROPERTIES IN THE CHEMICAL INDUSTRY. Raymond Oliver, David Sutton, Derek Graham, ICI Strategic Technology Group, Redcar, UNITED KINGDOM.

SESSION H4: FABRICATION AND PROPERTIES OF
2D-ORDERED NANOSTRUCTURES
Chairs: Koji Ikuta and Lhadi Merhari
Tuesday Afternoon, December 3, 2002
Room 309 (Hynes)

1:30 PM *H4.1

TWO-DIMENSIONAL ORDERED NANO PORE ARRAYS: FABRICATION AND FILLING WITH MATERIALS. Ulrich Goesele, Kornelius Nielsch, Frank Mueller, Sven Matthias, Manfred Reiche, Ralf Wehrspohn, Jinsub Choi, Max Planck Institute of Microstructure Physics, Halle, GERMANY.

2:00 PM *H4.2

3-D NANOSTRUCTURE FABRICATION BY NANOIMPRINT LITHOGRAPHY & LITHOGRAPHICALLY INDUCED SELF-ASSEMBLY Paru Deshpande, Zhaoning Yu, Wei Wu, Mingtao Li, Bo Cui, Xinya Lei and Stephen Y. Chou, NanoStructure Laboratory, Department of Electrical Engineering, Princeton University, Princeton, NJ.

2:30 PM *H4.3

OPTOELECTRONIC NANOSTRUCTURES. Gernot S. Pomrenke, Air Force Office of Scientific Research, Arlington, VA.

3:00 PM BREAK

3:30 PM H4.4

SELF-ASSEMBLY OF NANOSHEETS USING MAGNETIC FIELD. Jean-Christophe P. Gabriel[†], Franck Camerel, Patrick Batail, Sciences Moléculaires aux Interfaces, CNRS, Nantes, FRANCE; Bruno J. Lemaire, Patrick Davidson, Lab Physique des Solides, CNRS, Orsay Univ, France; Hervé Desvieux, Service de Chimie Moléculaire, CEA, Saclay, Gif-sur-Yvette, FRANCE; [†]Present address: Nanomix Inc., Emerville, CA.

3:45 PM H4.5

GELATION OF A SYNTHETIC, β -SHEET-DERIVED PEPTIDE. Nathan Lockwood, Univ of Minnesota, Dept of Chemical Engineering and Materials Science; Robert van Tankeren, Kevin Mayo, Univ of Minnesota, Dept of Biochemistry, Minneapolis, MN.

4:00 PM H4.6

SYNTHESIS AND CHARACTERIZATION OF METAL NANO-PARTICLES IN AMORPHOUS CARBON FILMS. I. Gerhards, H. Hofsäss, and C. Ronning, II. Physikalisches Institut; H. Gibhardt, Institut für Physikalische Chemie; M. Seibt, IV. Physikalisches Institut, Universität Göttingen, Göttingen, GERMANY.

4:15 PM H4.7

A BOTTOM-UP APPROACH TO POLYMER/CARBON NANOTUBE FILMS. Jason H. Rouse^a, Peter T. Lellehei^b, Emilie J. Siochi^b; ICASE^a; Advanced Materials and Processing Branch^b; NASA-Langley Research Center, Hampton, VA.

4:30 PM H4.8

SELF-ORGANIZED ZnO NANOSIZE ISLANDS WITH LOW-DIMENSIONAL CHARACTERISTICS ON SiO₂/Si SUBSTRATES BY METALORGANIC CHEMICAL VAPOR DEPOSITION. Sang-Woo Kim, Shigeo Fujita, Kyoto Univ, Dept of Electronic Science and Engineering, Kyoto, JAPAN; Shizuo Fujita, Kyoto Univ, International Innovation Center, Kyoto, JAPAN.

4:45 PM H4.9

MORPHOLOGY EVOLUTION OF PYRAMID-LIKE NANOSTRUCTURES ON COBALT THIN FILMS DURING DEPOSITION BY SPUTTERING. Shih-Wei Chen, Jin-Ruey Wen, Chuan-Pu Liu, Department of Materials Science and Engineering, National Cheng-Kung University, Tainan, TAIWAN; Jiun-Nan Chen, Department of Electrical Engineering, Fortune Institute of Technology, Kaohsiung, TAIWAN.

SESSION H5: FABRICATION AND PROPERTIES OF
NANOWIRES, NANORODS AND NANOTUBES
Chairs: Koji Ikuta and Thomas Orlando
Wednesday Morning, December 4, 2002
Room 309 (Hynes)

8:30 AM *H5.1

SELF-ASSEMBLY OF MULTIDIMENSIONAL NANOROD STRUCTURES ON SURFACES. Sarah K. St. Angelo, Benjamin R. Martin, Thomas J. Larrabee, Thomas E. Mallouk, The Pennsylvania State University, Department of Chemistry, State College, PA.

9:00 AM *H5.2

NANOWIRES AND NANOSPRINGS: UNEXPECTED CATALYST MEDIATED GROWTH PHENOMENA. David N. McIlroy, D. Zhang, A. Alkhateeb, H. Han, University of Idaho, Dept. of Physics, Moscow, ID; M. Grant Norton, Washington State University, School of Mech. and Mat. Eng., Pullman, WA.

9:30 AM H5.3

CARBON NANOTUBE-CONDUCTING POLYMER NANOCOMPOSITES: STRUCTURE AND ELECTROCHEMICAL PROPERTIES. Mark Hughes, George Z. Chen, Milo S.P. Shaffer, Derek J. Fray, Alan H. Windle, University of Cambridge, Dept of Materials Science and Metallurgy, Cambridge, UNITED KINGDOM.

9:45 AM H5.4

ELECTRON AND LIGHT EMISSION FROM CARBON NANOTUBES AND CdS NANOWIRES. Jun Jiao, Lifeng Dong, David W. Tuggle, Jeremy Petty, Logan Love, Trenton J. McKinney, Portland State Univ., Dept of Physics, Portland, OR.

10:00 AM BREAK

10:30 AM *H5.5

GRAPHITE-BASED ELECTRONICS. Claire Berger, Yan Yi, and Walt A. de Heer, School of Physics, Georgia Institute of Technology, Atlanta, GA.

11:00 AM H5.6

GRAPHYNE NANOTUBES: NEW FAMILIES OF CARBON NANOTUBES. Vitor R. Coluci, Scheila F. Braga, Sergio B. Legoas, Douglas S. Galvao, Applied Physics Department, State University of Campinas, SP, BRAZIL; Ray H. Baughman, NanoTech Institute and Department of Chemistry, University of Texas at Dallas, Dallas, TX.

11:15 AM H5.7

FIELD EMISSION PROPERTIES OF BN/C AND BN@C NANOTUBES. Vincent Meunier, Thomas Zacharia, Oak Ridge National Laboratory, Oak Ridge, TN; Christopher Roland, J. Bernholc, North Carolina State University, Raleigh, NC; Marco Buongiorno Nardelli, North Carolina State University, Raleigh, NC and Oak Ridge National Laboratory, Oak Ridge, TN.

11:30 AM *H5.8

METAL NANOWIRES ARRAYS FOR CHEMICAL SENSING. Reg Penner, Department of Chemistry, University of California-Irvine, Irvine, CA.

SESSION H6: PHYSICS, CHEMISTRY AND MODELING OF NANOSTRUCTURES

Chairs: Lhadi Merhari and Thomas Orlando
Wednesday Afternoon, December 4, 2002
Room 309 (Hynes)

1:30 PM *H6.1

BIOLOGICALLY INSPIRED CONTROLS OVER ASSEMBLY OF CRYSTALLINE NANOSTRUCTURES. J.J. De Yoreo, C.A. Orme, S.R. Qiu, C.L. Cheung, Lawrence Livermore National Laboratory; P.M. Dove, K.J. Davis, Virginia Polytechnic Institute; M. Kurimoto, B. Kahr, University of Washington, Seattle, WA.

2:00 PM H6.2

PHOTO-CONTROL OF NANO-INTERACTIONS IN MICRO-SYSTEMS. Nelson S. Bell, B.G. Potter, K. Simmons-Potter, Joe Thomes, John Lean, Chad Staiger, Doug Loy, and Greg Jamison, Sandia National Laboratories, Materials Chemistry, Albuquerque, NM.

2:15 PM H6.3

ATTACHMENT OF GOLD NANOPARTICLES TO CARBON NANOTUBES BY CHEMICAL MANIPULATION. Kuiyang Jiang, Ami Eitan, Linda S. Schadler, Pulickel M. Ajayan, Mauricio Terrones^a, Richard W. Siegel, Rensselaer Nanotechnology Center, Rensselaer Polytechnic Institute, Troy, NY; ^aFullerence Science Center, CPES, University of Sussex, Brighton, UNITED KINGDOM.

2:30 PM H6.4

PHASE TRANSITIONS IN OCTANETHIOL-CAPPED NANOCUSTER ASSEMBLIES. A.V. Ellis, R. Goswami, K. Vijayamohan, Rensselaer Polytechnic Institute, Dept of Material Science and Engineering, Troy, NY; C. Ryu, Rensselaer Polytechnic Institute, Dept of Chemistry, Troy, NY; G. Ramanath, Rensselaer Polytechnic Institute, Dept of Material Science and Engineering, Troy, NY.

2:45 PM H6.5

CRITICAL UNIVERSALITY AND MAGNETIC PHASE TRANSITIONS OF A MODEL NANOCRYSTALLINE FERROMAGNET: A MONTE CARLO STUDY. Guang-Ping Zheng and Mo Li, School of Materials Science and Engineering, Georgia Institute of Technology, Atlanta, GA.

3:00 PM BREAK**3:30 PM H6.6**

SUPERCONFORMAL FILM GROWTH IN SUBMICRON FEATURES. T.P. Moffat, D. Wheeler, B. Baker and D. Josell, NIST, Gaithersburg, MD.

3:45 PM H6.7

MODELING THE FLOW OF BINARY FLUIDS IN A PATTERNED MICROCHANNEL. Olga Kuksenok, Anna Balazs, Chemical Engineering Department, University of Pittsburgh, Pittsburgh, PA; David Jasnaw, Physics Department, University of Pittsburgh, Pittsburgh, PA; Julia Yeomans, Theoretical Physics Department, Oxford University, Oxford, UNITED KINGDOM.

4:00 PM H6.8

FINITE ELEMENT ANALYSIS OF NANOSCALE THERMAL MEASUREMENTS OF SUPERLATTICES. Jason R. Foley and C. Thomas Avedisian, Thermal Sciences Laboratory, Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY.

4:15 PM *H6.9

PROCESSING IN MATERIALS THAT MEDIATE THREE-DIMENSIONAL FABRICATION. H. Helvajian, Laboratory Operations, The Aerospace Corporation, Los Angeles, CA.

4:45 PM H6.10

EVOLUTION OF CARBON SELF-ASSEMBLY IN COLLOIDAL PHASE DIAGRAM. Vaclav Bouda, Czech Tech Univ, Dept Mechanics and Materials Science, Prague, CZECH REP.

SESSION H7: POSTER SESSION
SYNTHESIS, PROPERTIES AND APPLICATIONS
OF 1D/2D/3D NANOSTRUCTURES

Chairs: Lhadi Merhari and David P. Taylor
Wednesday Evening, December 4, 2002
8:00 PM

Exhibition Hall D (Hynes)

H7.1

DIRECT NANOSCALE PATTERNING OF SOFT AND HARD MAGNETIC NANOSTRUCTURES VIA DIP-PEN NANOLITHOGRAPHY (DPN). Lei Fu, Vinayak P. Dravid, Dept. of Materials Science & Engineering; Xiaogang Liu, and Chad A. Mirkin, Dept. of Chemistry, Northwestern University, Evanston, IL.

H7.2

TEM ANALYSIS OF FIB PREPARED CROSS-SECTIONS OF THE ELASTOMER STAMPS AND IMPRINTED PATTERNS FOR NANO-LITHOGRAPHY. Richard Langford, Amanda Petford-Long, Oxford Univ, Dept. of Materials, Oxford, UNITED KINGDOM.

H7.3

FROM SELF-ORDERING TOWARDS IMPRINT LITHOGRAPHY: LARGE-SCALE SYNTHESIS OF MONODISPERSE NANORODS. Cornelius Nielsch, Jinsub Choi, Ralf B. Wehrspohn, Herbert Hofmeister, and Ulrich Gösele, Max-Planck-Institute of Microstructure Physics, Halle, GERMANY; Guido Sauer, Georg Brehm, and Siegfried Schneider, Institute of Physical Chemistry, University of Erlangen, GERMANY.

H7.4

FORMATION OF CARBON NANOTUBES ON NICKEL FILMS/PARTICLES USING CVD. Stephane Bazzana and Al Sacco Jr., Center for Advanced Microgravity Materials Processing, Department of Chemical Engineering, Northeastern University Boston, MA.

H7.5

SYNTHESIS AND CHARACTERISATION OF CATALYST-FREE CARBON NANOTUBES FROM SILICON CARBIDE PRECURSORS. Elen S. Humphreys, Sung-Yoon Chung, John B. Vander Sande and Yet-Ming Chiang, Dept. of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA.

H7.6

SIMPLE USE OF SiO₂ FILM THICKNESS FOR THE CONTROL OF CARBON NANO-TUBE DIAMETER DURING FERROCENE CATALYZED CVD GROWTH. Nitin Chopra, Bruce Hinds, Dept. of Chemical and Materials Eng., University of Kentucky, Lexington, KY; Padmaker Kichambare, Rodney Andrews, Center for Applied Energy Research, University of Kentucky, Lexington, KY.

H7.7

FIB-ASSISTED Pt DEPOSITION FOR CARBON NANOTUBE INTEGRATION AND 3-D NANOENGINEERING. K. Dovidenko, J. Rullan, K. Dunn, R. Moore, F. Heuchling, University at Albany-SUNY, School of NanoSciences and NanoEngineering, UAlbany Institute for Materials, Albany, NY.

H7.8

GROWTH OF WELL-DEFINED CARBON NANOTUBES ON ATOMIC FORCE MICROSCOPY PROBES SUITABLE FOR METROLOGY APPLICATIONS. Y.N. Emirov, J.D. Schumacher, M. Beerbom, University of South Florida; D.A. Walters, University of Central Florida; Z.F. Ren, Z.P. Huang, Boston College; B.B. Rossie, Agere Systems; and R. Schlaf, University of South Florida.

- H7.9**
BUILDING MACRO-SCALE NETWORKS AND BRIDGES OF ALIGNED CARBON NANOTUBES. Anyuan Cao, Bingqing Wei, P.M. Ajayan, G. Ramanath, Dept of Materials Science & Engineering, Rensselaer Polytechnic Institute, Troy, NY.
- H7.10**
VERTICAL ALIGNMENTS OF SINGLE-WALLED CARBON NANOTUBES ON CHEMICALLY FUNCTIONALIZED SILICON SUBSTRATES. Ha Jin Lee, Hyeoung Park, Sunyoung Koo, Haiwon Lee, Hanyang University, Department of Chemistry, Seoul, KOREA.
- H7.11**
CONTROLLED DEPOSITION AND APPLIED FIELD ALIGNMENT OF SINGLE WALLED CARBON NANOTUBES FOR CNT DEVICE FABRICATION. Jan Smits, Lockheed Martin Space Operations, Hampton, VA; Buzz Wincheski, NASA Langley Research Center, Hampton, VA; JoAnne Ingram, Swales Aerospace, Hampton, VA; Neal Watkins, Swales Aerospace, Hampton, VA; Jeffrey Jordan, NASA Langley Research Center, Hampton, VA.
- H7.12**
Abstract Withdrawn
- H7.13**
Transferred to H5.3
- H7.14**
HYDROPHOBIC ATTACHMENT OF GOLD NANOCLUSTERS TO CARBON NANOTUBES. K. Vijayamohan, Materials Science and Engineering Dept, Rensselaer Polytechnic Institute, Troy, NY; A.V. Ellis, Materials Science and Engineering Dept, Rensselaer Polytechnic Institute, Troy, NY; R. Goswami, Rensselaer Polytechnic Institute, Troy, NY; N. Chakrapani, Materials Science and Engineering Dept, Rensselaer Polytechnic Institute, Troy; L.S. Ramanathan, Chemistry Dept, Rensselaer Polytechnic Institute, Troy, NY; P.M. Ajayan, G. Ramanath, Rensselaer Polytechnic Institute, Troy, NY.
- H7.15**
NANOSTRUCTURED MATERIALS ON CARBON NANOWALL TEMPLATES. Yihong Wu, National University of Singapore, Dept of Electrical and Computer Engineering, Singapore and Data Storage Institute, SINGAPORE; Bingjun Yang, National University of Singapore, Dept of Physics, Singapore and Data Storage Institute, SINGAPORE.
- H7.16**
EFFECT OF SITE DENSITY OF ALIGNED CARBON NANOTUBES ARRAY ON ELECTRIC FIELD SCREENING. Yi Tu, Zhongping Huang, Dezhi Wang, Zhifeng Ren, Dept of Physics, Chestnut Hill, MA.
- H7.17**
Abstract Withdrawn
- H7.18**
FABRICATION OF CARBON NANOTUBE LATERAL FIELD EMITTERS. A.S. Teh, K.B.K. Teo, Manish Chhowalla, W.I. Milne, G.A.J. Amaratunga, Cambridge University, Engineering Dept., Cambridge, UNITED KINGDOM; S.-B. Lee, H. Ahmed, Cambridge University, Cavendish Laboratory, Cambridge, UNITED KINGDOM.
- H7.19**
FIELD EMISSION FROM RUTHENIUM CONTAINING MULTI-WALLED CARBON NANOTUBES. Padmakar Kichambare, Dali Qian, David Jacques, Rodney Andrews, University of Kentucky, Center for Applied Energy Research, Lexington, KY.
- H7.20**
 $Zn_{1-x}Mg_xO$ NANORODS VIA MOLECULAR BEAM EPITAXY. Young Woo Heo, V. Varadarajan, K. Kim, Michael Kaufman, David Norton, University of Florida, Dept. of Materials Science and Engr, Gainesville, FL; Matthew Chisholm, Solid State Div., Oak Ridge National Laboratory, Oak Ridge, TN.
- H7.21**
 ZnO NANOWIRE GROWTH ON VARIOUS SUBSTRATES BY CVD THROUGH VAPOR-LIQUID-SOLID CRYSTAL GROWTH MECHANISM. Hyun-Gi Hong, Jung Inn Sohn, Youn-Su Kim, Seonghoon Lee, Department of Materials Science and Engineering, Kwangju Institute of Science and Technology (K-JIST), Kwangju, KOREA.
- H7.22**
CONDUCTING NANOWIRES AND NANOTUBE MATERIALS PREPARED FROM POLYMER FIBER TEMPLATES. Hong Dong, Verrad Nyame, Frederick Ochanda, and Wayne E. Jones Jr., Chemistry Department and Institute for Materials Research, State University of New York at Binghamton, NY.
- H7.23**
UNIDIRECTIONALLY ORIENTED NANORIBBON-DYE HYBRID MATERIALS CREATED BY SELF-ASSEMBLY AND ELECTROPHORESIS. Leiming Li, Guizhong Zhang, John C. Stendahl, Eugene R. Zubarev, and Samuel I. Stupp, Department of Materials Science and Engineering, Department of Chemistry, Medical School, Northwestern University, Evanston, IL.
- H7.24**
THERMOELECTRIC NANOWIRES BY TEMPLATE SYNTHESIS: FABRICATION, CONTACTS AND PROPERTIES. Oded Rabin^a, Yu-Ming Lin^b, Stephen B. Cronin^c, Gang Chen^d, Mildred S. Dresselhaus^{b,c}, Massachusetts Institute of Technology, ^aDept. of Chemistry, ^bDept. of Electrical Engineering and Computer Science, ^cDepartment of Physics, and ^dDept. of Mechanical Engineering, Cambridge, MA.
- H7.25**
Abstract Withdrawn
- H7.26**
RATIONAL CONTROL OF NANOSCALE HELICAL MORPHOLOGIES THROUGH BINARY SELF-ASSEMBLY. George John, Jong Hwa Jung, Kaname Yoshida, Hiroyuki Minamikawa, Toshimi Shimizu, CREST, Japan Science and Technology Corporation, Nanoarchitectonics Research Center, National Institute of Advanced Industrial Science and Technology, Tsukuba, JAPAN.
- H7.27**
SYNTHESIS BY SELF-ASSEMBLY OF IRON-COBALT NANOALLOYS. Melissa Zubris, Rina Tannenbaum, Georgia Institute of Technology, School of Materials Science and Engineering, Atlanta, GA.
- H7.28**
ORGANIC MOLECULES ACTING AS TEMPLATES ON Cu(110). Federico Rosei, Y. Naitoh, M. Schunack, E. Legsgaard, I. Stensgaard, and F. Besenbacher, Physics Department and I-NANO, University of Aarhus, DENMARK; P. Jiang, A. Gourdon, and C. Joachim CEMES - CNRS Toulouse, FRANCE.
- H7.29**
SELF-ASSEMBLY OF METAL-OXIDE NANOSTRUCTURES: OXIDATION OF Cu FILMS BY IN-SITU UHV-TEM. Guangwen Zhou, Judith C. Yang, Materials Science and Engineering Dept, University of Pittsburgh, Pittsburgh, PA.
- H7.30**
A GENERALIZED FLUID-FORMING METHOD FOR SELF-ASSEMBLY OF PARTICLES INTO PLANAR ARRAYS. X. Liu, Dept of Ceramic and Materials Engineering, Rutgers, the State University of New Jersey, Piscataway, NJ; E.F. McCandlish, Ceramar Corporation, New Brunswick, NJ; F. Cosandey, K. Mikulka-Bolen, Dept of Ceramic and Materials Engineering, Rutgers, the State University of New Jersey, Piscataway, NJ; L.E. McCandlish, Ceramar Corporation, New Brunswick, NJ; R.E. Riman, Dept of Ceramic and Materials Engineering, Rutgers, the State University of New Jersey, Piscataway, NJ.
- H7.31**
THE DEVELOPMENT OF THE CONTROL OF MORPHOLOGY TITANIA BASED PHOTONIC BANDGAP STRUCTURES. Bonnie Gersten, Samuel Hirsch and Jennifer Synowczynski, Processing and Properties Branch, WMRD, US Army Research Laboratory, Aberdeen Proving Grounds, MD.
- H7.32**
THE IMPORTANCE OF NOTHING IN NANOARCHITECTURES. Debra R. Rolison, Jeffrey W. Long, Erik M. Lucas, Christopher P. Rhodes, Jeremy J. Pietron, Jean Marie Wallace, Wendy S. Baker, Rhonda M. Stroud, Naval Research Laboratory, Washington, DC.
- H7.33**
SYNTHESIS AND PROPERTIES OF HYDROGEL CRYSTALS. Xihua Lu, Zhibing Hu, University of North Texas, Dept of Materials Science and Physics, Denton, TX.
- H7.34**
DEVELOPMENT OF METAL-SILICA NANOCOMPOSITES IN A SINGLE STEP PROCESS BY THE POLYMERIZABLE COMPLEX METHOD. E.R. Leite, N.L.V. Carreo, E. Longo, J.F.R. Bachege and

F.M. Pontes, CMDMC-LIEC, Departamento de Quimica, UFSCar, Sao Carlos, SP, BRAZIL; A. Barison, A.G. Ferreira, Departamento de Quimica, UFSCar, Sao Carlos, SP, BRAZIL; J.A. Varela, Instituto de Quimica, UNESP, Araraquara, SP, BRAZIL.

H7.35

SELF-ASSEMBLED ORGANIC/INORGANIC NANOCOMPOSITES. Byron Mccaughey, Donghai Wang, Eric Hampsey, Xianglin Ji, and Yunfeng Lu, Chemical Engineering Department, Tulane University, New Orleans, LA.

H7.36

NANOPARTICLE INKS FOR DIRECTED ASSEMBLY OF 3-D PERIODIC STRUCTURES. Qi Li, Gregory Gratson, and Jennifer A. Lewis, University of Illinois, Urbana, IL; James Smay, Oklahoma State University, Stillwater, OK.

H7.37

WET PROCESS MOLECULAR PLANTING IN A SPECIFIC SITE OF SILICON WITH Si-C COVALENT BONDS. Hirokazu Tada, Masato Ara, Shoji Tanaka, Institute for Molecular Science, Okazaki, JAPAN.

H7.38

DENDRIMER MEDIATED 'BRICKS AND MORTAR' SELF-ASSEMBLY OF NANOPARTICLES. Benjamin L. Frankamp, Andrew K. Boal, Vincent M. Rotello, University of Massachusetts, Department of Chemistry, Amherst, MA.

H7.39

SELF ASSEMBLY OF MAGNETIC AND SEMICONDUCTING NANOPARTICLES: BUILDING BLOCKS FOR NANOTECHNOLOGY. Franz Redl, Stephen O'Brien, Ming Yin, Stephanie Grancharov, Columbia University, Materials Science and Engineering, Dept of Applied Physics, New York, NY; Christopher B. Murray, K-S. Cho, Glenn Held, IBM T.J. Watson Research Center, Yorktown Heights, NY.

H7.40

SYNTHESIS, STRUCTURE, AND MAGNETIC PROPERTIES OF $Fe_xPt_{85-x}Cu_{15}$ NANOCOMPOSITE PARTICLES. Xiang-Cheng Sun, D.E. Nikles, S.S. Kang, J.W. Harrell, Center for Materials for Information Technology, The University of Alabama, Tuscaloosa, AL; Z.R. Dai, J. Li, Z.L. Wang, School of Materials Science and Engineering, Georgia Institute of Technology, Atlanta, GA.

H7.41

MOLECULAR-DYNAMICS STUDY OF THE MECHANICAL PROPERTIES OF METAL NANOWIRES. T. Nakajima, K. Shintani, Univ of Electro-Comm, Dept of ME & Intelligent Sys, Tokyo, JAPAN.

H7.42

EFFECTIVE MEDIUM CALCULATIONS OF THE ELECTROMAGNETIC BEHAVIOR OF SINGLE WALLED CARBON NANOTUBE COMPOSITES. John W. Schultz, Georgia Tech Research Institute, Atlanta, GA.

H7.43

IONIC COLLOIDAL CRYSTALS PRODUCED VIA CONTROLLED HETEROCOAGULATION. Garry R. Maskaly, R. Edwin Garcia, W. Craig Carter, Yet-Ming Chiang, Massachusetts Institute of Technology, Dept of Materials Science, Cambridge, MA.

H7.44

AB INITIO STUDY OF THE ANODIZATION PROCESS OF CRYSTALLINE SILICON IN THE PRESENCE OF HF. Thompson Le Blanc, Daniel Melendez, Ivan Cao-Berg, Javier Avalos, Univ. Metropolitana, San Juan, PR.

SESSION H8: FABRICATION AND PROPERTIES OF 3D-ORDERED NANOSTRUCTURES

Chairs: David P. Taylor and Koji Ikuta
Thursday Morning, December 5, 2002
Room 309 (Hynes)

8:30 AM *H8.1

THREE-DIMENSIONAL NANOSTRUCTURE FABRICATION BY FOCUSED-ION-BEAM CHEMICAL VAPOR DEPOSITION. Shinji Matsui, Himeji Institute of Technology, Kamigori, Ako, Hyogo, JAPAN.

9:00 AM H8.2

FORMATION OF 3-Dimensionally Orientated NANO-SIZED CRYSTALS IN AN AMORPHOUS ALLOY UNDER

ION BEAM IRRADIATION. Ryuichi Tarumi, Takuya Kamikawa, Kazuki Takashima and Yakichi Higo, Tokyo Inst of Technology, Tokyo, JAPAN.

9:15 AM H8.3

NANOMETER-SCALE PATTERN TRANSFER BY ION IMPLANTATION AND SELECTIVE CHEMICAL ETCHING. Naomi Matsuura, Xiang-Yang Mei, P. Morales, Harry E. Ruda, University of Toronto, Dept of Materials Science and Engineering, Toronto, CANADA; Todd W. Simpson, Chris P. McNorgan, Ian V. Mitchell, University of Western Ontario, Dept. of Physics & Astronomy, London, CANADA.

9:30 AM H8.4

3D MICRO- AND NANO-FABRICATION OF METAL NANOPARTICLE PATTERNS AND CONDUCTIVE METAL STRUCTURES VIA ONE- AND TWO-PHOTON INDUCED LITHOGRAPHIC AND HOLOGRAPHIC METHODS. Francesco Stellacci, Christina A. Bauer, Wim Wenseleers, Timo Meyer-Friedrichsen, Valérie Alain, Stephen M. Kuebler, Seth R. Marder, Joseph W. Perry, Department of Chemistry, The University of Arizona, Tucson, AZ.

9:45 AM H8.5

FABRICATION OF PERFORATED FILM NANOSTRUCTURES. A.L. Elias, K.D. Harris and M.J. Brett, Dept of Electrical and Computer Engineering, Univ of Alberta, Edmonton, CANADA.

10:00 AM BREAK

10:30 AM *H8.6

NANOTECHNICS: FABRICATION OF INORGANIC TRANSISTORS AND MICRO-ELECTRO-MECHANICAL SYSTEMS FROM NANOPARTICLE BUILDING BLOCKS. Joseph Jacobson, Eric Wilhelm, Colin Bulthaupt and Brent Ridley, The MIT Media Lab Center for Bits and Atoms, Massachusetts Institute of Technology Cambridge, MA.

11:00 AM H8.7

ASSEMBLY OF SEMICONDUCTOR AND MAGNETIC NANOCRYSTALS INTO BINARY NANOCRYSTAL SUPERLATTICES. F.X. Redl, IBM Corp; K.S. Cho, IBM Corp and University of New Orleans; C.B. Murray, IBM Corp, Yorktown Heights, NY.

11:15 AM H8.8

SYNTHESES OF COMPLEX-SHAPED, 3D, SELF-ASSEMBLED NANOPARTICLE STRUCTURES WITH TAILORED CHEMISTRIES BY THE BASIC PROCESS. Frank Zalar, Matthew Dickerson, Raymond Unocic, Ken Sandhage, Dept of Materials Science and Engineering, Ohio State Univ, Columbus, OH; Rajesh Naik, Gunjan Agarwal, Morley Stone, Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright-Patterson AFB, OH.

11:30 AM H8.9

NANOPARTICLE RIBBONS: A METHOD FOR FABRICATING COMPLEX 3-D ELECTRONIC CIRCUITS. Venugopal Santhanam, Ronald P. Andres, Purdue Univ, School of Chemical Engineering, West Lafayette, IN; Jaewon Choi, David B. Janes, Purdue Univ, School of Electrical and Computer Engineering, West Lafayette, IN; Stephen W. Howell, Ronald Reifenberger, Purdue Univ, Department of Physics, West Lafayette, IN; Scott E. Burns, Clifford P. Kubiak, University of California, San Diego, Department of Chemistry and Biochemistry, La Jolla, CA.

11:45 AM H8.10

3D NANOENGINEERING OF METAL OXIDES AND OXYHYDROXIDES FROM AQUEOUS SOLUTION. Lionel Vayssieres, Arumugam Manthiram, Texas Materials Institute, The University of Texas at Austin, Austin, TX.

SESSION H9: APPLICATIONS OF FUNCTIONAL NANOSTRUCTURES

Chairs: Lhadi Merhari and David P. Taylor
Thursday Afternoon, December 5, 2002
Room 309 (Hynes)

1:30 PM *H9.1

ADVANCED CHEMICAL GAS SENSORS FOR OUTDOOR AIR QUALITY MONITORING. Marie-Isabelle Baraton, UMR CNRS 6638, Faculty of Sciences, Limoges, FRANCE.

2:00 PM H9.2

CHARACTERIZATION OF NANOASSEMBLED TIN-OXIDE NANOPARTICLES FOR FABRICATION OF A HIGH SELECTIVITY MICRO GAS SENSOR. R.C. Ghan, Y. Lvov, R.S. Besser, Institute for Micromanufacturing and Chemical Engineering, Louisiana Tech University, Ruston, LA.

2:15 PM *H9.3

NANOMECHANICAL SYSTEMS. H.G. Craighead, Applied and Engineering Physics, Cornell University, Ithaca, NY.

2:45 PM H9.4

OPTICALLY DRIVEN MICROMANIPULATION TOOLS FABRICATED BY TWO-PHOTON MICROSTEREO-LITHOGRAPHY. Shoji Maruo, Koji Ikuta and Hayato Korogi, Department of Micro System Engineering, School of Engineering, Nagoya University, Aichi, JAPAN.

3:00 PM BREAK

3:30 PM *H9.5

BIOLOGY DOES IT DIFFERENTLY. HOW CAN WE HARNESS ITS ADVANTAGES? Daniel E. Morse, Jan Sumerel, Wenjun Yang, James Weaver, Germaine Fu, Timothy Deming, Bradley F. Chmelka, Galen D. Stucky and Paul K. Hansma, University of California at Santa Barbara, Biomolecular Science and Engineering and Materials Research Laboratory, Santa Barbara, CA.

4:00 PM *H9.6

FABRICATION OF 3-D BIOACTIVE STRUCTURES. Kenneth E. Gonsalves, Dept. of Chemistry & C.C. Cameron, Applied Research Center, Univ. of North Carolina, Charlotte, NC; Wei He, Dept. of Chemistry, Univ. of Connecticut, Storrs, CT; Ashutosh Chilkoti, Dept. of Biomedical Engineering, Duke University, Durham, NC.

4:30 PM *H9.7

BIO-INSPIRED SELF ASSEMBLY OF MICRO- AND NANO-STRUCTURES FOR SENSING AND ELECTRONIC APPLICATION. H.McNally^a, S.W. Lee^a, D. Guo^a, M. Pingle^b, D. Bergstrom^b, R. Bashir^{a,c}; School of Electrical and Computer Engineering^a; Department of Medicinal Chemistry^b, Department of Biomedical Engineering^c; Purdue University, W. Lafayette, IN.