National Nanotechnology Infrastructure Network Vol. 5 # 2

A Periodic Newsletter of NNIN News and Announcements

April 2009

NNIN

The **National Nanotechnology Infrastructure Network** consists of 14 nanotechnology user facilities at 14 major academic institutions. Funded by the National Science Foundation, our facilities are available to the national user community on an open basis. We provide accessible resources across the entire breadth of nanotechnology. To this end, each site has specialized areas of expertise within the network, ranging from biology and chemistry to materials characterization and traditional microfabrication. Complete information on NNIN sites, resources and access is available via the web site at nnin.org

(note to recipients: All links clicked in this newsletter are redirected through a proxy server and are thus tracked. You may access the links directly without tracking by opening them manually in your browser)

Special Event Announcement

Invitation

You are invited to a Reception for NNIN Users and Potential Users in conjunction with the Spring MRS meeting in San Francisco next week.

Thursday April 16, 2009
7-9 pm
Marriott San Francisco @ Moscone Center
55 Fourth Street
Room Pacific H (4th Floor)

Light food and refreshments will be served.

Please Come and Join Us

Equipment and Process Highlights

Computational Activity at SNF

Dr. Zhiyong Zhang (zyzhang@stanford.edu) and Dr. Blanka Magyari-Kope (blankamk@stanford.edu) provide software expertise for plane wave and local basis set based

Density Functional Theory approaches and wave function based methods such as Configuration Interaction, Coupled Cluster, Many Body Perturbation, as well as Quantum Monte Carlo calculations. Computational support is available in the following areas: Atomistic nanoelectronics simulations including *Ab Initio* non-equilibrium Greens function transport simulations.

- Atomistic simulations related to energy sciences including hydrogen storage, photovoltaics, nuclear energy and heterogeneous/homogeneous catalysis.
- Atomistic simulation of biological systems.
- *Ab initio* and force field based molecular dynamics simulation.
- Solutions to high performance computing issues.

Additional support for computational nanotechnology is available from **Dr. Derek Stewart** at Cornell and **Dr. Michael Stopa** at Harvard. Information on NNIN s computationl nanotechnology resources is available at http://www.nnin.org/nnin_compsim.html

New NanoMan V AFM Available at Michigan

A new Veeco NanoMan V Atomic Force Microscope is now available to the Michigan Lurie Nanofabrication Facility user community. It features a tip-scanning system with a closed-loop XYZ scanner, NanoScope V controller and a large-sample (up to 6) stage. Located in the expanded LNF and mounted on a vibration isolation table inside an acoustic chamber, the NanoMan V AFM is a powerful metrology tool for semiconductor applications. In the present configuration the tool can be used in Contact Mode, TappingMode , PhaseImaging , Force Spectroscopy, and Lateral Force Microscopy.

New Parylene Deposition System Available at Michigan (LNF)

A new parylene deposition system SCS PDS 2035 CR, specifically designed for parylene coating in a class 100 cleanroom environment has been installed in the Lurie Nanofabrication Facility. This tool will provide some redundancy with existing parylene deposition system (PDS 2010) at LNF and will be most beneficial to all users for whom parylene deposition is an integrated part of their cleanroom fabrication process.

New SPR System at the University of Washington

The University of Washington has added a new surface plasmon resonance (SPR) system. The GE Health Care Biacore T100 SPR system is an industry standard that allows for the quantification of binding kinetics, affinity, specificity, concentration, and thermodynamics for proteins, DNA, and small molecules using 4 simultaneous channels and a 96 well format.

New RIE Systems at the University of Washington

Two new Oxford Instruments ICP 180 etchers will expand dry etching and film deposition capabilities in the Microfabrication Laboratory at UW. The first tool has a ring inlet for silane that allows for room temperature deposition of silicon dioxide and silicon nitride. This instrument is also equipped with a low-temperature stage and liquid nitrogen supply for cryo-etching of silicon and is capable of anisotropic etches on glass substrates (e.g., Pyrex and quartz). The second tool is equipped with chlorine-based source gases for dry-etching metals, and will also be used for selective etches on III-V compound semiconductors.

New UV Flood Exposure System at Penn State

Penn State University has added an OAI Deep UV Flood Exposure System to its suite of tools. This system provides additional capability for high resolution lift-off metals processing. More information can be obtained from the Penn State Nanofab website at http://www.mri.psu.edu/facilities/NNIN/Equipment/EquipmentDUVFlood.asp.

New Deposition Tools Available at Arizona State University

Two new deposition tools and a new etch tool have been installed in the ASU Nanofab cleanroom for general purpose use. The deposition tools are based on the Lesker PVD75 platform, one being configured for electron beam deposition from a variety of metal sources, while the other is dedicated to the sputtering of thin ZnO films. The etch tool is an Xactix e-1 XeF2 system for the isotropic etching of silicon that is commonly used during MEMS processing as part of a sacrificial release step. The tools are now available for NNIN users at the ASU site and more details can be found at www.fulton.edu/nanofab.

Reminder: NNIN Tool Database

As a reminder, there are almost 1000 advanced fabrication and characterization tools available within NNIN, openly available to all users. A searchable database of available tools can be found on the NNIN web site at http://www.nnin.org/nnin_tool.taf

Facility Highlights

Spotlight on New NNIN Sites

Nano Research Facility at Washington University in St. Louis

One of Three New NNIN Sites

Exciting opportunities exist for nanomaterials to cure cancer, convert sunlight to electric power, and help clean the environment. By joining the National Nanotechnology Infrastructure Network in March 2009, **Nano Research Facility (NRF) at Washington University in St. Louis** offers a new open and shared research and education environment with emphasis on the emerging area of nanomaterials with applications in the energy, environment, health and safety, and biomedical fields. NRF is available to both academic and industrial users nation-wide, providing unique capabilities in areas of knowledge-based synthesis of nanostructured materials; particle instrumentation tools for toxicity studies; and non-invasive imaging modalities for nano- and biological applications. Specifically, NRF will provide facilities, resources, and technical support for 1) Nanostructured materials the bottom up approach to nanofabrication;2) Nanotoxicilty nanotechnology in the context of public health and environment; 3) and Photoacoustic Microscopy as an enabler for early cancer detection. Additional information on the Nano Lab, one of three new NNIN facilities, is available at http://www.nano.wustl.edu. Point of Contact: Dr Yujie Xiong at xiongy@seas.wustl.edu

Lurie Nanofabrication Facility Wins Special Construction Award

CAM Magazine, the official publication of the Construction Association of Michigan, highlights

in its Fall Special Issue the 12 most outstanding construction projects in the previous year. This year, the University of Michigan s Lurie Nanofabrication Facility was selected as one of the 12 winners, and will be featured the Fall feature. The project expanded the LNF from 4,500 to over 12,500 square feet of state-of-the-art class 10/100/1000 and 10,000 cleanroom facilities. The construction was led by SmithGroup (architect, engineer) and Skanska (construction contractor).

NNIN Upcoming Events

Technology and Characterization at the Nanoscale Short Course at Cornell

This intensive four day short course, the CNF TCN, offered by the Cornell NanoScale Science & Technology Facility, combines lectures and laboratory demonstrations designed to impart a broad understanding of the science and technology required to undertake research in nanoscience. Attendance is open to the general scientific community and is not limited to CNF users or Cornell students. class size is limited. Schedule and Location: The course will be held Tuesday-Friday, **June 2-5, 2009 in Ithaca, New York**. For registration and additional information, contact malison@cnf.cornell.edu or visit http://www.cnf.cornell.edu/cnf_2009tcn.html

Lab-on-a-Chip Workshop at the University of Michigan

This 1-day workshop will be held on June 11, 2009 at the Lurie Nanofabrication Facility at the University of Michigan in Ann Arbor, MI. It will provide an introduction to MEMS and other techniques and technologies used for lab-on-a-chip devices and systems. No previous microfabrication experience is required. The workshop will include both classroom lectures and hands-on laboratory activities. More details are available at http://www.LNF.umich.edu/Events.aspx?id=106

Workshop in Scanning Probe Microscopy for Undergraduate Students at the University of Washington

Nanoscience on the Tip , a workshop in scanning probe microscopy supported in part by the NSF Nanoscience Instrumentation for Quality Undergraduate Education (NUE UNIQUE), will be offered on the University of Washington campus on July 6-10, 2009. The workshop provides true hands-on experience in a laboratory setting in which a variety of SPM techniques are applied to nanoscale aspects of chemistry, physics and biology. With an intensive one-week (40 hour) schedule, low student to instrument ratio, and a student to TA ratio of 4:1, deep and lasting learning will occur. The number of participants is limited and restricted to enrolled undergraduate students after their first year in a 4 year higher educational institution, or to senior students in a 2 year higher educational institution (e.g., Community College). This year we also accept a small number of junior graduate students. Applications must be received by April 30, 2009 (http://depts.washington.edu/nanolab/NUE_UNIQUE/NUE_UNIQUE_Workshop.htm)

Penn State Materials Research Institute User Facilities Expo

Penn State University will be holding an MRI User Facilities Expo 2009 event on Friday, April 24, 2009 from 10 am to 5 pm. The Expo will be a showcase for non-Penn State researchers to learn about analytical capabilities and fabrication tools available to them in the MRI Shared Facilities at Penn State. Events include a facilities tutorial, guest speakers, lunch, and a list of open house activities to choose from. Look to the MRI website, http://www.mri.psu.edu/facilities/mcl/events/MRIfacilitiesEXPO09.asp, for details and registration information.

BioMEMS and Microfluidics for the Life Sciences Workshop

The University of Minnesota will be hosting its 4th offering of BioMEMS and Microfluidics for the Life Sciences on July 23 24, 2009. This two-day workshop will provide an understandable overview of microfluidics for biomedical applications. A hands-on component will get participants in the lab where they will build some basic microfluidic structures. For complete information visit http://www.nano.umn.edu/biomems09 or contact Becky von Dissen at vondi001@umn.edu.

Nano-Imprint Lithography Workshop at U. Texas

Due to the big success of our 6th Nano-imprint Lithography workshop in February 2009, the Microelectronics Research Center (MRC) at The University of Texas at Austin will hold another session on Step and Flash Nano-Imprint Lithography (S-FIL) on Aug 18-19, 2009. Through lectures and demo lab, participants will learn about the S-FIL technique and its sub-50nm molding capabilities. During the hands-on sessions, the attendees will practice on the IMPRIO100 from Molecular Imprint Inc. and other state-of the-art equipment needed to do the post imprinting processes. Check the event MRC/NNIN web site (http://www.mrc.utexas.edu/nnin-events.html) for detailed schedule and registration form.

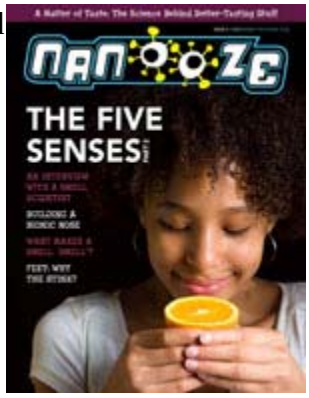
NNIN Upcoming Events

ASML Customer Workshop at SNF

As part of the SNF-ASML joint development agreement, Stanford hosted an ASML customer workshop for their customized imaging solutions group on March 31, 2009. There were 67 registered attendees for the half day workshop including 45 from companies, 14 from Stanford, 3 from other universities, and 5 consulting engineers. Topics covered included the MEMS market, the ASML/Stanford JDA, the Canadian photonics fabrication center, handling small pieces on the ASML tool, ASML's compound imaging software, thin film head market, and foundry solutions at SVTC.

Education News, Resources, Events, and Activities

Nanooze



Nanooze is the NNIN science news magazine for children of all ages, and some adults too! . It is available both on the web at http://www.nanooze.org) and in print. The content is intended to support classroom activities by showing nanotechnology concepts and applications within the scope of the normal curriculum. The content level is centered at Middle School, but we have found that the content is of interest to upper elementary, high school, and even college students. Nanooze in Print is distributed in classroom packs to schools free of charge., three or four issues per year, at conferences or by direct mail to schools. Recent issues have highlighted the Five Senses in the context of nanotechnology. Over 100,000 copies have been distributed since Jan 2007. Teachers may subscribe by contacting info@nanooze.org.

Nanotechnology at the National Science Teachers Association

NNIN participated at the National Science Teachers Association annual convention held March 18-22, 2009 in New Orleans, LA. For the fifth year, NNIN had an exhibit booth and was the only nanotechnology outreach program in the exhibit hall. Interest in how to incorporate nanotechnology into the science classroom continues to increase. Our booth was extremely busy during the three days the exhibit area was open. NNIN distributed 15,000 Nanooze to attendees, primarily as classroom packs of 30. In addition, Joyce Palmer of the Georgia Tech NNIN education office presented a very popular workshop entitled: *Nano in Your Classroom: Easy Lessons Tied to Basic Science Concepts*.

George Tech Improving Teacher Quality States Grant

The Georgia Tech site has received a $45,000 award from the Improving Teacher Quality States Grant (ITQ) program. The ITQ program is designed to provide high quality professional development for teachers in high need schools and districts. The GT program, Exploring Nanotechnology, will provide grade 8-12 science teachers located in rural South Georgia with an understanding of nanoscale science and technology; develop their understanding of the connections between nanoscale science and technology and traditionally taught sciences; enhance their content knowledge of physics, chemistry, biology, and physical science; and provide nano instructional materials linked to Georgia Performance Standards (GPS). This professional development program involves a three-step approach for teachers: a one week teacher workshop that will provide in-depth exposure to inquiry based nano instructional materials, an additional week with teacher teams providing a summer camp for students in their local high schools, and follow-up meetings to support inclusion of the materials in the participants classroom.

Employment Opportunities

Job Openings at Michigan

The Lurie Nanofabrication Facility at the University of Michigan is seeking motivated individuals for two Ph.D level research staff positions:

- Geosciences/Sensing Domain Expert responsible for developing interactions with the geosciences and environmental sensing communities. This position involves leveraging the expertise of UM users in sensor technologies and systems to benefit the earth and ocean sciences communities.
- Computation / Modeling Domain Expert responsible for developing nanoscale modeling capabilities at Michigan, especially focusing on MEMS / NEMS and micro / nanofluidics.

To find more details about the positions, please contact Dr Sandrine Martin sandrine@eecs.umich.edu

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