

## National Nanotechnology Infrastructure Network Vol.3 # 3

### A Periodic Newsletter of NNIN News and Announcements

May, 2007

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## NNIN

The National Nanotechnology Infrastructure Network consists of 13 nanotechnology user facilities at 13 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](http://nnin.org).

## New Equipment and Processes

### Cornell Installs Trion ICP Etch tool for Chromium

The Cornell NanoScale Science and Technology Facility has installed a new Trion ICP etch system configured with chlorine for etching chromium. It is expected to be used for both photomasks and imprint templates.

### Georgia Tech Installs STS SOE Oxide Etcher

Georgia Tech has expanded its lineup of etch tools with the addition of an STS SOE ICP system. It combines a high conductance high vacuum compatible process chamber with a patented ICP source to produce a very high ion density at low pressures. The SOE is capable of etching group III-V materials which require more shallow etching (less than 15m), higher etch rates, higher aspect ratios, and better selectivity than can be achieved using standard Reactive Ion Etching (RIE) technology. The SOE substrate temperature can be adjusted up to 200 C which extends the processing capabilities of this tool. To learn more, visit: <http://grover.mirc.gatech.edu/equipment/>

### Michigan installs ION Implanter

The new addition to the Michigan Ion Beam Laboratory at the University of Michigan is a state-of-the-art research ion implanter capable of delivering beams with energies between 10 and 400 KV, potentially from any element in the periodic table. The target area consists of a wafer holder that allows the sequential ion implantation of five 4-inch wafers or four 6-inch wafers, with cooling option to LN temperatures or heating up to 800 C. Access to this tool is available through the NNIN/Michigan Nanofabrication Facility. For more info please visit: <http://www-ners.engin.umich.edu/research/Mibl/Implanter.html>.

### **University of Minnesota installs ALD System**

The University of Minnesota node is pleased to announce the availability of an Atomic Layer Deposition (ALD) system. This system allows very well controlled growth of extremely thin films, even over highly nonplanar structures such as nanopores, nanowires, and nanoparticles. Furthermore the deposition temperature is very low, allowing conformal coating of even organic materials in some cases. The ALD process involves the sequential exposure of the substrate to two gasses. The gasses are chosen such that at least one of them saturates the surface at one monolayer of coverage and the process conditions are such that neither gas, by itself, will decompose to form a solid. After exposure to the first gas, the system is flushed, but one monolayer of this gas remains on the substrate where it can react with the second gas to form a monolayer of the desired film. The process is repeated until the desired film is grown. The ALD system has been installed and is now capable of running HfO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>. Recipes exist for many other materials, and the system will ultimately be capable of running elemental metals and metal nitrides.

### **JEOL JBX-6300FS Electron Beam Lithography System at UCSB**

UCSB announces installation of its new JBX-6300FS ebeam lithography system, which will be the first system of this model installed in the United States. It is currently being installed in our new ESB clean room and is scheduled to be available for academic and industrial research by June-July 2007. Tool qualification is currently under way.

Researchers will be able to utilize this advanced lithography system, which features a spot beam, vector scanning, and a step-and-repeat stage, to write patterns literally on the nano-scale over areas as large as 150x150mm; for example, an 8 nm minimum line-width is guaranteed at 100kV when using the Nanometer Mode lens.

## **Workshops and Conferences**

### **Future of Nanotechnology Conference**

On the occasion of the 30th anniversary of the Cornell NanoScale Facility and its predecessors, CNF is hosting a one-day symposium on **The Future of Nanotechnology on June 14, 2007**. Keynote speakers Stanley Williams, James Heath, and Sheila Jasanoff will address future trends in nanotechnology, nanomedicine, and Social and Ethical Issues in Nanotechnology, respectively. These keynotes will be followed by three parallel sessions of prominent invited speakers addressing the same areas. [More Information and Registration](#)

### **Kavli Workshop for Journalists**

As a lead-in to the Future of Nanotechnology Conference at Cornell, The Kavli Institute at Cornell for NanoScale Science will host a Journalist's Workshop in Nanotechnology, Wednesday, June 13, 2007. Program highlights include: primer on NanoScale science; hands-on experiences in nanotechnology labs; one-on-one meetings with faculty and inventors. Hands-on activities for this event are provided by the Cornell NanoScale Facility and the Nanobiotechnology Center at Cornell. [More Information and Registration](#).

### **Technology and Characterization at the NanoScale Short Course at Cornell**

This intensive 3.5-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, but class size is limited to 30 participants. Tuesday (eve) - Friday, June 5th-8th, 2007 [More Information and Registration](#).

### **Step and Flash Nano-Imprint Lithography Workshop at Texas**

The Microelectronics Research Center (MRC) at University of Texas at Austin will hold a workshop on Step and Flash Nano-Imprint Lithography (S-FIL ) on **September 11-12, 2007**. Through presentations and hands-on experience, participants will learn about the S-FIL technique and its sub-50nm molding capabilities. During the two hands-on sessions, the attendees will practice on the IMPRIO100 from Molecular Imprint Inc. and other state-of-the-art equipment, like the Oxford RIE, needed to do the post imprinting processes or the Woollam ellipsometer to measure the thickness of the different polymer films involved in the imprint fabrication process. Check the event MRC/NNIN web site (<http://www.mrc.utexas.edu/nnin-events.html>) for detailed schedule and registration form.

### **Workshop on NanoScale Epitaxial Semiconductor Structures**

In conjunction with North America Molecular Beam Epitaxy Conference, the workshop on NanoScale Epitaxial Semiconductor Structures will start at noon, Sept. 26th to noon, Sept. 27th, 2007, Albuquerque, NM. NanoScale epitaxial semiconductor structures with two or three of their dimensions at the nanometer scale promise revolutionary new device concepts and significant performance improvements for current devices. This workshop will spotlight the latest results of this dynamic technology and will focus on the epitaxial growth, characterization and device results of NanoScale epitaxial structures. This workshop is co-sponsored by the NSF National Nanotechnology Infrastructure Network (NNIN) and the DOE Center for Integrated Nanotechnologies (CINT) <http://nsg.chtm.unm.edu/>.

### **Stanford University to Host Lithography Workshop**

On Thursday, May 24, Stanford University will host a Lithography workshop from 1-5 pm in Paul Allen Auditorium, CISX-101. ASML and SNF have joined in a partnership to bring access to new optical lithography capabilities to the broader lab member community. This workshop will be the first of many which will consist of tutorials on topics ranging from beginning to advanced lithography methods and offer a chance for lab members to interact with applications engineers. <http://snf.stanford.edu/Affiliates/LithoWorkshop/index.html>.

### **ASME's 5th Annual Nano Training Bootcamp at SCU in conjunction with the Stanford Nanofabrication Facility**

On September 5-7, 2007, Santa Clara University will be hosting ASME's 5th Annual Nano Training Bootcamp. The camp is specifically organized to offer a detailed and tutorial-based account of advances in fundamentals related to Nanoscience in a wide

variety of fields, and prospects for translating these advances into useful Nanotechnologies. The Stanford Nanofabrication Facility and the Stanford Nanocharacterization Laboratory are also participating in the ASME Nano Boot Camp by providing laboratory experiences.

<http://www.asmeconferences.org/nanobootcamp07/>.

## Outreach

### **NNIN Attends National Science Teachers Association Convention**

The NNIN RETs presented "Nanotechnology: Teacher-developed Hands-on Activities for Your Classroom" at the annual meeting of the National Science Teachers Association (March 28- April 1, 2007). NNIN RETs also had a half-day share-a-thon where they presented their summer research experiences and classroom activities to one another. Activities developed by the 2006 RETs will soon appear on the [NNIN education web portal](#).

### **Nanotechnology Workshop for Teachers**

The American Society for Engineering Education will host a full day of teacher workshops at its annual meeting in Honolulu, Hawaii. The workshops will take place on June 23, 2007 prior to the opening of the annual conference. The NNIN education office (Nancy Healy and Diana Palma) will provide two workshops on incorporation of nanotechnology into middle and high school classrooms. NNIN-developed units will be used. [Exploring Nanotechnology through Consumer Products](#) will introduce nanotechnology, provide information on education/career opportunities, and explore currently available nano-products. This unit serves as an introduction to NanoScale science, its history, and its future directions. The second activity is a hands-on unit developed by teacher Rocquel Stanley at the NNIN site at the University of Washington. There are two parts to the unit: 1) [The Fly Prison](#), designed to introduce students to nanotechnology and give them a basic understanding of how researchers build very small devices by self-assembly of molecules. 2) [The Water Maze](#) is a follow-up activity to give the students additional time to demonstrate what they have learned.

For more information: <http://www.asee.org>

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### **Nanomanufacturing Workshop at PSU**

On April 10, The [Penn State Center for Nanotechnology Education and Utilization \(CNEU\)](#) hosted a workshop on Competitive Modern Manufacturing through Nanotechnology, in which more than 100 industrial representatives attended. The Penn State Nanofabrication Facilities, located directly across the street from the Penn State Conference Center, provided guided tours to more than 65 industrial representatives and engaged them in lengthy discussion during the 1-1/2 hour complimentary luncheon.

### **NNIN Staff named to Journal of Nano Education Editorial Board**

Based on their extensive experience in nanotechnology education, NNIN staff Dr. Ethan

Allen (U. Washington), Prof. Steve Fonash (Penn State), and Dr. Nancy Healy (Georgia Tech and NNIN Education Coordinator) have been named to the Editorial Board of the new Journal of Nano Education. <http://www.aspbs.com/jne/>

### **University of North Carolina State Science Olympiad**

On April 20-21, more than 2,000 middle- and high-school students from 150 schools across the state tested their mettle in building robots, launching bottle rockets, conducting nanoscience experiments and constructing towers at North Carolina State University for the North Carolina Science Olympiad (NCSO) State Tournament, the largest youth science and technology competition in the state. On Friday, April 20, many of these students participated in NanoDays 2007. The TNLC/NNIN hosted about 400 of these students and their teachers and advisors. The activities included: clean room tours, a gowning competition, making of nano ice cream (which was a big hit), the NanoQuest video game, hands-on exercises in self assembly and optical microscopy, and a display of nano products.

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NNIN is a network of open user facilities. All resources at member facilities are available equally to users from Academia, industry, and government. Contact information and facility details are available via the NNIN web site at <http://www.nnin.org>.