

This will be the last issue of the newsletter for the Nanofabrication Center (NFC). Beginning July 1, we will be called the Minnesota Nano Center (MNC). The name change reflects the expanding responsibilities that the lab will be taking on with our pending move into the new building. In addition to supporting a new and much larger clean room, MNC will offer our users access to two new wet labs. A recent survey of potential users that we conducted showed that 50% would use these two new labs. The equipment was chosen based on survey results. The first will be dedicated to bio nano research. This lab will eventually house BSL2 cabinets, cell culturing facilities, TIRF, confocal microscopy, PCR, protein/RNA analysis, and a microplate reader. The second wet lab will support nanomaterials work, especially nanoparticle suspensions. Equipment in this lab will include particle sizing with conventional and dynamic light scattering, tracking analysis for suspension flows, contact angle measurements, and equipment for forming and functionalizing nanoparticles. It is our hope that the combination of these research capabilities will be synergistic, and enable a new level of progress in the areas of nanoscience and nanotechnology at Minnesota.



CLEAN ROOM PERSPECTIVE
August 2011

ARCHITECTURAL ALLIANCE
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School of Science & Engineering
University of Minnesota

The Minnesota Nano Center is intended to be a resource for researchers. We welcome users from across the University, but we also want to work with external users. Whether you represent a large established company, a small start-up, a regional university, or a one person garage venture, it is easy to work with the Minnesota Nano Center. We can act as your “nanomachine shop”, offering development and prototyping services and allowing you to avoid capital equipment and maintenance costs. If you prefer, you can receive training on the tools you need and carry out your project yourself. You’ll get ready access to our facility and the ability to reserve the tools you need in advance. Regardless of how you chose to work with us, we’ll treat your work with confidentiality and ensure that your IP is protected. We look forward to collaborating!

Reminder: If your work uses the Minnesota Nano Center (formerly NFC) please add the following in the acknowledgements section of any publication: “Parts of this work were carried out in the Minnesota Nano Center which receives partial support from NSF through the NNIN program.”

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COLLEGE OF
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CHARACTERIZATION FACILITY NEWS

CHARFAC DIRECTOR'S MESSAGE



*CharFac Director,
Greg Haugstad*

We are excited to announce the installation of a new FEI Titan aberration-corrected TEM, as funded by the I3 internal grant competition along with matching funds (lead PI Andre Mkhoyan). This addition takes the University of Minnesota into a new realm of high-resolution characterization, both in imaging and compositional analysis. To accommodate this instrument, two rooms were combined into one and the ceiling was locally raised; a separate walled-in remote operating space was created (not shown) for cases when greater instrument isolation is needed.

Technical details and capabilities of this instrument include the ability to operate at accelerating voltages ranging from 60 to 300 kV and a spherical-aberration corrector for the probe-forming lenses, yielding a STEM spatial resolution of less than 0.08 nm. The combination of an ultra-bright X-FEG source and the Super-X energy-dispersive X-ray detector system will allow elemental composition maps to be collected approximately 10 times faster than with previous systems. An electron beam monochromator and Gatan Enfium spectrometer will enable electron energy-loss spectroscopy to be performed with an energy resolution of 0.1 eV, allowing unparalleled access to structural and bonding information and the capability to determine elemental composition at atomic resolution.



FEI Titan aberration-corrected TEM

The growth and modernization of our TEM enterprise also leads to a heightened need for equipment to handle specimen and specimen holder cleaning for high-resolution work. As announced in our last newsletter, a grant-in-aid award to Prof. Mkhoyan has enabled the purchase of an advanced plasma cleaner for transmission electron microscopy specimens and specimen holders. This augments a 10-year old system that has experienced substantial downtime with increasing age. The new system will provide greater capacity and the additional ability to mix gases for more precisely controlled chemical action.

CHARFAC AT THE UNIVERSITY OF MINNESOTA

12 Shepherd Labs
100 Union Street SE
Minneapolis, MN 55455

Website: www.charfac.umn.edu
Email: charfac@umn.edu
Telephone: 612-626-7594

Greg Haugstad, Director



*Advanced plasma cleaner for transmission electron microscopy
specimens and specimen holders*

NANOFABRICATION CENTER NEWS

NFC DIRECTOR'S MESSAGE



*NFC Director,
Steve Campbell*

For our lab users this will come as no surprise, but in anticipation of the new building coming on line at the end of this year, we have been adding new equipment to the existing facility. Some of these new systems will be moved early in 2014. Our new ion mill, which replaces a system that is about 40 years old, will be installed in early June, but moved next spring. Over the last five years we have added over four million dollars of equipment.

Here is the list:

Type	Vendor	Cost (New/Recon/Used)
Sputtering	AJA	\$380,000 N
i-line Lith	Canon	\$100,000 U
E-beam	Vistec	\$2,000,000 N
Ion Mill	Intlvac	\$350,000 N
FE-SEM	Amray	\$100,000 R
Etcher	Adv Vacuum	\$180,000 N
XeF ₂ etcher	Xactix	\$35,000 N
Mask maker	Heidelberg	\$700,000 N
Etcher	Oxford	\$220,000 R



New Xactix EI XeF₂ etcher (located in the Keller Hall cleanroom) is ready for anisotropic etching of silicon. Contact Paul Kimani for training: kima0004@umn.edu / 612-625-5968.

I want to thank the faculty who helped us bring these systems in and the staff who have worked hard to install, maintain, and safely operate this equipment. It has supported research for many groups and has greatly upgraded our capabilities for external users. Over the next year we plan to add additional equipment for the new building, primarily for the wet bio and materials labs. You can expect a schedule in the fall of 2013 of when systems will be taken off line and when moved systems, as well as new systems, will be available in the new Physics and Nanotechnology Building.

NANOFABRICATION CENTER AT THE UNIVERSITY OF MINNESOTA

1-165 Keller Hall
200 Union Street SE
Minneapolis, MN 55455

Website: www.nfc.umn.edu
Email: nfc@umn.edu
Telephone: 612-624-8005

*Steve Campbell, Director
Greg Cibuzar, Lab Manager*

SAFETY TRAINING

NFC is offering safety training for new users twice each month. On the first Thursday of every month, the training sessions begin at 1:00PM, and on the third Thursday of the month sessions begin at 10:00AM. The training includes watching our safety video and taking a brief quiz. Also, a NFC staff member provides a tour showing some of the safety related equipment and the gowning process used for the NFC cleanroom. Finally, there is training on using the Badger lab software. The safety training takes about two hours to complete, and must be done before users will be granted access to NFC facilities.

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1-165 Keller Hall
200 Union Street SE
Minneapolis, MN 55455

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Comments and suggestions are welcome! Would you like to be added to or removed from our distribution?

Contact: Becky von Dissen at vondi001@umn.edu or 612-625-3069

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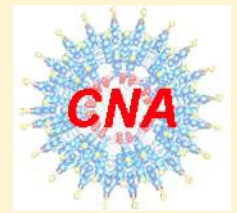
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Center for Nanostructure Applications

The primary mission of the Center for Nanostructure Applications is to seed interdisciplinary nano research projects that will go on to attract external support. Active nanostructures include applications of nano as diverse as energy conservation and production, large area displays and lighting, printed electronics, smart fabrics, electronic noses, drug delivery, cancer therapy, and new types of medical imaging.

These applications often require significant participation across traditional disciplines and the Center is designed to foster the cross-disciplinary research necessary to bolster the nano applications area at the University.

The Center also organizes workshops, speaker series, and short courses, as well as serving as a focal point for nano at the University.



For more information, visit <http://www.nano.umn.edu/>

The National Nanotechnology Infrastructure Network

The National Nanotechnology Infrastructure Network (NNIN) is an integrated networked partnership of user facilities, supported by the National Science Foundation, serving the needs of nanoscale science, engineering and technology. The mission of the NNIN is to enable rapid advancements at the nano-scale by efficient access to nanotechnology infrastructure. The NNIN supports the Minnesota Nano Center at the University of Minnesota. As a node in NSF's National Nanotechnology Infrastructure Network (NNIN), the NFC provides access to advanced multi-user facilities to both industry and academic researchers, the latter at a subsidized rate.

For more information, visit www.nnin.org

