

MCN

Melbourne Centre for **Nanofabrication**

Under the microscope

Issue 1 - April 2010



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MCN opens its doors



On the 2nd of March 2010, the MCN played host to its first visitors with a User Open Day aimed at showcasing the centre to its academic partners. The event was a huge success with over 180 people arriving from 20 organizations, from as far away as Israel, eager to see the brand new facilities.

MCN staff greeted visitors, and the Director formally welcomed all to the facility in his speech (pictured right). Tours were offered to all guests, which gave them the opportunity to mingle with MCN technical staff in each of the facility areas generating a great deal of discussion.

We are very encouraged by the interest showed by everyone involved in the day and look forward to working with everyone in the future.

MCN welcomes its first users

Dr Deborah Lau and Dr Tim Muster of CSIRO Materials Science and Engineering are the MCN's first users, bringing 300 nm metal film specimens into the Class 10,000 cleanroom for characterisation using the Veeco Dimension Icon atomic force microscope (visible in the background above). The instrument was commissioned only a fortnight ago by Veeco engineers and is the first of this newest model to be installed in Australia. The Dimension Icon supports specimens as large as 20 cm and was designed with the objective of minimising drift and noise, for faster imaging and improved productivity. The metal films being examined are the first instance in Australia of a ternary gradient compositional thin film for potential application in the fabrication of novel sensors and sensing materials.



Dr Deborah Lau (right) and Dr Tim Muster (left) of CSIRO Materials Science and Engineering with specimens for characterisation by AFM. © MCN 2010



A word from the Director

Welcome to the inaugural edition of the MCN Newsletter. Its purpose is to inform the community of local, national, and worldwide activities in "nano".

MCN is a multidisciplinary consortium of six universities, CSIRO, and the Victorian State Government. We are the largest node within the Australian National Fabrication Facility (ANFF) and as such, draw upon one of the most talented populations of high-tech experts in the country. Our new \$50m centre houses some of the most advanced machining tools in the world, and provides a unique capability for researchers and developers, offering an environment where not only new materials, but also new devices can be fabricated, packaged and tested.

Our second user day is imminent. The first hosted 180, mostly academic, visitors, while this concentrates on industrialists. More thematic user events will occur in the months ahead, prior our official opening in July. Enjoy the content, and stay tuned for further issues.

Gavin Jennings MLC, Minister for
Innovation to visit MCN on April 16th

MCN Update

After three years of meticulous planning, the Melbourne Centre for Nanofabrication has arrived. The project is the result of collaboration between government both at state and federal levels, CSIRO and six Victorian universities.

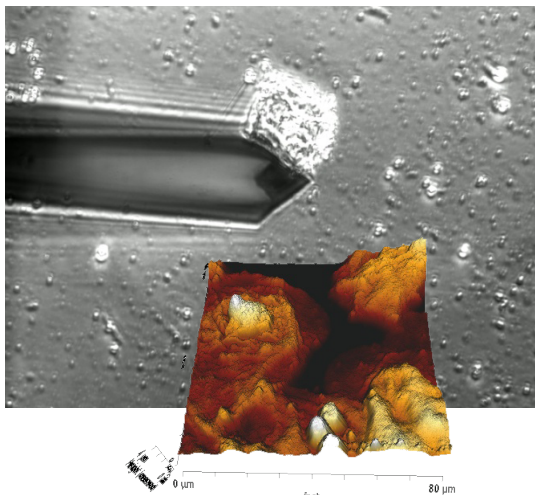
With the completion of the class 10,000 cleanroom and biochemical laboratories, work can now begin on installing and commissioning process equipment. Other activities include the huge task of OH&S implementation. All of the MCN staff are undertaking rigorous OH&S training in order to provide the safest possible environment for all MCN users. We are also in the process of putting together a training program to allow users to be inducted safely in addition to in depth training on equipment and process.

The schedule for equipment availability is as follows:

Nikon Optical Microscopes	Online
Nikon A1Rsi Confocal Microscope	Online
Veeco Dimension Icon AFM	Online
JPK Nanowizard Bio AFM	Online
Angstrom polymer electronics	Jun 2010
Oxford Plasmalab DRIE + PECVD	Jun 2010
Int'lVac NanoChrome I & II PVD	Jun 2010
EVG 620 Mask Aligner + NIL	Jun 2010
520IS Substrate Bonder	Jun 2010
FEI Helios Nanolab FIB-SEM	Jun 2010
Digital Matrix Electroforming	Aug 2010
Vistec EBPG5000pES EBL	Dec 2010
FEI Nova NanoSEM	Dec 2010



Under the microscope



Probing the living nano world

One of the first few tools being commissioned is the integrated BioAFM Nanowizard from JPK. This is a new generation Atomic Force Microscope designed specifically for biological applications and samples in liquid with heating, gas and liquid exchange capabilities and integration with fluorescence microscopes for simultaneous imaging. The image to the left is of cheek cells measured on the MCN tool during commissioning.

MCN at ICONN

The 2010 International Conference on Nanoscience and Nanotechnology (ICONN 2010) brought together the Australian and International community working in the field of nanoscale science and technology to discuss new and exciting advances in the field. ICONN 2010 covered nanostructure growth, synthesis, fabrication, characterisation, device design, modeling, testing and applications. Over 800 delegates from all over the globe attended with 100s of papers presented.

A number of Plenary Speakers from institutions all over the world gave talks on areas such as spintronics, nanofabrication, novel materials etc.

MCN, along with ANFF had the pleasure of co-sponsoring ICONN in 2010. Director Professor Ian Boyd gave a talk on nanotechnology within Victoria and introduced the MCN facility to the audience.

Of particular interest at the conference was a nanofabrication workshop run by the NSW node, which served as a showcase for all the fabrication processes offered across all the ANFF nodes. The course was a huge success and was attended by 190 of the 800 conferences delegates.



Pictured from left to right are Sally McArthur (Associate professor at Swinburne University), Fouad Karouta (Facility Manager at ANU and Rosie Hicks (CEO of ANFF).



Under the microscope

Nano meets Bio

Nanofluidics; Lab on a chip processes



Nanofluidics can be defined as the study of fluid flow within nanoscale structures. The vision is to develop fully integrated hand held devices with the ability to conduct traditional laboratory style experiments such as chemical reactions and physical manipulations on individual molecules so called Lab-on-a-Chip (LOC) experiments.

The key to developing devices that are able to interrogate individual biochemical molecules is the fabrication of nanoscale structures that are of similar dimensions as the molecules themselves. An example of a nanofluidic particle sensor is shown in Figure 1.

Fluorescent nanoparticles are electro-kinetically driven through a sensing nanochannel. The nanoparticles are detected using electrical methods as they flow through the sensing nanochannel.

Several researchers around the world have been developing such miniature

LOC devices using on-chip polymerase chain reaction (PCR) techniques.

MCN has state of the art nanofabrication tools such as Vistec EBPG5000plusES electron beam lithography tool, FEI Helios NanoLab Dual-Beam Focused Ion Beam/Scanning Electron Microscope and EVG 620 Mask Aligner with Nano Imprint Lithography (NIL) able to fabricate complex nanoscale structures down to 10nm.

Dr. James Friend and his research group at Monash University are harnessing this capability in their work developing nanofluidic surface acoustic wave (SAW) devices for novel biological and chemical sensor applications. Figure 2 shows a SEM image of a long, T-shaped FIB milled nanochannel on a lithium niobate substrate which is the basis of the nanofluidic SAW device and was made by MCN using a FIB-SEM tool.

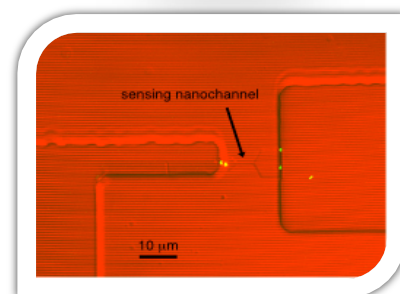


Figure 1: Overlay image of sensing nanochannel region of nanofluidic particle sensor showing 210nm fluorescent polystyrene nanobeads flowing through the nanochannel.

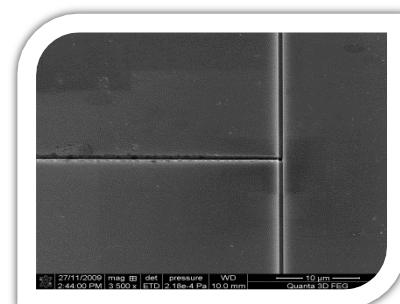


Figure 2: SEM image of 500nm wide 1mm long, T-shaped nanochannel on a lithium niobate sample for nanofluidic SAW device.

If you would like further information about MCN please contact the facilities manager.

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