ANFF

ACT Node News

THE AUSTRALIAN NATIONAL UNIVERSITY

THE UNIVERSITY OF WESTERN AUSTRALIA
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UWA Infra-Red Detectors to go airborne

Concept image courtesy of NASA

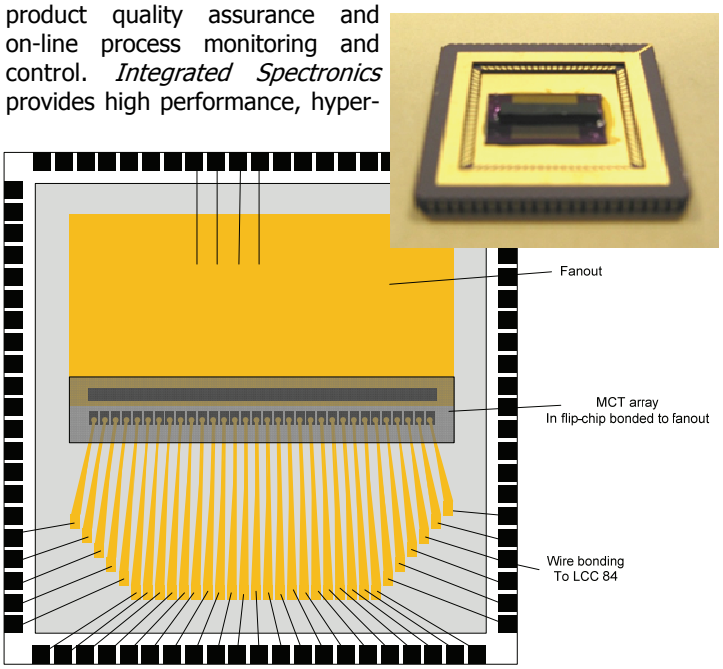
The ANFF ACT Node continues to be highly involved with the industry sector with the UWA facility fabricating, via the ANFF initiative, linear infrared detector arrays for *Integrated Spectronics Ltd* for applications in airborne infrared remote sensing.

Integrated Spectronics is an Australian based company established in 1989 to develop and manufacture electro-optical instrumentation for the mining, remote sensing and environmental industries. The company is now expanding its product range into applications such as agricultural and industrial product quality assurance and on-line process monitoring and control. *Integrated Spectronics* provides high performance, hyper-spectral imaging spectrometers for earth resources remote sensing and field portable, near-infrared spectrometers for mineral identification. These instruments represent "world best" in performance.

Use of the infrared band for hi-tech airborne imaging allows not only visualising features *on the ground*, but it also makes it easy to identify constituents *of the ground*. Using the spectral signatures of the surface materials, one can identify and accurately (and rapidly) map the surface materials. This is highly attractive in applications for a wide range of mapping tasks essential in the fields of mineral exploration, agriculture, energy resources (oil, gas and geothermal), coastal mapping (bathymetry) and environmental monitoring.

Linear infrared detector arrays fabricated at the ANFF ACT Node UWA facility are aimed to be the sensing element in next-generation airborne imaging systems and keep Australia at the forefront of applying infrared detection technology to airborne mapping.

Mariusz Martyniuk , ANFF ACT Node, UWA facility.



Drawing of the LCC 84 carrier with a 32x1 linear array of HgCdTe infrared detectors in the middle (centre gray/semitransparent rectangle). The detector array is flip-chip bonded to a fanout of metal tracks indicated with yellow, which are then wire-bonded to the carrier. Picture (inset) shows the actual device.

Welcome to the New Year - and, already, we are more than two months into it!

What an eventful three months it has been since our last newsletter - it's astonishing how much has been achieved in this time given the Christmas/New Year break was in there as well.

As you will read overleaf, all the flagship equipment at the Node is now installed and operational, training of staff undertaken and some exciting process development underway - all in anticipation of the influx of service requests from our colleagues and customers.

We are ready to assist you with your research and project development and are looking forward to the opportunity to showcase our capabilities.

Other news in this issue:

Next Issue: due June 2010

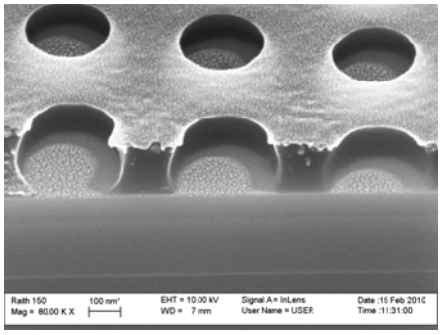
ACT Node information:

- The ANU facility specialises in III-V compound semi-conductors.
- The UWA facility specialises in II-VI compound semi-conductors and MEMS.
- We can provide full support with the use of the equipment available.
- Full pricing policy and rates are available on the ANFF website at www.anff.org.au or contact us direct for more information - see contact details overleaf.

Facility Equipment and Infrastructure Update

The ANU facility of the ANFF ACT Node is very pleased to announce that the final commissioning of all flagship equipment was accomplished in February 2010. Since then we have begun developing a range of processes we believe will be important for the scientific community in Australia (both academia and industry). Below is a complete list of the equipment and capabilities so far:

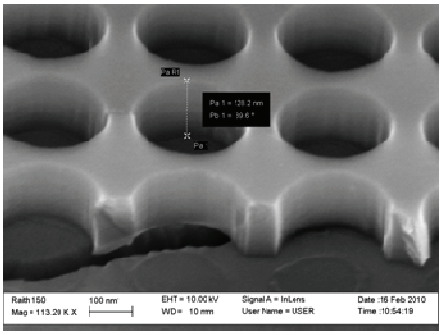
- E-beam lithography: patterning can be done using positive resists (PMMA, ZEP) and negative resists (ma-N 2405 and 2401). We have developed a PMMA-based bi-layer process with a strong undercut to enhance metals lift-off process (see photograph below).



E-beam Lithography - undercut profile for lift-off in double PMMA layers

- Sputter system featuring a microwave and DC sputtering of a large range of metals and dielectrics with a maximum wafer size of 100mm.
- Nano-Imprint Lithography: various tests of UV-curing and hot embossing were practiced and after having just received the appropriate chemicals further process development is now being undertaken.
- E-beam and thermal evaporator: for Ohmic and Schottky contacts.
- Dual Frequency Plasma Enhanced Chemical Vapour Deposition system: besides the regular SiO_x, SiN_x, *a-Si* at 300°C and *poly-Si* at 500-600°C, *SiON* layers have been investigated covering the entire range of refractive index from 1.45 up to 2.0. Furthermore we have developed a stress-free SiN_x layer at 300°C on *Si* based on a combined HF-LF plasma generation.
- Inductively Coupled Plasma Etching system: various etching processes are being investigated and so far the most promising results were obtained using Cl_2-CH_4-H_2 for etching *GaAs* and *InP* at 60°C and 180°C respectively (photo right). We also developed a selective etching process of *GaAs* towards *AlAs* based on chlorine-fluorine chemistry.
- Focused Ion Beam system: this system has been used for localised deposition and etching experiments. It is also used for metrology. Very shortly the micro-manipulators will be installed enabling the preparation of TEM lamellae and STEM analysis.

Besides the flagship equipment the ANU Facility enjoys access to in-kind equipment of the Electronic Materials Engineering group (ion implanter, MOCVD of III-V semiconductors, various processing and metrology) and the Laser Physics Centre who are active in the CUDOS centre of excellence (ICP etching system for *Si*, various metrology tools).



ICP etching of shallowly etched GaAs photonic crystal patterns for membrane application demonstrating the great potential of this technique in state-of-the-art dry etching.

If you have any enquiries or would like advice on how these processes can be applied to your research and development please contact Dr Fouad Karouta, the Facility Manager, by phone (+61 2 6125 7174) or via e-mail at fouad.karouta@anu.edu.au.

Inter-Node training following Nano Imprint Lithography System Installation and Commissioning

Engineers from EVG Group, suppliers of the Node's new Nano Imprint Lithography/Hot Embossing system, completed the commissioning and installation of the machine in December 2009 and the first batch of researchers underwent training. Local node staff, Dr Fouad Karouta and Dr Kaushal Vora, were joined by researchers from the University of South Australia and the new Melbourne Centre for Nanofabrication (MCN) to take part in a two day training session in the new clean-room facility at The Australian National University (see photo right). The training covered the basic operation of the machine, capabilities and maintenance. ACT Node staff will now begin developing basic processes for the machine in anticipation of providing services to the broader scientific community in 2010 and beyond.

Participants in the recent NIL/HE training (clockwise from bottom centre): Luke Parkinson, Uni of SA; Hermann Zauner, EVG Group; Steven Walker, MCN; Kaushal Vora, ACT Node Process Engineer; Simon Doe, Uni of SA; Sasi Kandasamy, MCN; and Peter Ledel, EVG Group.

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