Bragg Peaks
> for neutron users
ISSUE 4 | OCT 07

OPAL news

As most of our users are aware, the last 3 months have been difficult: on 24 July 2007, the OPAL reactor was shut down following a fault with some of the reactor fuel assemblies, some of which had one or more fuel plates displaced vertically. All the fuel assemblies have now been unloaded from the reactor core and are stored safely in the service pool.

INVAP (the reactor designer) and ANSTO are undertaking investigations and tests using dummy fuel assemblies in the reactor and in flow-test facilities to investigate potential causes for the fault. In addition, INVAP in consultation with the fuel manufacturer (CNEA) is working on potential design changes aimed at stopping the displacement of fuel plates from the assemblies. Restart of the reactor will depend upon approval of our regulator ARPANSA, who is being continuously informed of progress.

During this shut-down period, repairs to the reflector vessel defects (seepage of light water into heavy water) are being carried out. The first results of the repair programme are satisfactory, and completion is expected by the 3rd week of October. The schedule for reactor restart will then become clearer: at present the best estimate is some time between November and early in 2008.

Around the instruments

Echidna *(high-resolution powder diffractometer) and* ***Wombat*** *(high-intensity powder diffractometer)*

The various teams are working together to test the range of available sample-environment devices on the two powder instruments. Two examples: the 7-Tesla cryomagnet has been put to test for functionality and safety on Echidna, see photo above, and the cryofurnace has been successfully assessed for functionality and integration with the data-acquisition system, see photo below on Wombat.

Koala *(quasi-Laue diffractometer)*

The Koala diffractometer is currently in France for repair and upgrade of its electrical systems. In September a short visit was made to the factory where a working demonstration of the upgraded system was shown.

A comprehensive set of factory tests will be performed in October by an ANSTO instrument scientist, electronics specialist, and electrical engineer.

While the diffractometer is in France, improvements have been made to the neutron optics to increase beam intensity and reduce instrument background.

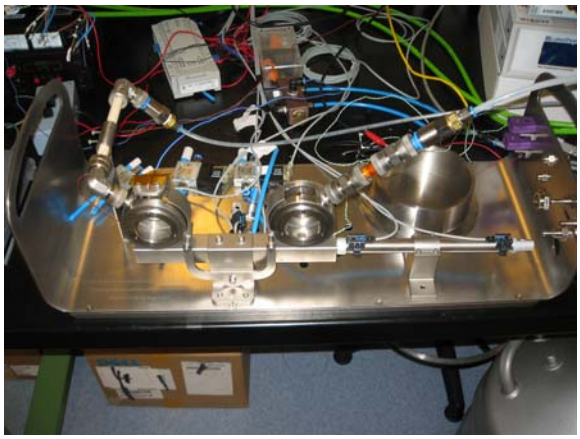
Platypus *(reflectometer)*

Construction of the Platypus time-of-flight neutron reflectometer is now complete and we await cold neutrons from OPAL. In the interim we have been conducting tests on the key systems of Platypus: radiation shielding and interlocks, the disc chopper system, collimating optics, motion control systems and helium-3 neutron detector.

Preliminary measurements have also been made of the cold-neutron flux and spectrum of the CG3 supermirror neutron guide and show a incident neutron-beam flux of ~$6 \cdot 10^9$ $ncm^{-2}s^{-1}$. Hot commissioning experiments in coming months will accurately quantify the flux and spectrum under pulsed and collimated conditions.

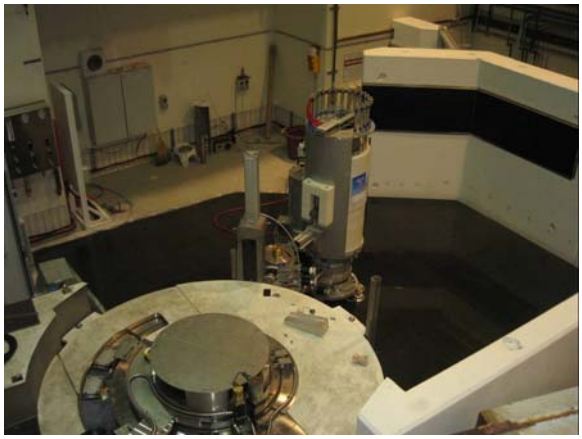
Quokka *(small-angle neutron scattering, SANS)*

There has been notable progress on Quokka, particularly with respect to the installation of its polarisation capability. This gives the opportunity for conducting polarised SANS experiments on magnetic colloids, for example.
Our novel rapid heat-quench cell (see photo below) - a sample-environment device which has completed successful lab trials both heating and cooling between 150 and 450 K with rates of 3° per second - will be tested with neutrons in October at Argonne National Laboratory in the USA.



Taipan *(thermal three-axis spectrometer)*

Taipan has advanced considerably, with the whole instrument being assembled for the first time (see photo below): In the last quarter, Taipan had its perimeter shielding wall installed, its dance floor has been successfully ground and polished, and the detailed programming of the Cassette-wedge changing logic in the monochromator drum has been completed. The motion control and safety-system cabinets have also been installed.



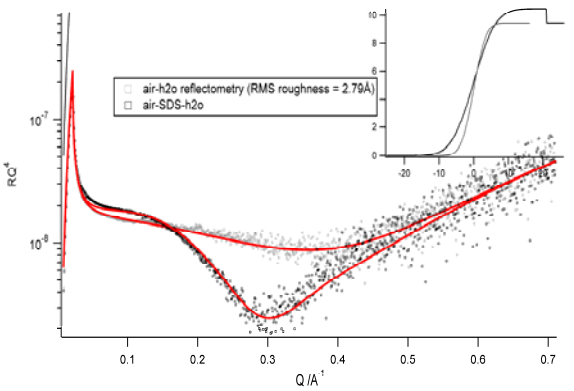
X-ray instruments

The small-angle x-ray scattering (SAXS) instrument in the Bragg Institute has suffered a major breakdown; as a consequence the instrument will be out of working order until at least February 2008.

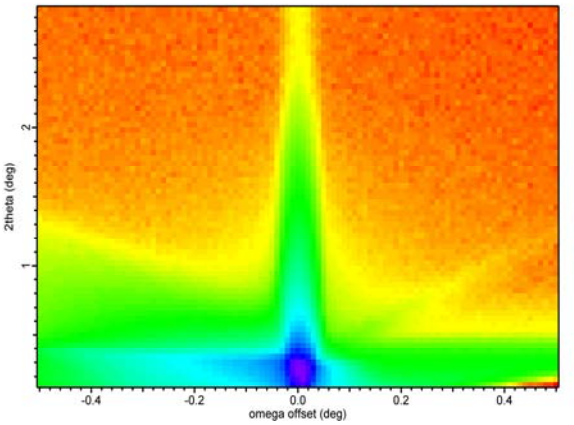
The x-ray reflectometer has recently been commissioned to examine reflectivity from free-liquid surfaces. This will allow the instrument to perform exciting work in many more areas, such as protein/lipid/surfactant adsorption at interfaces.
Problems with evaporation, vibration and acoustic noise have been solved with a specially designed sample can, see photo below. The sand is necessary to damp low-frequency vibrations passed up through the instrument.

The sample and instrument are stable enough to measure both specular and off-specular

scattering, from the air-liquid interface in a quick and easy manner. The diagrams below show the reflectivity (and fits) from pure water, and from a sodium dodecyl sulphate (SDS) solution.



As expected the pure water has a roughness of 2.8 Å - its literature value. SDS adsorbs at the air-water interface and forms a layer that is ~21 Å thick. Each of the specular curves was measured in around 2 minutes, with the off-specular scattering taking about an hour.



Future advances in this sample environment will include temperature control and variable gas/humidity atmospheres. We aim to access temperature ranges between 0 and 150°.

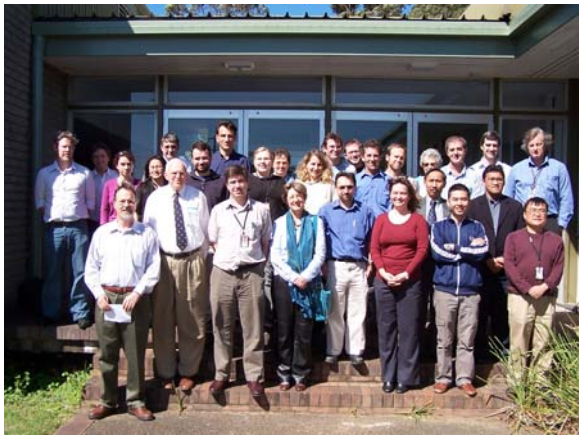
Announcements

Commissioning of instruments

Commissioning will be resumed as soon as the reactor is operational again. Platypus, Quokka and Taipan are scheduled to measure neutrons for the first time. After the commissioning phase all instruments will have friendly-user experiments before being officially scheduled. However, an operating license (for each instrument) is required for scheduling any user experiments. We expect to obtain operating licenses for the two powder diffractometers shortly after the restart, because applications were submitted before the shutdown. However, neutrons are required for finalising the acceptance.

Users' needs for deuterating samples

On 27 September, the first AINSE/ANSTO consultation meeting with potential users of the proposed chemical deuteration laboratories in the National Deuteration Facility (NDF) was held; see the photo of participants below. Peter Holden, the NDF's director, is keen to obtain all users' input concerning their requirements for deuterating samples through chemical exchange and synthesis. This will be taken into account when establishing the NDF's chemical deuteration laboratories.



Please contact Peter providing the following information: your name, affiliation, email, research interest, and a list of preferred compounds (in order of priority). A ***response*** by email (peter.holden@ansto.gov.au.) of no more than 1 page ***by 31st of October 2007*** would be appreciated.

Workshop on 'Pushing Small-Angle Neutron Scattering at OPAL to Smaller Q', 15-16 Nov. 2007

The purpose of the workshop is to demonstrate the different very small-angle neutron scattering U/V/SE-SANS techniques to Australian industry, government and universities, and to make a start on defining specifications for a new instrument at the OPAL reactor.
In particular, we will discuss the science case, the capabilities of current instruments employing different techniques, instrumental features demanded by users as well as options for

improvement. The workshop will be concluded by a brainstorming session where we would like to draft a report on the scientific and technical requirements for the next OPAL instrument. For this we seek for comments, suggestions, ideas etc. of all workshop attendees. Please ***register before 20 October 2007*** on the web under: http://www.ansto.gov.au/bragg/science/conferences_and_workshops/psns_workshop.html

Polarisation workshop before end 2007

An international workshop on *Polarisation* will be held at the end of November or in December 2007, at the Bragg Institute, ANSTO. Dates are currently being fixed. Details will be available on our web site shortly, or contact Frank Klose, frank.klose@ansto.gov.au, for more information.

ANSTO-AINSE Neutron School on Diffraction in collaboration with IAEA, 29 Nov – 3 Dec 2007

This school will provide training for newcomers to neutron scattering with a focus on diffraction: its use and its applications. We will have lectures and also practical sessions with hands-on experiments and data analysis.
The school is aimed at PhD students and post docs – novice users. We received 55 applications, but due to logistical reasons the school is limited to 30 people. In the selection process, preference was given to PhD students. The International Atomic Energy Agency (IAEA) supports the school and sponsors 2 students (from India and China). The next school is planned for mid-2008.
For a preliminary programme of this year's school and more details please see: http://www.ansto.gov.au/bragg/science/conferences_and_workshops/neutron_school.html.

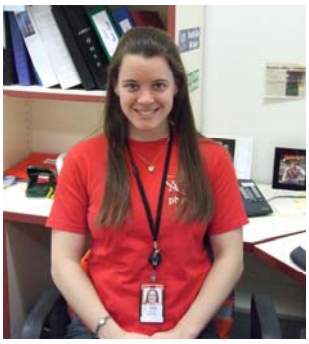
Neutron Science Symposium, 4-6 Dec 2007

The 6th ANBUG/AINSE symposium will be held directly after the neutron school. ***Deadline for abstracts and registration is 23 October 2007.*** For further details please look under http://www.ansto.gov.au/__data/assets/pdf_file/0017/20285/AANSS2007_web_info.pdf.

Faces

Newcomers
Recently, the Bragg Institute welcomed:
Christine Rehm (left) for looking into ultra small-angle neutron scattering. *Frank Klose* (right) was recruited for his expertise in polarised-neutron reflectometry.


Food Science Project gets the international thumbs up!
The Food Science at the Bragg Institute recently received international recognition for its work in understanding the molecular and microscopic basis for protein properties in dry conditions. The collaboration with the CSIRO Food Futures Flagship and the University of Queensland aims to predict and test new and improved properties of food proteins and their mixtures. The team won first prize in the international poster competition at the 14th Gums and Stabilisers for the Food Industry Conference held in Wrexham, UK. Catherine Kealley presented the paper 'water-induced conformational changes in solid-state soy gycinin' to the selection committee.



Furthermore, Catherine Kealley has won 3rd place for the 2007 George F. Stewart IFT International Research Paper Competition, at the recent Institute of Food Technologists Conference held in Chicago, with over 100 entries in the 2007 competition by Elsevier.

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