Bragg Peaks > for neutron users
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OPAL news

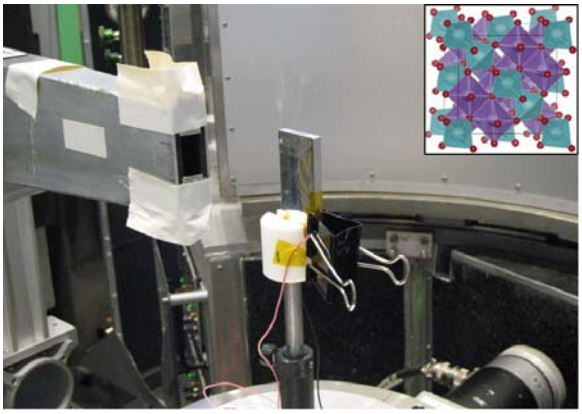
In the October-December quarter, OPAL had its best cold-neutron performance yet, with 76 days of reliable delivery. Congratulations to our colleagues in Reactor Operations.

Bragg Institute news

Towards the end of 2012 (November-December), OPAL will take a long shutdown to allow the installation of the in-pile components for the split cold-neutron guide that feeds the new BILBY time-of-flight SANS instrument. This shutdown will commence no earlier than November 1st, but it could consume all of November and December. The reactor operating schedule for late-2012 is not yet issued, but there will likely be at least 100 beam days between 1st July and 31st October. These beam days will be available to the current proposal round that closes on 15th March 2012, and which will be assessed by the Program Advisory Committee meeting on 10-11 May 2012. All seven instruments, including QUOKKA, will be available to users.

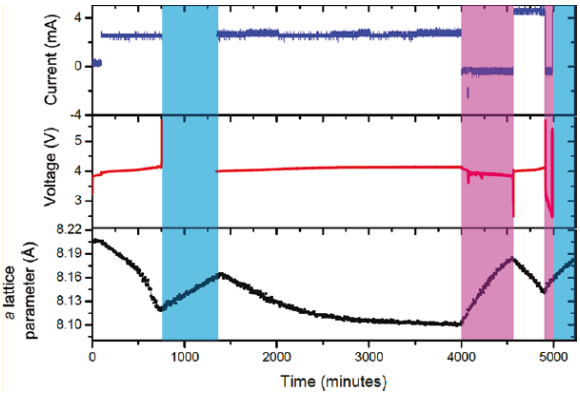
Around the instruments

Wombat *(high-intensity powder diffractometer)*



Main: in-situ Li-ion battery setup on Wombat. Inset: the crystal structure of the cubic $LiMn_2O_4$ cathode material.

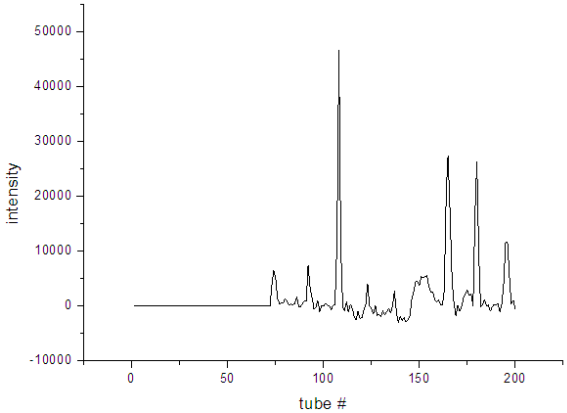
We have taken real-time *in-situ* neutron diffraction data of a custom-made lithium-ion battery while it was charging and discharging (with National University of Singapore and University of Wollongong). The purpose of the investigation was to show how the crystal-structure of spinel-derived $LiMn_2O_4$ cathode material changes during charge-discharge cycles.



$Li_x(Co_{0.16}Mn_{1.84})O_4$ cathode lattice parameter (black) with measured voltage (red) and applied current (blue) as a function of time. Current-free discharge processes are shaded in blue and applied-current discharge processes are shaded in purple.

The data showed that a partially charged $Li(Co_{0.16}Mn_{1.84})O_4$ cathode undergoes current-free discharge during its first charge cycle, resulting in a ~40% expansion of the crystal lattice. Following subsequent current-applied or current-free discharge, the lattice does not return to the predischarge values, indicating a limited ability for Li-ion reinsertion (capacity loss) in partially charged $Li(Co_{0.16}Mn_{1.84})O_4$ batteries. This work, published in J. Phys. Chem. C, highlights the need to elucidate the relationship between non-equilibrium electrode structures and their electrochemical behaviour for improved battery performance and illustrates the opportunities for rapid real-time neutron diffraction techniques in materials analysis.

Pelican *(Time-of-Flight Spectrometer)*



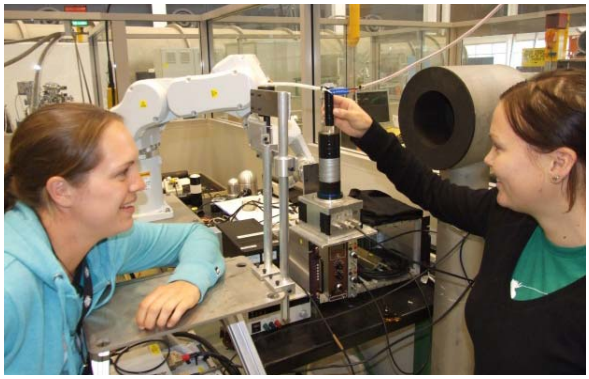
The first diffraction pattern from Pelican obtained by integrating the 2-D pattern over each tube.

In December Pelican began hot commissioning: Aside from checking the background radiation levels, Pelican collected its first diffraction pattern from a LaB_6 calibration sample, as shown above. The first large bank of detectors was excluded to avoid exposure to the direct beam during commissioning. The expected peaks were observed at 67° and 99° corresponding to tubes 107 and 159 while a few additional and unexpected peaks were observed with no beryllium filter in the beam. In January, commissioning of the chopper system will commence.

The Pelican Team.

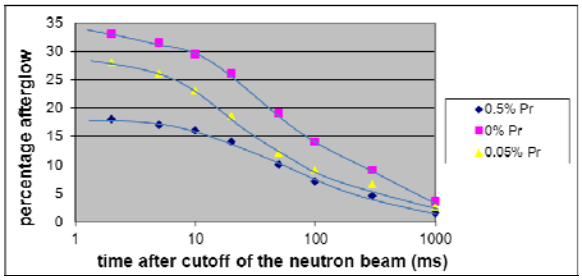
***Koala** (Laue Diffractometer)*

Afterglow, the light that continues to be emitted from a scintillator after the stimulating source is abruptly cut off, may limit applications of scintillators in fast imaging systems such as are required for medical and security applications.



PhD students Nicola Winch and Laura Dixie from the Radiation Imaging and Dosimetry group in New Zealand aligning the afterglow system on Koala.

Murray Bartle (GNS Science, New Zealand), along with two PhD students from Victoria University Wellington, New Zealand are investigating in the compositional sensitivities of developmental scintillation materials especially the way changing small percentages of additive elements such as Ce, Pr and Eu influence the afterglow of ceramic materials where continuous processes of manufacture may be possible.
By developing an afterglow measurement system which utilises a fast shutter and a robotic system that allows remote accurate positioning of the sample, the afterglow or percentage of light that remains a prescribed period (e.g. 10 ms) after the stimulating radiation is abruptly cut off was measured.



Graph illustrating that the addition of small amounts of Praseodymium reduces afterglow in some developmental ceramic scintillators.

Using this system, it was determined that afterglow is reduced by the addition of small quantities of praseodymium to a ceramic scintillator formulation that contains both 1% europium and variable praseodymium composition. This series of experiments at the Institute is establishing general techniques for reducing afterglow that may have applications to the manufacture of new, faster scintillators typically containing some ^{6}Li, ^{10}B or Gd.

A paper describing two novel methods of measuring afterglow; one for x-ray measurements, and one for the thermal neutron measurements undertaken at the Institute is available here.

***Dingo** (Radiography/Tomography/Imaging Station)*

Left: The DINGO CCD camera and; Right: the final roof shielding element ready for installation.

In early December the Institute took delivery of the first neutron-beam-instrument component for

our new DINGO Radiography/Tomography/ Imaging Station: its CCD camera. The DINGO project is led by Ulf Garbe, and the station is scheduled to accept its first neutrons in mid-2013. Contracts are now in place for all major procurements for DINGO, and the concrete shielding structures are being currently formed and assembled on-site at ANSTO.

Prize for Best Student Presentation at NCTA 2011

David Cortie, a University of Wollongong PhD student based at the Institute, has been awarded a prize for Best Presentation by a Student at the 17th AINSE Conference on Nuclear and Complementary Techniques of Analysis, in Canberra. His talk was entitled "The Magnetic Velcro Effect: Exchange Bias in Nanocrystalline Thin films investigated with Neutron and X-ray Scattering" was based on his work on the experimental study of exchange bias in nanocrystalline α-Fe_2O_3/Permalloy bilayer film using our Platypus neutron reflectometer. This work was previously, featured in Bragg Peaks Issue 19.

4th Asia-Oceania Neutron School 2011

Delegates of the 4th AONSA Neutron School hosted at ANSTO.

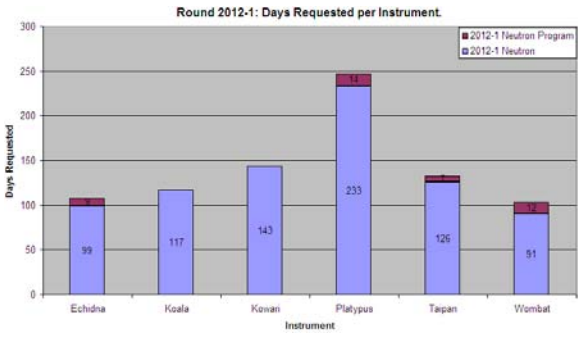
In November, ANSTO hosted the annual Asia-Oceania Neutron Scattering Association (AONSA) Neutron School, which was originally planned for Tokai, Japan, but which we offered to host, in the wake of the 2011 Tohoku Earthquake. Thirty-two students attended the school from seven different countries in the region.

The school program consisted of 23 scientific talks, 4 days of beamtime and analysis on 6 instruments, guidance on applying for beamtime, a Sydney habour cruise and tour of the CBD, an early-morning bushwalk and Australian wine tasting. Needless to say, a great time was had by all!

We wish to thank the speakers and instrument scientists for their fine efforts in stimulating the interests of the participants; as well as AONSA, AINSE, IAEA and the Australian Prime Minister's Education Assistance Program for Japan for their financial assistance provided to attending students.

Echidna instrument scientist James Hester helping the students to prepare their experimental setup.

Proposal Round 2012-1 Summary



Our 2012-1 proposal round closed with 143 proposals across 7 neutron instruments and both Chemical and Bio-deuteration at the National Deuteration Facility. A total of 851 beam days were requested across all instruments, with an overall success rate of 49%. 44% of demand was from Australian universities and CSIRO and 20% from ANSTO itself. Roughly 36% of demand in the 2011-1 Round was from overseas (Taiwan, UK, New Zealand, China, Japan, Singapore, Germany, South Africa, United States, Spain, Russia, Puerto Rico, Malaysia, India and Canada).

Approved experiments will be run in the period January to July 2012.

Announcements

The 2012-2 Proposal Round is now open, for beam time between July and October 2012 and access to all 7 initial neutron-beam instruments plus the National Deuteration Facility. Proposals should be submitted online by **15 March 2012** via https://neutron.ansto.gov.au.

Scoping Workshop on Second Guide Hall for OPAL, 16-18 April 2012.

We are starting to think about the options for the OPAL Reactor, beyond the instruments located in the present Neutron Guide Hall. These include possibilities for a second cold source, a hot source, positron science, fundamental neutron-based physics and the possibility doubling the present number of instruments, using purposed-designed and optimised guides in a second guide hall on the south side of the reactor. The OPAL Reactor was designed from the outset to allow these possibilities, and one might anticipate that the case could be made to start on such expansion in this decade.

In order to flesh out more of the details, we are holding a 3-day workshop at the Bragg Institute, together with the Australian/New Zealand user community, interested state and overseas agencies and selected international experts **16-18 April 2012**. All interested parties are welcome to attend. To register your interest in attending this workshop, please fill the online registration form.

Sample Environments at Neutron Scattering Facilities

The 7th International Sample Environment Workshop will be held 17-20 September, 2012 at the Amora Hotel Jamison in the city of Sydney. This workshop aims to bring together experts in sample environments from major neutron scattering facilities to discuss new developments and techniques applicable to the needs of the user community. The forum will provide the perfect environment for open discussion between scientists, engineers, technical staff and companies. The main goals are for continuous improvement in the efficiency of neutron scattering sample environments and improving capabilities at the facilities.

The preliminary programme, registration form and other information are available here. **The deadline for abstracts is 20 June 2012.** If you would like more information, please contact Paolo Imperia: paolo.imperia@ansto.gov.au.

New Faces

Arrivals

Cy Jeffries is a postdoctoral researcher who joins us from the University of Sydney working on the structural characterisation of bio-macromolecules and higher-order biomacromolecular complexes/assemblies in solution using small-angle scattering and other biophysical techniques.

Malinda Monaco is the Institute's User Office Liaison Officer, and as such the primary user contact. Malinda recently joined the Institute from the National Medical Cyclotron and will be filling this role while Renee Rose is away on Maternity leave.

Departures

Best wishes to Emily Luks (National Deuteration Facility) and Renee Rose (User Office) on the births of their children. We look forward to their return! We also congratulate Phil Bentley on his new role as Group Leader – Neutron Optics at the European Spallation Source in Sweden.

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