Neutron Sciences Progress at Oak Ridge National Laboratory
November 2008

Summary

- HFIR Cycle 418 began November 12, 2008, and ended December 5, 2008. Cycle 419 will begin January 7, 2009.
- SNS neutron production cycle began August 21, 2008, and will end January 3, 2009.
- The call for proposals for experiments at the HFIR and SNS neutron facilities closes at noon EST, on January 5, 2009. See http://neutrons.ornl.gov/users/user_news.shtml for details.

Instruments and Users

- New sample environment capabilities are expanding at HFIR. A 4.5T magnet is now available for users of the two SANS instruments at HFIR. The SANS magnet will allow users to observe magnetic ordering, especially structures such as flux lattices with long (several nanometers) length scales. See photo below in which the magnet is the blue cylinder in the foreground.

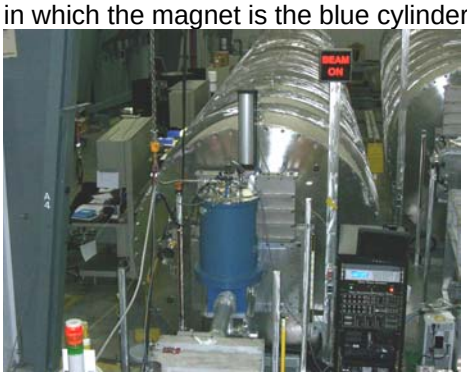
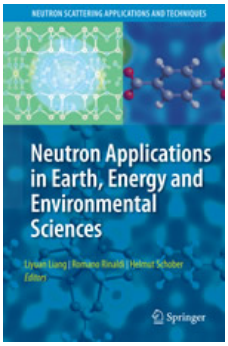


Photo credit: ORNL



- The book *Neutron Applications in Earth, Energy and Environmental Sciences* has been published by Springer (see above right). This book offers a comprehensive overview of the wide ranging applications of neutron scattering techniques to elucidate the fundamental materials properties at the nano-, micro- and meso-scale, which underpin research in the related fields of earth, energy and environmental sciences. It is the first book in the *Springer Series on Neutron Scattering Applications and Techniques* (http://www.springer.com/series/8141)
- The Dynamics of Soft Matter Workshop was held in Boston, MA, as a satellite of the MRS 2008 Fall Meeting on December 4-6, 2008. The goal of the Workshop was to assess the forefront research being carried out in the field and highlight the future directions and concomitant needs in neutron instrumentation and associated infrastructure. Each talk included an overview of the status of current applications and techniques, the prospect of using advanced neutron techniques to provide new insight, and the developments required to ensure this potential will be met. It was directed to a broad-based international scientific community with sessions on complex fluids, biology, polymers, and surfaces. The 80 attendees from North America, Europe, and Asia heard plenary talks by Dieter Richter (Jülich) on polymers, Jeremy Smith (Oak Ridge) on biology, and Peter Green (University of Michigan) on surfaces. Each half-day session included seven talks. Based on presentations and discussions during this Workshop plans are being developed for a book in the *Springer Series on Neutron Scattering Applications and Techniques* (http://www.springer.com/series/8141). It is expected that this book will serve as a guideline for future international collaborations.
- Research utilizing the Wide Angular-Range Chopper Spectrometer (ARCS, SNS BL-18) on iron arsenic compounds has continued with an investigation of single crystal samples of $BaFe_{1.84}Co_{0.16}As$ with a superconducting transition Tc = 22K, led by Mark Lumsden of ORNL [arXiv:0811.4755v1 (2008)]. A broad survey of the excitations in momentum and energy space on ARCS revealed the appearance of an excitation at low temperatures at a wavevector associated with antiferromagnetic ordering in the parent compound. Detailed measurements of this excitation at the HB-3 triple-axis spectrometer at HFIR show that its intensity grows in the superconducting state, i.e., for T<Tc. A gap in the energy spectrum develops, and the intensity distribution of the scattering is characteristic of two-dimensional fluctuations

in the Fe-As planes. This work demonstrates the power of strong collaborations between sample growth capabilities and the two neutron scattering centers at ORNL.
- The first annual report of ORNL's Neutron Sciences Directorate "Neutron Sciences Annual Report 2007", highlights of HFIR and SNS activities, is posted at http://neutrons.ornl.gov/nscd_2007_annual_rpt.pdf.
- Two SNS instruments are scheduled to receive their first neutron beams in December 2008: Extended Q-Range Small Angle Neutron Scattering (EQ-SANS, BL-6) and Powder Diffractometer (POWGEN3, BL-11A).

Operations

- HFIR Cycle 418 began on November 12, 2008, and ended December 5, 2008. In addition to supporting neutron scattering experiments, Cycle 418 supported 71 in-vessel irradiation capsules. At the end of November, HFIR had produced 3074.9 MW-Days in fiscal year 2009; well above the goal of 1,870 MWD. The previous cycle, Cycle 417, supported neutron scattering experiments, 69 in-vessel irradiation capsules and 29 neutron activation analysis samples. The FY2009 goals for the High Flux Isotope Reactor are operation for 6 cycles with >90% predictability. Cycle 419 will begin January 7, 2009.
- The SNS accelerator Run 2009-1 began on September 30, 2008 and will end on January 6, 2009. In November, the SNS delivered 259.5 MW-Hrs of beam to target. The beam to target scheduled in November was 517 hours and 406 were delivered for a total operating efficiency of 78%. A new peak power record of 671 kW was also established. For the first time, the Ion Source was operated in November 2008 at the full design value of 38mA for an extended neutron production run.
- The SNS schedule in the coming months may be perturbed by the planned, but undetermined, end of life of the first mercury target. This foreseen operational event will cause the shutdown of SNS for about two weeks while a new target is installed. Users will be notified as soon as possible and rescheduled to a future time. Our goal is to predict the target end of life and schedule future target replacements within normal maintenance periods.

Employment Opportunities

Positions in the Neutron Sciences Directorate or related to neutron scattering are available for browsing. Click on "View Open Positions" at http://jobs.ornl.gov/.

- **Neutron Scattering Postdoctoral Fellowship Positions with ORNL through Oak Ridge Associated Universities** [description available at http://www.orau.gov/orise/edu/ornl/postneeds.htm. Recently announced open positions are listed below.
  - Postdoctoral Research Associate for Neutron Scattering Research on the Backscattering Spectrometer (BASIS), [ORNL09-23-NSSD]
  - Postdoctoral Research Associate in Polarized Neutron Diffraction Studies on Protein Crystals, [ORNL09-15-RAD]
- **Educational and Research Experiences**: ORNL has educational programs covering many scientific disciplines with the education continuum from pre-college through postgraduate including teachers and faculty. The main link to all of these programs is http://www.orau.gov/orise/edu/ornl/

Meetings of interest to SNS and HFIR users

- The U.S. Particle Accelerator School (USPAS) is offering a program of graduate-level courses sponsored by Vanderbilt University in Nashville from January 12-23, 2009. Two short courses are of special interest: "Design and Engineering of Neutron and X-Ray Beamlines for Accelerator-Driven Sources" by R. Kent Crawford, to be held January 12-16 and "High Power Beam Targets (and Collimation)" by John Haines and Phil Ferguson, held January 19-23. Please visit http://uspas.fnal.gov for full course descriptions and an electronic application form. For further information please contact the USPAS Office at 630-840-3896 or uspas@fnal.gov.
- Physics Diversity Summit and the Joint Annual Conference of the National Society of Black Physicists and National Society of Hispanic Physicists, February 11-15, 2009, Nashville, TN. http://www.nsbp.org/conference/
- The Minerals, Metals, and Materials Society (TMS), February 15-19, 2009, San Francisco, CA. Symposium on "Emerging Applications of Neutron Scattering in Materials Science and Engineering," http://cmsplus.tms.org/CMS/CMSPlus.nsf/layout2?OpenFrameSet&Frame=main&Src=%2FCMS%2FCMSPlus.nsf%2FWeb%2520Views%2FUpcomingConferences%2F91ebf2c3c9c57919852572730050bb89%3FOpenDocument%26AutoFramed. Contact Xun-Li Wang, wangxl@ornl.gov, for details.

- Workshop on a National Materials Irradiation Sciences User Facility, March 4-6, 2009, Oak Ridge, TN. http://neutrons.ornl.gov/conf/mi2009/index.shtml.
- International Conference on Neutron Scattering, scheduled for May 3-7, 2009, Knoxville, TN. http://neutrons.ornl.gov/conf/icns2009/index.shtml.
- National School on Neutron and X-ray Scattering, tentatively scheduled for May 30-June 13, 2009, Argonne and Oak Ridge National Laboratories. Details to be announced soon.
- 20th Annual VM Goldschmidt Conference, June 13-18, 2010, Knoxville, TN. http://www.goldschmidt2010.org.