ADVANCES IN NEUTRON SOURCES AND SCATTERING FACILITIES AT ORNL

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Although most people don't know it, neutron-scattering research has a lot to do with our everyday lives. For example, things like jets; credit cards; pocket calculators; compact discs, computer disks, and magnetic recording tapes; shatter-proof windshields; adjustable seats; and satellite weather information for forecasts have all been improved by neutron-scattering research. Neutron research also helps researchers improve materials used in high-temperature superconductors, powerful lightweight magnets, aluminum bridge decks, and stronger, lighter plastic products. At ORNL DOE is sponsoring upgrades at the High Flux Isotope Reactor (HFIR) and construction of the Spallation Neutron Source.

The HFIR Center for Neutron Scattering at the Oak Ridge National Laboratory is the highest flux reactor-based source of neutrons for condensed matter research in the United States. The Center is a national user facility operated by ORNL for the United States Department of Energy. Thermal and cold neutrons produced by the High Flux Isotope Reactor (HFIR) are used to study physics, chemistry, materials science, engineering, and biology. Fifteen new instruments are being installed in the thermal neutron beam room and in the cold guide hall. Currently five instruments are available in the user program. These include three triple axis spectrometers for inelastic scattering studies, the mirror reflectometer and the residual stress mapping facility for measurement of materials behavior during deformation and for mapping residual stresses throughout the thickness of components. More information about HFIR is available at http://neutrons.ornl.gov/. The residual stress mapping facility is operated by the High Temperature Materials Laboratory User Program (http://html.ornl.gov), in close collaboration with the Center for Neutron Scattering.

The SNS is an accelerator-based neutron source being built in Oak Ridge, Tennesse, at a total cost of $1.4 billion. The construction of this one-of-a-kind facility will be completed in 2006; SNS will provide the most intense pulsed neutron beams in the world for scientific research and industrial development. The SNS is being built by a partnership of six DOE laboratories. One of the first five instruments to be available is POWGEN3 which will be an extremely flexible and versatile general-purpose diffractometer useful for a wide range of structural studies. It can cover d-spacings from ~0.5 Å or less to well over 10 Å in a single measurement and is capable of collecting typical Rietveld statistics in ~20 minutes from a 0.6 cm3 sample with a <0.1% resolution at short d-spacings and <1% resolution for nearly all d-spacings of interest. Alternatively, much of this resolution can be traded for intensity, making it possible to take measurements in << 20 minutes with still quite good resolution. To learn more about the SNS and why it's important both for you and for the nation follow the link http://www.sns.gov