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New High-Flux SANS Instrumentation at Oak Ridge National Laboratory

G.W. Lynn[1,2], M.V. Buchanan[1], P.D. Butler[2], W.T. Heller[1,2], D.A.A. Myles[1], V.S. Urban[1] and G.D. Wignall[2]
[1]Chemical Sciences Division, Oak Ridge National Laboratory
[2]Condensed Matter Sciences Division, Oak Ridge National Laboratory

A number of upgrades are in progress at the High Flux Isotope Reactor (HFIR), including the installation of a supercritical hydrogen moderator (T ~ 20 K) that will be one of the "brightest" cold sources currently available. It will feed four cold neutron guides (CG1-4), each with new instrumentation. CG2 and CG3 are reserved for two new small-angle neutron scattering (SANS) instruments. A 40 m SANS instrument (SANS1), funded by the Department of Energy (DOE) Office of Basic Energy Sciences and the University of Tennessee, Knoxville is designed for CG2. The 35 m small-angle neutron scattering facility (Bio-SANS on CG3) is optimized for the study of biological systems and is the cornerstone of the Center for Structural Molecular Biology (CSMB), funded by the DOE Office of Biological and Environmental Research. The facilities will be housed in a recently completed Guide Hall, along with a suite of other instruments, including a reflectometer and a cold triple-axis spectrometer. Both SANS facilities will have variable wavelength and large area ($1m^2$) high count-rate detectors ($> 10^5$ Hz) that can translate 45 cm off axis to increase the dynamic Q-range (< 0.001-1 $Å^{-1}$ overall). As the HFIR is one of only two reactors with a core flux greater than 10^{15} neutrons/sec/cm^2, the beam intensities (up to 10^7/sec/cm^2) will be comparable to the best facilities worldwide. This will improve both the quantity and quality of data that we can collect from synthetic and biological macromolecules, allowing us to increase throughput, to use smaller sample volumes and to perform kinetic (time-resolved) experiments.