Speaker: Changwoo Do, Oak Ridge National Lab

Title: “Understanding inelastically scattered neutrons from water on a time-of-flight small-angle neutron scattering (SANS) instrument”

Abstract: It is generally assumed by most of the small-angle neutron scattering (SANS) user community that a neutron’s energy is unchanged during SANS measurements. Here, the scattering from water, specifically light water, was measured on the EQ-SANS instrument, a time-of-flight (TOF) SANS instrument located at the Spallation Neutron Source of Oak Ridge National Laboratory. A significant inelastic process was observed in the TOF spectra of neutrons scattered from water. Analysis of the TOF spectra from the sample showed that the scattered neutrons have energies consistent with room-temperature thermal energies (~20 meV) regardless of the incident neutron’s energy. With the aid of Monte Carlo particle transport simulations, we conclude that the thermalization process within the sample results in faster neutrons that arrive at the detector earlier than expected based on the incident neutron energies. This thermalization process impacts the measured SANS intensities in a manner that will ultimately be sample- and temperature-dependent, necessitating careful processing of the raw data into the SANS cross-section.