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Small-angle Neutron Scattering and its Applications for Strongly Interacting Soft Matter Systems

YURI MELNICHENKO, Biology and Soft Matter Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831-6393

The first experimental studies of concentrated and thus strongly interacting polymer systems became possible due to the development of the small angle neutron scattering (SANS) technique combined with deuterium labeling of a fraction of the polymer. The technique opened an opportunity to extract information about size, shape, conformational changes as well as molecular associations of polymers in “crowded” environments, due to capability of separating the *inter*- and *intra*-chain contributions to the structure. Modern applications of SANS are numerous and it has been successfully used for investigations of the variety of systems, such as polymeric materials, biological macromolecules, colloids, confined fluids, etc. In this talk I will give examples of how SANS can be used to study strongly interacting soft matter systems, where the technique, in combination with deuterium labeling and high concentration method, can provide important and often unique information on the structure and thermodynamic properties and has helped to unveil universal aspects of the polymer behavior in polymer solutions, blends, polyelectrolytes, supercritical mixtures, and nanocomposites. I will also overview instrumentation and sample environments at SNS and High Flux Isotope Reactor, Oak Ridge National Laboratory available for users who are interested in studying structure and dynamics of soft matter materials.