

Static and dynamic fluctuations in polymer systems

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Neutron spin echo (NSE) technique is a powerful tool to study dynamic fluctuations in soft materials including polymers, biological materials, and colloid systems. In this talk we will discuss some topics in NSE studies of polymer systems on the basis of our experiments to show the power of the technique. The topics include polymer gels, polymer micelles, and glass-forming polymers.

Polymer gels often show very heterogeneous structure in small-angle neutron and small angle X-ray scattering measurements. In this study, we separated the total fluctuations observed in small-angle neutron scattering into static and dynamic fluctuations and discuss the role of dynamic fluctuations. In the second topic we studied two polymer micelles: one shows collective dynamics among the corona chains while another does single chain dynamics. This was assigned to the difference of the second virial coefficient. We also studied the dynamics of glass-forming polymer near the glass transition temperature in a high Q range covering the second peak in the static structure factor. The Q dependence of relaxation rate will be discussed and compared with molecular dynamics simulation.