STRUCTURE AND KINETICS OF SELF-ASSEMBLED NANOCYRSTAL SYSTEMS PROBED BY SMALL ANGLE X-RAY SCATTERING TECHNIQUES

Xiao-Min Lin*
Center for Nanoscale Materials, Argonne National Laboratory

Jin Wang
Advanced Photon Sources, Argonne National Laboratory

Development of colloidal nanopartice synthesis has created a variety of highly monodispersed colloidal nanoparticle systems. These nanocrystals can act as building blocks to form supercrystals or be dispersed into different matrix to form composite materials. Because the typical length scales between nanoparticles in systems are on the order of a few or a few tens of nanometers, small angle x-ray scattering (SAXS) or grazing incidence small angle x-ray scattering (GISAXS) provide ideal techniques to study these self-assembled structures. Coupled with real space optical and electron microscopy and other x-ray techniques such as photon correlation spectroscopy and x-ray standing wave, x-ray scattering techniques can be used to study self assembly kinetics, structural transition and particle diffusion kinetics. In this talk, I will introduce some basic small angle x-ray scattering techniques and illustrate their applications in studying nanocrystal systems by two specific examples: one is self-assembly of nanocrystals during colloidal droplet evaporation another is nanoparticle diffusion in polymer thin film matrix.