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Synchrotron radiation studies of the evolution dynamics of self-assembled nanoparticle Langmuir films YELING DAI, OLEG SHPYRKO, Department of Physics, University of California, San Diego, BINHUA LIN, MATI MERON, Center for Advanced Radiation Sources (CARS), University of Chicago, KYUNGIL KIM, Department of Chemistry and Biochemistry, University of California, Los Angeles, BRIAN LEAHY, Department of Physics, Cornell University —
Nanoparticle Langmuir films self-assembled on a liquid sub-phase represent a class of systems that is of great interest for studies of phase transitions in quasi-2D systems, chemical self-assembly, surfactant behavior and biologically relevant monolayers and membranes. We utilize Grazing Incidence X-ray Off-Specular (GIXOS) scattering to study elastic properties, structure and surface fluctuating modes of these systems. We present here a comparison between the GIXOS and the X-ray Reflectivity (XR) measurements, where XR is conventionally used to provide structural information of samples along the surface-normal direction. We further present a detailed analysis of GIXOS data from the self-assembled nanoparticle films and describe how we use it to obtain quantitative, Angstrom-resolution details of the electron density profile normal to the surface, complementary to that obtained with XR. Additionally, GIXOS provides us with improved temporal resolution that allows us to directly study the evolution dynamics of self-assembled nanoparticle films in response to lateral compression.

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