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X-ray Studies of Rapidly Evolving Interfacial Nanostructures YELING DAI, Department of Physics, UC San Diego, BINHUA LIN, MATI MERON, KYUNGIL KIM, BRIAN LEAHY, Center for Advanced Radiation Sources(CARS), University of Chicago, OLEG SHPYRKO, Department of Physics, UC San Diego — Interfacial nanostructures represent a class of systems that is of great interest for studies of quasi-2D systems, chemical self-assembly, surfactant behavior and biologically relevant membranes. During the compression process, the self-assembled nanoparticle films at the air-liquid interface exhibit rich mechanical behavior, undergoing a rapid structural evolution which is marked by the transition from monolayer to multilayer and/or the formation of periodic wrinkles and folds. Due to the compression rate of the barrier, the timescale of this evolution is typically several minutes, which is much shorter than the time the conventional Xray Reflectivity (XR) takes for a liquid surface measurement. Therefore we explore the ability of Grazing Incidence X-ray Off-Specular (GIXOS) scattering to capture the elastic properties, structures and surface fluctuating modes of Au nanoparticle films during the rapid structural evolution. We present here the detailed analysis of GIXOS data from the self-assembled Au nanoparticle films and show how we obtain quantitative, Angstrom-resolution details of electron density profile normal to the surface with a temporal resolution that allows us to study in-situ the rapid evolution of Au nanoparticle films structure in response to the compression.

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