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Structure, Dynamics, and Viscoelasticity of Nanoparticle Thin Films at the Liquid-Air Interface LEANDRA BOUCHERON, JACOB STANLEY, YELING DAI, Department of Physics, University of California, San Diego, BINHUA LIN, MATI MERON, Center for Advanced Radiation Sciences, University of Chicago, SURESH NARAYANAN, ALEC SANDY, Advanced Photon Source, Argonne National Lab, OLEG SHPYRKO, Department of Physics, University of California, San Diego — We experimentally probe the structure and inter-particle dynamics of iron oxide nanoparticle thin films self-assembled at the liquid-air interface. We find that upon deposition on a water substrate, iron oxide nanocrystals coated in oleic acid ligands spontaneously arrange themselves into a hexagonally close-packed configuration. At low particle concentrations, this close-packing results in isolated islands of particles distributed across the liquid surface. Compression in a Langmuir-Blodgett trough and the corresponding increase in surface pressure results in the formation of a uniform quasi-2D monolayer. Using X-Ray Reflectivity (XR) measurements, we were able to quantify the overall change in surface-normal film structure due to an increase in surface pressure. Utilizing X-Ray Photon Correlation Spectroscopy (XPCS), we have measured the characteristic timescale of in-plane particle dynamics. I will discuss these results and their relation to viscoelasticity in quasi-2D self-assembled monolayers.

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