Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Glassy Dynamics and Anomalous Diffusion in Self-Assembled Nanoparticle Monolayers LEANDRA BOUCHERON, JACOB STANLEY, YELING DAI, Univ of California - San Diego, SEAN YOU, University of Chicago, BINHUA LIN, MATI MERON, Center for Advanced Radiation Sciences, University of Chicago, SURESH NARAYANAN, ALEC SANDY, ZHANG JIANG, Advanced Photon Source, Argonne National Lab, OLEG SHPYRKO, Univ of California - San Diego — We experimentally investigate the structure and dynamics of iron oxide nanoparticle thin films self-assembled at the liquid-air interface. Upon deposition on a water surface and subsequent lateral compression, iron oxide nanoparticles coated with oleic acid ligands self-assemble into a morphologically uniform quasi-2D monolayer. We examined the in-plane structure of these self-assembled films using Grazing-Incidence X-Ray Diffraction (GIXD) and investigated the interparticle dynamics using X-Ray Photon Correlation Spectroscopy (XPCS). The logarithmic relaxation of the surface pressure of the films post-compression suggests the presence of glassy dynamics in the system. Autocorrelation functions derived from XPCS measurements quantify the characteristic timescale of such dynamics and have been fit using the Kohlrausch-Williams-Watts (KWW) model to extract the degree of glassiness. Finally, the q-dependence of the interparticle dynamics in the films is supportive of an anomalous diffusion regime, $\langle x^2 \rangle \propto t^n$, with $n > 1$. I will discuss these results and their implications with regards to the nanoscale interactions involved in thin film self-assembly and rearrangement.

Leandra Boucheron
Univ of California - San Diego

Date submitted: 11 Nov 2013 Electronic form version 1.4