

Abstract Submitted
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Synchrotron studies of nanocrystal thin film self-assembly¹

DIEGO PONTONI, KYLE ALVINE, DEAS, Harvard University, Cambridge, MA, 02138, ANTONIO CHECCO, OLEG GANG, BEN OCKO, BNL, Upton, NY, 11973, PETER PERSHAN, DEAS, Harvard University, Cambridge, MA, 02138, FRANCESCO STELLACCI, MIT, Cambridge, MA, 02129 — This work is aimed at exploring the mechanisms of formation and dissolution of nanocrystal 2D and 3D assemblies in the presence of nano-thin wetting films. In particular monolayers of bimodal/polydisperse thiol-stabilized gold nanocrystals are studied. In-situ synchrotron X-ray grazing incidence diffraction reveals that upon adsorption of a good solvent for the nanocrystals, the monolayer first expands and then undergoes a transition to a bilayered/disordered state. A detailed physical model for the corresponding X-ray reflectivity data suggests that the transition starts when the substrate is completely covered by the monolayer as a result of its expansion into 2D voids. Further liquid adsorption forces the expulsion of nanocrystals from the monolayer by vertical displacement. The first nanocrystals to be expelled are the large ones. The whole process is reversible upon slow decrease of the adsorbed liquid.

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