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Magnetic domain formation in monolayer nanoparticle films BRIAN MARANVILLE, KATHRYN KRYCKA, JULIE BORCHERS, National Institute of Standards and Technology, CHARLES HOGG, SARA MAJETICH, Carnegie Mellon University, YUMI IJIRI, Oberlin College — Self-assembled magnetic nanoparticle films offer promise as data storage media, but an understanding of the interactions is missing. Modified Langmuir-Blodgett methods were used to prepare monolayer films of 7 and 11 nm diameter Fe_3O_4 nanoparticles with large structural domains. Small-angle neutron scattering (SANS) shows a peak at a wavevector Q corresponding to the particle size and spacing, and scattering at intermediate Q indicating possible long-range correlations. We extend to lower Q with off-specular neutron reflectivity, achieving high intensity by sacrificing resolution along one in-plane direction y while retaining high resolution in the other in-plane direction x and the normal direction z. We measure in saturation and zero field to extract magnetic scattering. In high fields, the specular scattering ($Q_x = 0$) is increased, consistent with aligned moments. Preliminary results show weak magnetic scattering for nonzero Q_x . Since the maximal Q_x roughly corresponds to the lowest Q in SANS, the combination of these techniques allows us to quantify field-dependent magnetic domain size.

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