Abstract Submitted
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Magnetic order and fluctuations in Fe_3O_4 nanoparticles assemblies KARINE CHESNEL, YANPING CAI, MATEA TREVINO, Physics department, BYU, ROGER HARRISON, JARED HANCOCK, Chemistry department, BYU, ANDREAS SCHERZ, ALEXANDER REID, SSRL, SLAC — Magnetite (Fe_3O_4) particles exhibit a superparamagnetic behavior when their sizes are in nanometer scale. We are interested in investigating the magnetic order and fluctuation dynamics in self-assemblies of such nanoparticles. We fabricate our Fe_3O_4 nanoparticles following various chemical routes (organic and inorganic). The particle sizes range from 5 nm to 50 nm We have studied the effect the particle's size on their structural and magnetic properties with X-ray-Diffraction (XRD) and Vibrating Sample Magnetometry (MFM). The 5nm particles were deposited on membrane where they self-assemble in a hexagonal lattice. We have studied the magnetic order in such assemblies using X -ray resonant magnetic scattering (XRMS) at the SSRL synchrotron facility. This unique technique, combined with X-ray Magnetic Circular Dichroism (XMCD), provide information about the spatial distribution of the particles and their magnetic order [1]. In addition, the use of coherent light at the SSRL beamline, combined with the application of magnetic field in-situ at different temperatures, allows for studying local magnetic disorder [2] and dynamics of fluctuations near the blocking temperature.

[1] J.B.Kortright et al., PRB 71, 012402 (2005)
[2] K. Chesnel et al., PRB 83, 054436 (2011)

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