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Polarized small angle neutron scattering of MnO/Mn_3O_4 nanocrystals L. DEDON, Y. IJIRI, Department of Physics and Astronomy, Oberlin College, R. BOOTH, Department of Physics, Carnegie Mellon University, K. KRYCKA, J.A. BORCHERS, W.C. CHEN, S. WATSON, NIST Center for Neutron Research, NIST, J.J. RHYNE, Lujan Neutron Scattering Center, Los Alamos National Laboratory, S.A. MAJETICH, Department of Physics, Carnegie Mellon University — Monodisperse magnetic nanoparticles are of great interest for biomedical and data storage applications, particularly in cases where the core and shell can be carefully controlled to alter properties like magnetic anisotropy. However, it is often difficult to determine the underlying moment arrangements and correlations in these systems. Here, we focus on manganese (II) oxide/manganese (II,III) oxide core/shell nanoparticles, using polarized small angle neutron scattering (SANS) to probe the magnetic intra and interparticle interactions. The 30nm diameter particles with 4-5nm shell were prepared by solution chemistry methods and self-assembled into 3D nanocrystals. SANS measurements were conducted in magnetic fields from remanence-1T and temperatures from 10-300K. Magnetic and structural scattering components were separated using an algorithm previously described in [1]. The magnetic signature depended on the field and temperature history of the sample. Modeling work has been done to further quantify the interparticle length scales and the effects of crystal packing. This work was supported in part by NSF grants DMR-0454672, -0704178, -0804779, -1104489, and DOE grant DE-FG02-08ER40481. [1] K.L. Krycka, et al. Phys. Rev. Lett. 104, 207203 (2010).

Yumi Ijiri
Oberlin College

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