Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Orientational Distributions and Nematic Order of Rodlike Iron Nanoparticles in Magnetic Inks VEMURU KRISHAMURTHY, Oak Ridge National Laboratory, GARY MANKEY, BIN HE, MAIHUA PIAO, JOHN WIEST, DAVE NIKLES, The University of Alabama, LIONEL PORCAR, National Institute of Standards and Technology, LEE ROBERTSON, Oak Ridge National Laboratory — The suitability of nanoparticles for magnetic recording applications depends on the control of the orientational order in an external force field, such as a shear flow or a magnetic field. Using small angle neutron scattering (SANS), we have investigated the orientational order of iron nanoparticles dispersed in cyclohexanone. The particles are rod shaped and polydispersed with an average length of 200 nm, an average diameter of 25 nm. SANS shows an anisotropy, which is a measure of orientational order, for 3.2 vol. % and 3.9 vol. % iron particle dispersions at shear rates of 0-4000 s^{-1} and/or in a magnetic field of 0-180 Oe. The scattering anisotropy could be fitted by a model considering Onsager distribution of the orientation of the particles. The orientational distribution parameter α and orientational order parameter S indicate that the particles start to orient either in a shear flow of 100 s^{-1} or in a magnetic field of 20 Oe. The orientational structure of the dispersion is reversible in shear flow, but irreversible in the magnetic field.

Vemuru Krishamurthy
Oak Ridge National Laboratory

Date submitted: 20 Nov 2006 Electronic form version 1.4