Abstract Submitted
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Influence of dipolar interactions on the formation of domains in layered Ni/Al_2O_3 nanocomposites R. DAS, A. HEBARD, University of Florida, A. GUPTA, D. KUMAR, North Carolina Agricultural and Technical State University, S. OH, S. PENNYCOOK, Oak Ridge National Laboratory — Pulsed laser deposition has been used to fabricate Ni/Al_20_3 multilayer composites in which Ni nanoparticles of uniform size in the range of 3-60 nm are embedded as layers in an insulating Al_20_3 host. At fixed temperatures, the coercive fields show well-defined peaks which define a critical size that delineates a crossover from single domain (SD) to multiple domain (MD) behavior. Most applications require that the particles be single domain with a uniform magnetization that remains stable with a sufficiently large anisotropy energy to overcome thermal fluctuations and beat the superparamagnetic limit, which establishes a temperature-dependent *lower bound* to the particle size (superparamagnetic limit). These considerations must take into account the effect of interactions on magnetic properties as is evident for high-density recording media where particles are very close to each other. The effect of dipolar interactions on the establishment of an *upper bound* to particle size (d_c), which defines the crossover from SD to MD behavior will be discussed. We show using coercivity measurements that, with increasing temperature, d_c increases and then saturates due to attenuated dipolar interactions from thermally induced motions of neighboring randomly oriented particles.

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