MAR08-2007-001788

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

Magnetism of FePt nanoparticles and nanodot arrays.[1]

HAO ZENG, University at Buffalo-SUNY

$L1_0$ structured FePt materials show great potential for magnetic data storage media applications.[1] The first part of this talk concerns the magnetism in chemically synthesized FePt nanoparticles. Discrete FePt nanoparticles with $L1_0$ structure have recently been realized by salt annealing, making it possible to study their size dependent magnetic properties.[2] We have discovered a strong reduction of magnetization with decreasing FePt particle size and an unusual temperature dependent magnetization that deviates from the Bloch's $T^{3/2}$ law at low temperatures. A model based on competing exchange interactions is proposed to explain the unusual behavior, considering explicitly the nanoparticle shape. FePt system has complicated exchange interactions, with interaction in the (100) plane being strongly ferromagnetic and inter-plane much weaker. The ferromagnetic and antiferromagnetic exchange interactions contribute differently at the nanoparticle surface and interior, leading to reduced ferromagnetic order at the surface terminated by certain facets. The model correctly explains the magnetization reduction with decreasing particle size, a surface paramagnetic phase as evidenced by Mossbauer spectroscopy and the unusual temperature dependent magnetization behaviors. The second part of this talk will report our recent efforts in developing ordered FePt nanodot arrays using self-assembled porous templates as evaporation masks. The arrays possess perpendicular anisotropy, large coercivity and extremely high density, all of which are desirable features for future data storage media.

[1]S. Sun *et al.*, Science, 287, 1989 (2000).

[2]C. Rong, *et al.*, Adv. Mater. 18, 2984 (2006).

[1]Research supported by NSF DMR-0547036.