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Magnetic Properties of Core-Shell FePt(CFx) Nanocluster Films[1]

YINGFAN XU, MINGLANG YAN, D.J. SELLMYER, CMRA and Dept. of Physics and Astronomy, University of Nebraska, Lincoln, NE 68588 — A core-shell FePt nanocluster system, in which the magnetic core is coated with a layer of a non-magnetic shell, is of great interest for study and tailoring magnetic properties such as magnetization, anisotropy and interparticle interactions. In this study core-shell FePt clusters with fluorocarbon (CF_x) shell are synthesized by a cluster-deposition system with gas-aggregation technique. Monodispersed core-shell structure FePt(CF_x) clusters are produced with average diameter of 4 nm and with a uniform size distribution. High magnetic anisotropy $L1_0$ phase FePt(CF_x) cluster-assembled films were realized via post-deposition annealing. Crystal structure and nanostructure of the films were studied by XRD and TEM. Magnetic properties of the films were measured at temperatures between 10 K and 300 K. Results show that the FePt $L1_0$ ordering temperature is decreased by addition of CF_x.Interparticle interactions were studied by measuring the ΔM curves. Thermal stability of the films was also studied by fitting the temperature dependence of coercivity with the Sharrock formula. Our results indicate that the magnetic properties of the core-shell FePt(CF_x) nanoclusters are tunable for various nanomagnetic applications.

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Yingfan Xu
CMRA and Dept. of Physics and Astronomy
University of Nebraska, Lincoln, NE 68588

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