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Magnetic Properties of Chemically Synthesized FePt Nanoparticles

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Chemically synthesized FePt nanoparticles have attracted considerable attention in recent years because of their potential use in ultra-high density magnetic recording media. In the original procedure described by Sun et al., the as-synthesized nanoparticles have the fcc phase and must be thermally annealed to achieve the high-anisotropy $L1_0$ phase [1]. We have been addressing some of the materials problems associated with obtaining the $L1_0$ phase. These include lowering the ordering temperature, reducing sintering during annealing, orienting the easy axes, and understanding the size effect on chemical ordering. Additive Au and Ag significantly lower the ordering temperature, while additive Cr and Cu increase the ordering temperature; however, the onset of ordering is correlated with sintered grain growth. Sintering can be reduced by encapsulating the nanoparticles with a shell such as silicon oxide or copper. Easy-axis orientation has been achieved using $L1_0$ FePt nanoparticles that were directly synthesized using a high-temperature solvent [2]. The nanoparticles were dispersed in a PVC binder and oriented by drying the dispersion in a magnetic field. [1] S. Sun et al., Science 287, 1989 (2000). [2] S. Kang et al., Appl Phys. Lett. (in press).