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Synthesis and Magnetic Properties of $L1_0$FePt / Silica Core Shell Nanoparticles[1] ANDREW HEITSCH, DOH LEE, BRIAN KORGEL — FePt nanocrystals were coated with silica (SiO_2) shells in an inverse micelle microemulsion by tetraethyl orthosilicate (TEOS) hydrolysis and condensation. The shell thickness can be varied (from 6 to 25 nm), along with the FePt loading (per silica shell) to a limited extent, by changing the FePt:TEOS ratio. The silica-coated FePt nanocrystals can be heated up to $\sim 850^o$C without shell layer decomposition or FePt sintering. Annealing under forming gas (7%H2/ 93%N2) at 700 $^\circ$ C for 2 hours transforms the as-synthesized fcc FePt nanocrystals to the $L1_0$ phase with at least 90% conversion. Magnetic measurements of annealed FePt nanocrystals confirm their phase transformation, with blocking temperatures exceeding room temperature. However, the hysteresis loops exhibit a constriction at low fields and zero field cooled (ZFC) magnetization scans show an intermediate plateau at temperatures between 50K$\sim$200K. Temperature and time-dependent remanance relaxation measurements reveal a short and fast, $\sim 10^4$ and 10^5 seconds, relaxation of the remanance, which might be due to the presence of an additional "soft"magnetic phase in the sample. The possible origins of the soft magnetic component will be presented and discussed.

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