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**Nanostructure and Magnetic Properties $L1_0$ FePt Films with Additions of Au and Cu** T. GEORGE, M. YAN, Y. XU, R. SKOMSKI, R. KIRBY, D. J. SELLMYER, Nebraska Center for Materials and Nanoscience, University of Nebraska — Non-epitaxially grown $L1_0$ FePt:Au and FePt:Cu films have been fabricated and investigated. All films are initially deposited with the structure $[\mathrm{FePt/X}]_n$ and have individual layer thicknesses from about 0.1 nm to 1 nm. The $L1_0$ phase is achieved by post-deposition annealing at temperatures from 500 to 600 $^\circ$C for varying times. XRD and TEM show that Cu enters the $L1_0$lattice whereas Au segregates at the grain boundaries. Both types of films exhibit a decrease in $M_s$, due to magnetic dilution. The coercivity ($H_c$) increases and decreases with the addition of Au and Cu, respectively. These changes are due to reduced anisotropy (Cu) and to reduced inter-granular exchange coupling (Au). In the FePt:Au films, MFM shows a decrease in magnetic coherence length ($\mathrm{L}_M$) from 90 to 74 nm and the $M-H$ slope $\alpha = (\mathrm{d}M/\mathrm{d}H)_{Hc}$ decreases from 5.7 to 0.9 for Au contents from zero to 32 vol%. A simple interaction model quantifies these trends by considering that interparticle exchange cooperatively enhances both $\alpha$ and $\mathrm{L}_M$. In the FePt:Cu films, the addition of Cu yields a decrease in Curie temperature (574 K at 20 vol%). Mean-field calculations qualitatively reproduce this decrease in $T_c$ but indicate deviations from random solid-solution behavior. - This research is supported by INSIC, NSF-MRSEC and NCMN.

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