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Tuning magnetic anisotropy in (001) oriented L10 ($Fe_{1-x}Cu_x)_{55}Pt_{45}$ films DUSTIN A. GILBERT, KAI LIU, Physics Dept., University of California, Davis, LIANG-WEI WANG, CHIH-HUANG LAI, Materials Science and Engineering, National Tsing Hua University, Taiwan, TIMOTHY KLEMMER, JAN-ULRICH THIELE, Seagate Technology — The development of high anisotropy magnetic materials that are compatible with industrial processing is critical in advancing magnetic recording, permanent magnet, and spintronic technologies. Specifically, high anisotropy materials are necessary to ensure long-term thermal stability in magnetic nanoelements, such as ultra-high density recording media and magnetic memory. A material of particular interest is $L1_0$ ordered FePt because of its large magneto-crystalline anisotropy (K_U), saturation magnetization (M_S), and chemical stability. A key limiting factor has been the high annealing temperature necessary to transform the as-deposited disordered face centered cubic (fcc) $A1$ phase into the ordered tetragonal$L1_0$ phase. We have achieved (001) oriented $L1_0$ $(Fe_{1-x}Cu_x)_{55}Pt_{45}$ thin films, with K_U up to 3.6×10^7 erg/cm^3, using atomic-scale multilayer sputtering and post annealing at 400 °C for 10 seconds, which is a much lower temperature annealing for a much shorter time compared to earlier studies. By fixing the Pt concentration, structure and magnetic properties are systematically tuned by the Cu addition. Increasing Cu content results in an increase in the tetragonal distortion of the $L1_0$ phase, significant changes to the film microstructure, and lowering of the M_S and K_U. The relatively convenient synthesis conditions, along with the tunable magnetic properties, make such materials highly desirable for future magnetic recording technologies.

Dustin Gilbert
Physics Department, University of California, Davis

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