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Magnetic Anisotropy of Cr-Substituted Magnetostrictive Cobalt Ferrite YEVGEN MELIKHOV, JOHN SNYDER, CHESTER LO, PAUL MATLAGE, SANG-HOON SONG, KEVIN DENNIS, Iowa State University, Ames, IA 50011, USA, DAVID JILES, Cardiff University, Cardiff CF243AA, UK — In order to tailor the magnetomechanical response of substituted cobalt ferrite for strain sensing and actuating applications, more needs to be known about the variation of the basic magnetoelastic and magnetic properties with temperature and composition. In this study, the variation of magnetic anisotropy with temperature and composition for a series of Cr-substituted cobalt ferrites, $CoCr_xFe_{2-x}O_4$, ($0 \leq x \leq 0.8$) was investigated. In order to determine the cubic anisotropy constant K_1,the "high field" regime (from 1 T to 5 T) of the major magnetic hysteresis loops, which were measured at temperatures over the range 10-400 K using a SQUID magnetometer, was fitted using the law of approach approximation $M(T) = M_S(1\text{-}8/105K_1^2/(\mu_0 H M_S)^2)$ plus a forced magnetization term linear in applied field H. It was found that anisotropy increases with decreasing temperature, with the steepest increase coming at progressively lower temperatures for increasing Cr content. For fixed temperatures, anisotropy decreases with increasing Cr content. For the pure cobalt ferrite and x=0.2 Cr samples it appears that for temperatures less than 150 K, 5 Tesla is not enough to saturate the samples, so anisotropy cannot be computed correctly by this method. This research was supported by NSF, Grant No.DMR-0402716, and by NASA, Award No.NAG-1-02098.

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