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Anisotropy of Manganese-Substituted Cobalt Ferrite YEVGEN MELIKHOV, CHESTER LO, JOHN SNYDER, DAVID JILES, Materials and Engineering Physics Program, Ames Laboratory, US Department of Energy, Ames, Iowa 50011, U.S.A., JASON PAULSEN, ANDY RING, Center for Nondestructive Evaluation, Ames, IA 50011, U.S.A. — Study of the anisotropy of magnetostrictive cobalt ferrite composites and its temperature dependence helps better understand the magnetomechanical properties, which will allow tuning the properties of the materials for magnetoelastic stress and torque sensors applications. We have investigated the temperature dependence of anisotropy of Mn-substituted cobalt ferrite $CoMn_xFe_{2-x}O_4$ ($0 \leq x \leq 0.8$). Magnetization measurements of the hysteresis loops were made at temperatures over the range 200-300 K using a SQUID magnetometer. To determine the anisotropy constant K_1, the high field regime of the loops was fitted using the law of approach approximation $M(T) = M_s \cdot (1\text{-}\alpha K_1^2/H^2)$, where $\alpha = 8/105\ \mu_0^{-2} M_s^{-2}$ for the samples which have spinel structure and cubic anisotropy. It was found that anisotropy decreases with increasing Mn content and with increasing temperature for all compositions. However, at higher temperatures the anisotropy of the Mn-substituted specimens converges to approximately the same value K_1=200 kJ/m^3. The pure cobalt ferrite sample appears to have considerably higher anisotropy K_1 than the Mn-substituted samples over the whole temperature range.

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