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Improvements in magnetomechanical properties of highly magnetostrictive ferrites due to magnetic annealing CHESTER C.H. LO, ANDY P. RING, Center for NDE, Iowa State University, JOHN E. SNYDER, DAVID C. JILES, Materials and Engineering Physics Program, Ames Laboratory, U.S. Dept. of Energy, Iowa State University, MAGNETICS GROUP ISU TEAM — Magnetostrictive composites based on cobalt ferrite and newer compounds in which 3d elements such as Mn and Cr are substituted for some of the iron, hold promise for use in stress sensors due to their large magnetostriction and high sensitivity of magnetization to stress which depends on the piezo-magnetic coefficient $d = d\lambda/dH$. We report substantial increases of both magnetostriction and $d\lambda/dH$ of cobalt ferrite by magnetic annealing under a field of 0.4 T at a temperature of 300 C for 36 hours. The annealed sample showed a uniaxial anisotropy, with the easy axis being along the annealing field direction. The maximum magnetostriction increased from -200 $\times$ 10^{-6} for the as-fabricated sample to -252 $\times$ 10^{-6} (field and strain along the hard axis) after magnetic anneal, whereas the maximum $d\lambda/dH$ increased from 1.3×10^{-9} $A^{-1}m$ to 3.9×10^{-9} $A^{-1}m$. This is attributed to the induced anisotropy, which resulted in increased rotation and non-180° domain wall processes as domain magnetizations re-oriented from the induced easy direction towards the applied field along the hard axis. This research was supported by the National Aeronautical and Space Administration (NASA) under award No NAG-1-02098.

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