Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Anisotropy and Magnetostriction in Cobalt-Modified Magnetite: A Crystal Field Approach CAJETAN NLEBEDIM, Ames Laboratory, US DOE, Iowa State University, DAVID JILES, Department of Electrical and Computer Engineering, Iowa State University — The anisotropy and magnetostrictive properties of magnetite are altered by the introduction of cobalt ions into the spinel crystal lattice. 4% of Co^{2+} substituted for Fe^{2+} changes both the sign and magnitude of magnetocrystalline anisotropy coefficient. Such strong dependence can be useful for tailoring the properties of cobalt-iron oxides for applications. This is especially important, considering that cobalt ferrite materials prepared for magnetostrictive, multiferroic and other related applications often deviate from targeted or stoichiometric compositions. In this study, magnetite has been systematically modified by substitution of cobalt. The changes in anisotropy and magnetostriction have been studied and can be explained using the single ion model. The agreement between the trend observed in this experimental investigation and previous theoretical studies is noteworthy. The variation in anisotropy and magnetostriction will be presented on the basis of two competing factors; the unquenched orbital angular momentum of Co^{2+} and changes in the crystal field due to Co^{2+} substitution.

David Jiles
Department of Electrical and Computer Engineering, Iowa State University

Date submitted: 28 Nov 2012 Electronic form version 1.4