Abstract Submitted
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Giant Coercive Fields of 2.5 Tesla in Nanostructured Mn_xGa Films[1] STEVEN BENNETT, THOMAS NUMMY, THOMAS CARDINAL, WELVILLE NOWAK, DON HEIMAN, Northeastern University — There is a growing interest in designing new magnetic materials that are free of rare-earth elements. The magnetism of the Heusler ferrimagnet Mn_xGa [1] was found to be enhanced when fabricated with nanoscale structural disorder. Films of Mn_xGa (x=2 to 3) with thicknesses of 20 to 40 nm were grown using molecular beam epitaxy at 100 $^\circ$C then annealed at 400 $^\circ$C. Disordered films were grown on lattice mismatched Si (001) substrates, then compared to epitaxially grown films on desorbed GaAs (001) substrates. While the epitaxial films have small hysteresis in the magnetization with coercive fields in the range $\mu_o H_C = 10^{-2}$ - 10^{-1} T, the disordered films exhibited surprisingly wide hysteresis with record high coercive fields as large as $\mu_o H_C = 2.5$ T. These magnitudes are comparable to those of rare-earth-based magnets. This hysteresis was also present in the anomalous Hall effect. The enhanced coercive field in the disordered material arises from a combination of the exceptionally large magnetocrystalline anisotropy and nanoscale structural disorder. These results point out a new opportunity for developing rare-earth-free magnetic materials. Discovery of this unusually high coercive field is outlined and its sources discussed. [1] J. Winterlik, et al., Phys. Rev. B **77**, 054406 (2008).

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