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Nanostructured $CoFe_2O_4$ Films for Magnetic Logic Applications
RYAN COMES, MAN GU, University of Virginia, MIKHAIL KHOKHLOV, Guilford College, JIWEI LU, STUART WOLF, University of Virginia — $CoFe_2O_4$ (CFO) offers unique properties as a magnetoelectric material due to its large magnetoelastic response when strained. Previous work has shown that when CFO is co-deposited with $BiFeO_3$ (BFO) nanostructured phase segregation occurs and electrical control of the magnetic anisotropy is possible [1]. Such a system offers unique possibilities for an electrically-controlled spintronic logic scheme. To that end, CFO films were grown on MgO and $SrTiO_3$ (STO) substrates using pulsed electron deposition. Films grown on MgO substrates exhibit large perpendicular anisotropy due to epitaxial strain, while films on STO exhibit mixed anisotropy. Using electron-beam lithography, nanopillars were etched into the film in dense arrays and characterized using magnetic force microscopy. Pillar arrays were produced with diameters between 30 and 75 nm with pitch ranging from 90 to 200 nm. The dipole interactions in these pillars were examined and their potential applications for spintronic logic were evaluated. Thinner $CoFe_2O_4$ islands were also patterned on STO with EBL and then used as a template for a co-deposited BFO/CFO film. Results of this work will also be presented.

[1] Zavaliche, F., et al. *Nano Lett.*, 2007, 7 (6), pp 1586–1590

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