Abstract Submitted
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Magnetic and ferroelectric properties of patterned multiferroic $CoFe_2O4$-$BiFeO_3$ nanocomposites[1] RYAN COMES, University of Virginia, Department of Materials Science and Engineering, MIKHAIL KHOKHLOV, Guilford College, HONGXUE LIU, JI-WEI LU, STUART WOLF, University of Virginia, Department of Materials Science and Engineering — $CoFe_2O_4$ (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 with CFO pillars forming in a BFO matrix and electrical control of the magnetic anisotropy is possible.[1] Such a system offers unique possibilities for an electrically-controlled spintronic logic scheme.[2] We have recently demonstrated the ability to control the location of the CFO pillars in CFO-BFO nanocomposites using e-beam lithography patterning of uniform CFO films grown on Nb-doped $SrTiO_3$. Square arrays of pillars with spacings as small as 100 nm have been grown in nanocomposites using pulsed electron deposition. Piezoresponse force microscopy (PFM) measurements show clear ferroelectric response in the BFO matrix. The out-of-plane piezoelectric response, d_{33}, has been measured via PFM within the BFO matrix and is in good agreement with published results for BFO. Magnetic force microscopy (MFM) shows in-plane magnetic anisotropy in the pillars due to compressive in-plane strain. [1] F. Zavaliche, et al. *Nano Lett.* **7** (2007). [2] S.A. Wolf, et al. *Proc. IEEE* **98** (2010).

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