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Origin of Reversible Electric Exchange Bias Modulation in a Multiferroic Field Effect Device[1] STEPHEN WU, SHANE CYBART, PU YU, R. RAMESH, R.C. DYNES, Materials Sciences Division, Lawrence Berkeley National Lab — We report the fabrication and characterization of two different oxide heterostructure based electric field effect devices: the multiferroic/ferromagnet, $BiFeO_3$(BFO) / $La_{0.7}Sr_{0.3}MnO_3$(LSMO) and the ferroelectric/ferromagnet, $Pb(Zr_{0.2}Ti_{0.8})O_3$(PZT)/LSMO. By switching FE polarization of BFO in the multiferroic device we observe a change in conductivity in the channel of 50%, and a 55% change in magnetic coercivity at 5.5 K. Furthermore, we can reversibly switch between two distinct exchange bias states corresponding to the different FE polarizations without additional field cooling. The difference in exchange bias between the two states is approximately 20mT. We further characterize the device by performing Hall Effect and temperature dependent exchange bias modulation measurements. Finally, we compare this device to a similarly fabricated PZT/LSMO field effect device. We observe no exchange bias and significantly smaller coercivity. No change in magnetic coercivity is observed when ferroelectric polarization is switched in PZT. Models based on these results will be presented.

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