Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

An In Situ Electric Field Study of Magnetoelectric Coupling in PZT-LSMO Thin Film Heterostructures Using Polarized Neutron Reflectometry and Transmission Electron Microscopy STEVEN SPURGEON, JENNIFER SLOPPY, Drexel University, ESTHER HUANG, RAMA VASUDEVAN, University of New South Wales, SAMUEL LOFLAND, Rowan University, VALERIA LAUTER, Oak Ridge National Laboratory, NAGARAJAN VALANOOR, University of New South Wales, MITRA TAHERI, Drexel University — The development of "spintronics" devices based on charge and spin transport has signaled a paradigm shift in the design of data storage and computing technologies. Magnetoelectric materials, which exhibit intrinsic coupling between electronic and magnetic order, are ideal for these applications. Unfortunately, single-phase magnetoelectrics are exceedingly rare in nature and attention has turned to composite heterostructures that display coupled functionalities at interfaces. A promising system in which to explore this coupling is a thin film oxide heterostructure of the piezoelectric Pb(Zr0.2Ti0.8)O3 (PZT) and the half-metal La0.7Sr0.3MnO3 (LSMO). We show that it is possible to construct a capacitor-type device structure from these materials that may form the basis for an electrically-switched magnetic memory. We conduct polarized neutron reflectometry (PNR) measurements and measure changes in the magnetization depth profile throughout the composite under the reversal of an in situ electric field. We then correlate these PNR results to local strain and chemistry using transmission electron microscopy (TEM). We find that a combination of charge doping and strain mechanisms governs coupling in this system.

Steven Spurgeon
Drexel University

Date submitted: 14 Nov 2012 Electronic form version 1.4