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***In Situ* Electrical Biasing Studies of Magnetoelectric Coupling in $La_{1-x}Sr_xMnO_3$-$PbZr_xTi_{1-x}O_3$ Thin Film Oxide Heterostructures** STEVEN SPURGEON, Drexel University, Department of Materials Science and Engineering, IAN MCDONALD, Northeastern University, Department of Electrical and Computer Engineering, ESTHER HUANG, RAMA VASUDEVAN, University of New South Wales, School of Materials Science and Engineering, SAMUEL LOFLAND, Rowan University, Department of Physics and Astronomy, BRIAN KIRBY, National Institute of Standards and Technology, Center for Neutron Research, NAGARAJAN VALANOOR, University of New South Wales, School of Materials Science and Engineering, MITRA TAHERI, Drexel University, Department of Materials Science and Engineering — Thin film $La_{1-x}Sr_xMnO_3$ (LSMO) – $PbZr_xTi_{1-x}O_3$ (PZT) magnetoelectric heterostructures possess desirable properties for a range of spintronic applications, but a poor understanding of interfacial coupling dynamics has made them difficult to implement. Here we present a series of magnetization studies utilizing direct *in situ* electrical biasing and switching of PZT polarization. We show that a piezoelectric strain effect gives rise to significant changes in the bulk saturation magnetization of LSMO. We complement these measurements with novel *in situ* polarized neutron reflectometry measurements that reveal the spatial extent of induced magnetization. We then correlate these magnetic measurements with local structural and chemical probes to elucidate a structural basis for the observed magnetic properties. From these results we suggest ways to tune coupling for a particular application and we also propose ways to extend these techniques to other composites.

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