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Ferroelectric field effect modulation of magnetism in composite multiferroics JASON HOFFMAN, CARLOS VAZ, YARON SEGAL, MATTHEW MARSHALL, FRED WALKER, CHARLES AHN, Yale University
— This work harnesses the strong charge-driven magnetoelectric coupling in $Pb(Zr_{0.2}Ti_{0.8})O_3/La_{0.8}Sr_{0.2}MnO_3$ (PZT/LSMO) heterostructures to explore the sensitivity to charge of the electron transport and magnetic behavior of complex oxides. Epitaxial LSMO films that exhibit a highly ordered crystalline structure, as determined by *in situ* reflection high energy electron diffraction (RHEED) measurements and *ex situ* x-ray diffraction and transmission electron microscopy are grown by oxide molecular beam epitaxy. Off-axis RF magnetron sputtering is used to grow the PZT gate dielectric, which is characterized by square polarization-electric field hysteresis loops, with a large polarization and low leakage current. We use a combination of low-field magneto-transport and magneto-optic Kerr effect (MOKE) magnetometry to study the ferroelectric field effect induced changes in the magnetic coercive field in PZT/LSMO bilayers. A reversible shift in the coercive field is observed for the two polarization states of the ferroelectric, with a larger coercive field in polarization state that accumulates hole carriers at the PZT/LSMO interface. The reversible electrical control of magnetism in engineered heterostructures is opens new directions in the field of spintronics.

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