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Cation Valence Control in $La_{0.7}Sr_{0.3}Co_{0.5}Mn_{0.5}O_3$ Thin Films and Bilayers ALEX KANE, RAJESH CHOPDEKAR, University of California, Davis, ELKE ARENHOLZ, Advanced Light Source, Lawrence Berkeley National Laboratory, APURVA MEHTA, Stanford Synchrotron Radiation Lightsource, SLAC National Accelerator Laboratory, YAYOI TAKAMURA, University of California, Davis
— The unique interplay between spin, orbital, charge, and lattice degrees of freedom at interfaces in perovskite oxides makes them model systems to probe and exert magnetic control at the nanoscale. Previous work revealed exchange coupling in bilayers composed of a hard ferromagnetic (FM) $La_{0.7}Sr_{0.3}CoO_3$ (LSCO) layer and a soft FM $La_{0.7}Sr_{0.3}MnO_3$ (LSMO) layer, coincident with charge transfer across the LSCO/LSMO interface. An interfacial Co^{2+}-rich LSCO layer produced a FM superexchange interaction with Mn^{4+} ions in the adjacent LSMO layer, [1] mimicking the behavior of ordered Co^{2+}/Mn^{4+} ions in the double perovskite La_2CoMnO_6 [2]. In an attempt to manipulate the extent of charge transfer in this system, $La_{0.7}Sr_{0.3}Co_{0.5}Mn_{0.5}O_3$ (LSCMO)/LSMO and LSCMO/LSCO bilayers were deposited by pulsed laser deposition. Bulk magnetometry and soft x-ray magnetic spectroscopy were used to investigate the Mn/Co magnetic and electronic structures, comparing the surface/interface dominant effects vs. the film average. The LSCMO/LSMO bilayer enhanced the magnetically soft Co^{2+} population at the interface, while the LSCMO/LSCO bilayers strongly suppressed the Co^{2+} state in the LSCMO layer. [1] B. Li, et. al., APL. 105, 202401 (2014) [2] R. I. Dass and J. B. Goodenough, PRB, 67, 014401 (2003)

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