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Orientation dependence of the interfacial magnetic phase separation in epitaxial $\text{La}_{1-x}\text{Sr}_x\text{CoO}_3$ films on SrTiO_3 and LaAlO_3 substrates¹ M. SHARMA, M.A. TORIJA, J. SCHMIDT, C. HE, C. LEIGHTON, UMN, J. GAZQUEZ, M. VARELA, ORNL, M. LAVER, S. EL-KHATIB, B.B. MARANVILLE, J.A. BORCHERS, NIST, M. ZHERNENKOV, M.R. FITZSIMMONS, LANL — We have observed interfacial magneto-electronic phase separation in epitaxial films of $\text{La}_{1-x}\text{Sr}_x\text{CoO}_3$ ($x > 0.18$) on SrTiO_3 (001) substrates, where no such phase separation occurs in the bulk. This magnetic phase separation was detected indirectly via reduced magnetization, insulating transport, and the presence of intercluster type GMR, and subsequently verified directly by small-angle neutron scattering. Z contrast STEM/EELS results reveal that the effect originates from a reduction in local hole doping near the interface, due to combined and subtle effects of slight Sr and O deficiency. Surprisingly, films on SrTiO_3 (110) and LaAlO_3 (001) surfaces show a large reduction in the thickness of this interfacial phase separated region. The origin of this suppression, which is important for heterostructured devices, will be discussed in light of detailed magnetotransport, Z contrast STEM/EELS and polarized neutron reflectivity measurements in different orientations.

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