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Orientation and Strain Dependence of the Magnetic Phase Separation at Perovskite Cobaltite Interfaces[1] S. BOSE, M. SHARMA, M.A. TORIJA, CEMS, UMN, J. GAZQUEZ, M. VARELA, MST, ORNL and Univ Complutense, Madrid, H. AMBAYE, R. GOYETTE, V. LAUTER, Neutron Sciences Directorate, ORNL, M.R. FITZSIMMONS, LANSCE, LANL, J. SCHMITT, C. LEIGHTON, CEMS, UMN — We recently showed that the degraded magnetic and electronic properties in very thin STO(001)/$La_{1-x}Sr_xCoO_3$ films is due to a form of magnetic phase separation. This is primarily due to the strain driven accumulation of O vacancies near the interface. In this work we demonstrate how this understanding allows us to engineer these interfacial properties via crystallographic orientation and strain control. Using PNR, magnetometry and transport, we show how this degradation can be significantly mitigated by using LAO(001) and STO(110) substrates cf. STO(001). PNR on 400Å x=0.28 films reveals an interfacial layer with suppressed magnetism on all three substrates. However, while this layer is 150Å on STO(001), it extends at most to 30Å on LAO(001) and STO(110). Transport measurements on x=0.5 films show that at a thickness of $\sim$ 55Å, films on STO(110) and LAO(001) exhibit AMR whereas films on STO(001) are dominated by inter-cluster GMR. Finally, thickness dependent magnetometry shows that the magnetic order deteriorates more quickly on STO(001) than on LAO(001) and STO(110). Our work thus opens up a possible new route to tailor interfacial magneto-electronic properties in oxide heterostructures.

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