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Ordering of defects induced by epitaxy in $LaCoO_3$ films[1] VIRAT MEHTA, University of California-Berkeley, NEVEN BISKUP, Universidad Complutense, Madrid 2840, Spain, FRANKLIN WONG, University of California-Berkeley, ELKE ARENHOLZ, Lawrence Berkeley National Laboratory-Advanced Light Source Division, MARIA VARELA, Oak Ridge National Laboratory, YURI SUZUKI, University of California-Berkeley — In the bulk, LaCoO3 (LCO) undergoes a spin state transition from a diamagnet to a paramagnet with increasing temperature. Recent studies of epitaxial LCO thin films have resulted in the stabilization of a higher spin state and ferromagnetic ordering at low temperatures. Here, we explore the effects of epitaxy on the electronic structure of LCO films with X-ray absorption spectroscopy (XAS) and scanning transmission electron microscopy (STEM). We find differences in XAS spectra in coherently strained thinner films compared to the thicker partially relaxed films which may be due to differences in Co valence and bonding. STEM and electron energy loss spectroscopy of thinner LCO films reveal ordered defect planes that appear to be associated with a change in the O and Co bonding environments. In films on LaAlO3 strained in compression periodic planes occur parallel to the substrate-film interface, while films on SrTiO3 strained in tension have perpendicular defect planes. Correlation with magnetic data suggests that defect rich regions may exhibit greater ferromagnetism.

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