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Percolation-Type Ferromagnetic Order in Epitaxial Strained $LaCoO_3$ Thin Films GEORGE STERBINSKY, National Institute of Standards and Technology, PHILIP RYAN, JONG-WOO KIM, EVGUENIA KARAPETROVA, Advanced Photon Source, Argonne National Laboratory, J. MA, JING SHI, Department of Physics, University of California, Riverside, JOSEPH WOICIK, National Institute of Standards and Technology — Support for percolation-type ferromagnetic order in $LaCoO_3$ thin films is provided by x-ray diffraction and Co K-edge x-ray absorption fine structure (XAFS) spectroscopy. X-ray diffraction shows considerable changes in structure with respect to bulk $LaCoO_3$, and extended XAFS (EXAFS) demonstrates a large Jahn-Teller like distortion of the oxygen octahedra in highly strained films. Structural distortions of the oxygen octahedra are strongly coupled to the hybridization between orbitals of Co and O atoms, as shown by x-ray absorption near edge spectroscopy (XANES). Our results indicate that increased Co-O hybridization, and therefore increased magnetic exchange energy, does not cause ferromagnetism to occur in $LaCoO_3$ thin films. Instead, we suggest that the strain-induced distortions of the oxygen octahedra increase the population of e_g electrons and concurrently depopulate t_{2g} electrons beyond a stabilization threshold for ferromagnetic order.

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