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Magnetism in LaCoO₃ epitaxial thin films

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Publication Date

2010-03-29

Magnetism in LaCoO₃ epitaxial thin films VIRAT MEHTA, UC Berkeley, Dept. of Mat. Sci. and Eng., MARCO LIBERATI, ELKE ARENHOLZ, Advanced Light Source, Lawrence Berkeley National Laboratory, YURI SUZUKI, UC Berkeley, Dept. of Mat. Sci. and Eng. — Bulk LaCoO₃(LCO) exhibits a competition between diamagnetic and paramagnetic behavior without any magnetic ordering. Recent studies of epitaxial LCO thin films surprisingly show ferromagnetism. While some have attributed this to tetragonal distortions from the substrate or to a cation or oxygen non-stoichiometry, many discrepancies and open questions still persist as to the precise mechanism underlying the magnetism. To address this we have synthesized and characterized epitaxial LCO films grown on SrTiO₃, LaAlO₃, (La,Sr)(Al,Ta)O₃, and YAlO₃ substrates inducing different strain states. The films grown in oxygen rich atmospheres are ferromagnetic with a Curie temperature of 75K-85K. The observed magnetic moment varies with strain but remains consistently below $2\mu\text{B}/\text{Co}$ ion indicative of an intermediate Co spin state. Synchrotron x-ray techniques reveal a small orbital contribution to the total Co magnetic moment.

Supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.