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Separation of the strain and finite size effect on the ferromagnetic properties of $La_{0.5}Sr_{0.5}CoO_3$ thin films[1] CHANGKUN XIE, JOSEPH BUDNICK, BARRETT WELLS, Department of Physics, University of Connecticut, Storrs, CT 06269-3046, JOSEPH WOICIK, National Institute of Standards and Technology, Gaithersburg, Maryland 20899 — The ferromagnetic properties of epitaxial $La_{0.5}Sr_{0.5}CoO_3$ thin films have been studied. The magnetic transition is affected by both strain and finite thickness. We have used a series of films of different thickness and on different substrates in order to quantitatively determine the change in Curie temperature contributed by each effect. The phase diagram of T_C versus in-plane strain suggests that the ferromagnetic transition temperature is suppressed by tensile strain and enhanced by compressive strain. The general method of separating strain and finite thickness effects should be applicable to any ordering phase transition in thin films. A leading theory for the ferromagnetism in $La_{0.5}Sr_{0.5}CoO_3$ is the double exchange mechanism. This model relies upon Co-O-Co electron hopping so that a strong dependence on bond length is expected. Our recent EXAFS results will examine whether the double exchange mechanism quantitatively predicts the strain dependence we have measured.

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