Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Origin of ferromagnetic ordering in $LaCoO_3$ epitaxial thin films[1] WOO SEOK CHOI, Oak Ridge National Laboratory, J.-H. KWON, Seoul National University, HYUNGJEEN JEEN, Oak Ridge National Laboratory, VLADIMIR HINKOV, University of British Columbia, M. KIM, Seoul National University, HO NYUNG LEE, Oak Ridge National Laboratory — $LaCoO_3$ (LCO) film has received attention due to its unexpected ferromagnetic (FM) ordering, which is distinctly different from the bulk counterpart. Although the exact origin has not been understood, previous studies have suggested that the epitaxial strain should play an important role. In this work, we show that the FM ordering could be related to a locally-ordered microstructure. We used PLD to deposit epitaxial LCO thin films on various substrates in order to impose different degree of strain. XRD and XAS studies showed that the films are of high quality, without any secondary phases or changes in the Co valence. In addition, all the films were coherently-strained. From the STEM investigation, however, we noticed that some of the films had an unexpected stripe-like superstructure along the <100> direction. While the microstructure resembles that of oxygen-vacancy or charge ordering, typically found in doped transition metal oxides, we could rule out such possibilities and interpret it as a nanoscale twin boundary. The strain induced structural change seems to originate the FM ordering.

[1]The work was supported by the U.S. Department of Energy, Basic Energy Sciences, Materials Sciences and Engineering Division.

Woo Seok Choi
Oak Ridge National Laboratory

Date submitted: 11 Nov 2011 Electronic form version 1.4