

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Magneto-electronic Phase Separation in $\text{Pr}_{1-x}\text{Ca}_x\text{CoO}_{3-\delta}$: Intrinsic Exchange Spring Magnetism¹ S. EL-KHATIB, American University of Sharjah, S. BOSE, C. HE, J. KUPLIC, University of Minnesota, M. LAVER, J.A. BORCHERS, Q. HUANG, J.W. LYNN, NIST Center for Neutron Research, J.F. MITCHELL, Argonne National Laboratory, C. LEIGHTON, University of Minnesota — We present a neutron diffraction, small-angle scattering, and magnetometry study of the narrow bandwidth perovskite cobaltite $\text{Pr}_{1-x}\text{Ca}_x\text{CoO}_3$, demonstrating an unusual form of magneto-electronic phase separation where long-range ordered ferromagnetism coexists spatially with short-range ferromagnetism. The two phases have very different coercivities and, remarkably, are strongly exchange coupled. The electronic phase separation thus leads to spontaneous formation of a hard-soft nanocomposite, exhibiting prototypical exchange-spring behavior in the absence of chemical interfaces.

¹Work at UMN supported by DoE (neutron scattering) and NSF.

S. El-Khatib
American University of Sharjah

Date submitted: 15 Nov 2010

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