Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Multiferroic Domain Dynamics and Phase Transitions in Strained $SrTiO_3$ Films S. DENEV, A. VASUVADERAO, A. KUMAR, M. BIEGALSKI, Y. LI, L.-Q. CHEN, S. TROLIER-MCKINSTRY, D. SCHLOM, V. GOPALAN, Dept. of Materials Science and Engineering, Pennsylvania State University — $SrTiO_3$ is a material that is not normally ferroelectric or multiferroic at any temperature. However, epitaxial biaxial strain in thin film form can induce multiferroicity in strained $SrTiO_3$ (J.H.Haeni *et al.*,Nature **430**,758 (2004)). We have demonstrated multiferroicity in strained $SrTiO_3$ films on scandate substrates, with the presence of two independent order parameters, a polar ferroelectric polarization vector, and an axial antiferrodistortive rotation vector. Using Optical Second Harmonic Generation (SHG), we have distinguished these axial and polar properties, tracked the ferroelectric and antiferrodistortive phase transitions as a function of temperature, and determined the point group symmetry of the ferroelectric and multiferroic phases. For the first time, we have shown direct imaging of ferroelectric domains and revealed the mechanism of coupled switching of ferroelectric-ferroelastic domains under electric fields using piezoelectric force microscopy combined with phase field simulations. (Phys. Rev. Lett., Accepted, in print (2006)). These studies have broader relevance to multiferroics with coupled polar and axial order parameters, such as ferroelectric antiferromagnets.

S. Denev
Dept. of Materials Science and Engineering, Pennsylvania State University

Date submitted: 20 Nov 2006 Electronic form version 1.4