Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Strain-induced Electric Field Switching of Magnetic Anisotropy in Ferromagnetic/Ferroelectric Interface[1] DORJ ODKHUU, Department of Physics, Incheon National University, South Korea, P. V. ONG, T. TSEVELMAA, N. KIOUSSIS, Department of Physics and Astronomy, California State University Northridge,USA — Multifunctionality of the magnetoelectric materials, simultaneous electric and magnetic orders, would offer a great opportunity in memory applications, in which switching the magnetization direction with an electric field is the main prerequisite. Ab initio calculations were carried out to reveal the importance of an epitaxial strain on magnetoelectric effects, possibly the spin reorientation of magnetization by ferroelectric polarization, in the interface between ferroelectric and ferromagnetic films. As a generic example, we show that the compressive strains larger than 1% that imposed to the in-plane lattice of $SrTiO_3$ (001) underneath the Fe (001) overlayers result in a phase transition in magnetocrystalline anisotropy (MCA) from an in-plane to perpendicular magnetization with polarization reversal. A considerably large sensitivity of MCA with ferroelectric polarization is also found in the strained $Fe/SrTiO_3$ (001), a factor of greater than those of well-studied multiferroic heterostructures. This switching of magnetization pertains to a competition of spin-orbit coupling states between t_{2g} bands, driven by the mutual mechanisms of the electrostatic screening with the spin-polarized carriers and the orbital hybridization at the interface.

[1]This work was supported by NSF Grant No. ERCTANMS- 1160504.

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Date submitted: 14 Nov 2014 Electronic form version 1.4