Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Piezoelectric tuning of exchange bias from negative to positive bias fields[1] SRINIVAS POLISETTY, CHRISTIAN BINEK, University of Nebraska, SARBESWAR SAHOO, Seagate Technology — Tuning of the exchange bias has been attempted using magnetoelectric and multiferroic systems. Alternatively, we propose tuning of the exchange bias via the piezoelectric property of ferroelectric material. A ferromagnetic Co thin film is deposited on top of a ferroelectric tetragonal $BaTiO_3$ (001) by using MBE at a base pressure of 1.5×10^{10}m bar. An ex-situ antiferromagnetic CoO film is naturally formed on top of the Co Hereby, the piezoelectric $BaTiO_3$ induced electrically tunable stress in the adjacent Co film. The stress induced strain alters the magnetic anisotropy of the Co film and by that the magnetization at the Co/CoO-interface modifying the exchange bias field. This includes sign change of the exchange bias from negative to positive bias fields by increasing electric field applied on $BaTiO_3$. The observed complex electric field dependence of the exchange bias is interpreted through competition between ferromagnetic and antiferromagnetic exchange at the rough Co/CoO interface. The competition involves weakening of negative exchange bias through deviations from collineraity of the Co and CoO interface magnetization and simultaneous activation of antiferromagnetic exchange giving rise to a crossover into positive exchange bias.

[1]Thanks to NSF through CAREER DMR-0547887, NRI and MRSEC.

Srinivas Polisetty
University of Nebraska

Date submitted: 10 Nov 2009 Electronic form version 1.4