Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Ferroelectric field effect tuning of planar Hall effect in epitaxial $La_{0.8}Sr_{0.2}MnO_3$ thin films ANIL RAJAPITAMAHUNI, XIA HONG, University of Nebraska-Lincoln — We report the ferroelectric field effect modulation of planar Hall effect in ultra-thin $La_{0.8}Sr_{0.2}MnO_3$ (LSMO) films. We fabricated LSMO thin filmsand Pb(Zr,Ti)O_3 (PZT)/LSMO heterostructures on (001) $SrTiO_3$ substrates via off-axis RF magnetron sputtering, with high crystallinity and smooth surfaces. We worked with LSMO thin films with thickness close to the electric dead layer thickness (˜4 nm). The resistivity-peak temperature (T_p) is ˜170 K, significantly lower than the bulk value, with magnetoresistance (MR) ratio of 8.6 observed at 150K. We employed planar Hall effect (PHE) to study the in-plane magnetocrystalline anisotropy (MCA). The PHE resistance of LSMO films exhibits sinusoidal angular dependence in an in-plane magnetic field and shows four-fold resistance switching below a critical magnetic field of 500 Oe. This yields a biaxial magnetic anisotropy energy density of ˜1.09 x 10^5 erg/cm^3, with the easy axis along <110>directions. We then modulate the carrier density in the PZT/LSMO heterostructure via ferroelectric polarization switching. We will discuss the effect of electric field doping on the magnetotransport properties such as T_p, MR, and MCA of the LSMO thin films.

Anil Rajapitamahuni
University of Nebraska-Lincoln

Date submitted: 13 Nov 2016 Electronic form version 1.4