Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Ferroelectric field effect control of electronic and magnetic properties in ultrathin manganite films ZSOLT MARTON, Univ. of Pennsylvania, HO NYUNG LEE, Oak Ridge National Laboratory, TAKESHI EGAMI, Univ. of Tennessee/Oak Ridge National Laboratory — Electrostatic modulation of the carrier density in correlated electron oxides can be used to bring about drastic modifications of the electronic and magnetic properties. Therefore, in order to test the fascinating concept of electrostatic modulation of carrier population, we have fabricated field effect heterostructures composed of ferroelectric $PbZr_{0.2}Ti_{0.8}O_3$ (PZT) and magnetic $La_{1-x}Sr_xMnO_3$ (LSMO) thin films by pulsed laser deposition on $SrTiO_3$. The high polarization (80 $\mu C/cm^2$) in PZT is found to be crucial to effectively alter the carrier density in the vicinity of the interface between two layers. Note that the polarization of our PZT films corresponds to 0.8 e/interface unit cell. As an example, we have observed a clear metal-insulator-transition by changing the direction of ferroelectric polarization, resulting in a huge resistance change (up to about three orders of magnitude). In this talk, therefore, we will present a study on how effectively the transport and magnetic properties can be modulated by ferroelectric polarization by systematically changing the hole concentration in LSMO films. Furthermore, the influence of thickness and strain on the carrier modulation will be also discussed (Research sponsored by the LDRD Program of ORNL and by NSF DMR-0602876).

Zsolt Marton
Univ. of Pennsylvania

Date submitted: 20 Nov 2009 Electronic form version 1.4