Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Giant tunneling electroresistance (up to ~10,000%) in $La_{0.7}Sr_{0.3}MnO_3/BaTiO_3/La_{0.5}Ca_{0.5}MnO_3/La_{0.7}Sr_{0.3}MnO_3$ ferroelectric tunnel junctions YUEWEI YIN, QI LI, Department of Physics, Pennsylvania State University, University Park, PA 16802, USA, J.D. BURTON, E.Y. TSYMBAL, Department of Physics and Astronomy, Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln, NE 68588, USA, X.G. LI, Hefei National Laboratory for Physical Sciences at Microscale, Department of Physics, University of Science and Technology of China, Hefei 230026, PRC — Tunnel junction with a Ferroelectric (FE) barrier (FTJ) presents an opportunity for nanoelectronics because of the bi-stable electric field control of the tunneling resistance. FTJs of $La_{0.7}Sr_{0.3}MnO_3/BaTiO_3/La_{0.5}Ca_{0.5}MnO_3/La_{0.7}Sr_{0.3}MnO_3$ have been fabricated with pulsed-laser deposition. The special feature in the FTJ design is to insert an ultrathin (0.4 - 1.2 nm) $La_{0.5}Ca_{0.5}MnO_3$ film between $La_{0.7}Sr_{0.3}MnO_3$ Ferromagnetic (FM) electrode and $BaTiO_3$ FE barrier. A giant and reproducible tunneling electroresistance effect (~10,000%) was obtained with the reversal of FE polarization, about two orders of magnitude larger than the similar sized FTJ without the inserted $La_{0.5}Ca_{0.5}MnO_3$ layer. This result is consistent with the theoretical prediction [PRL 106, 157203 (2011)] that at a $BaTiO_3/La_{0.5}Ca_{0.5}MnO_3$ interface, an anti-FM insulating - FM metallic phase transition can occur in $La_{0.5}Ca_{0.5}MnO_3$ when the polarization of the $BaTiO_3$ is reversed due to the interfacial charge doping effect.

Yuewei Yin
Department of Physics, Pennsylvania State University,
University Park, PA 16802, USA

Date submitted: 21 Nov 2011 Electronic form version 1.4