Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Angular dependence of exchange bias and magnetization reversal controlled by electric-field-induced competing anisotropies. YONGGANG ZHAO, AITIAN CHEN, PEISEN LI, Tsinghua University, XU ZHANG, Beijing National Laboratory for Condensed Matter Physics, Chinese Academy of Sciences, RENCI PENG, Tsinghua University, HAOLIANG HUANG, University of Science and Technology of China, LVKUAN ZOU, XIAOLI ZHENG, Beijing National Laboratory for Condensed Matter Physics, Chinese Academy of Sciences, SEN ZHANG, College of National University of Defense Technology, PEIXIAN MIAO, Tsinghua University, YALIN LU, University of Science and Technology of China, JIAN CAI, Beijing National Laboratory for Condensed Matter Physics, Chinese Academy of Sciences, CE-WEN NAN, Tsinghua University — Combination of exchange-biased systems and FE materials gives a new avenue to study angular dependence of exchange bias and achieve reversible electric-field-controlled magnetization reversal. We study the angular dependence of electric-field-controlled exchange bias and magnetization reversal in CoFeB/IrMn/$Pb(Mg_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}O_3$. It is demonstrated that the ratio of the exchange-coupled unidirectional anisotropy and the uniaxial anisotropy of the FM layer, as well as their relative orientation can be dramatically and continuously tuned via electric fields. Simulations confirm that the electric-field-controlled exchange bias originates from the competition between the uniaxial anisotropy induced by the piezostrain and the exchange-coupled unidirectional anisotropy. Moreover, electric-field-controlled magnetization reversal was realized at zero magnetic field.

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Date submitted: 06 Nov 2015 Electronic form version 1.4