Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Voltage controlled exchange bias in an all-thin-film Cr_2O_3 based heterostructure[1] WILL ECHTENKAMP, CHRISTIAN BINEK, University of Nebraska - Lincoln — Spintronics utilizes the electron's spin degree of freedom for an advanced generation of electronic devices with novel functionalities. Controlling magnetism by electrical means has been identified as a key challenge in the field of spintronics, and electric control of exchange bias is one of the most promising routes to address this challenge. Previously, robust isothermal electric control of exchange bias has been achieved near room temperature utilizing a bulk single crystal of Cr_2O_3 [1,2]. In this study electric control of exchange bias in an all-thin-film system is demonstrated with significant implications for device realization. In particular, voltage controlled switching of exchange bias in a Cr_2O_3 based magnetoelectric magnetic tunnel junction enables nonvolatile memory storage with virtually dissipationless writing at, or above, room temperature. Additionally, unique physical properties which arise due to the Cr_2O_3 thin film geometry are highlighted.

[1] Xi He, et. al, Nat. Mater. 9, 579-585 (2010)
[2] W. Echtenkamp, Ch. Binek, Phys. Rev. Lett. 111, 187204 (2013)

[1]This project is supported by NSF through MRSEC DMR 0213808, by the NRC/NRI supplement to MRSEC, and by CNFD and C-SPIN, one of six centers of STARnet, a Semiconductor Research Corporation program

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Date submitted: 14 Nov 2013 Electronic form version 1.4