Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

**Probing boundary magnetization through exchange bias in heterostructures with competing anisotropy**[1] YI WANG, CHRISTIAN BINEK, Department of Physics and Astronomy, University of Nebraska-Lincoln — $Cr_2O_3$ (chromia) is a magnetoelectric antiferromagnet with a bulk $T_N$ of 307 K. It has been utilized for electrically controlled exchange bias (EB) by taking advantage of voltage-controllable boundary magnetization (BM) occurring as a generic property in magnetoelectric single domain antiferromagnets.[2] In the perpendicular $Cr_2O_3$(0001)/CoPd EB system the EB-field shows an order parameter type T-dependence close to $T_N$ reflecting the T-dependence of the BM. At about 150 K a decrease of the EB-field sets in with decreasing temperature suggesting canting of the BM. To evidence this mechanism we use EB as a probe. Specifically, we investigate EB in Permalloy(5nm)/$Cr_2O_3$ (0001)(100nm) with Permalloy and chromia having competing anisotropies. We measure easy axis magnetic hysteresis loops via longitudinal magneto-optical Kerr effect for various temperatures after perpendicular and in-plane magnetic field-cooling. The T-dependence of the EB field supports the canting mechanism. In addition to the all thin film EB system, we explore a Permalloy(10nm)/$Cr_2O_3$(0001 single crystal) heterostructure where magnetoelectric annealing allows selecting $Cr_2O_3$ single domain states. Here the effect of T-dependent canting of the BM is compared with findings in the complementary perpendicular EB system.

[1]Financial support by NSF through MRSEC and the Nanoelectronic Research Initiative.
[2]Xi He, et al., Nature Mater.**9**, 579-585 (2010)

Yi Wang
Department of Physics and Astronomy, University of Nebraska-Lincoln

Date submitted: 28 Nov 2012 Electronic form version 1.4