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Investigation of Boundary Magnetization and Exchange Bias of B-doped Chromia MICHAEL STREET, WILL ECHTENKAMP, CHRISTIAN BINEK, University of Nebraska-Lincoln — This work is devoted to utilize the magnetoelectric material Cr_2O_3 (chromia) for spintronics. We exploit the electric switchable boundary magnetization (BM) of chromia to manipulate an adjacent exchange-coupled ferromagnetic material. Using a ferromagnetic Co/Pd multilayer deposited on chromia, reversible, room-temperature isothermal switching of the exchange bias (EB) field has been achieved by reversing the electric field in the presence of a constant magnetic field. To use voltage-controlled BM in chromia as a key component in a spintronic device, the Néel temperature must be increased above the bulk value of T_N =307 K. First principle calculations show that boron doping of chromia can increase T_N by roughly 10% per 1% O site substitution by B. We have grown B-doped chromia samples in a gaseous decaborane background atmosphere. We diagram structural and magnetic characterizations of pure and B-doped chromia. SQUID measurements of the BM of B-doped chromia samples indicate an enhancement of T_N from the bulk value. This finding has been corroborated by spin dependent inverse photoemission spectroscopy [Ref]. Further, we investigate EB systems using a Co/Pd multilayer deposited on B-doped chromia for independent proof of T_N increase in the experimental context most relevant for voltage-controlled spintronics. [Ref] M. Street, et al., Appl. Phys. Lett. 104, 222402 (2014). This work was supported in part by C-SPIN, a center of STARnet, a SRC program, sponsored by MARCO and DARPA.

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