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Boundary Magnetization and Exchange Bias of Boron Doped Cr_2O_3 Pinning Layers[1] MICHAEL STREET, WILL ECHTENKAMP, PETER DOWBEN, CHRISTIAN BINEK, Univ of Nebraska - Lincoln — This research is part of an effort to utilize voltage-controlled boundary magnetization (BM) in the magnetoelectric (ME) Cr_2O_3 for spintronic applications. We exploit the electric switchable boundary magnetic moment (MM) of Cr_2O_3. The net MM at the interface can be useful to manipulate the magnetic states of an adjacent ferromagnetic (FM) material. Using a FM Pd/Co multilayer deposited on Cr_2O_3, reversible, room-temperature isothermal switching of the exchange bias field has been achieved by reversing the electric field. The voltage-controlled magnetization of the FM layer can be utilized as a state variable. However, to use voltage-controlled BM as a key spintronic material for devices operating at room temperature, the Néel temperature T_N of the ME antiferromagnet must be increased above the bulk value of T_N =307 K of pure Cr_2O_3. First principles calculations show that boron doping of Cr_2O_3 can increase T_N. We diagram structural and magnetic characterizations of pure and B-Cr_2O_3 grown on Al_2O_3. An increase in T_N of 120 K is achieved making Cr_2O_3 suitable for room temperature spintronic applications. Further, we attempt to create an exchange bias (EB) system using a FM Pd/Co multilayer on B-doped Cr_2O_3. From this, we attempt to switch the EB field via the electric field.

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