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Simultaneous Kerr and Faraday investigations of boundary magnetization and order parameter switching in voltage-controllable exchange bias films[1] JUNLEI WANG, WILL ECHTENKAMP, MIKE STREET, CHRISTIAN BINEK, University of Nebraska-Lincoln — Magnetoelectric oxides are of great interest for ultra-low power spintronics with memory and logic function. A key property for the realization of electrically switchable state variables is the voltage-controlled boundary magnetization in magnetoelectric antiferromagnets. It allows electric switching of an adjacent exchange coupled ferromagnetic layer in the absence of dissipative currents. Previous surface sensitive measurements of boundary magnetization in thin films of the archetypical magnetoelectric antiferromagnet chromia lacked explicit demonstration of the predicted rigid coupling between the bulk antiferromagnetic order parameter and the boundary magnetization. We designed a magneto-optical setup allowing simultaneous measurement of Kerr and Faraday rotation. Our experiments correlate electric field induced bulk magneto-optical effects (non-reciprocal rotation), including the response on switching of the antiferromagnetic order parameter, with the boundary magnetization. Our results suggest that switching of a ferromagnetic film strongly exchange coupled to a magnetoelectric antiferromagnetic ultra-thin film allows switching of the antiferromagnetic order parameter. We investigate the possibility that this switching phenomenon might induce a voltage pulse via a generalized variation of the inverse linear magnetoelectric effect.

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Junlei Wang
University of Nebraska-Lincoln

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