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Correlated electric-field induced reversal of antiferromagnetic order and surface magnetization in magnetoelectric Cr_2O_3[1] JUNLEI WANG, UDAY SINGH, CHRISTIAN BINEK, Univ of Nebraska - Lincoln — The electric-field-induced Faraday effect in magnetoelectrics comprises a superimposition of linear electric field responses with temperature dependencies of the linear magnetoelectric susceptibility and the antiferromagnetic order parameter. The tunability of the relative strength between the two contributions leads to a table-top set-up allowing to measure voltage-controlled selection and temperature dependence of the antiferromagnetic order parameter. Simultaneous measurement of the polar Kerr effect and the electric-field-induced Faraday effect is utilized to investigate correlated formation and switching of the surface magnetization and bulk antiferromagnetic order in Cr_2O_3 The correlated reversal of surface or boundary magnetization in response to voltage-controlled reversal of the bulk antiferromagnetic order parameter is of key importance for applications in spintronic devices such as the magnetoelectric MRAM. The Faraday rotation per applied voltage is independent of the sample thickness making the method scalable and versatile for thin film investigations. Scalability, compactness, and simplicity of the data analysis combined with low photon flux requirements make the Faraday approach advantageous for the investigation of the otherwise difficult to access voltage-controlled switching of antiferromagnetic domain states in magnetoelectric thin films.

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