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Magneto-Ionic Control of Interfacial Magnetic Anisotorpy[1] UWE BAUER, SATORU EMORI, GEOFFREY BEACH, Department of Materials Science and Engineering, Massachusetts Institute of Technology — Voltage control of magnetism could bring about revolutionary new spintronic memory and logic devices. Here, we examine domain wall (DW) dynamics in ultrathin Co films and nanowires under the influence of a voltage applied across a gadolinium oxide gate dielectric that simultaneously acts as an oxygen ion conductor. We investigate two electrode configurations, one with a continuous gate dielectric and the other with a patterned gate dielectric which exhibits an open oxide edge right underneath the electrode perimeter. We demonstrate that the open oxide edge acts as a fast diffusion path for oxygen ions and allows voltage-induced switching of magnetic anisotropy at the nanoscale by modulating interfacial chemistry rather than charge density. At room temperature this effect is limited to the vicinity of the open oxide edge, but at a temperature of 100°C it allows complete control over magnetic anisotropy across the whole electrode area, due to higher oxygen ion mobility at elevated temperature. We then harness this novel "magneto-ionic" effect to create unprecedentedly strong voltage-induced anisotropy modifications of 3000 fJ/Vm and create electrically programmable DW traps with pinning strengths of 650 Oe, enough to bring to a standstill DWs travelling at speeds of at least 20 m/s.

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Uwe Bauer
Department of Materials Science and Engineering,
Massachusetts Institute of Technology

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