

Abstract Submitted
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Surface Magnetoelectric Effects from First Principles. CHUN-GANG DUAN, Key Laboratory of Polarized Materials and Devices, East China Normal University, Shanghai, China, CE-WEN NAN, Department of Materials Science and Engineering, Tsinghua University, Beijing, China, SITARAM S. JASWAL, EVGENY Y. TSYMBAL, Department of Physics and Astronomy, University of Nebraska, Lincoln, Nebraska, USA — A magnetoelectric effect allows affecting magnetic properties of materials by applying electric fields which may be interesting for potential technological applications such as electrically controlled magnetic data storage. We use density functional calculations to reveal and elucidate magnetoelectric effects due to an electric field applied to ferromagnetic metal surfaces.¹ We find that the surface magnetoelectric effect originates from spin-dependent screening of the electric field and leads to notable changes in the surface magnetization and the surface magnetocrystalline anisotropy. If the ferromagnet is a half-metal the screening charge is formed entirely by a single conducting spin channel which leads to the surface magnetoelectric coefficient being the universal constant $\mu_B/ec^2 \approx 6.44 \times 10^{-14} \text{ Gcm}^2/V$. This is in an excellent agreement with our first-principles calculation result for the half-metal CrO_2 . These results are of considerable interest in the area of electrically-controlled magnetism and magnetoelectric phenomena. 1. C.-G. Duan et al., *Phys. Rev. Lett.* 101, 137201 (2008).

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