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Interface states in $CoFe_2O_4$ spin-filter tunnel junctions PAVEL LUKASHEV, J.D. BURTON, Department of Physics and Astronomy and Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln, Nebraska 68588, USA, ALEXANDER SMOGUNOV, CEA, Institut Rayonnement Matière de Saclay, SPCSI, F-91191 Gif-sur-Yvette Cedex, France, JULIAN VELEV, Department of Physics, Institute for Functional Nanomaterials, University of Puerto Rico, San Juan, Puerto Rico 00931, USA, EVGENY TSYMBAL, Department of Physics and Astronomy and Nebraska Center for Materials and Nanoscience, University of Nebraska, Lincoln, Nebraska 68588, USA — Spin-filter tunneling is a promising way to generate highly spin-polarized current, a key component for spintronics applications. In this work we explore the tunneling conductance across the spin-filter material $CoFe_2O_4$ interfaced with Au electrodes, a geometry which provides nearly perfect lattice matching at the $CoFe_2O_4$/Au(001) interface.[1] Using density functional theory calculations we demonstrate that interface states play a decisive role in controlling the transport spin polarization in this tunnel junction. For a realistic $CoFe_2O_4$ barrier thickness, we predict a tunneling spin polarization of about -60%. We show that this value is lower than what is expected based solely on considerations of the spin-polarized band structure of $CoFe_2O_4$, and therefore that these interface states can play a detrimental role. We argue that this is a rather general feature of ferrimagnetic ferrites and could make an important impact on spin-filter tunneling applications.

[1]P. Lukashev, et al., Phys. Rev. B, **88**, 134430 (2013).

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