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Highly Spin-Polarized Conducting State at the Interface between Nonmagnetic Band Insulators: LaAlO3/FeS2 (001) J.D. BURTON, E.Y. TSYMBAL, University of Nebraska - Lincoln, Nebraska Center for Materials and Nanoscience — Interface engineering of complex oxide heterostructures allows creating interfaces with properties and functionalities distinct from those typical for the respective bulk constituents. In the spirit of the well known conducting LaAlO3/SrTiO3 interface we study a similar interface with the added functionality of being unambiguously ferromagnetic. Our first-principles density functional calculations demonstrate that such a spin-polarized two-dimensional conducting state can be realized at the (001) interface between the two non-magnetic band insulators FeS2 and LaAlO3. The (001) surface of FeS2(pyrite), a diamagnetic insulator, supports a localized surface state deriving from the Fe d-orbitals near the conduction band minimum. We find that, similar to the LaAlO3/SrTiO3 system, the deposition of a few unit cells of the polar perovskite oxide LaAlO3 leads to electron transfer into these surface bands, thereby creating a conducting interface. The occupation of these narrow bands leads to an exchange splitting between the spin sub-bands, yielding a highly spin-polarized conducting state quite distinct from the rest of the non-magnetic, insulating bulk. [Ref: J. D. Burton and E. Y. Tsymbal, Phys. Rev. Lett. 107, 166601 (2011).]

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