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Prediction of a Spin-Polarized Two-Dimensional Electron Gas at the LaAlO3/EuO(001) Interface YONG WANG, MANISH NIRANJAN, JOHN BURTON, JOONHEE AN, KIRILL BELASHCHENKO, EVGENY TSYMBAL, Department of Physics and Astronomy, University of Nebraska-Lincoln — The discovery of a two-dimensional electron gas (2DEG) at the interface between insulating oxides like LaAlO3/SrTiO3 is promising in designing novel electronic devices. Making a spin-polarized 2DEG is a very exciting prospect for spintronics applications, where the involvement of the spin degree of freedom broadens the spectrum of potential applications. Here we propose a method to achieve a spin- polarized 2DEG by employing a ferromagnetic insulator as one of the constituents in the oxide heterostructure and consider EuO as a representative ferromagnetic insulator in conjunction with LaAlO3 to form a spin-polarized 2DEG at the LaAlO3/EuO (001) interface.[1] This polar interface favors electron doping into the Eu-5d conduction bands. Due to the exchange splitting of the Eu-5d states in the ferromagnetic insulator the 2DEG is spin-polarized below the Curie temperature of EuO. Spin-polarized properties of this 2DEG at the interface between polar and ferromagnetic insulators inherited from the ferromagnetism of the oxide may provide a robust magnetism of the 2DEG which is beneficial and interesting for spintronics applications. [1] Y. Wang et al, Phys. Rev. B 79, 212408 (2009).

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