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Ferroelectric tunnel junctions with electron doped $SrTiO_3$ elelctrodes XIAOHUI LIU, J.D. BURTON, EVGENY TSYMBAL, University of Nebraska-Lincoln — Increasing the tunneling electroresistance (TER) is crucial for the application of ferroelectric tunnel junctions (FTJs) for electronic devices.[1] Normal FTJs are composed of a thin ferroelectric layer sandwiched by two metallic electrodes, where TER results from the ferroelectric polarization dependent electric potential height in the ferroelectric barrier. Since the resistance depends exponentially not only on potential height but also on barrier width, TER is expected to be greatly enhanced by modulation of the polarization dependent barrier width when one of the electrodes is substituted by a semiconductor.[2] Recently, experiment reported sizable (10^4) TER in a FTJ where one electrode is n-type $SrTiO_3$, namely $Pt/BaTiO_3/Nb:SrTiO_3$.[3] To reveal the mechanism of this phenomenon, we perform theoretical studies on a representative system $SrRuO_3/BaTiO_3/n\text{-}SrTiO_3$ using on first-principles modeling. We analyze as a function of doping level the effect of ferroelectric polarization on the electronic structure near the interface, its influence on the barrier width and on the transport properties of such a system. [1] E. Y. Tsymbal and H. Kohlstedt, Science 313, 181 (2006) [2] M. Y. Zhuravlev, et al., Phys. Rev. Lett. 94, 246802 (2005) [3] Z. Wen, et al., Nat. Mater. 12, 617 (2013)

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