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Novel Spin-dependent tunneling magnetoresistance of Fe/O/NaCl/O/Fe KUI GONG, LEI ZHANG, DONGPING LIU, HONG GUO, McGill Univ, MCGILL UNIVERSITY TEAM — We propose and theoretically investigate an very attractive novel magnetic tunnel junction (MTJ) Fe(001)/O/NaCl(001)/O/Fe(001) for spintronics. Due to the presence of the single p(1×1)O layer between Fe electrode and NaCl insulator, the interfacial strain can be full released. Therefore, area perfectly ordered NaCl can be grow on top of Fe electrode. Since the unit cell of Fe crystal in [001] direction has two layers, there are two different kinds of contact interface between Fe electrode and NaCl insulator, i.e., the translational and mirror symmetry configurations. According to our ab initio total energy calculation, both of them are experimentally accessible. For the translational symmetry configuration, the tunneling magnetoresistance (TMR) ratio of Fermi energy is in the magnitude of 500%. More interestingly, for the mirror symmetry configuration, the TMR ration will drastically increase to 5500%. Different from the role of MgO barrier in well known Fe/MgO/Fe MTJ, the evanescent state with the Δ_5 symmetry dominates the transmission of the majority spin electrons through the NaCl barrier. By studying the scattering states and the complex band structure of NaCl insulator, we systematically understand the transport properties of Fe/O/NaCl/O/Fe MTJ.

Kui Gong
McGill Univ

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