

Magnetic and electronic transport properties of some tunnel junctions with AgBr Δ_1 symmetry-filter barriers

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Abstract

A new tunnel junction with AgBr based barrier is proposed in this study. Electronic and magnetic properties of Fe/AgBr (001) are investigated via first principles calculations. The interlayer exchange coupling and electronic transport properties are analyzed as function of the AgBr barrier thickness. The results show that Fe magnetism at Fe/AgBr (001) interfaces is robust. The exchange coupling between Fe electrodes oscillate as function of the barrier thickness. A strong direct tunnelling of Fe Δ_1 states is observed. The minority-spin channel is characterized by the resonant tunnelling of the interfacial states that are forming at Fe/AgBr (001) interfaces. The spin polarization of the tunnelling current is positive but interface sensitive. Tunnelling magnetoresistance ratios exceeding 5000% are evidenced for the junctions with clean interfaces. In the presence of interfacial disorder, TMR ratios decrease dramatically.

Keywords: electronic structure, magnetic moment, atomic scale structure, magnetic tunnel junction, spin-dependent transport, tunnelling magnetoresistance.