Spin-dependent electrical transport in Fe-MgO-Fe heterostructures

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Abstract

In this paper, spin-dependent electrical transport properties are investigated in a single-crystal magnetic tunnel junction (MTJ) which consists of two ferromagnetic Fe electrodes separated by an MgO insulating barrier. These properties contain electric current, spin polarization and tunnel magnetoresistance (TMR). For this purpose, spin-dependent Hamiltonian is described for $\Delta_1$ and $\Delta_5$ bands in the transport direction. The transmission is calculated by Green's function formalism based on a single-band tight-binding approximation. The transport properties are investigated as a function of the barrier thickness in the limit of coherent tunneling. We have demonstrated that dependence of the TMR on the applied voltage and barrier thickness. Our numerical results may be useful for designing of spintronic devices. The numerical results may be useful in designing of spintronic devices.

Keywords: spintronic, magnetic tunnel junction, tunnel magnetoresistance

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