The influence of different magnetic configurations on tunneling current in double tunnel junctions with ferromagnetic electrodes

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9.7 cm

Tunnelling current in double-barrier junctions with ferromagnetic electrodes depends on relative orientation of the magnetic moments of all the three electrodes. When four different current densities for a specific value of the bias voltage can be obtained, the junctions may be used in MRAM devices as 2-bits memory cells. In this paper we present and discuss results of numerical calculations of I-V characteristics, tunnel conductance, and TMR in such two-barrier junctions. The calculations are performed in the free-electron model, assuming a trapezoidal shape of the barriers and neglecting tunnelling with simultaneous reversal of electron spin. The influence of various parameters, like for instance of the spin splitting of the electron bands on the TMR effects is analyzed. Generally, one can obtain four different values of the tunnelling current density for a fixed bias voltage. The corresponding four values of the junction resistance can be particularly well separated when the electrodes are made from materials with different spin polarizations.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces, Multilayers and Nanostructures

Presentation mode :
poster

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