Conductance spectra of asymmetric ferromagnet/ferromagnet/ferromagnet junctions

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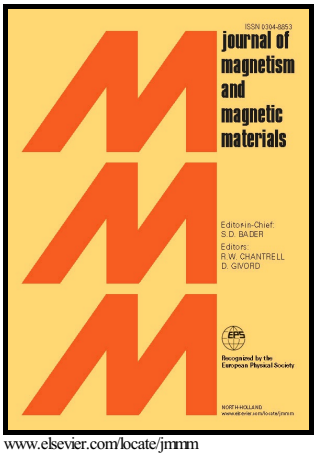

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Conductance spectra of asymmetric ferromagnet/ferromagnet/ferromagnet junctions

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Abstract

A theory of tunneling spectroscopy of ferromagnet/ferromagnet/ferromagnet junctions was studied. We applied a delta-functional approximation for the interface scattering properties under a one-dimensional system of a free electron approach. The reflection and transmission probabilities were calculated in the ballistic regime, and the conductance spectra were then calculated using the Landauer formulation. The magnetization directions were set to be either parallel (P) or anti-parallel (AP) alignments, for comparison. We found that the conductance spectra was suppressed when increasing the interfacial scattering at the interfaces. Moreover, the electron could exhibit direct transmission when the thickness was rather thin. Thus, there was no oscillation in this case. However, in the case of a thick layer the conductance spectra oscillated, and this oscillation was most prominent when the middle layer thickness increased. In the case of direct transmission, the conductance spectra of P and AP systems were definitely suppressed with increased exchange energy of the middle ferromagnet. This also refers to an increase in the magnetoresistance of the junction. In the case of oscillatory behavior, the positions of the resonance peaks were changed as the exchange energy was changed.

Keywords: tunneling conductance spectra, magnetic junction, magnetism effect, ferromagnetic double junction
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