SPIN POLARIZED ELECTRON TUNNELLING IN ULTRA-SMALL MAGNETIC TUNNEL JUNCTIONS

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9.7 cm

Nonequilibrium Green's function technique was used to calculate electric current in mesoscopic junctions consisting of two ferromagnetic leads coupled to one or two quantum dots. In the former case we considered single-level and two-level quantum dots. In a general case, the discrete levels can be spin split. In the latter case, on the other hand, we distinguished between the limits of weak and strong coupling between the two single-level dots. Electron correlations on the dots were taken into account in the Hubbard model and the appropriate Green's functions were calculated in the Hartree-Fock approximation. Therefore, the results are valid for temperatures higher than the Kondo temperature. The main objective of our self-consitent calculations was to determine the tunnel magnetoresistance related to the change of magnetic configuration of the junction from antiparallel to parallel alignment. The influence of junction asymmetry on the transport characteristics was analysed in detail, particularly in the context of possible applications of such systems as magnetic diodes. Effects related to renormalization of spin-degenarate discrete levels due to spin-dependent tunneling processes in nonmagnetic dots were also studied.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces and Multilayers

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