9.7 cm

EFFECT OF SPIN-FLIP PROCESSES ON ELECTRONIC TRANSPORT THROUGH A QUANTUM COUPLED TO FERROMAGNETIC ELECTRODES

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Using nonequilibrium Green function formalism the spin-polarized electronic transport through a quantum dot coupled to ferromagnetic electrodes is studied. Arbitrary Coulomb correlations and spin-flip processes are considered within the dot, for both parallel (P) and antiparallel (AP) magnetic configurations of the junction. It is found that spin-flip processes suppress the magnetoresistance between each pair of the threshold bias voltages, thus giving rise to sharp TMR maxima at the thresholds. Spin-flips reduce also the magnetically induced asymmetry in the current-voltage characteristics with respect to the bias reversal. The spin relaxation on the dot may lead to accumulation of the spin transverse components on the dot, to a negative differential conductance, to splitting of the resonance peaks in the differential conductance as well as to widening of the corresponding TMR maxima at threshold bias voltages. It is also found that in the linear response limit TMR may be inverted and significantly enhanced due to spin-flip processes on the dot. Interestingly, a similar behavior of TMR in the linear response regime was observed recently in experiments on tunneling through semiconducting quantum dots coupled to nickel or cobalt electrodes.

13.4 cm

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