SPIN DEPENDENT TUNNELING IN DOUBLE NANOJUNCTIONS

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9.7 cm

Spin dependent single electron transport in ferromagnetic double junction devices is investigated theoretically in the limit of incoherent sequential tunneling. We consider a small nonmagnetic metallic grain with discrete energy level spacing, which is connected to two ferromagnetic electrodes. Magnetic configuration of the junction can be varied by applying an external magnetic field and the rotation from the antiparallel alignment to the parallel one is accompanied by a decrease in the junction resistance. This effect is known as tunnel magnetoresistance (TMR). When the intrinsic spin relaxation time on the grain is much longer than the time between successive tunneling events, then competition between the currents of opposite spins leads to spin accumulation. This effect is responsible for TMR and can produce some additional features in the electron transport.Sequential opening of the spin channels is clearly seen in all characteristics, including *I-V* curves, TMR, and spin accumulation. We have also analyzed the characteristics of the ferromagnetic SET as a function of the gate voltage. All curves are periodic and depend on whether the number of excess electrons on the grain is even or odd.
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