SPIN POLARIZED COTUNNELING THROUGH A QUANTUM DOT

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9.7 cm

We present results of theoretical analysis of the second-order tunneling processes (cotunneling) through a magnetic quantum dot. The dot is weakly coupled to two ferromagnetic leads. We also restrict our considerations to two-level quantum dots (with a single spin-split level). This means that at most two electrons with opposite spin orientations can simultaneously reside on the dot. However, we assume that only one electron exists at the dot in the relevant ground state. Two electrons on the dot can only occur in the intermediate (virtual) states. In that case, their mutual Coulomb interaction is taken into account. Our considerations are valid for cotunneling processes far from the resonance regime. In a general case, we include both the elastic and inelastic cotunneling processes. Apart from this, we also distinguish between one-junction and two-junction processes. Only the latter processes contribute directly to the current flowing through the dot. However, the one-junction cotunneling processes affect the magnetic state of the dot and therefore also have an indirect influence on the current. Therefore, they should be taken into account. To find total electric current, we have calculated nonequilibrium occupation of both discrete levels. We have also determined the tunnel magnetoresistance related to magnetization rotation.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces and Multilayers

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