Spin reversal processes in single molecular magnets due to spin polarized currents

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The effect of spin polarized transport between ferromagnetic metallic electrodes on the relaxation process of a single molecular magnet (SMM) [1, 2] is considered theoretically. The relaxation times are calculated in the second order (Fermi golden rule) perturbation approach. The central aim of the work is to analyze the possible mechanisms responsible for the reversal of a SMM's spin. We investigate two distinctive regimes in which the spin reversal is driven either by an external magnetic field or by a spin polarized current flowing between the electrodes. In the former case, the magnetic switching of a SMM is essentially induced by the quantum tunneling of magnetization, whereas in the latter one it is a consequence of an interaction between the spin polarized current and the SMM's spin. The total charge flowing between the electrodes during the reversal process is calculated. The thorough analysis of the magnetically induced switching of the molecular spin leads to the conclusion that the system under consideration can serve as an electronic pump. The results are discussed in terms of some possible future applications in spintronics systems.

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