SPIN-DEPENDENT THERMOELECTRIC EFFECTS IN TRANSPORT THROUGH A SINGLE-MOLECULE MAGNET

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9.7 cm

Motivated by recent advances in thermoelectric measurements on nanoscopic systems, in the present communication we discuss theoretical aspects of thermoelectric effects that can accompany spin-dependent transport through a single-molecule magnet. The model assumed consists of a single-molecule magnet embedded between two metallic ferromagnetic electrodes (a molecule in a magnetic tunnel junction), whose magnetic moments can be oriented either parallel or antiparallel. The key assumption of the model is that conduction electrons traversing the barrier can be scattered by a large spin of the molecule due to exchange interaction. This in turn can result in exchange of angular momentum between the spin-polarized current and the molecule. Thermoelectric effects arise when there is a temperature gradient between the electrodes. Transport of charge, spin and heat is analyzed by means of perturbative approach (Fermi golden rule) and the master equation method. Basic characteristics such as charge and thermal conductance, thermopower and spin thermopower, as well as the dimensionless figure of merit describing the thermal efficiency of the system, are discussed as a function of both uniaxial and transverse magnetic anisotropy constants representative for single-molecule magnets.

13.4 cm

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