Magnetic switching of single-molecule magnets by current pulses

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9.7 cm

Dynamics of current-induced magnetic switching (CIMS) of a single magnetic molecule (SMM) weakly coupled to two ferromagnetic contacts with collinear magnetic moments is investigated theoretically. Electronic transport is assumed to take place *via* the lowest unoccupied orbital (LUMO) level of the molecule. In such a case, the CIMS can occur as a result of exchange coupling between the electrons in the LUMO level and the molecule's spin. The key objective of the work is to analyze the possibility of the SMM's spin manipulation with short current pulses, which is believed to be a promising method for writing a bit of information in the molecule. Furthermore, the role of physical processes influencing the molecule switching is considered with the main emphasis put on the intrinsic spin relaxation in the molecule. Time dependence of transport characteristics as well as the average value of the total spin is derived by means of the perturbative approach and relevant master equations. It is shown that despite spin relaxation a current pulse of a proper length can be used to switch the magnetic moment of the molecule. The obtained results are discussed in terms of potential applications of SMMs as elements of novel spintronics devices.

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