Quantum Tunneling of the Magnetization in Molecular Nanomagnets

MYRIAM P. SARACHIK, City College of New York - CUNY

Molecular nanomagnets, sometimes referred to as single molecule magnets, have attracted a great deal of recent attention for interesting behavior that is borderline between the classical and quantum mechanical regimes, and because of their potential usefulness for high-density data storage and quantum computation. Quantum mechanical processes are observed in these materials on a macroscopic scale in the form of steps in the magnetization curves. Two particularly simple prototypes, Mn$_{12}$-acetate and Fe$_8$, have been studied in great detail. Typical behavior of the class will be examined by considering Mn$_{12}$-acetate: the structure of the molecule, the tetragonal (four-fold symmetric) crystal, the Hamiltonian that models the behavior, and the tunneling process that gives rise to the magnetization steps. * J. R. Friedman, M. P. Sarachik, J. Tejada, and R. Ziolo, Phys. Rev. Letters, 76, 3830 (1996).

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