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Geometric-Phase Effect in the Thermally Assisted Resonant Tunneling of Mn_{12}-tBuAc J.R. FRIEDMAN, E. H. DA SILVA NETO, Amherst College Physics Dept., C. LAMPROPOULOS, G. CHRISTOU, University of Florida Chemistry Dept., N. AVRAHAM, Y. MYAESOEDOV, H. SHTRIKMAN, E. ZELDOV, Weizmann Institute of Science — Mn_{12}-tBuAc, like the better-known single-molecule magnet Mn_{12}-Ac, relaxes between up and down spin states by thermally assisted resonant tunneling when a longitudinal magnetic field (H_L) brings energy levels into resonance. In Mn_{12}-Ac, tunneling is induced by a second-order transverse anisotropy produced by local solvent disorder. Such disorder makes the observation of any possible geometric-phase interference effect impractical. Mn_{12}-tBuAc, in contrast, has negligible solvent disorder and an intrinsic fourth-order transverse anisotropy. We present experimental data on the transverse-field (H_T) dependence of the magnetic relaxation rate for Mn_{12}-tBuAc. When on resonance (H_L=0), the rate increases as a function of H_T in a series of steps and plateaus due to abrupt changes in the dominant tunneling pair of levels. Surprisingly, a similar effect occurs when off resonance (i.e. large H_L). Detailed numerical simulations show that the experimental results, both on and off of resonance, can be well described if the fourth-order anisotropy is included in the spin Hamiltonian. The results can be understood as arising from a geometric-phase effect that occurs when H_T is applied along the hard axis. Support: NSF grant #DMR-0449516.

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