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Geometric-phase interference in a Mn_{12} single-molecule magnet with four-fold rotational symmetry[1] SPENCER ADAMS, EDUARDO H. DA SILVA NETO, SAITI DATTA, JOHN WARE, Department of Physics, Amherst College, Amherst, MA 01002, CHRISTOS LAMPROPOULOS, GEORGE CHRISTOU, Department of Chemistry, University of Florida, Gainesville, FL, YURI MYAESOEDOV, ELI ZELDOV, Department of Condensed Matter Physics, The Weizmann Institute of Science, Rehovot, Israel — We study the magnetic relaxation rate Γ of the single-molecule magnet Mn_{12}-tBuAc as a function of magnetic field component H_T transverse to the molecule's easy axis. When the spin is near a magnetic quantum tunneling resonance, we find that Γ increases abruptly at certain values of H_T. These increases are observed just beyond values of H_T at which a geometric-phase interference effect suppresses tunneling between two excited energy levels. The effect is washed out by rotating H_T away from the spin's hard axis, thereby suppressing the interference effect. Detailed numerical calculations of Γ using the known spin Hamiltonian accurately reproduce the observed behavior. These results are the first experimental evidence for geometric-phase interference in a single-molecule magnet with true four-fold symmetry. Furthermore, the results demonstrate that geometric-phase-interference effects can play a role in the thermally assisted tunneling regime.

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