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Magnetic Quantum Tunneling in a Mn_{12} Single-Molecule Magnet Measured With High Frequency Electron Paramagnetic Resonance JON LAWRENCE, SUNG-SU KIM, STEVE HILL, University of Florida, Physics, MURALEE MURUGESU, University of California at Berkeley, Chemistry, GEORGE CHRISTOU, University of Florida, Chemistry — The low temperature spin dynamics of the single-molecule magnet $[Mn_{12}O_{12}(CH_3COOH)_{16}(H_2O)_4]\cdot 2CH_3COOH\cdot 4H_2O$, were studied using High Frequency Electron Paramagnetic Resonance (HFEPR) in order to demonstrate magnetic quantum tunneling between resonant spin projection states. We prepare the spins such that they populate only one side of the axial potential energy barrier and, using a magnetic field, we cause tunneling of the magnetic moment between resonant spin projection states. We then use HFEPR to monitor the populations on each side of the potential energy barrier. We show that, in addition to measuring the ensemble average of the relaxation, these HFEPR experiments demonstrate that one can separately monitor the relaxation from different parts of the inhomogeneous distribution of spin environments. This technique, therefore, provides an alternative method for performing hole-digging experiments for measuring spin relaxation dynamics.

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