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Mitigation of decoherence in crystals of a $\mathbf{Ho}_x\mathbf{Y}_{1x}\mathbf{W}_{10}$ (x = 0.001 to 0.25) single-molecule magnet SANHITA GHOSH, SAITI DATTA, STEPHEN HILL, National High Magnetic Field Laboratory and Deptt. of Physics, Florida State University, Tallahassee, FL 32310, ENRIQUE DEL BARCO, Deptt. of Physics, University of Central Florida, Orlando, FL 32816, SALVADOR CARDONA-SERRA, EUGENIO CORONADO, Instituto de Ciencia Molecular, Universidad de Valencia, Poligono la Coma s/n, 46980 Paterna, Spain — Mononuclear lanthanide-based single-molecule magnets (SMMs) have attracted considerable recent attention due to their potential application in quantum information processing devices [Nat. Nanotechnol. **2**, 312 (2007)]. In these systems, the magnetization is associated with a single rare-earth ion, which facilitates mitigation of spin decoherence due to nuclear hyperfine and electron dipolar interactions via isotope purification and dilution. Their large magnetic moments enable coherent manipulation at low driving fields. We report multi-frequency electron paramagnetic resonance (EPR) studies on a Ho polyoxometalate (POM). Simulations indicate appreciable transverse spin-orbit anisotropy, resulting in a gap in the spectrum of several GHz between pairs of levels having the same nuclear projection (effectively a tunneling gap between excited electron-nuclear spin states). Measurements at 9 GHz reveal electron-spin-echoes at low temperatures. Remarkably, a T_2 time of several hundred nanoseconds is found for concentrated samples, with much longer values found in diluted samples containing deuterated solvent. We show that these long coherence times are related to the tunneling gap, which results in an insensitivity of the spin dynamics to dipolar field fluctuations.

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