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Precision ESR Measurements of Transverse Anisotropy in the Single-molecule Magnet Ni_4[1] JONATHAN FRIEDMAN, CHARLES COLLETT, Department of Physics and Astronomy, Amherst College, Amherst, MA 01002, USA, RAFAEL ALLAO CASSARO, Instituto de Química, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, 21941-909 Brazil — We present a method to precisely determine the transverse anisotropy in a single-molecule magnet (SMM) through electron-spin resonance measurements of a tunnel splitting that arises from the anisotropy via first-order perturbation theory. We demonstrate the technique using the SMM Ni_4 diluted via co-crystallization in a diamagnetic isostructural analogue. At 5% dilution, we find markedly narrower resonance peaks than are observed in undiluted samples. Ni_4 has a zero-field tunnel splitting of ~ 4 GHz, and we measure that transition at several nearby frequencies using custom loop-gap resonators, allowing a precise determination of the tunnel splitting. Because the transition under investigation arises due to a first-order perturbation from the transverse anisotropy, and lies at zero field, we can relate the splitting to the transverse anisotropy independent of any other Hamiltonian parameters. This method can be applied to other SMMs with zero-field tunnel splittings arising from first-order transverse anisotropy perturbations.

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