We demonstrate that the electron paramagnetic resonance spectrum of Mn$^{2+}$ impurities in calcite, and therefore also in marble, may be accurately reproduced by a traditional spin Hamiltonian formalism. The success of such a treatment, however, very much depends on the spin Hamiltonian parameters having the correct signs as well as magnitudes. We present data that determine the sign of the axial anisotropy parameter and thereby facilitate future quantum mechanical characterizations of marble electron paramagnetic resonance spectra that supplement provenance determination.