Experimental study of the spin relaxation in S=7/2 Heisenberg antiferromagnet Gd2(fum)3(H2O)4.3H2O

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The compound Gd2(fum)3(H2O)4.3H2O representing an S=7/2 Heisenberg antiferromagnet with weak antiferromagnetic interactions arising predominantly from dipolar coupling and leading to magnetic ordering at TN = 0.19 K is studied. The spin relaxation of Gd2(fum)3(H2O)4.3H2O was investigated by ac-susceptibility measurements at temperatures from 2 to 30 K, frequencies from 100 Hz to 10 kHz for different dc-magnetic field. It was found, that the magnetic field induces anomalous thermally activated relaxation. The behavior of the relaxation time as function of temperature is consistent with the phonon bottleneck effect. Subsequent determination of characteristic parameters as g-factor g = 2.0, single - ion anisotropy D/kB ≈ -0.24 K and exchange interaction J/kB ≈ -3 mK allows considering resonance trapping of low-energy phonons, recently proposed in Ni10 magnetic molecules [1], as one of mechanisms of the phonon bottleneck effect in the studied material.

[1] S. Caretta et al., Phys. Rev. Lett. 97 (2006) 207201