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Spin excitations in the molecule Mn_{19} with a record ground-state spin $S = 83/2$ B. BURGER, Institut für Anorganische Chemie, Universität Karlsruhe, 76128 Karlsruhe, Germany, O. WALDMANN, Physikalsiches Institut, Universität Freiburg, 79104 Freiburg, Germany, A.M. AKO, A.K. POWELL, Institut für Anorganische Chemie, Universität Karlsruhe, 76128 Karlsruhe, Germany, H. MUTKA, Institut Laue-Langevin - 6 Rue Jules Horowitz, BP 156-38042, Grenoble Cedex 9, France, T. UNRUH, FRM-II, Technical University Munich, ZWE, 85747 Garching, Germany — In the magnetic molecule Mn_{19}, 12 Mn(III) and 7 Mn(II) ions are ferromagnetically coupled such as to yield a $S = 83/2$ ground state. We recorded Q-band EPR and inelastic neutron scattering (INS) spectra on powder samples of Mn_{19}. The EPR data is well interpreted by the model of an isolated $S = 83/2$ spin with uniaxial magnetic anisotropy, $H = DS_z^2 + g\mu_B \mathbf{S}\cdot\mathbf{B}$. We find $D = 0.004$ cm^1, hence Mn_{19} is not a single-molecule magnet. The INS spectra show a broad feature I at ca. 0.25 meV, which exhibits an uncommon temperature dependence, and two peaks II and III at ca. 3.0 and 5.7 meV. The analysis of the INS data is complicated by the huge Hilbert space of Mn_{19} of 6.8 10^{13} states. Peaks II and III are assigned to discrete ferromagnetic spin waves. Understanding feature I is more difficult because it consists of many transitions which combine such as to yield a complex temperature dependence. Hence, its behavior cannot be described in a single-spin picture, but requires an inherent many-body description.

O. Waldmann
Physikalisches Institut, Universität Freiburg, 79104 Freiburg, Germany

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