

NIT-2Py

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We present thermodynamic and magnetic properties, as well as μ SR spectroscopy results of a new organic magnet which is built from molecules in the nitronyl nitroxide family of free radicals. NIT-2Py exhibits a complex magnetic phase diagram at low temperatures and high magnetic fields. Susceptibility measurements at high temperatures show the paramagnetism of a free spin $1/2$ with antiferromagnetic interactions. We saw the onset of bulk magnetic order at 1.3 K, as determined from specific heat C_p measurements. This anomaly in C_p is suppressed by magnetic fields above 3 T. In this field range, the sharp peak in C_p is replaced by a Schottky anomaly pointing to collective switching of all magnetic moments between two distinct levels. At a higher fields of 5 T, we observed a second sharp anomaly indicating a second magnetic phase. Magnetisation curves measured below the ordering temperature show magnetization plateau at half of the saturation value of $1 \mu_B$ /molecule. In combination with the specific heat results, this behaviour suggests a new quantum spin ground state in NIT-2Py. In order to get a better understanding of the magnetic interactions between the molecules, we carried out electronic structure calculations. μ SR measurements show oscillations in the longitudinal signal in zero field indicative of an internal field below the phase transition. The temperature dependance of this internal field follows a mean field behaviour. This oscillation fits to a two frequencies model indicating two distinct muon sites. Applications of longitudinal fields up to 2 T did not show any longitudinal signal, typical in a Ising system without hard magnetic axes.

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