Spin dynamics in a low-dimensional dipolar magnet $CsGd(MoO_4)_2$

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Magnetization, ac susceptibility and dc susceptibility of $CsGd(MoO_4)_2$ single crystal have been investigated in the temperature range from 2 to 30 K, magnetic fields B‖a from 0 to 5 T and frequencies from 0.5 Hz up to nominally 1 kHz. Previous specific heat studies in B=0 [1] revealed a phase transition to the magnetically ordered state at T_c=0.45 K and confirmed a spatial anisotropy of magnetic correlations expected from the crystal structure. The strength of intrachain and interchain dipolar coupling was estimated, $J_1/k_B \approx 0.6$ K and $J_2/J_1 \approx 0.01$, respectively. The temperature dependence of dc susceptibility obeys Curie-Weiss law with Curie temperature θ=-0.8 K, reflecting the combined effect of dipolar coupling and crystal field. While ac susceptibility measured in B=0 implies only real part, in the field 100 mT, imaginary susceptibility, χ'', appears, indicating a thermally activated relaxation process. The behaviour of χ'' is nontrivial and potentially reflects two relaxation regimes separated by the frequency region of the order 10 Hz. The origin of the observed behavior is discussed.

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