Slow magnetic relaxation in the single-ion magnet
CsNd(MoO$_4$)$_2$

Vladimír Tkáč,$^1$ Alžbeta Orendáčová,$^1$ Róbert Tarasenko,$^1$
Martin Orendáč,$^1$ and Alexander Feher$^1$

$^1$Institute of Physics, P. J. Šafárik University,
Park Angelínium 9, 040 01 Košice, Slovak Republic

The present work is devoted to the study of the magnetic relaxation in CsNd(MoO$_4$)$_2$. The absence of a phase transition to the ordered state down to 50 mK predetermines CsNd(MoO$_4$)$_2$ as the candidate for novel mononuclear lanthanide-based single-ion magnets. Nd$^{3+}$ ions with the ground state $^4$I$_{9/2}$ are responsible for the magnetic properties. Low-symmetry crystal field splits this state into 5 doublets with large energy separation between the ground and first excited doublet, inducing easy-axis anisotropy. AC susceptibility measurements performed in various magnetic fields ($B = 0 – 5$ T) and frequencies ($f = 1$ Hz – 1kHz) revealed rather complex field-induced slow magnetic relaxation. Temperature dependencies of the relaxation times at the different time scale extracted from Cole-Cole diagrams indicate several relaxation channels. Possible origin of the nontrivial observed relaxation phenomenon considering quantum tunnelling and nuclear degrees of freedom is discussed.

*This work has been supported by VEGA grant 1/0269/17, ITMS26220120047, APVV-14-0073 and APVV-14-0078.*