

Applied Magnetic Resonance 2016, pages 1-9

Spin Dynamics and Ground State of the Frustrated Diamond Lattice Magnet CoAl₂O₄ as seen by ²⁷Al NMR

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Abstract

© 2016 Springer-Verlag Wien We report an experimental study of the low-temperature dynamics of electron spin fluctuations in the magnetically frustrated spinel CoAl₂O₄ as revealed by ²⁷Al nuclear magnetic relaxation measurements in a magnetic field of 7.7 T in the temperature range $4 < T < 240$ K. With this local probe technique, we show that the dynamics of the correlated Co spins strongly depends on the frustration of spin interactions and on Co/Al site disorder. The anisotropy of the temperature dependences of the spin-lattice ($T_{1\rho}$) and spin-spin ($T_{2\rho}$) ²⁷Al nuclear relaxation rates reveals a coexistence of the short-range Néel order below a characteristic temperature $T^* = 8$ K and slow non-commensurate magnetic correlations below and above T^* , in agreement with the results of neutron diffraction experiments and our previous NMR spectroscopy data.

<http://dx.doi.org/10.1007/s00723-016-0773-9>
