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Slow Magnetic Relaxation in Dysprosium Based Single-Ion Magnets

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The experimental and theoretical study of two mononuclear dysprosium-based complexes is reported. Both complexes demonstrate slow relaxation of magnetization at low temperatures. The Hamiltonian for explanation of the magnetic behavior (the magnetic susceptibility as a function of temperature and magnetization as a function of the applied magnetic field) includes the crystal field of the nearest ligands of the dysprosium ion and the interaction with the external magnetic field. The crystal field parameters are evaluated in the framework of the exchange charge model, taking account for covalence effects. The proposed model provides a good agreement between the observed and calculated magnetic behavior. It is demonstrated that the low-lying energy levels for both studied complexes form the energy barriers for magnetization reversal that agrees with the observed single-ion magnetic behavior.