SUB-THZ HIGH FIELD ESR SPECTROSCOPY ON MAGNETICALLY ACTIVE MOLECULAR COMPOUNDS

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Magnetically active metal-organic molecules that comprise in their cores interacting paramagnetic transition metal ions currently attract a significant interdisciplinary attention due to their unprecedented properties. Some of them provide a realization on a molecular level of a superparamagnetic particle (single molecule magnet) characterized by a big and anisotropic magnetic moment, hysteresis behavior and metastable magnetic states. Such molecular-based materials provide a unique playground to study fundamental aspects of quantum magnetism on the macroscopic level but also there is a need to access them for possible applications in future spin electronic devices. New techniques of tunable sub-Terahertz electron spin resonance spectroscopy in high magnetic fields enable detailed insights into the energy spectrum of the spin states, exchange interactions and anisotropy effects in such kind of systems.

In this talk, ESR studies of transition-metal ion based molecular complexes carried out in the framework of the Saxonian Research Unit “Towards Molecular Spintronics” will be overviewed. It will be shown how the spin-multiplet structure, magnetic anisotropy and exchange interactions can be assessed in the ESR experiment complemented by static magnetic measurements. A relationship between the chemical structure, bonding topology and magnetism of the studied compounds with regard to the rational design of functional materials will be discussed.