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Guest Lecture

Title:

"Molecular Nanomagnets for Data Storage and Quantum Computing"

Speaker: Prof. Dr. Joris van Slageren

Address: University of Stuttgart, Institute of Physical Chemistry; Germany

Date: Friday, 2nd of December 2016
Time: 14:30
Place: Lecture hall 3, Freihaus, Wiedner Hauptstraße 8-10, yellow area, 2nd floor

Abstract: Molecular nanomagnets (MNMs) are coordination complexes consisting of one of more transition metal and/or f-element ions bridged and surrounded by organic ligands. Some of these can be magnetized in a magnetic field, and remain magnetized after the field is switched off.

Because of this, MNMs have been proposed for magnetic data storage applications, where up to 1000 times higher data densities than currently possible can be obtained. The magnetic bistability of MNMs originates from the magnetic anisotropy of the magnetic ions, which creates an energy barrier between up and down orientations of the magnetic moment. Other MNMs were shown to display quantum coherence, and, as a consequence, are suitable as quantum bits. Quantum bits are the building blocks of a quantum computer, which will be able to carry out calculations that will never be possible with a conventional computer.

Currently, most work in the area focuses on complexes of either lanthanide ions or low-coordinate transition metal ions. Synthetic chemical efforts have led to a large

number of novel materials, but the rate of improvement has been slow. Therefore a better understanding of the origin of the magnetic anisotropy is clearly necessary. To this end we have applied a wide range of advanced spectroscopic techniques, ranging from different electron spin resonance techniques at frequencies up to the terahertz domain to optical techniques, including luminescence and magnetic circular dichroism spectroscopy In addition, we have strived to elucidate the origin of the long-lived quantum coherence and the decoherence mechanisms. We have shown that a quantitative simulation of the coherence decay is possible.