Fachbereich Physik, Mathematik und Informatik

SONDERTERMIN:
SFB TRR 173 Spin+X - Kolloquium

Wednesday 29th, 2020 at 10:30 am
online via Skype for Business

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Molecular Spin Nanostructures

Graphene, a well-defined two-dimensional honeycomb network of carbon atoms, shows impressive electrical and mechanical properties. Quasi-onedimensional nanoribbons of graphene have emerged particular interest. By introducing magnetic edges in graphene nanoribbons, for example, ferromagnetic couplings and superior spin filtering are predicted, making them promising materials for future spintronic devices. Conventional techniques such as unzipping of carbon nanotubes, however, do not deliver the necessary degree of purity to design such systems.

By utilising an ultra-clean synthetic bottom-up approach, we were able to create graphene nanoribbons (GNRs) with great purity. We were furthermore able to covalently functionalize the ribbon edges with magnetic spin sites, such as organic radicals The attachment of magnetic sites leads to an injection of spin density into the nanoribbon backbone. This enables the stabilisation of a sensitive, magnetic state that is delocalized along the nanoribbon edges. While its physics is well-described from a theoretical point of view, experimental tests are scarce. With magnetically functionalized GNRs, we can now explore the magnetic properties of the edge state. Via electron paramagnetic resonance spectroscopy (EPR), we gain a comprehensive picture of the interactions within such a ribbon, and investigate the spin dynamics. EPR allows us to characterise quantum coherence and spin-lattice relaxation times, unravel the coupling between the spins and the edge state (DEER spectroscopy) and investigate the coupling to nuclei. By simulating and fitting the spectra, we find the interaction mechanisms and decoherence pathways. In this talk I will show EPR results on novel magnetic GNRs and graphenoids, and a comprehensive investigation on the decoherence mechanisms as well as their elimination, showing that graphen-based systems reach competitive coherence times. I will furthermore show how we can use light as an ultra-clean and innovative approach to manipulate the magnetization of molecular units using spin-forbidden transitions.

The guest is invited by Prof. Dr. M. Kläui
Everybody interested is welcome!