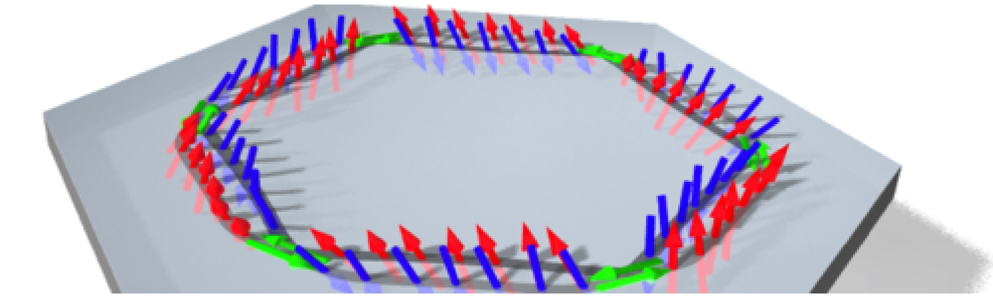
DFG-Forschergruppe FOR1162



Electron Correlation-Induced Phenomena in Surfaces and Interfaces with Tunable Interactions

The Research Unit FOR1162 is targeted at the collaborative investigation of electronic correlation effects and emergent phenomena in nanostructured surfaces and interfaces. Based on a successful initial phase we propose here an extension for a second funding period. The central aim is a microscopic understanding of competing interactions in systems with reduced dimensionality and their effect on the macroscopic electronic and magnetic properties. Surfaces and interfaces are particularly well suited for this purpose as they allow precise preparation and manipulation down to atomic length scales, thereby facilitating active control and tunability of relevant interaction parameters. Systems of interest include self-organized 1D and 2D metal adsorbate structures on semiconductor and metal surfaces, 4*f* metal surface alloys, and conducting interfaces in transition metal oxide heterostructures. Depending on their specific properties they represent versatile model systems for the study of prototypical correlation phenomena such as the breakdown of Fermi liquid physics in 1D, the occurrence of Mott-Hubbard physics in frustrated 2D lattice geometries, or the emergence of heavy-fermion behavior in 2D Kondo systems. An important new aspect to be addressed in the second funding period is the interplay of electronic correlations and strong spin-orbit coupling which can be induced by incorporating heavy (*i.e.*, high-*Z*) elementsinto the surface/interface systems.
The scientific questions are tackled with a wide range of (mostly spectroscopic) surface science techniques in close cooperation with advanced quantum-mechanical many-body theory. As demonstrated in the first funding period, the combination of different but complementary methods available within the Research Unit represents a powerful approach in the pursuit of its objectives. Apart from a substantially improved microscopic understanding of electron correlation effects in low dimensions, the expected results will also be useful for a controlled design of novel correlation-induced functionalities in, *e.g.*, thin film devices.