Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter

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CFEL SR I, Ground Floor EG.076 (Bldg. 99)

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Electronic structure of low dimensional materials: from graphene to magnetic nanostructures

Low dimensional structures combine pronounced surface effects with distinct many body interactions. Both affect material properties decisively, as they determine excitations and boundaries between different electronic as well as structural phases. Here, we discuss how the electronic structure of low dimensional materials can be understood based on microscopic theory along with three examples of how interactions affect material properties. First, we consider chemically functionalized graphene and show how doping triggers adsorbate phase transitions including tendencies towards sublattice symmetry breaking. Regarding the electrons in layered materials, local “Hubbard interactions” generally compete with large non-local Coulomb interactions. We will discuss the “two-faced” nature of these non-local interactions: while they contribute to strong renormalizations of electronic excitations, non-local Coulomb terms turn out to weaken ground state electronic correlations frequently. Finally, we will turn to magnetic nanostructures, demonstrate that electronic correlations can be largely driven by Hund’s exchange instead of local Hubbard repulsion and show how electronic interactions shape excitation spectra.

Host: Isabella Gierz

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