



# › Allgemeines Physikalisches Kolloquium

› Donnerstag, 12.05.2016 um 16 Uhr c.t.

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## Ultrafast Electronic Dynamics in Surface Reactions and 2D Materials

Electronic excitations at surfaces and in solids can lead to rich variety of processes, which often include transfer of energy from the electronic system into nuclear motion. Femtosecond laser excitation results in a highly non-equilibrium electron distribution, which may induce chemical reactions of adsorbed molecules, displacive excitation of phonons or ultrafast phase transitions in solids. Both types of processes occur on ultrafast (femto- to pico-second) timescales and are accompanied by pronounced changes of the electronic structure.

In this talk, I will discuss different experimental approaches to probe such transient electronic structure changes on ultrafast timescales by employing (i) time-resolved resonant inelastic x-ray scattering (trRIXS) and (ii) time- and angle-resolved photoelectron spectroscopy (trARPES). Experiments performed with trRIXS at the X-ray free electron laser LCLS provide direct insight into the changes of chemical bonding in ultrafast surface reactions. These studies provide new insights into dynamics and details of the potential energy landscape.

Furthermore, we have investigated the mechanism of the photoinduced insulator-to-metal transition in a prototypical charge-density wave (CDW) systems where a periodic lattice distortion leads to the opening of an electronic gap at the Fermi surface at low temperatures. trARPES allows for probing directly the transient evolution of the electronic structure and collective phonon dynamics after photoexcitation through their influence on the electronic band structure. Recent advances in trARPES employing a 500kHz high harmonic source will be discussed.