
SEMINAR aus Halbleiterphysik und Nanotechnologie

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“Structural and electronic properties of organic/metal interfaces investigated with photoemission tomography”

Assoc.-Prof. Dr. Peter Puschnig
Institut f. Physik, FB Theoretische Physik, Karl-Franzens-Universitaet Graz, Austria

In the last years, a renaissance of angle-resolved photoemission spectroscopy (ARPES) for organic/metal interfaces could be observed. This development was mainly driven by the fact that, in opposition to conventional wisdom, the angular dependence of the photoemission current from oriented molecular films can be understood by assuming a plane wave as the final state of the photoemission process. This approximation allows for a simple and intuitive interpretation of the transition matrix element in terms of the Fourier transform of the initial state orbital leading to a combined experimental/theoretical technique, called photoemission tomography (PT).

In this contribution, I will focus on recent experimental and theoretical results obtained by PT. First, on the example of a Cs-doped bilayer of sexiphenyl, I demonstrate how PT enables a layer-resolved picture of the electronic structure thereby revealing the charge transfer processes upon doping. Similarly, for the doping of a monolayer of pentacene on Ag(110), PT unambiguously identifies the electronic states at various doping stages and unravels the processes determining the electronic level alignment. Finally, for the example of a PTCDA monolayer on Ag(110), I will show how ARPES data for a set of photon energies in the range between 20 and 55 eV leads to three-dimensional real-space images of molecular orbitals.