WWU MÜNSTER

Physikalisches Institut — Institut für Festkörpertheorie

Integriertes Seminar

Aktuelle Probleme dimensionsreduzierter Festkörper

Ort: Seminarraum 718 (Wilhelm-Klemm-Straße 10)

Zeit: **Mittwoch, 09.05.2018, 10:15 Uhr**

On the timescales of correlated electron dynamics

F.O. Schumann

Max-Planck Institute of Microstructure Physics, Weinberg 2, 06120 Halle, Germany

The availability of intense and short light pulses has opened up a new and active research field. This allows to address fundamental questions on the time evolution of the electron dynamics leading to electron emission. We demonstrate in our studies that electron pair emission from surfaces holds the promise to unravel the time scale of electron dynamics. This can be achieved without atto-second light sources.

Specifically, we studied the Auger decay following the emission of a core-electron due to photon absorption. With coincidence spectroscopy, we demonstrate an extensive energy sharing between the Ag 4p photoelectron and the NVV Auger electron exceeding 10 eV. This energy width provides access to the time scale of the emission process. We convert this to a timescale of 60 as over which the fluctuations takes place. This value is in fair agreement with the theoretical calculation of the timescale to fill an exchange-correlation hole. [1]

The neutralization of ions near a surface is known to be an efficient process and leads to electron emission via Auger-type pathways. In the case of the He^{2+} ions the double ionization energy of 79 eV becomes available. We demonstrate that the neutralization of a single He^{2+} ion near an Ir(100) surface leads to the emission of an electron pair. Via coincidence spectroscopy we give evidence that a sizable amount of these electron pairs originate from a correlated single step neutralization of the ion involving a total of 4 electrons from the metal. These correlated electron pairs cannot be explained in the common picture of two consecutive and independent neutralization steps. We infer a characteristic time scale for the correlated electron dynamics in the metal of 40-400 as. [2]

[1] Z. Wei, F.O. Schumann, C.H. Li, L. Behnke, G. Di Filippo, G. Stefani, and J. Kirschner, Phys. Rev. Lett. **113**, 267603 (2014).
[2] C.-H. Li, C. Tusche, F.O. Schumann, and J. Kirschner, Phys. Rev. Lett. **118**, 136402 (2017).

Einladender: Markus Donath