Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

FAKULTÄT FÜR PHYSIK UND ASTRONOMIE
- DEKANAT -

PHYSIKALISCHES KOLLOQUIUM

Wintersemester 2018/19

Das Kolloquium findet (soweit unten nicht anders angegeben) jeweils montags 17:15 Uhr im Hörsaal P des Physikalischen Instituts auf dem Hubland Campus Süd der Universität Würzburg statt.

14. Januar 2019

Prof. Dr. Michael Horn von Hoegen
Universität Duisburg-Essen, Experimentalphysik

Atomic wires at the quantum limit

Abstract

How fast do atoms move? This seemingly simple question will be addressed and finally answered in this talk. The method of choice to study the non-equilibrium structural dynamics of atoms at a silicon surface is ultra-fast electron diffraction. In combination with a fs-laser system in a pump probe setup we obtained an ultimate temporal resolution better than 350 fs. The drosophila of atomic wires systems, i.e., the indium induced (4×1) reconstruction on Si(111), is employed for these studies. At 130 K a metal-insulator transition to the (8×2) ground state takes place. A Peierls-like distortion causes periodicity doubling, opening of a bandgap, and formation of a charge density wave. Upon photo excitation through an intense IR-laser pulse the (8×2) ground state is coherently driven to the (4×1) excited state as observed through the transient changes of spot intensity. The transition is described in a strongly accelerated displacive excitation scenario, which relies on transient changes in the potential energy surface. The strong coupling between substrate and adsorbate is responsible for the sub-picosecond structural response by dephasing and damping the characteristic phonons in 1/4th of their oscillation period: the 1D system switches from insulating to metallic in only 700 fs. Transient heating of the In atoms from 30 K to 80 K occurs delayed at 6 ps. Thus, the phase transition is driven by electronic entropy and not thermally. [T. Frigge et al., Nature **544**, 207 (2017)]

Für die Dozenten der Fakultät für Physik und Astronomie

Frau Prof. Dr. Erdmenger, Prof. Dr. Bode, PD Dr. Behr und Herrn Steppert