

O 15 Invited talk Gudde

Time: Tuesday 09:30–10:15

Room: TRE Phys

Invited Talk

O 15.1 Tue 09:30 TRE Phys

Control of coherent electron motion and adsorbate diffusion at surfaces by femtosecond laser excitation — •JENS GUDDE —
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Diffusion of adsorbates is usually a thermally activated process. The corresponding rate can be influenced only by varying the substrate temperature, which may also induce unwanted competitive surface reactions. In particular for metal surfaces, however, the diffusive motion of adsorbates is strongly coupled to electron-hole pair excitations within the substrate, which makes it possible to induce diffusion also by optical excitation of metal electrons. I will show for atomic oxygen on vicinal Pt(111) that femtosecond-pulse laser excitation is capable of inducing lateral motion of oxygen atoms even at low substrate temperatures. By applying a sequence of two laser pulses, the diffusion rate can be controlled by varying their time-delay. In this way it is possible to study the coupling between electronic excitation and diffusive motion in the time domain.

While the diffusive adsorbate motion is excited by an incoherent distribution of electrons, the primary laser excitation is coherent and allows a more sophisticated control of motion at surfaces. In the second part of my talk I will show for a copper surface how a multiphoton excitation scheme can be used to induce coherent electron motion at surfaces, i.e. a coherent DC current, the direction of which can be controlled by the relative phase of the excitation pulses. The current is detected with high sensitivity by time-resolved photoemission.