IAP Seminar

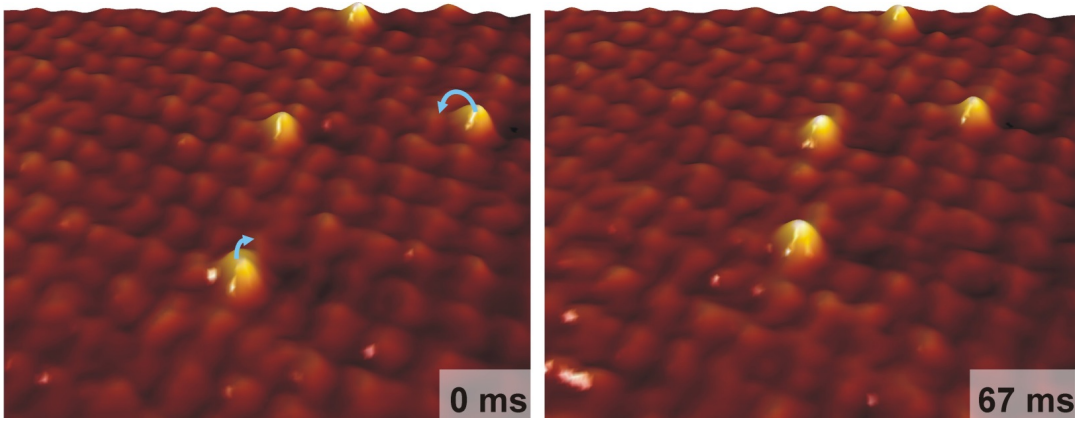
Olaf Magnussen

Kiel University, Institute of Experimental and Applied Physics
Kiel/Germany

Tuesday, 30th January 2018, 16:00 s.t.
TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B“, 5th floor, SEM.R. DB gelb 05 B

Elementary steps in surface dynamics and reactivity at electrochemical interfaces

Processes at electrochemical interface are the key to many current and emerging technologies, e.g. in energy storage or micro- and nanofabrication. Using modern *in situ* and *in operando* techniques, detailed insights into these processes on the atomic scale can be obtained. In this talk, results by fast *in situ* scanning tunneling microscopy (Video-STM) and novel synchrotron X-ray scattering techniques are presented. The first method allows microscopic observations of atomic motion in real time, enabling studies of the mechanisms and dynamics of adsorbate diffusion and adsorbate-adsorbate interactions on electrode surfaces. As examples, measurements of the potential-dependent diffusion of isolated anionic, cationic, and organic adsorbates on noble metal electrodes will be described, which indicate a decisive role of coadsorbed anionic species. Specifically, these coadsorbates completely determine the potential dependence of the diffusion process. Assisted by ab initio calculations, this behavior is attributed to an anion-induced change of the diffusion mechanism. In the second part, the atomic-scale mechanisms of surface restructuring during electrochemical surface oxidation and oxide reduction are discussed for the case of platinum surfaces. Using *in situ* surface X-ray scattering, the structural changes during these reactions, are quantitatively studied. Fundamental differences between different surface orientations are found: While on Pt(111) oxygen ingress into the Pt surface is initially fully reversible, it results in irreversible structural changes on Pt(100). These observations as well as the nanoscale surface roughening induced by oxidation/reduction cycles can be linked to the well-known Pt surface dynamics under UHV conditions.



All interested colleagues are welcome to this seminar lecture (45 min. presentation followed by discussion)

Friedrich Aumayr
(LVA-Leiter)

Ulrike Diebold
(Seminar Chair)