

O 31 Invited talk Repp

Time: Thursday 10:15–11:00

Room: TRE Phys

Invited Talk

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Scanning Tunneling Microscopy of Adsorbates on Insulating Films: From the Imaging of Individual Molecular Orbitals to the Manipulation of the Charge State — •JASCHA REPP — IBM Research, Zurich Research Laboratory, 8803 Rüschlikon, Switzerland

Ultrathin insulating films on metal substrates are unique systems to use the scanning tunneling microscope to study the electronic properties of single atoms and molecules, which are electronically decoupled from the metallic substrate.

Individual gold atoms on an ultrathin insulating sodium chloride film supported by a copper surface exhibit two different charge states, which are stabilized by the large ionic polarizability of the film. The charge state and associated physical and chemical properties such as diffusion can be controlled by adding or removing a single electron to or from the adatom with a scanning tunneling microscope tip. The simple physical mechanism behind the charge bistability in this case suggests that this is a common phenomenon for adsorbates on polar insulating films.

In the case of molecules on ultrathin NaCl films the electronic decoupling allows the direct imaging of the unperturbed molecular orbitals, as will be shown in the cases of individual pentacene and oligothiophene molecules. Scanning tunneling spectroscopy of these double-barrier tunneling junctions reveals strong electron-phonon coupling to NaCl phonons.