# O 10 Adsorption an Oberflächen I

Zeit: Freitag 15:45–17:00 Raum: TU EB301

O 10.1 Fr 15:45 TU EB301

**The Adsorption of Triptycene on Au(111): a bilayer growth stabilised by intermolecular $\pi$-$\pi$ interactions** — •I.F. Torrente[1,2], N. Henningsen[1], and J. I. Pascual[1] — [1]Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, D-14195 Berlin, Germany — [2]Institut Català de Nanotecnologia, Campus UAB, Bellaterra, Barcelona, Spain

The adsorption of triptycene molecules (C20H14) on Au(111) is studied by means of Low-Temperature Scanning Tunnelling Microscopy and Spectroscopy. Triptycene is a model system to investigate the balance between the tendency of the aromatic units to bond flat, parallel to a metal surface, and the intermolecular $\pi$-$\pi$ interactions. In planar aromatic molecules, the interaction of $\pi$ states with the metal electronic states usually dominates. The structure of triptycene frustrates partially such planar configuration. As a result, triptycene interaction with the Au(111) metal surface is described by a weak physisorption. As soon as the substrate temperature is above a few tenths of K, Triptycene ensemble in self-assembled molecular islands with a characteristic bilayer structure. The interpretation of such growth mechanism is done on the basis of the dominant role of stronger intermolecular interactions respect to physisorption energies.

O 10.2 Fr 16:00 TU EB301

**Manipulation und Adsorptionsplatzbestimmung von einzelnen Pentazen-Molekülen auf Cu(111)** — •Stefan Fölsch[1], Kiyoshi Kanisawa[2] und Jérôme Lagoute[1] — [1]Paul-Drude-Institut für Festkörperelektronik, Hausvogteiplatz 5-7, D-10117 Berlin — [2]NTT Basic Research Laboratories, NTT Corporation, Atsugi-shi, Kanagawa 243-0198, Japan

Atomare und molekulare Manipulation mittels Tieftemperatur-Rastertunnelmikroskopie läßt sich als analytisches Werkzeug für die Oberflächenphysik einsetzen. Wir demonstrieren dies anhand der Adsorptionsplatzbestimmung einzelner Pentazen-Moleküle auf Cu(111) bei 7 K. Pentazen (C22H14) ist ein aromatischer Kohlenwasserstoff bestehend aus fünf linear angeordneten Benzolringen. Das Einzelmolekül adsorbiert in planarer Geometrie, wobei die lange Molekülachse stets parallel zu den dichtgepackten Cu-Reihen in der Oberflächenebene ausgerichtet ist. Attraktive Wechselwirkungen zwischen Molekül und STM-Spitze können dazu ausgenutzt werden, um kontrollierte laterale Translationen des Moleküls entlang verschiedener hochsymmetrischer Richtungen auszuführen. Durch kombinierte Manipulation sowohl des Moleküls als auch einzelner Cu-Adatome finden wir, daß die Benzoleinheiten des adsorbierten Moleküls stets über hexagonal-dichtgepackten (HCP-) Plätzen der Cu(111)-Oberfläche zentriert sind.

O 10.3 Fr 16:15 TU EB301

**Coulombic amino-group–metal bonding: Adsorption of adenine on Cu(110)** — •Martin Preuss, Wolf Gero Schmidt, and Friedhelm Bechstedt — Institut für Festkörpertheorie und -optik, Max-Wien-Platz 1, 07743 Jena

The knowledge of the interaction between biologically active molecules such as proteins or nucleic acid and solid surfaces is relevant to the preparation of biocompatible materials and biosensors. The adsorption of small organic molecules, in particular amino acids or nucleic acid bases, on metal surfaces thereby serves as a model case for the understanding of more complex systems as well as reactions between organic molecules. The bonding of molecular amino groups to metal surfaces is of particular interest and has given rise to a number of interpretations. Here we analyze the adsorption of adenine on Cu(110) using *first principles* calculations. A directional bonding between the amino-group nitrogens and copper surface atoms is found to emerge that cannot simply be explained by covalent or ionic contributions. Instead we propose the established bond to be a result of mutual polarization of the amino-group N lone pair of electrons and the metal substrate. To rationalize this notion we decompose the Coulombic interaction energy due to the charge transfer into monopole and dipole terms.

O 10.4 Fr 16:30 TU EB301

**Electronic interaction between a single molecular wire and a metallic nanostructure** — •Leonhard Grill[1], Francesca Moresco[1], Ping Jiang[2], Sladjana Stojkovic[2], Christian Joachim[2], Andre Gourdon[2], and Karl-Heinz Rieder[1] — [1]Institut für Experimentalphysik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin — [2]Nanoscience Group, CEMES-CNRS, 29 rue J.Marvig, 31055 Toulouse, France

We have studied organic so-called Lander molecules with low temperature STM. On Cu(110) these molecules act as templates for the formation of characteristic copper nanostructures, two atoms wide and seven atoms long. By manipulation with the STM tip the molecules can be shifted laterally along these nanostructures where they adapt to various stable conformations. The characterization and control of the electronic contact between a molecule and an electrode is of fundamental importance for future molecular electronics. In the present work an electronic contact, i.e. additional contribution to the tunneling current, between the molecular board and the metal atoms is observed, in particular if the Lander is brought to the end of the copper nanostructure by STM manipulation. We have studied the dependence of this electronic interaction on the molecular position and conformation, the height of the molecular wire and the chemical properties of its end group. Experimentally determined results are compared with calculations.

O 10.5 Fr 16:45 TU EB301

**Mediated Co-Adsorption of Hydrogen-Bound Molecular Monolayers** — •Lorenz Kampschulte, Markus Lackinger, Stefan Griessl, and Wolfgang M. Heckl — Department for Earth- and Environmental Sciences, Ludwig-Maximilians-University Munich, Theresienstr. 41, D-80333 Munich, www.nano-science.de

Self-assembled monolayers (SAMs) are an important grounding for future applications of long range ordered molecular structures in nanotechnology. Hence it is of general interest to understand the parameters determining the growth and stability of these systems.

By means of Scanning Tunneling Microscopy (STM) based experiments we try to learn more about driving forces for molecular self-assembly and the influence of external parameters. Stable adsorption of TPT (1,3,5-tris(4-pyridyl)-2,4,6-triazin) molecules at the liquid-solid interface (which normally do not adsorb in an equilibrium situation) was observed by STM. Adsorption of TPT was made possible with the aid of H-bonding "glue-molecules" like TMA (1,3,5-benzene-tricarboxylic acid - trimesic acid) or TPA (1,4-benzene-dicarboxylic acid -terephthalic acid). With this method it was possible to prepare SAMs of TPT co-adsorbed with either TMA or TPA which were stable during the observation time of approximately 30 min. For continuative investigations the same molecular systems were prepared under Ultra-High-Vacuum (UHV) conditions.