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Doctoral Programme

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Guest Lecture

Title:

“Touching' Single Functional Molecules: From Switches to Wires”

Speaker: Prof. Dr. Leonhard Grill

Address: Institute of Chemistry, Single-Molecule Chemistry, University of Graz,
Austria

Date: Friday, 22nd of May 2015

Time: 14:30

Place: Seminar Room CBEG02 (387, Photonics); Gußhausstraße 27

Abstract: The investigation of functional molecules on surfaces is of fundamental interest for a detailed understanding of physical and chemical processes at the single molecule level as well as for future molecular nanotechnology, in particular in view of molecular machines, novel materials and molecular electronics. The scanning tunneling microscope is very a tool to study such systems, because it can image with sub-molecular resolution and is at the same time also capable to manipulate (thus "touch") individual molecules in a controlled way.

In this presentation, various examples of single-molecule manipulations will be given. The controlled assembly of molecules on surfaces will be presented, whereas covalent bonding is the desired intermolecular interaction, leading to bottom-up fabricated networks of desired architectures. Various molecular wires can be grown in this way and, when pulling a single polymer with the STM tip, not only the molecular conductance but also the forces, which are active during the conformational changes, can be measured.

An important issue for any functional molecule is the role of the direct environment for the molecular function. We have studied the atomic scale surroundings of individual molecules and found that chemical processes within individual molecular can be controlled by single atoms. This was observed for molecular switches, where the atomic-scale surroundings cause drastic changes in their switching probability, leading to periodic switching patterns. Moreover, the rate of an intramolecular hydrogen transfer reaction can be tuned up and down by only one single atom in the vicinity of the molecule.