

Chemistry Colloquia

Physics and Chemistry with Single Molecules



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Thursday **Mondi 2**

The characterization and controlled manipulation of molecules gives insight into fundamental physical and chemical properties. We use scanning tunneling microscopy (STM) to study single molecules that exhibit specific mechanical, optical, electronic or chemical functions. This not only allows to control and investigate molecular processes, but also to investigate the role of the local environment at the atomic scale.

In this talk, several examples of our research will be presented: Molecular wires, assembled directly on a surface from pre-designed building blocks. Their electric conductance is then measured by pulling single wires off the surface with STM manipulation. Molecular switches, which strongly depend on their switching efficiency on the local atomic-scale surroundings. Molecular motion either by manipulation in a pseudo-blind (and therefore much faster) mode, by using two independent STM tips or by measuring distance-time relationships to determine the real speed of a single molecule. 'Adsorbate motors', which move unidirectionally, although they are based on a simple molecule that does not contain any motor function, but achieves its functionality only in combination with a surface. Chemical reactions induced by controlled collisions of two molecules to study the impact parameters that are required for a successful bond formation.

After his undergraduate studies in physics at the University of Graz, **Leonhard Grill** worked at the INFM in Trieste on his doctoral thesis about electron scattering and spectroscopy at surfaces before he moved to the Freie University (FU) of Berlin where he began to work on the manipulation of single molecules using scanning tunneling microscopy (STM). In 2006 he became group leader, first at the FU Berlin and then at the Fritz-Haber-Institute of the Max-Planck-Society in Berlin before he moved to the University of Graz in 2013. His research focuses on the understanding of physical and chemical processes at the atomic scale, using functional molecules at surfaces. He received several awards, among which the Feynman Prize in Nanotechnology 2011 and an ERC Advanced Grant 2023, and was the winner of the first Nanocar Race in 2017.

