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S E M I N A R
aus
Halbleiterphysik und Nanotechnologie

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"Manipulation of single functional molecules on surfaces - from switches to wires"

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An important challenge of nanotechnology are functional molecules and their assembly into pre-defined architectures which is of interest in various fields from molecular electronics over novel materials to molecular machines. Various examples of functional molecules, studied by scanning tunneling microscopy (STM) under ultrahigh vacuum conditions, will be discussed. Specifically designed molecular building blocks are connected to two-dimensional networks or one-dimensional chains, which can act as molecular wires. The conductance of these chains can be measured at the level of single molecules, allowing a direct determination of electrical and mechanical properties as well as a correlation of electronic with electrical properties. Moreover, the forces that are acting on such a polymer when pulling it off a surface are determined by atomic force microscopy.

On the other hand, chemical processes within individual molecular can be controlled via their environment. This was observed for molecular switches, where the atomic-scale surroundings cause drastic changes in their switching probability. It could be shown that the rate of an intramolecular hydrogen transfer reaction can be tuned up and down by single atoms in the vicinity of the molecule. Single atoms were also found to modify the appearance of adsorbed molecules in STM images during their diffusion underneath the molecules.