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S E M I N A R
aus
Halbleiterphysik und Nanotechnologie

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"Single molecule chemistry by STM"

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Scanning tunneling microscopy is today one of the standard techniques for the analysis of solid surfaces. It allows to elucidate the geometrical and electronic structure of surfaces with atomic resolution. Recent research has shown that electron tunneling can also be used to chemically modify surfaces and adsorbates either by manipulation or by inelastic electron transfer processes. In this presentation we will review the possibilities of chemically modifying adsorbed molecules using the STM under ultra-high vacuum conditions. The focus will be on dehydrogenation processes, which have been observed for isolated molecules but also in compact molecular layers. We will use recent results obtained for dihydrotetraazapentacene (DHTAP) on Au(111) to illustrate the power of the method for synthesizing molecules, which cannot be produced by conventional organic synthesis. In this particular case, the STM can be used to produce tetraazapentacene (TAP) by dehydrogenation of the NH-groups and this with molecular resolution in compact layers. TAP can be thus produced in the first and second monolayer. The decoupling of the DHTAP molecules in the second molecular layer further allows for the creation of radicals by either single hydrogenation or dehydrogenation. We will discuss the potential applications of this method for the production of entire molecular layers of TAP. This could lead to semiconducting molecular layers, which should possess similar properties as pentacene layers.