ORGANIC MOLECULES ON SURFACES STUDIED BY STM: DYNAMICS, CHIRALITY, ORGANIZATION AND SELF-ASSEMBLY.

Flemming Besenbacher (fbe@inano.dk)

Interdisciplinary Nanoscience Center (iNANO)
University of Aarhus, DK-8000 Aarhus C, Denmark

Adsorption and organization of organic molecules on solid surfaces is central to self-assembly and bottom-up fabrication within nanoscience and technology. The Scanning Tunneling Microscope allows exploration of atomic-scale phenomena occurring at surfaces: Dynamic processes can be followed by fast-scanning STM and from data acquired at a range of temperatures; detailed information on kinetic parameters can be extracted. In the talk, a number of studies investigating dynamics and organization of organic molecules on metal surfaces under Ultra-High Vacuum conditions will be described.

First the fundamental process of surface diffusion will be discussed, and the case of metal adatoms [1] will be compared to the considerably more complicated situation arising when molecular adsorbates with many internal degrees of freedom migrate on surfaces. In the latter case, the molecular properties can be tailored to control the molecular diffusion properties [2], and the diffusion can be influenced by the molecular adsoption geometry, as shown by molecules that have assumed metastable adsorption sites either spontaneously [3] or through STM manipulation [4].

Secondly, the fascinating field of chiral adsorption will be addressed. Chirality is the property of molecules to have a handedness, either inherently or due to loss of symmetry elements upon adsorption. In the case of the amino acid cysteine on gold surfaces, STM was used to examine intermolecular chiral recognition [5] and also the interaction of molecules with chiral sites on a metal surface [6].

Finally, the themes of dynamics and chirality will be combined, describing recent results in which we have investigated chiral switching by spontaneous conformational changes in a molecule belonging to a family of oligo-phenylene-ethynelenes [7]. The switching mechanism has implications for chiral ordering on surfaces and various ordered structures formed by this family of molecules will be discussed.

References

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