DYNAMICS OF NANOSTRUCTURES ON SURFACES REVEALED BY HIGH-RESOLUTION, FAST-SCANNING STM

Flemming Besenbacher

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

In the interdisciplinary area of nanoscience and nanotechnology, the physical and chemical properties of nanostructures are often unique functions of their size and shape and can be very different from those of bulk matter. In this talk I will show how the unique aspect of our Aarhus STM and the time-resolved, high-resolution STM imaging can be used to obtain important new insight into the dynamics and can provide very important new information on the atomic-scale realm and on the dynamics of nanostructures. The time-resolved STM data are visualized in the form of STM movies (see www.inano.dk/spm) which can subsequently be analyzed in order to extract quantitative information on activation energy, prefactors and adsorbate-promoted diffusion.

I will mainly illustrate the capabilities of the STM with examples from my own research group, and I will discuss topics such as surface diffusion of adatoms [1,2] and molecules on surfaces [3,4], diffusion of vacancies and molecules on oxide surfaces [5,6], anchoring of molecules on surfaces and how they can acts as templates, forming nanostructures which can be adapted to the dimensions of the molecules [4,7].

Finally, I will address recent results concerning a simple, biologically relevant molecule - the chiral, sulphur-containing amino acid cysteine – and the DNA base guanine (G) on a gold surface. I will show how we obtain fundamental new insight into the chiral recognition on the single-molecule level [8], and show how the guanine molecules self-assemble into G-quartets with the same structure as those found to couple different strands of DNA in solution [9].

References

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