

Plenary Talk

PV VII Wed 8:30 H1

Catalytic model systems studied by high-resolution, video-rate Scanning Tunneling Microscopy — ●FLEMMING BESENBACHER — Interdisciplinary Nanoscience Center (iNANO), Aarhus University, DK-8000 Aarhus C, Denmark

The development of renewable, sustainable and green energy resources and the protection of the environment by reducing emission pollutants are two of the largest challenges for the human civilization within the next 50 years. Besides the well-known energy resources that power the world today; petroleum, coal, and natural gas, active research and development exploring alternative energy resources such as solar, biomass, wind, and hydrogen is currently being performed.

To realize the vision of a clean society and our vision of plentiful, low cost sustainable energy, research and innovation within the area of the rapidly expanding fields of nanoscience and nanotechnology, multidisciplinary by nature involving physics, chemistry, biology, molecular biology, is mandatory. For decades single-crystal surfaces have been

studied under ultra-high vacuum (UHV) conditions as model systems for elementary surface processes. This “surface science approach” has contributed substantially to our understanding of the processes involved in especially catalysis.

In this talk I will show how Scanning Tunneling Microscopy (STM) can reveal fundamental processes in relation to catalysis, and how we can extract quantitative information on surface diffusion of adatoms and molecules; diffusion of vacancies; interstitials and molecules, e.g. water molecules on oxide surfaces; sintering and diffusion of nanoclusters on oxide surfaces [1]; diffusion of intermediate species [2]; identification of active sites and determination of new nanostructures with novel, catalytic properties from time-resolved, high-resolution STM images/movies (see www.phys.au.dk/spm). The atomic-scale information obtained may even lead to the design of new and improved catalysts in certain cases.

[1] D. Matthey et al., Science 315, 1692 (2007)

[2] S. Wendt et al. Science 320, 1755 (2008)