МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

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Nanoanalytical and nano(bio)technological research projects at Institut für Allgemeine Physik, Vienna University of Technology

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The Institut für Allgemeine Physik has broad competence in nanoanalytical methods. This comprises nanophysics, -chemistry and -tribology. The apparative equipment comprises scanning probe microscopes (AFM, STM, MFM), in ultra-high vacuum as well as in air and in controlled gaseous or fluid (also chemically aggressive) environments, a scanning Auger microprobe in combination with a finely focussed ion-beam (FIB) and an angle-resolved photo electron spectrometer (ESCA, XPS). These methods are applied in short term industrial applications, developmental research and basic research.

In the field of micro- and nanotribology the institute has strong collaboration with the Austrian Center of Competence for Tribology, an industrial research centre.

Three ongoing research projects will be presented on more detail: nanostructuring surfaces with highly charged ions, AFM investigation of *Euglena gracilis* and tribochemistry of hydroxyquinolines on copper and steel.

Nanostructuring surfaces with highly charged ions

Upon interaction of highly charged ions with solid surfaces a large amount of potential energy is deposited within a few femtoseconds within a nanometer size volume close to the surface. This unique action of HCI offers a promising way for surface nanostructuring of different materials. We present first results on the generation of surface nanostructures by HCI on CaF_2 (111) single crystal surfaces that were irradiated with slow highly charged ions. CaF_2 is our material of choice for such investigations, since the ion-induced surface structures are stable in atmosphere at room temperature, opening the possibility to use such structures in technological applications.

Investigation of *Euglena gracilis*

Eulena gracilis is a single celled green algae species. The photoreceptive crystal of *E. gracilis* has directional sensitivity to incident light. Incident photons induce conformational changes in the algal rhodopsin single molecule, resulting in highly efficient energy conversion exceptionally little disturbed by thermal noise. The photocycle of this single photon detector is a simple two step process. This biomaterial with molecular precision is a promising candidate for biomimetic applications, e.g. in information technology. Emerging nanoelectromechanical systems (NEMS) might even use such a crystal as energy converter, simply by making use of ambient light. We will present characterization of this biomaterial with confocal laser microscopy, scanning probe microscopy and nanoscale force spectroscopy, thereby contributing to a sound basis for the correlation between structure and function of this amazing material.

Tribochemistry of hydroxyquinolines on copper and steel

This project aims at correlation of macroscopic tribological experiments for lubricant optimization with ESCA investigations of the chemical binding of hydroxiquinoline isomers to copper and 100-Cr-6 steel. Macroscopic tribometer experiments show distinct differences in the lubrication behaviour depending on the isomer used as additive in toluene (2-, 4-, 6- and 8- hydroxiquinoline). ESCA results indicate the formation of different tribolayers depending on the isomer used.