INVESTIGATING MOLECULAR TRANSFORMATIONS AT THE NANOMETER SCALE USING FRICTION FORCE MICROSCOPY

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The functionalization of inorganic surfaces by molecular layers, including self-assembled monolayers, is a widely applied and important technique for the fabrication of functionlized and nanostructured materials. By conferring photoreactivity to molecular layers at surfaces, various surface properties can be adjusted by UV illumination. This includes surface polarity, optical properties as well as chemical reactivity, thus enabling follow-up reactions utilizing the photogenerated groups. In combination with lithographic patterning, 2D structures are accessible on various substrates.

It will be demonstrated how photosensitive units can be attached to inorganic surfaces utilizing thiol or trialkoxysilyl anchoring units. Exemplary photoreactions are the thiocyanate – isothiocyanate photoisomerization, the photo-cleavage reaction of ortho-nitrobenzylesters and the photo-Fries rearrangement, both providing new functional groups and reactivity in the irradiated zones. Post-modification reactions from the liquid phase and the gas phase as well as methods for the micro and nanopatterning will be reviewed. A particular focus is set on friction force microscopy, which allows for the investigation of changes in the surface properties and thus a visualization of laterally structured molecular films. In this context, the nanopatterning of photosensitive surface layers utilizing scanning near-field optical lithography will be demonstrated enabling resolutions down to the sub-µm range.