

Seminar

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Nanoparticles Affects the Function of Photosystem I

Plasmonic metal-nanostructures are an emerging tool for manipulating optical properties of fluorophores. They are used for enhancing the sensitivity of fluorescence-based assays in drug discovery and high-throughput screenings as well as in immunoassays. Even plasmon-assisted detection of biological reactions in vivo has been suggested. The fast evolving range of applications for plasmonic nanomaterials make a deeper understanding of nanostructure–protein interactions necessary.

During the last years different constructs of photosystem I and nanoparticles were investigated in order to enhance the function of PSI. Some of these constructs are also able to produce hydrogen upon illumination. Here, I focus on the question, how the optical properties of PSI – a huge multi-chromophore FRET-coupled system – are modified by nearby plasmonic nanostructures. The optical properties of these constructs are investigated by low temperature single-molecule spectroscopy. The used constructs are formed by PSI and nanoparticles/nanostructures made from gold and silver. Beside remarkable fluorescence-enhancement significant changes of the characteristic fluorescence emission from photosystem I were observed. Particularly the higher energy chlorophylls with site-energies close to the reaction center show increased deactivation via fluorescence emission, thereby, reducing the efficiency of energy transfer towards the site of charge separation (P700), and thereby, the protein function. This reduction will also affect the efficiency of PSI-nanoparticle hybrids discussed for biotechnological applications. It can be supposed that altered responses can generally be expected for multi-chromophore FRET-coupled systems near to plasmonic nanostructures. The observed spectral changes are discussed in a general framework of plasmonic interaction with multi-chromophore FRET-systems

Wednesday, June 6, 14h15

Hörsaal Makromolekulare Chemie, Stefan-Meier-Str. 31

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