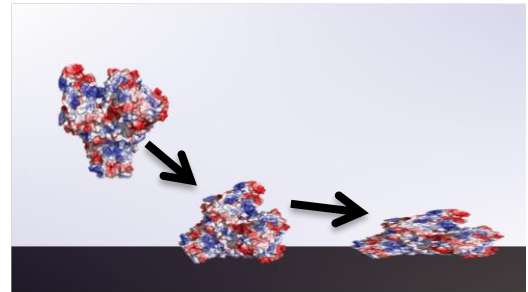


Master and Bachelor Projects:

Understanding protein adsorption at solid-liquid interface

Protein adsorption at solid-liquid interfaces plays a key role in biomedical technologies such as biosensors, biochips or biomaterials for medical implants. Despite considerable progress in this field there are still widely differing and even contradicting opinions on the driving force of protein adsorption at an interface, which is influenced by multiple parameters such as the bulk protein's shape, charge, diffusion and conformation, as well as, the surface charge, hydrophobicity and the system's temperature, pH and ionic strength. Protein adsorption to non-biological substrates under various conditions is well studied, but much less well in the presence of multivalent ions, which offer unique opportunities to tailor the interactions. In this project, we make use of several scattering techniques, such as XRR, IR, ellipsometry, and other methods e.g. UV-VIS, AFM, contact angle to determine the protein layer formation, growth, density, thickness, and kinetics, as well as conformational changes occurring during the adsorption process. This project will complement studies on the protein adsorption via neutron reflectivity and QCM-D in Didcot, United Kingdom. The projects listed below are suitable for students of various backgrounds with an interest in interdisciplinary work for their Bachelor's or Master's thesis.



Characterization of protein adsorption at the solid-liquid interface studied by ellipsometry, AFM, NR, XRR, IR and QCM-D.

Topics and Methods:

- Characterization of protein adsorption behavior of various trivalent and divalent salts e.g. AlCl_3 , MgCl_2
- Study of wetting layer: temperature effect on protein adsorption
- Surface modification: Change of surface properties on protein adsorption e.g. through coating with self-assembled monolayer (SAMs)
- Role of ions: Do the ions rather bind at the protein, which then adsorb at the solid-liquid interface or do the ions form an active bridge between proteins and interface?
- Characterization of conformational changes proteins undergo while adsorbing to an interface studied via infrared reflectivity
- Cooperation with medical group (AG Prof. Geis-Gerstorfer): Study of implant surfaces

Contact: fajun.zhang@uni-tuebingen.de or frank.schreiber@uni-tuebingen.de

Address: Auf der Morgenstelle 10, C-Building, 7th floor

References and further information:

<http://www.soft-matter.uni-tuebingen.de> (see under publications and open positions)

1. S. Schuster et al., Int. J. Med. Microbiol. 304.8 (2014): 949-957.
2. M. R. Fries et al., Phys. Rev. Lett. (2017) in print