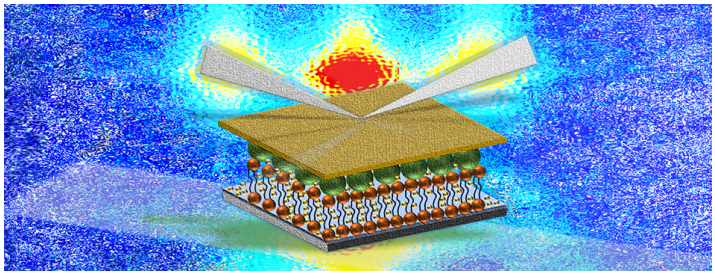

Beitrag ID: **11** Typ: **Invited talk**

Neutron Scattering as diagnostic tool to investigate the molecular interactions at lipid nano-biointerfaces

Donnerstag, 10. Oktober 2024 11:00 (30 Minuten)

Biointerfaces describe the areas of making contact with biological environments, such cells, tissues, living organisms, bio(macro)molecules or organic/inorganic materials. Nano-biointerfaces are being mimicked by various models which allow studying important components of cell-life, hence permitting to reproduce various structural conditions [1], such as the architecture of plasma or bacterial membranes to monitor their interactions with guest molecules, the vesicle fusion intermediates, as well as the tubular cell-to-cell communicational connections.
The investigation of the structural organization and the molecular interactions occurring at the nano–biointerfaces level in controllable manner remains challenging due to analytical complexities and limitations. In this context, Neutron Scattering techniques represent powerful tools to shed light onto molecular features of functional nano-biointerfaces and their function with guest molecules, such as ions, proteins and peptides, oligonucleotides, antibodies and/or nanoparticles, thus involved into many molecular recognition processes. Here, an overview of the main results obtained through Small-Angle Neutron Scattering (SANS) and Neutron Reflectometry (NR) measurements will be presented to show the powerful opportunity offered by them to describe the structural organization of lipid nano-biointerfaces biomimicking plasma or outer membranes of Gram(-) bacteria [2]. In this way, the type of nano-biointerfaces, such as lipid vesicles or supported lipid bilayers, as well as the nature and relative content of lipids, such as zwitterionic or anionic bi- or multi-chained phospholipids, sterols/hopanoids and lipopolysaccharides (LPS), resulted decisive in influencing the interaction with different bioactive molecules like antimicrobial peptides and oligonucleotides involved into specific biorecognition processes [2]. SANS and NR analyses allowed to shed light on the molecular interactions and binding affinity with specific portions (i.e., hydrophobic or hydrophilic region) of each lipid molecule, thus contributing to define the mechanisms occurring at molecular level and, consequently, the functional activity of such biomolecules.

[1] M. Rappolt, Advances in Biomembranes and Lipid Self-Assembly 35, 25 (2022).
[2] G. Vitiello et al., Journal of Colloid and Interface Science 594, 891 (2021); A. Luchini et al., Langmuir 37, 8508 (2021); A. Vanacore et al., Carbohydrate Polymers 2771, 118839 (2022); A. Luchini et al., Journal of Molecular Liquids 39615, 123973 (2024); G. Vitiello et al. Journal of Molecular Liquids under review (2024).

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