



Combination of Small Angle Neutron Scattering and Quantum Cascade Laser-based Infrared Spectrophotometer for the Investigation of Amyloid Formation

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Infrared spectroscopy serves as local probe reporting on specific vibrations in some side chains which are spectrally distant from the complicated infrared spectrum of a protein in solution. But it can also serve as a global probe using the coupling of the amide I or amide II vibrations of the protein backbone. Here, infrared spectroscopy can give information on the fold of the protein and also follow aggregation phenomena. Small angle neutron scattering (SANS) also reports on the global structure of proteins in solution and can give information on the shape of growing aggregates or folded proteins in solution. Both techniques prefer heavy water as a solvent for biological samples over normal water. This makes it so attractive to explore the combination of these two techniques with respect to biological processes.

In this study we would like to explore the capabilities of quantum cascade laser (QCL) based infrared spectrophotometry in combination with small angle neutron scattering (SANS). The advantages of QCLs over conventional infrared light sources are their superior beam characteristics and spectral density. Their disadvantage is the more complicated mode of operation and the limited spectral width they can cover.

As first scientific sample the effect of pH on protein aggregation and amyloid like structure formation in insulin was investigated. The sample was dissolved in phosphate buffer adjusted pH to 2. The sample was pumped constantly through varying combinations of flow through cells of the following techniques: FTIR spectrophotometer, the QCL based infrared spectrophotometer, the UV-Visible spectrophotometer, small angle neutron scattering or the static light scattering device. Thereby we could follow the amyloid like structure formation on the very same sample using different techniques in parallel. For example, we could follow the unfolding of the protein insulin and its formation of an amyloid like structure by the observation of an increasing absorption at 1627 cm^{-1} in the infrared spectral range and correlate this process with an increase in low momentum transfer scattering of the SANS technique, indicative of the formation of large protein assemblies.

Hauptautoren: Dr. STADLER, Andreas (Juelich Centre for Neutron Science); Dr. RADULESCU, Aurel (Juelich Centre for Neutron Science); Prof. FITTER, Jörg (. Physikalisches Institut, AG Biophysik, RWTH Aachen); Dr. DADFAR, Seyed Mohammad Mahdi (Institute of Organic Chemistry, University of Stuttgart); SCHRADER, Tobias (Juelich Centre for Neutron Science)

Vortragende(r): SCHRADER, Tobias (Juelich Centre for Neutron Science)

Sitzung Einordnung: Mounting Posters, Beer and light Dinner

Track Klassifizierung: Health & Life