isas Leibniz-Institut für Analytische Wissenschaften – ISAS – e.V.

COLLOQUIUM

NOVEL IR SPECTROSCOPIC TECHNIQUES TO STUDY PROTEINS

Speaker:

Prof. Dr. Joachim Heberle

Freie Universität Berlin,

Dept. of Physics, Experimental Molecular Biophysics

Place:

ISAS, Schwarzschildstraße 8, Room 218

12489 Berlin

Tuesday, December 6, 2016 – 3 pm

Contact:

Prof. Dr. Norbert Esser

Membrane proteins are the target of more than 50% of all drugs and are encoded by about 30% of the human genome. Electrophysiological techniques, like patch-clamp, unravelled many functional aspects of membrane proteins but suffer from structural sensitivity. We have developed Surface Enhanced Infrared Absorption Spectroscopy (SEIRAS) to probe potential-induced structural changes of a protein on the level of a monolayer [1]. The expression, insertion and folding of membrane proteins was traced by SEIRAS[2]. In this novel approach, the complex reaction sequence is time-resolved on the level of a monolayer of a biomembrane. I will present a new idea to trigger voltage-gated ion channels with the help of intense THz pulses[3]. This approach opens an avenue towards mechanistic studies of voltage-gated ion channels with unprecedented structural and temporal sensitivity. We have developed a new ultrarapid-scanning FTIR spectrometer to trace biological reactions at a scan time of 13 μs[4]. For ns time resolution, a setup was designed and constructed based on tunable quantum cascade lasers (QCL)[5,6]. Finally, scanning near-field IR micrososcopy will be introduced and applied to study the structure of biomembranes[7]. Mapping of protein structure with 30 nm spatial resolution and sensitivity to individual protein complexes by Fourier transform infrared nano-spectroscopy (nano-FTIR) will be demonstrated. We present the first broadband infrared spectra of purple membranes indicating their local α-helical structure.