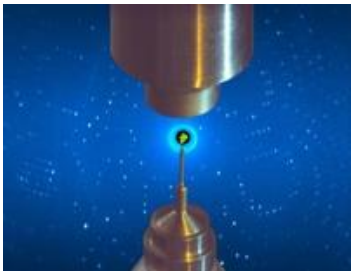

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Quantum cascade laser-based infrared spectrometer combined with small angle neutron scattering for life science applications

Wednesday, 9 June 2021 14:40 (20 minutes)

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. Here, infrared spectroscopy can give information on the fold of the protein and also follow aggregation phenomena. Small angle neutron scattering 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.
In the framework of a BMBF-funded project, we would like to explore the capabilities of quantum cascade lasers for this combination of methods. Their advantage is superior gaussian beam characteristics and higher spectral density over the glow bar infrared light sources of the FTIR spectrometer. Their disadvantage is the more complicated pulsed mode of operation and the limited spectral width they can cover.
As a first scientific sample, the effect of temperature on protein aggregation and amyloid formation in insulin as a peptide hormone, secreted in ß-cells of the pancreatic islets was examined. For this purpose insulin was dissolved in a phosphate buffer, where the pH was adjusted to 2. In the following, the temperature was increased from 25 to 37 ℃ and IR spectra were recorded at different times. In the beginning, no change was observed in the spectra. But, after 100 min, a shift from 1655 to 1622 cm-1 appeared in the amide I region which can be due to amyloid formation of insulin.

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