PAUL SCHERRER INSTITUT

Master thesis project

Infrared Spectroscopy with Dual Laser Frequency Comb Spectrometer

Time frame: Early spring to summer 2024

Research background and context

In contrast to traditional FTIR spectrometers, our new, laser based, IRis-F1 spectrometer allows to work also with relatively strong absorbing samples such as e.g. solutions. For reactive systems liquid jets allow fast mixing of two dissolved reactants and their subsequent observation after a short residence time downstream in the same jet. This kind of measurements has so far not been attempted because the absorption by the solvent in the liquid jet is too strong when using a conventional FTIR spectrometer.

Objectives

- Develop a measurement protocol to work on dissolved samples in a liquid jet interfaced to the IRis-F1 spectrometer
- Establish the boundary conditions (concentration ranges, operation parameters for liquid jet, …) for this kind of experiments

Tasks

- Introduce yourself into the working principle of the spectrometer and its handling
- Interface an existing liquid jet with the spectrometer
- Perform experiments on simple, non-reactive systems
- Develop and document the data analysis
- Establish the boundary conditions for this kind of experiments

Benefits for the student

- You have the opportunity to work with state-of-the-art, non-trivial spectrometers
- Your curiosity will be needed to develop different “modes” to work with the novel combination spectrometer / liquid jet
- You will gain unique skills and knowledge

The work will be carried out in the Applied Catalysis and Spectroscopy group at the Paul Scherrer Institut (PSI) in Villigen.

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