Friedrich-Alexander-Universität
Technische Fakultät

AOT-TP

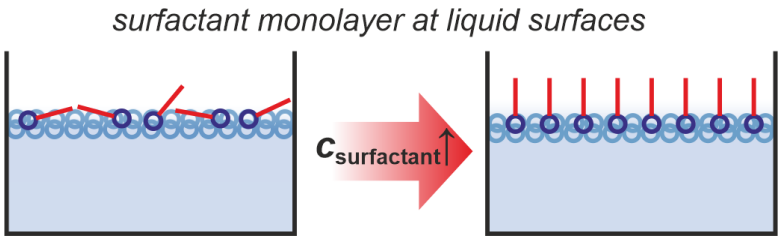
The **Institute of Advanced Optical Technologies – Thermophysical Properties (AOT-TP)** offers a

Master thesis

with the tentative title

Surface light scattering in the presence of surfactant monolayers at vapor-liquid interfaces

Surface light scattering (SLS) is a contactless method for the absolute and accurate determination of viscosity and surface or interfacial tension of fluids in macroscopic thermodynamic equilibrium. The technique probes the dynamics of surface fluctuations which can be accessed by the analysis of the light scattered from the phase boundary. Significant progress has been made in recent decades in the application of SLS for thermophysical property research of different types of vapor-liquid systems in process and energy engineering. Under special conditions when surfactant monolayers are present at vapor-liquid interfaces, a viscoelastic behavior is induced which affects the dynamics of surface fluctuations. In this case, the latter do not longer directly reflect viscosity and interfacial tension. Nevertheless, the analysis of the SLS signals allows to derive viscoelastic properties of the surfactant monolayer such as surface dilatational elasticity and surface dilatational viscosity, which is the focus of the present thesis. Such information is very important in connection with, e.g., foaming and wetting phenomena in various technical applications.



The major task of the master student is to evaluate SLS experiments in the presence of surfactant monolayers at vapor-liquid interfaces. This includes both experimental and theoretical investigations. SLS experiments are to be carried out for selected model systems at vapor-liquid equilibrium for varying thermodynamic state with respect to the surfactant concentration and/or temperature. As required reference for viscosity and interfacial tension, corresponding measurements using capillary viscometry and the pendant-drop method are also intended. The experimental results for the dynamics of the surface fluctuations obtained from the recorded SLS signals are to be compared with the corresponding theoretical description. By applying data for viscosity and interfacial tension within the theory, the viscoelastic properties of the surfactant monolayer should be deduced. These results should be compared with corresponding information reported in the literature for the same or comparable systems.

For the described thesis, we are looking for a committed student with interests in the fields of optical metrology, thermophysical property research, and programming. We offer a diverse, multidisciplinary, and international working environment with excellent potential for scientific and personal development.

Start of the thesis: April 2024

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