

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

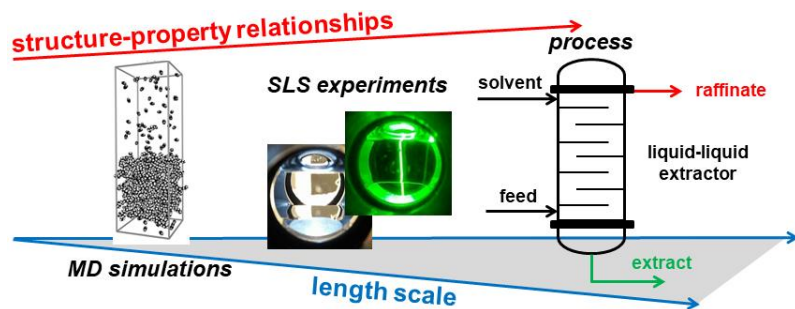
Position as Doctoral Researcher (m/f/d)

associated with the research topic

Interfacial tensions in multiphase systems containing organic solvents and carbon dioxide

Multiphase systems contain at least two partially miscible phases which are separated by phase boundaries. Besides a vapor-liquid interface, also liquid-liquid interfaces can be present, sometimes even at the same time. A key property characterizing each interface is the interfacial tension. It is important in mixtures of carbon dioxide (CO₂) with organic solvents at high pressures, where liquid-liquid systems can be formed. Understanding the physics at the interfaces of multiphase systems is of importance in process engineering. In liquid-liquid extractions, for example, a solvent such as supercritical CO₂ is often used to extract the valuable solute product from the feed stream. Here, alcohols are attractive agents for reducing the interfacial tension between the oil-rich and CO₂-rich phases and the minimum pressure to obtain full miscibility. For process and product design in connection with multiphase systems, knowledge on their interfacial tensions is necessary yet often lacking. This situation seems to be caused by the challenges adherent to corresponding experimental and theoretical methods.

The main objective of a new research project is to contribute to a fundamental understanding of alcohols on the interfacial tensions in multiphase systems containing CO₂ and different classes of organic solvents. To characterize the phase boundaries, reliable information about their interfacial tensions should be obtained at high pressures, where two- or three-phase systems can be found. For this, both experimental and theoretical work will be necessary. For an accurate measurement of interfacial tensions over a broad range down to vanishing values, the surface light scattering (SLS) method characterized by its contactless working principle at thermodynamic equilibrium has to be further developed with respect to its application for multiphase systems at pressures up to 200 bar. The experimental interfacial tensions serve also to test calculations from molecular dynamics (MD) simulations. Furthermore, the latter should also be used for the interpretation of the measurement results on a molecular level. The findings from the experiments and simulations should allow for the development of a prediction model representing the influence of alcohols on the interfacial tensions in mixtures with CO₂ and organic solvents.



We are looking for a graduated researcher with interests and competences in the fields of optics and thermophysical property research. We offer an interdisciplinary and international working environment allowing for an excellent scientific and personal development.

Project start: as soon as possible

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