Interactions in Thin Liquid Films: Towards Non-Aqueous Foams, Emulsions & Dispersions

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Dispersed systems such as foams, emulsions and solid dispersions consist of a discrete phase (gas, liquid, or solid) which is dispersed in a continuous liquid phase. They are widely used in industrial applications and everyday products, e.g. in household and personal care products, in pharmacy, food, paint or firefighting. They are also used as templates for the synthesis of porous materials. In some cases, however, they arise as a nuisance and need to be avoided. Consequently, a specific control over their stability is indispensable! Surprisingly and despite 35 years of research, the reason for their stability - or instability - is not yet understood in detail. This is particularly true for non-aqueous systems! What we do know, however, is the fact that the stability of a dispersed system is directly related to the stability of the thin liquid film separating the bubbles (foams), the droplets (emulsions), or the particles (solid dispersions). This project thus aims at studying these thin liquid films with various techniques to learn more about the macroscopic counterparts.

The stabilisation of non-aqueous foams, emulsions or dispersions is a poorly developed field despite its relevance for a wide range of applications, for example non-aqueous emulsions in cosmetics, non-aqueous foams in food science, or non-aqueous polymer foams in material science! Since the stability of thin liquid films separating bubbles, droplets or particles is crucial for the stability of the dispersed system we will investigate for the first time the interactions in non-aqueous thin liquid films stabilised by model surfactants or amphiphilic block-copolymers and compare our results with those obtained for the corresponding aqueous systems. For this purpose, we will combine three different techniques: the Thin Film Pressure Balance (TFPB) for foam films, the Liquid Surface Force Apparatus (LSFA) for emulsion films, the Surface Force Apparatus (SFA) for films between solid surfaces. Note that up until now almost all investigations have been carried out with aqueous systems and no systematic comparison exists between the different film types.

Searched profile: A physico-chemist with experience in measuring surface forces and/or disjoining pressures!

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