

Structure of Adsorbed Layers on Solid Surfaces - From Adsorbed Amounts to the Identification of Structures

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The adsorption of surfactants, ions or polymers at the solid-liquid interface is one important parameter for the dispersing process and the stability of dispersions.

The adsorption process can be studied by various methods to obtain different parameters. The measurement of the adsorbed amounts is usually the first step. The resulting adsorption isotherm can be evaluated by different models. Measurements of the adsorption enthalpies by calorimetry give additional information regarding the interaction between the surface and the adsorbed component. Atomic force microscopy (AFM) and high-resolution fluorescence microscopy (TIRF-M) can be used in order to identify the structure of adsorbed components directly.

In the present study the adsorption process of anionic surfactants, nonionic surfactants on non-polar and polar surfaces was investigated. The surfactants are adsorbed in a flat orientation to the non-polar surface with a further aggregation to micellar-like aggregates at higher concentrations. This could be assumed from the calorimetric data in combination with the adsorbed amounts dependent on the surface coverage. AFM measurements of the structure of the surfactant layers on flat surfaces directly in the surfactant solution confirmed the results of adsorption experiments. They show semi-cylindrical structures starting already below the critical micelle concentration for the non-polar surface. In studies of the adsorption of surfactants on polar surfaces with AFM and TIRF-M spherical micelles could be identified. A model for the structure is discussed.

A direct correlation of the results of the adsorption measurements to the stability of the dispersions was possible