Abstract

INVESTIGATIONS ON COLLOID-POLYMER MIXTURES IN THE PROTEIN- AND COLLOID-LIMIT

The PhD-thesis evaluates the behavior of colloid-polymer mixtures. One prerequisite for a successful investigation is the establishment of low-contrast systems, so that one component can selectively be observed in the presence of the other. Based on known polymer-solvent systems, exhibiting low scattering contrasts, new colloid-solvent systems are developed, compared and evaluated. The synthesized colloids cover a size regime from 0.7 nm to 250 nm with respect to R_C.

In the protein-limit, where the polymer chains are large compared to the colloids, the overall structure of the polymer chain is of interest. Four different colloid-polymer systems have been investigated. The addition of colloids leads to a decrease in polymer chain size, qualitatively confirming theoretical calculations. The shrinking of the polymer chain size has been observed by light and neutron scattering and by viscosimetry. Hints on a depletion of the colloidal particles from the polymer domain can be obtained by observing phase diagrams, by evaluating the change in apparent molar mass values and by neutron scattering.

The colloid-limit designates mixtures of large colloids and small polymer chains. The second osmotic virial coefficient A_2, is one important parameter to describe the interaction potential of the colloids. Theoretical considerations predict an effective attraction between the colloids, in the case of added polymer chains. This leads to decreasing A_2-values, which become negative. Static light scattering experiments give access to A_2. However, the obtained A_2-values for PMMA microlatices in the presence of small PMMA chains show no measurable effect on the polymer chain concentration.