

Influence of concentration-dependent wettability on sitting and sliding droplets of mixtures and suspensions

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ABSTRACT

We discuss the behaviour of small drops of non-volatile liquid mixtures, colloidal suspensions and polymer solutions on a solid substrate. In particular, our interest focuses on the effect of a concentration dependent wettability. To determine the latter we employ homogenisation techniques, based on the effective medium approximation, to obtain effective optical characteristics of the mixture [1]. Combining this with classical theory of effective molecular interactions between the film surface and the substrate [2], we arrive at a disjoining pressure that depends on film height and vertically averaged concentration. This description is implemented into long-wave theory and is applied to the description of sitting and sliding drops.

In particular, we (i) study the linear stability of flat homogeneous films and the resulting primary bifurcations, (ii) determine families of steady state solutions (drop and hole solutions) without lateral driving, and (iii) families of sliding drop and surface wave solutions with lateral driving for the cases of constant and concentration-dependent viscosity.

The drop and concentration profiles and their characteristics are obtained employing numerical continuation techniques [3].

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