Interfacial Fluid Dynamics: Role of Surfactants

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Fluid dynamics involving interfaces is of wide interest from fundamental and application view points. There are many interesting questions associated with such problems some of which have been addressed experimentally, numerically and theoretically. We review some of these works including the author's and his co-authors' contributions in this area. In particular, we will first review, from the literature, experimental and computational results on the effect of surfactant on the thickness of thin films in Landau-Levich drag coating problem and Bretherton's bubble movement problem through a capillary tube. In both of these problems surfactant thickens the thin-film. Using lubrication approximation and asymptotic methods, we will prove these thickening effects. In the case of drag-out coating problem, the proof will be based on results on the upper bound of film thickness. However, in the case of motion of bubbles through a capillary tube the proof is somewhat along the similar lines. There are some open interesting problems that will also be discussed.

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