Disjoining Pressure and Surface Tension of a Small Drop

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Abstract:

The dependence of the surface tension of a small drop on the drop radius is considered to be important for the process of new-phase formation. In this paper it is demonstrated that the Tolman formula is not unique and the size-dependence of the surface tension could be distinct for different systems. The reasoning is based on the relation between the surface tension and the drop disjoining pressure. The theory developed in this paper is applied to the van der Waals and electrostatic interactions. It is shown that the van der Waals interaction does not affect the thermodynamics of new-phase formation since the effects of the disjoining pressure and the size-dependent component of the surface tension cancel each other. However, it is demonstrated that the electrostatic interactions inhibit condensation phenomena.