Effects of Mesoscopic Fluctuations on Asymmetric Interfaces

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For decades the behavior of Tolman's length (a curvature-correction coefficient in the surface tension) [1] has remained one of the most controversial issues in mesoscopic thermodynamics of fluids. It was commonly believed that Tolman's length played no significant role in practice. However, it has been recently shown [2,3] that Tolman's length, affected by mesoscopic fluctuations, strongly diverges at the critical point of fluids with the amplitude of the divergence depending on the degree of asymmetry in fluid phase coexistence. In this presentation we consider a curvature dependence of the vapor-liquid and liquid-liquid interfacial profiles in systems with asymmetric fluid phase equilibria and smooth interface, such as polymer, surfactant, or ionic solutions. Two-dimensional and multicomponent phase separation are also considered. We show that the curvature correction sometimes can be as large as the thickness of the interface; thus strongly affecting properties of microdroplets and playing a significant role in behavior of fluids in porous media.

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[2] M. A. Anisimov, *Phys. Rev. Lett.*, **98**, 035702 (2007).
[3] M. A. Anisimov and H. St. Pierre, *Phys. Rev. E* **78**, 011105 (2008).