Surface Tension of Nuclei in Fluid Phases

V.G. Baidakov
Urals Branch of Russian Academy of Sciences, Institute of Thermal Physics, Ekaterinburg, Russia

G.Sh. Boltachev [C, S] and A.M. Kaverin
Urals Branch, Institute of Thermal Physics, Institute of Thermal Physics, Ekaterinburg, Russia

Intruding into metastable region is accompanied by a decrease of the effective critical nucleus size, nucleation work, and increase of nucleation rate. The effective nuclei sizes are equal to several nanometers in the region of intensive homogeneous nucleation and account must be taken of the size-dependence of their properties. To describe the properties of the fluid phases involving nuclei, an approach was advanced which is based on the capillarity theories of van der Waals and Gibbs and makes it possible to calculate the density profiles in the nucleus, the position of the dividing surfaces, surface tension, nucleation work, and other properties of nuclei of simple classical fluids. Calculation results are correlated with experimental data for nucleation in pure liquids (Ar, Kr, Xe) and mixtures (Ar Kr, He O_2). It is shown, that in the framework of classical nucleation theory, the account of the size-dependence of surface tension allows agreement of the theory and the experiment within the limits of their aggregate error.