One-Component and Binary Liquid Coexistence Curves on the Basis of the Van Der Waals Model of Gas Fluctuations

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The extended equation of the coexistence curve of one-component liquids and binary solutions near the critical temperature has been proposed on the basis of the fluctuation theory of phase transitions [1] and Van der Waals model of gas fluctuations [2]. This model takes into account the own volume ($v_f = 4/3\pi R_c^3$) of fluctuations of the order parameter and the interaction force between the fluctuations at distances $r > R_c$. Here R_c is the correlation length. The one-component liquids have been analyzed by using this equation of state. The temperature dependencies of the density ρ(T) for a wide class of both inhomogeneous liquids under gravity and homogeneous liquids have been studied in a temperature range of large fluctuations $t_f =(T-T_c)/T_c=10^{-2}-10^{-5} << Gi$. The linear dependencies of the coefficients B_n of the equation of state on the compressibility factor Z_c=PV/RT in the range Z_c =(0.224-0.311) have been obtained for the investigated liquids. On the basis of the dependences $B_n(Z_c)$ it is possible to predict the temperature behavior of the density ρ(T) for a wide class of liquids in the investigated range of the compressibility factor Z_c=0.224-0.311. The transition equations from one concentration to another [3] have been obtained for binary solutions on the basis of the Van der Waals model of gas fluctuations [2].

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