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Relationship between surface tension and density of a liquid and its vapour

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Abstract

A simple semi-empirical formula is derived that connects the surface tension ⊠ of a liquid with its density and the density of vapour in equilibrium with it:

$$\sigma = T\int_{T}^{T_c} \frac{f(T)}{T^2}dT$$

here $f(T) = a(\rho_l^2 - \rho_v^2) - b(\rho_l^4 - \rho_v^4) + c,$

T_c – critical temperature,
P_l and P_v are the densities of the liquid and its vapour,
a,b and c – the „trimming" parameters associated with Lennard-Jones potential parameters.
The formula describes the dependence of the surface tension of a liquid in the full temperature range from the triple point to the critical point. It agrees with experimental data exceptionally well and can be used for practical calculations of surface tension.

Biography

Alexander Levinsky worked as University chemical faculty. Scientific assistant at Institute for Polymer Research, Self-organization in the mass-polymerizing methyl methacrylate, Thermodynamics of the solutions, Viscosity of the concentrated suspensions, Instrument-based analytics, Development of the measuring systems. He also worked as Head of research and development department at Bekro Chemistry ltd Colorimetry, coloristics. Freelance lecturer at University of Applied Sciences Lectures in mathematics, physics and chemistry. Currently he is retired.

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