# Analysis of phase equilibrium line models

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The work discusses the so-called "Yang-Yang anomaly" (YYA) in relation to the description of the line of phase equilibrium of pure substances in the range of state parameters from the triple point to the critical point. The approach is based on the Clapeyron-Clausius equation and the renormalization group (RG) theory. Within the framework of the proposed system of equations for the vapor, $\rho^- = \rho^-(T)$, liquid, $\rho^+ = \rho^+(T)$, branches of the saturation line and the vapor pressure, $p_s = p_s(T)$, expressions for the average diameter, $d_f = (\rho^+ + \rho^-)/(2\rho_c) - 1$, and the order parameter, $d_s = (\rho^+ - \rho^-)/(2\rho_c)$, are obtained, which are consistent with the YYA and the corresponding RG models, $d_f = B_{2\beta}\tau^{2\beta} + B_{1-\alpha}\tau^{1-\alpha} + B_1\tau$ and $d_s = B_\beta\tau^\beta + B_{\beta+\Delta}\tau^{\beta+\Delta}$. Approbation of the specified model of the phase equilibrium line was carried out using the example of a joint description of experimental data on $\rho^-$, $\rho^+$ and $p_s$, which relate to carbon dioxide, water, $SF_6$ [1] and ethane [2]. The features of the behavior of the phase equilibrium line in the vicinity of the critical point are discussed on the basis of the proposed system of mutually consistent equations $\rho^- = \rho^-(T)$, $\rho^+ = \rho^+(T)$, $p_s = p_s(T)$ [1,2] and local equations of the saturation line [3]. Additionally, it is discussed how, within the framework of the proposed approach, consistency of thermal and caloric characteristics, heat of vaporization and heat capacity of a saturated liquid near the triple point is ensured.

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[2] Rykov S V, Kudryavtseva I V and Rykov S A 2023 *Russ. J. Phys. Chem. A* **97** 2367
[3] Ustyuzhanin E E, Ochkov V F, Rykov V A, Rykov S V and Kudryavtseva I V 2023 *Thermophys. Aeromech.* **30** 557