

# Features of the description of the coexistence curve of pure substances in the range from triple to critical point

Rykov S V<sup>1,®</sup>, Kudryavtseva I V<sup>1</sup>, Rykov V A<sup>1</sup> and Ustyuzhanin E E<sup>2</sup>

<sup>1</sup> ITMO University, Kronvergskiy 49, Saint-Petersburg 197101, Russia

<sup>2</sup> National Research University Moscow Power Engineering Institute, Krasnokazarmennaya 14, Moscow 111250, Russia

® togg1@yandex.ru

The question of modeling the coexistence curve of pure substances on the basis of various models of the average diameter and order parameter is considered. In particular, the Yang-Yang model is considered, which has found application in describing the saturation line of individual substances (argon, C<sub>6</sub>F<sub>6</sub> and SF<sub>6</sub>, ethane, etc. [1]) and metals [2] in the temperature range from the triple point to the critical point. The proposed approach is based on the modified Clapeyron-Clausius equation:

$$\frac{1}{\rho^-} = \frac{r^*}{T} \frac{dp_s}{dT}. \quad (1)$$

Here  $\rho^-$  is the density on the vapor branch of the coexistence curve;  $p_s$  is the saturated pressure;  $T$  is the temperature;  $r^* = r^*(T)$  is the function that is related to the heat of vaporization by the dependence

$$r = r^* \left( 1 - \frac{\rho^-}{\rho^+} \right), \quad (2)$$

where  $\rho^+$  is the density on the liquid branch of the coexistence curve.

[1] Vorob'ev V S, Ustyuzhanin E E, Ochkov V F, Shishakov V V, Tun A T R, Rykov V A and Rykov S V 2020 *High Temp.* **58** 333–41

[2] Apfelbaum E M and Vorob'ev V S 2015 *J. Phys. Chem. B* **119** 11825–32