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Editorial comment: The published paper is a discussion of at least one fundamentally important issue - an opportunity or inability to use analytical and non-analytical description in critical and near-critical regions of phase equilibria. Reviewers expressed common opinion on impossibility of analytical description of critical parameters. However, the author of publication has reasoned arguments in favor of self-righteousness. In this connection, the editors of the journal deemed it appropriate to submit these issues for public discussion and try by activating the discussion on this topic to come a little bit closer to the truth.
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
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Some consequences of analyticity of thermal state equation in the critical point of phase equilibrium liquid-gas

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Abstract

It has been shown that in the case when 1) $0<\beta<1/2$, or 2) $\beta=1/2$ and $\left.\frac{\partial^2 p(T,v)}{\partial v \partial T}\right|_{v=v_c,T=T_c}=0$, where β is a critical index, the third and fourth partial derivatives of pressure by volume per particle at the critical point of phase transition gas-liquid of one-component substance are equal to zero, if the thermal equation of state (dependence of pressure on temperature and volume) is an analytical function of temperature and volume at the critical point and the critical isotherm has zero slope and bend at the critical volume. It is proved that at the critical point of phase equilibrium liquid-gas thermodynamic equilibrium homogeneous state of a single-component substance is unstable.