General Description of Near-Critical Binary Mixtures inTwo-Phase Region

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On the base of the principle of critical-point universality and hypothesis of mixing of physical fields the general approach has been developed recently [1] for binary mixtures. Applying this method to two-phase region of a mixture we obtained an analytical equation for various curves of phase equilibria. The approach proposed permits us to establish the connection between the shape of these curves and certain derivatives along the critical locus of a mixture. The final equations appears to be transcendental in general but in some special cases they can be reduced to simple explicit (when the critical pressure or temperature of a mixture correspond to their extreme values). In addition we estimated positions of some specific points on these curves such as the maximum pressure or temperature points and some other characteristic parameters relative to the critical point of a mixture.

In fact our resulting equations become close to that derived in [2] by different way under some simplifying assumptions but since our approach is based on the general concepts only it could be used for any phase diagram description.

To verify our model we used the real curves of phase equilibria for methane-ethane mixture, namely constant-composition dew-bubble curves and pressure-composition curves at constant temperatures and found the good agreement between the theory and experimental data.

[1] M.A. Anisimov, E.E. Gorodetskii, V.D. Kulikov,and J.V. Sengers, *Phys. Rev. E* **51**, 1199 (1995).
[2] J.C. Rainwater, *Int. J. Thermophys.* **10,** 357 (1989).