Method for calculating the critical amplitude of the saturation line

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The known correlations for the critical amplitude B_0 of the saturation line (SL) take into account only the dependence of $B_0 = B_0(\beta)$ on the acentric factor ω [1], on the critical index of the SL, β, $B_0 = B_0(\omega)$ and on ω and β simultaneously: $B_0 = B_0(\omega, \beta)$ [2]. These correlations have a fundamental drawback: they do not take into account the experimentally established fact of "mixing" of the critical amplitudes B_0, when a substance with a large acentric factor ω_I has a critical amplitude B_I smaller than the amplitude $B_I I$ of a substance with a smaller acentric factor, $\omega_I I < \omega_I$. The fact of mixing of the B_0 amplitudes can be taken into account if we start from the hypothesis that the critical amplitude of the saturation line is a function of three independent variables: ω, β and the critical compressibility factor, Z_c. The proposed correlation $B_0(\omega, \beta, Z_c) = c_1 + c_2\omega + c_3\beta + c_4 Z_c$ was tested on the basis of 36 substances, including UF_6, sodium, cesium and lithium, for which the literature provides data on $B_0 = B_{0,exp}$ at $3.0 \le \beta \le 3.85$ and $-0.39 \le \omega \le 0.65$. The amplitudes of UF_6, sodium, cesium and lithium were determined on the basis of the saturation line equations [3], respectively. The deviations of the experimental values B_0 from those calculated using the correlation $B_0(\omega, \beta, Z_c)$ for almost all of the substances considered do not exceed 6% in absolute value. The only exceptions are He^4, sodium and lithium, for which these deviations are somewhat higher.

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