

## Scaling Models of Thermodynamic Properties Along the Coexistence Curve: Possibilities and Limits

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Some models of thermodynamic properties  $F = (\rho_l, \rho_g, P_s \dots)$  along the coexistence curve (CC) have been considered in the work. They are chosen as an equation  $F(\tau, D, B)$  that combines scaling and regular parts. The scaling part,  $F_{scale}$ , includes critical characteristics,  $D = (\rho_c, T_c, \alpha, \beta, \dots)$ , and its structure follows to the scaling theory (ST).  $F_{scale}$  represents measured values ( $F_{exp\ k, \tau_k}$ ) those are placed in the near critical temperature range ( $T_{scale} \dots T_{high}$ ) or in the relative interval  $\Delta\tau_{scale} = 0.1$ . The regular part,  $F_{reg}$ , has to compensate systematic deviations between  $F_{scale}$  and experimental values those take place at temperatures beyond the critical range ( $T < T_{scale}$ ) or in the interval  $\tau = 0.1 \dots 0.5$ . Statistical routines and some criteria have been elaborated to determine adjustable coefficients  $B$  and optimal values of critical characteristics,  $D_{opt}$ , with the help of the input data set ( $F_{exp\ k, \tau_k}$ ). Known models of properties  $F$  are analyzed in the report, among them equations suggested by Landau (1964), Wegner (1985), Anisimov et. al. (1990), Rabinovich and Sheludiak (1995), Shimanskaya et. al. (1996), Bazaev, Abdulagatov et. al. (2007). A combined model,  $P_s(\tau, D, B)$ , is proposed to represent experimental data in the temperature interval from the triple point to the critical one. The models of  $P_s$ ,  $f_s$ ,  $f_d$ ,  $\rho_l$  and  $\rho_g$  are built for such substances as R236ea, R134a, R143a, alcohols and H<sub>2</sub>O. They include optimal values of critical characteristics,  $D_{opt} = (T_c, \rho_c, P_c, \alpha, \beta \dots)$ , those are determined during our statistical treatment of the input data sets. Values  $\beta_{opt}$  and  $\alpha_{opt}$  deviate from the theoretical values of  $\beta$  and  $\alpha$ . The scaling functions  $Z_{l,g}$  are determined from  $F = (\rho_l, \rho_g)$  and compared with the form that follows to ST.