CH365 Chemical Engineering Thermodynamics

Lesson 29
Residual Properties II

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Residual Properties from Cubic EOS

Generic cubic equation of state (in Z-Form) **(WPR3)**

$$q = \frac{\Psi\alpha(x)}{\Omega T_r} = q(x) \qquad \text{(Eq. 3.51)}$$

Important: α is written as a function of x where x replaces T_r.

$$\beta = \Omega \frac{P_r}{T_r} \qquad (3.50)$$

$$Z = 1 + \beta - q\beta \frac{Z - \beta}{(Z + \varepsilon\beta)(Z + \sigma\beta)} \qquad (3.48)$$

$$\frac{H^R}{RT} = Z - 1 + T_r \left(\frac{dq}{dT_r} \right) \cdot I$$

(page 497)

$$\frac{S^R}{R} = \ln(Z - \beta) + \left(q + T_r \frac{dq}{dT_r} \right) \cdot I$$

$$I = \frac{1}{\sigma - \varepsilon} \ln\left(\frac{Z + \sigma\beta}{Z + \varepsilon\beta} \right) \qquad \varepsilon \neq \sigma$$

$$I = \frac{\beta}{Z} \qquad \varepsilon = \sigma$$