Peng–Robinson EOS @model

@wikipedia

One of the cubic equations of real gas state defining the Compressibility factor $Z(p,T)$ as a function of fluid pressure p and fluid temperature T:

(1)	$Z^3 - (1-B)\,Z^2 + (A - 2B - 3B^2)\,Z - (AB - B^2 - B^3) = 0$		
(2)	$A = 0.45724 \cdot \alpha \cdot \frac{p_r}{T_r^2}$	(3)	$B = 0.07780 \cdot \frac{p_r}{T_r}$
(4)	$\alpha = \left(1 + \kappa\,(1 - T_r^{0.5})\right)^2$	(5)	$\kappa = 0.37464 + 1.54226\,\omega - 0.26992\,\omega^2$

where

Z	Compressibility factor	p_c	Critical pressure
p	Fluid pressure	T_c	ritical temperature
T	Fluid temperature	$p_r = p/p_c$	Reduced pressure
R	Gas constant	$T_r = T/T_c$	Reduced temperature
ω	Acentric factor		

Once compressibility Z-factor $Z(p,T)$ is known the fluid density ρ can be calculated as:

(6) $$\rho(p,T) = \frac{1}{Z(p,T)} \cdot \frac{M}{R} \cdot \frac{p}{T}$$

where

M	fluid molar mass

See also

Natural Science / Physics / Thermodynamics / Equation of State / Real Gas EOS @model

[Real Gas]

Reference

Unknown macro: 'cite-summary' Unknown macro: 'single-cite'