Peng–Robinson-Stryjek-Vera (PRSV) EOS @model

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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)	$\kappa=\kappa_0+\left[\kappa_1+\kappa_2(\kappa_3-T_r)(1-T_r^{0.5})\right]\,(1+T_r^{0.5})\,(0.7-T_r)$
		(6)	$\kappa_0=0.378893+1.4897153\,\omega-0.17131848\,\omega^2+0.0196554\,\omega^3$

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	$\{\kappa_1,\,\kappa_2,\,\kappa_3\}$	fitting parameters

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

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

where

M	fluid molar mass

See also

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

[Real Gas]