包括两相区, PVT, 亥姆霍兹型

参数来源于经验,优点是极端条件也比较准确,不足是无法计算混合物 PVT 也可以用于实验数据较不广泛和较不准确的物质(参数用哪个???)

$$\frac{a(T,\rho)}{RT} = \frac{a^{\mathrm{id}}(T,\rho) + a^{\mathrm{R}}(T,\rho)}{RT} = \alpha^{\mathrm{id}}(\tau,\delta) + \alpha^{\mathrm{R}}(\tau,\delta)$$
(2.108)

$$\tau = T_c/T$$
, $\delta = \rho/\rho_c = \frac{m/V}{m/V_c} = V_c/V$

$$a^{id}(T, v) = u^{id}(T) - Ts^{id}(T, v)$$

$$= \int_{T_0}^T c_v^{id} dT - T \int_{T_0}^T c_v^{id} \frac{dT}{T} - RT \ln \frac{v}{v_0} + a(T_0, v_0)$$
 (2.109)

or

$$a^{\text{id}}(T,\rho) = \int_{T_0}^T c_v^{\text{id}} dT - T \int_{T_0}^T c_v^{\text{id}} \frac{dT}{T} + RT \ln \frac{\rho}{\rho_0} + a(T_0, \rho_0)$$
 (2.110)

Table 2.3 Typical accuracy demands for technical equations of state [29].

	ρ (P,T) [%]	w*(P,T)[%]	$c_{P}(P,T)$ [%]	Ps(T) [%]	$\rho'(T)$ [%]	$\rho^{\prime\prime}(T)$ [%]
P < 30 MPa	0.2	1-2	1-2	0.2	0.2	0.2
P > 30 MPa	0.5	2	2	_	1 <u></u>	_

For nonpolar fluids [32, 33] (methane, ethane, propane, n-butane, n-pentane, n-hexane, n-heptane, n-octane, argon, oxygen, nitrogen, ethylene, isobutane,cyclohexane, sulfur hexafluoride, carbon monoxide, carbonyl sulfide, n-decane, hydrogen sulfide, isopentane, neopentane, isohexane, krypton, n-nonane, toluene, xenon, and R116 六氟乙烷):

$$\begin{split} \alpha^{\mathrm{R}}(\tau,\delta) &= n_{1}\delta\tau^{0.25} + n_{2}\delta\tau^{1.125} + n_{3}\delta\tau^{1.5} + n_{4}\delta^{2}\tau^{1.375} + n_{5}\delta^{3}\tau^{0.25} + n_{6}\delta^{7}\tau^{0.875} \\ &\quad + n_{7}\delta^{2}\tau^{0.625}\,\mathrm{e}^{-\delta} + n_{8}\delta^{5}\tau^{1.75}\,\mathrm{e}^{-\delta} + n_{9}\delta\tau^{3.625}\,\mathrm{e}^{-\delta^{2}} + n_{10}\delta^{4}\tau^{3.625}\,\mathrm{e}^{-\delta^{2}} \\ &\quad + n_{11}\delta^{3}\tau^{14.5}\,\mathrm{e}^{-\delta^{3}} + n_{12}\delta^{4}\tau^{12}\,\mathrm{e}^{-\delta^{3}} \end{split} \tag{2.112}$$

For polar fluids [33, 34] (R11, R12, R22, R32, R113, R123, R125, R134a, R143a,R152a, carbon dioxide, ammonia, acetone, nitrous oxide, sulfur dioxide [35],R141b1,1-二氯-1-氟乙烷, R142b1-氯-1,1-二氟乙烷, R218 八氟丙烷, and R245fa1,1,1,3,3-五氟丙烷):

$$\begin{split} \alpha^{\mathrm{R}}(\tau,\delta) &= n_1 \delta \tau^{0.25} + n_2 \delta \tau^{1.25} + n_3 \delta \tau^{1.5} + n_4 \delta^3 \tau^{0.25} + n_5 \delta^7 \tau^{0.875} + n_6 \delta \tau^{2.375} \, \mathrm{e}^{-\delta} \\ &\quad + n_7 \delta^2 \tau^2 \, \mathrm{e}^{-\delta} + n_8 \delta^5 \tau^{2.125} \, \mathrm{e}^{-\delta} + n_9 \delta \tau^{3.5} \, \mathrm{e}^{-\delta^2} + n_{10} \delta \tau^{6.5} \, \mathrm{e}^{-\delta^2} \\ &\quad + n_{11} \delta^4 \tau^{4.75} \, \mathrm{e}^{-\delta^2} + n_{12} \delta^2 \tau^{12.5} \, \mathrm{e}^{-\delta^3} \end{split} \tag{2.113}$$

$$P(T,\rho) = -(\partial a/\partial v)_T = \rho RT \left[1 + \delta \left(\frac{\partial \alpha^{R}}{\partial \delta} \right)_{\tau} \right]$$
 (2.114)

Appendix B Coefficients for High-Precision Equations of State

Table B.1 Coefficients for nonpolar fluids (Eq. (2.113)).

Coefficients 1 2 3 4 5 n_1 0.89269676 0.97628068 1.0403973 1.0626277 1.0968643 n_2 -2.5438282 -2.6905251 -2.8318404 -2.8620952 -2.9988888 n_3 0.64980978 0.73498222 0.8439381 0.88738233 0.99516887 n_4 0.020793471 -0.035366206 -0.076559592 -0.12570581 -0.16170709 n_5 0.070189104 0.084692031 0.094697373 0.10286309 0.1133446 n_6 0.00023700378 0.00024154594 0.00024796475 0.00025358041 0.00026760595 n_7 0.16653334 0.23964954 0.274376 0.323252 0.40979882 n_8 -0.043855669 -0.042780093 -0.043846001 -0.037950761 -0.040876423 n_9 -0.1572678 -0.22308832 -0.26991065 -0.32534802 -0.38169482 n_{11} -0.02957024 -0.021718426 -0.029313413 -0.0797050969 -0.10931957 n_{11}		Methane	Ethane	Propane	<i>n</i> -Butane	<i>n</i> -Pentane
$\begin{array}{c} \mathbf{n}_2 \\ \mathbf{n}_3 \\ \mathbf{n}_3 \\ \mathbf{n}_4 \\ 0.020793471 \\ -0.035366206 \\ -0.076559592 \\ -0.12570581 \\ 0.016170709 \\ \mathbf{n}_5 \\ 0.070189104 \\ 0.084692031 \\ 0.094697373 \\ 0.10286309 \\ 0.1133446 \\ 0.6 \\ 0.00023700378 \\ 0.00024154594 \\ 0.00024796475 \\ 0.00025358041 \\ 0.00025758041 \\ 0.00025758041 \\ 0.00025758041 \\ 0.000257605959 \\ \mathbf{n}_7 \\ 0.16653334 \\ 0.23964954 \\ 0.2774376 \\ 0.323252 \\ 0.40979882 \\ \mathbf{n}_8 \\ -0.043855669 \\ -0.042780093 \\ -0.042780093 \\ -0.043846001 \\ -0.037950761 \\ -0.037950761 \\ -0.040876423 \\ \mathbf{n}_9 \\ -0.1572678 \\ -0.22308832 \\ -0.26991065 \\ -0.32534802 \\ -0.32534802 \\ -0.38169482 \\ \mathbf{n}_{10} \\ -0.035311675 \\ -0.051799954 \\ -0.069313413 \\ -0.079050969 \\ -0.10931957 \\ \mathbf{n}_{11} \\ -0.029570024 \\ -0.027178426 \\ -0.029632146 \\ -0.020636721 \\ -0.0057053809 \\ 0.016877016 \\ \hline \\ \textbf{N} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	Coefficients	1	2	3	4	5
$\begin{array}{c} n_3 \\ n_4 \\ n_4 \\ n_5 \\ n_6 \\ n_6 \\ n_6 \\ n_6 \\ n_7 \\ n_8 \\ n_8 \\ n_9 \\ n_{10} \\ n_{10} \\ n_{20} \\ n_{3} \\ n_{4} \\ n_{6} \\ n_{6} \\ n_{7} \\ n_{16} \\ n_{8} \\ n_{10} \\ n_{8} \\ n_{10} \\ n_{10} \\ n_{10} \\ n_{10} \\ n_{10} \\ n_{10} \\ n_{11} \\ n_{10} \\ n_{10} \\ n_{11} \\ n_{11} \\ n_{10} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{10} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{10} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{11} \\ n_{10} \\ n_{11} \\ n_{12} \\ n_{12} \\ n_{12} \\ n_{12} \\ n_{13} \\ n_{14} \\ n_{15} \\ n_{15} \\ n_{15} \\ n_{11} \\ n_{11} \\ n_{12} \\ n_{12} \\ n_{12} \\ n_{13} \\ n_{14} \\ n_{15} \\ n_{$	n_1	0.89269676	0.97628068	1.0403973	1.0626277	1.0968643
$\begin{array}{c} n_{4} \\ n_{5} \\ n_{6} \\ n_{5} \\ 0.070189104 \\ 0.084692031 \\ 0.094697373 \\ 0.10286309 \\ 0.1133446 \\ 0.6 \\ 0.00023700378 \\ 0.00024154594 \\ 0.00024796475 \\ 0.00025358041 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00026760595 \\ 0.00025358041 \\ 0.00037950761 \\ 0.004876423 \\ 0.032534802 \\ 0.038169482 \\ 0.01931957 \\ 0.01931957 \\ 0.01931957 \\ 0.01931957 \\ 0.014019842 \\ 0.011246305 \\ 0.014040127 \\ 0.0057053809 \\ 0.016877016 \\ \hline \\ \textbf{n}_{1} \\ \textbf{1.0553238} \\ \textbf{1.0543748} \\ \textbf{1.0722545} \\ \textbf{0.88978286} \\ \textbf{n}_{2} \\ \textbf{-2.6120616} \\ \textbf{-2.6500682} \\ \textbf{-2.4632951} \\ \textbf{-2.4003223} \\ \textbf{-2.4879433} \\ 0.59750191 \\ 0.096501817 \\ 0.59750191 \\ 0.0096501817 \\ 0.59750191 \\ 0.00027922861 \\ 0.00027266473 \\ 0.00030713573 \\ 0.00021428033 \\ 0.00021428033 \\ 0.0002237443 \\ 0.7 \\ 0.4634759 \\ 0.49865826 \\ 0.52656857 \\ 0.17429895 \\ 0.1858686 \\ 0.8 \\ 0.011433197 \\ 0.00071432815 \\ 0.019362863 \\ 0.033654496 \\ 0.016387351 \\ 0.016387251 \\ 0.0026726815 \\ 0.116709599 \\ 0.18558686 \\ 0.15352245 \\ 0.116709599 \\ 0.18558686 \\ 0.016387351 \\ 0.0024987667 \\ 0.0026726815 \\ 0.0026726815 \\ 0.00067273247 \\ 0.0061595287 \\ 0.0008966331 \\ -0.0024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.024987667 \\ -0.0249876$	n_2	-2.5438282	-2.6905251	-2.8318404	-2.8620952	-2.9988888
n_5 0.070189104 0.084692031 0.094697373 0.10286309 0.1133446 n_6 0.00023700378 0.00024154594 0.00024796475 0.00025358041 0.00026760595 n_7 0.16653334 0.23964954 0.2774376 0.323252 0.40979882 n_8 -0.043855669 -0.042780093 -0.043846001 -0.037950761 -0.040876423 n_9 -0.1572678 -0.22308832 -0.26991065 -0.32534802 -0.38169482 n_{10} -0.035311675 -0.051799954 -0.069313413 -0.079050969 -0.10931957 n_{11} -0.029570024 -0.027178426 -0.029632146 -0.020636721 -0.032073223 n_{12} 0.014019842 0.011246305 0.014040127 0.0057053809 0.016877016 Coefficients678910 n_1 1.0553238 1.0543748 1.0722545 0.85095715 0.88878286 n_2 -2.6120616 -2.6500682 -2.4632951 -2.4003223 -2.4879433 n_3 0.76613883 0.81730048 0.65386674 0.54127841 0.59750191 n_4 -0.29770321 -0.30451391 -0.36324974 0.016919771 0.0096501817 n_5 0.11879908 0.12253869 0.1271327 0.068825965 0.071970429 n_6 0.00027922861 0.00927266473 0.0030713573 0.00021428033 0.00022337443 n_7 0.4634759 0.49865826 0.52656857	n_3	0.64980978	0.73498222	0.8439381	0.88738233	0.99516887
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n_4	0.020793471	-0.035366206	-0.076559592	-0.12570581	-0.16170709
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n_5	0.070189104	0.084692031	0.094697373	0.10286309	0.1133446
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n_6	0.00023700378	0.00024154594	0.00024796475	0.00025358041	0.00026760595
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n_7	0.16653334	0.23964954	0.2774376	0.323252	0.40979882
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n_8	-0.043855669	-0.042780093	-0.043846001	-0.037950761	-0.040876423
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	n_9	-0.1572678	-0.22308832	-0.26991065	-0.32534802	-0.38169482
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	n_{10}	-0.035311675	-0.051799954	-0.069313413	-0.079050969	-0.10931957
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	n_{11}	-0.029570024	-0.027178426	-0.029632146	-0.020636721	-0.032073223
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	n_{12}	0.014019842	0.011246305	0.014040127	0.0057053809	0.016877016
$\begin{array}{cccccccccccccccccccccccccccccccccccc$						
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		n-Hexane	<i>n</i> -Heptane	<i>n</i> -Octane	Argon	Oxygen
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Coefficients		•		•	, -
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		6	7	8	9	10
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n_1	6 1.0553238	1.0543748	8 1.0722545	9 0.85095715	0.88878286
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n ₁ n ₂	6 1.0553238 -2.6120616	7 1.0543748 -2.6500682	8 1.0722545 -2.4632951	9 0.85095715 -2.4003223	10 0.88878286 -2.4879433
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n ₁ n ₂ n ₃	6 1.0553238 -2.6120616 0.76613883	7 1.0543748 -2.6500682 0.81730048	8 1.0722545 -2.4632951 0.65386674	9 0.85095715 -2.4003223 0.54127841	0.88878286 -2.4879433 0.59750191
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	n ₁ n ₂ n ₃ n ₄	6 1.0553238 -2.6120616 0.76613883 -0.29770321	7 1.0543748 -2.6500682 0.81730048 -0.30451391	8 1.0722545 -2.4632951 0.65386674 -0.36324974	9 0.85095715 -2.4003223 0.54127841 0.016919771	0.88878286 -2.4879433 0.59750191 0.0096501817
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$egin{array}{cccccccccccccccccccccccccccccccccccc$	1.0553238 -2.6120616 0.76613883 -0.29770321 0.11879908	7 1.0543748 -2.6500682 0.81730048 -0.30451391 0.12253869	1.0722545 -2.4632951 0.65386674 -0.36324974 0.1271327	9 0.85095715 -2.4003223 0.54127841 0.016919771 0.068825965	0.88878286 -2.4879433 0.59750191 0.0096501817 0.071970429
n_{10} -0.093750559 -0.13801822 -0.14069964 -0.016387351 -0.026726815 n_{11} -0.0067273247 -0.0061595287 -0.0078966331 -0.024987667 -0.025675299	$n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5 \\ n_6$	1.0553238 -2.6120616 0.76613883 -0.29770321 0.11879908 0.00027922861	7 1.0543748 -2.6500682 0.81730048 -0.30451391 0.12253869 0.00027266473	8 1.0722545 -2.4632951 0.65386674 -0.36324974 0.1271327 0.00030713573	9 0.85095715 -2.4003223 0.54127841 0.016919771 0.068825965 0.00021428033	0.88878286 -2.4879433 0.59750191 0.0096501817 0.071970429 0.00022337443
n_{11} -0.0067273247 -0.0061595287 -0.0078966331 -0.024987667 -0.025675299	$n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5 \\ n_6 \\ n_7$	1.0553238 -2.6120616 0.76613883 -0.29770321 0.11879908 0.00027922861 0.4634759	7 1.0543748 -2.6500682 0.81730048 -0.30451391 0.12253869 0.00027266473 0.49865826	8 1.0722545 -2.4632951 0.65386674 -0.36324974 0.1271327 0.00030713573 0.52656857	9 0.85095715 -2.4003223 0.54127841 0.016919771 0.068825965 0.00021428033 0.17429895	10 0.88878286 -2.4879433 0.59750191 0.0096501817 0.071970429 0.00022337443 0.18558686
11	n ₁ n ₂ n ₃ n ₄ n ₅ n ₆ n ₇ n ₈	1.0553238 -2.6120616 0.76613883 -0.29770321 0.11879908 0.00027922861 0.4634759 0.011433197	7 1.0543748 -2.6500682 0.81730048 -0.30451391 0.12253869 0.00027266473 0.49865826 -0.00071432815	8 1.0722545 -2.4632951 0.65386674 -0.36324974 0.1271327 0.00030713573 0.52656857 0.019362863	9 0.85095715 -2.4003223 0.54127841 0.016919771 0.068825965 0.00021428033 0.17429895 -0.033654496	0.88878286 -2.4879433 0.59750191 0.0096501817 0.071970429 0.00022337443 0.18558686 -0.038129368
n_{12} -0.0051141584 0.0004860251 0.0033036598 0.0088769205 0.0095714302	$n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5 \\ n_6 \\ n_7 \\ n_8 \\ n_9$	6 1.0553238 -2.6120616 0.76613883 -0.29770321 0.11879908 0.00027922861 0.4634759 0.011433197 -0.48256969	7 1.0543748 -2.6500682 0.81730048 -0.30451391 0.12253869 0.00027266473 0.49865826 -0.00071432815 -0.54236896	8 1.0722545 -2.4632951 0.65386674 -0.36324974 0.1271327 0.00030713573 0.52656857 0.019362863 -0.58939427	9 0.85095715 -2.4003223 0.54127841 0.016919771 0.068825965 0.00021428033 0.17429895 -0.033654496 -0.135268	10 0.88878286 -2.4879433 0.59750191 0.0096501817 0.071970429 0.00022337443 0.18558686 -0.038129368 -0.15352245
	n_1 n_2 n_3 n_4 n_5 n_6 n_7 n_8 n_9 n_{10}	1.0553238 -2.6120616 0.76613883 -0.29770321 0.11879908 0.00027922861 0.4634759 0.011433197 -0.48256969 -0.093750559	7 1.0543748 -2.6500682 0.81730048 -0.30451391 0.12253869 0.00027266473 0.49865826 -0.00071432815 -0.54236896 -0.13801822	8 1.0722545 -2.4632951 0.65386674 -0.36324974 0.1271327 0.00030713573 0.52656857 0.019362863 -0.58939427 -0.14069964	9 0.85095715 -2.4003223 0.54127841 0.016919771 0.068825965 0.00021428033 0.17429895 -0.033654496 -0.135268 -0.016387351	10 0.88878286 -2.4879433 0.59750191 0.0096501817 0.071970429 0.00022337443 0.18558686 -0.038129368 -0.15352245 -0.026726815

(Continued)

Table B.1 (Continued)

	Nitrogen	Ethylene	Isobutane	Cyclohexane	SF ₆
Coefficients	11	12	13	14	15
n_1	0.92296567	0.9096223	1.0429332	1.0232354	1.2279403
n_2	-2.5575012	-2.4641015	-2.8184273	-2.9204964	-3.3035623
n_3	0.64482463	0.56175311	0.86176232	1.073663	1.2094019
n_4	0.01083102	-0.019688013	-0.10613619	-0.19573985	-0.12316
n_5	0.073924167	0.078831145	0.098615749	0.12228111	0.11044657
n_6	0.00023532962	0.00021478776	0.00023948209	0.00028943321	0.00032952153
n_7	0.18024854	0.23151337	0.30330005	0.27231767	0.27017629
n_8	-0.045660299	-0.037804454	-0.041598156	-0.04483332	-0.062910351
n_9	-0.1552106	-0.20122739	-0.29991937	-0.38253334	-0.3182889
n_{10}	-0.03811149	-0.044960157	-0.080369343	-0.089835333	-0.099557419
n_{11}	-0.031962422	-0.02834296	-0.029761373	-0.024874965	-0.036909694
n_{12}	0.015513532	0.012652824	0.01305963	0.010836132	0.019136427

	Carbon monoxide	Carbonyl sulfide	<i>n</i> -Decane	Hydrogen sulfide	Isopentane
Coefficients	16	17	18	19	20
n_1	0.90554	0.94374	1.0461	0.87641	1.0963
n_2	-2.4515	-2.5348	-2.4807	-2.0367	-3.0402
n_3	0.53149	0.59058	0.74372	0.21634	1.0317
n_4	0.024173	-0.021488	-0.52579	-0.050199	-0.1541
n_5	0.072156	0.082083	0.15315	0.066994	0.11535
n_6	0.00018818	0.00024689	0.00032865	0.00019076	0.00029809
n_7	0.19405	0.21226	0.84178	0.20227	0.39571
n_8	-0.043268	-0.041251	0.055424	-0.0045348	-0.045881
n_9	-0.12778	-0.22333	-0.73555	-0.2223	-0.35804
n ₁₀	-0.027896	-0.050828	-0.18507	-0.034714	-0.10107
n_{11}	-0.034154	-0.028333	-0.020775	-0.014885	-0.035484
n_{12}	0.016329	0.016983	0.012335	0.0074154	0.018156

Table B.1 (Continued)

	Neopentane	Isohexane	Krypton	<i>n</i> -Nonane	Toluene
Coefficients	21	22	23	24	25
n_1	1.1136	1.1027	0.83561	1.1151	0.96464
n_2	-3.1792	-2.9699	-2.3725	-2.702	-2.7855
n_3	1.1411	1.0295	0.54567	0.83416	0.86712
n_4	-0.10467	-0.21238	0.014361	-0.38828	-0.1886
n_5	0.11754	0.11897	0.066502	0.1376	0.11804
n_6	0.00034058	0.00027738	0.0001931	0.00028185	0.00025181
n_7	0.29553	0.40103	0.16818	0.62037	0.57196
n_8	-0.074765	-0.034238	-0.033133	0.015847	-0.029287
n_9	-0.31474	-0.43584	-0.15008	-0.61726	-0.43351
$n_{10}^{}$	-0.099401	-0.11693	-0.022897	-0.15043	-0.1254
n_{11}	-0.039569	-0.019262	-0.021454	-0.012982	-0.028207
n_{12}	0.023177	0.0080783	0.0069397	0.0044325	0.014076

	Xenon	R116
Coefficients	26	27
$\overline{n_1}$	0.83115	1.1632
n_2	-2.3553	-2.8123
n_3	0.53904	0.77202
n_4	0.014382	-0.14331
n_5	0.066309	0.10227
n_6	0.00019649	0.00024629
n_7	0.14996	0.30893
n_8	-0.035319	-0.028499
n_9	-0.15929	-0.30343
$n_{10}^{}$	-0.027521	-0.068793
n_{11}	-0.023305	-0.027218
n_{12}	0.0086941	0.010665

 Table B.2 Coefficients for polar fluids (Eq. (2.114)).

	R11	R12	R22	R32
Coefficients	1	2	3	4
$\overline{n_1}$	1.0656383	1.0557228	0.96268924	0.92876414
n_2	-3.2495206	-3.3312001	-2.5275103	-2.4673952
n_3	0.87823894	1.0197244	0.31308745	0.40129043
n_4	0.087611569	0.084155115	0.072432837	0.055101049
n_5	0.00029950049	0.00028520742	0.00021930233	0.00011559754
n_6	0.42896949	0.39625057	0.33294864	-0.25209758
n_7	0.70828452	0.63995721	0.63201229	0.42091879
n_8	-0.017391823	-0.021423411	-0.0032787841	0.0037071833
n_9	-0.37626522	-0.36249173	-0.33680834	-0.10308607
$n_{10}^{}$	0.011605284	0.001934199	-0.022749022	-0.11592089
$n_{11}^{}$	-0.089550567	-0.092993833	-0.087867308	-0.044350855
<i>n</i> ₁₂	-0.030063991	-0.024876461	-0.021108145	-0.012788805
	R113	R123	R125	R134a
Coefficients	R113 5	R123	R125 7	R134a 8
Coefficients n_1				
	5	6	7	8
n_1	5 1.0519071	6 1.116973	7 1.1290996	1.0663189
n_1 n_2	5 1.0519071 -2.8724742	6 1.116973 -3.074593	7 1.1290996 -2.8349269	8 1.0663189 -2.449597
n_1 n_2 n_3	5 1.0519071 -2.8724742 0.41983153	6 1.116973 -3.074593 0.51063873	7 1.1290996 -2.8349269 0.29968733	8 1.0663189 -2.449597 0.044645718
$n_1 \\ n_2 \\ n_3 \\ n_4$	5 1.0519071 -2.8724742 0.41983153 0.087107788	6 1.116973 -3.074593 0.51063873 0.094478812	7 1.1290996 -2.8349269 0.29968733 0.087282204	8 1.0663189 -2.449597 0.044645718 0.075656884
$n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5$	5 1.0519071 -2.8724742 0.41983153 0.087107788 0.00024105194	1.116973 -3.074593 0.51063873 0.094478812 0.00029532752	7 1.1290996 -2.8349269 0.29968733 0.087282204 0.00026347747	8 1.0663189 -2.449597 0.044645718 0.075656884 0.00020652089
n ₁ n ₂ n ₃ n ₄ n ₅ n ₆	5 1.0519071 -2.8724742 0.41983153 0.087107788 0.00024105194 0.70738262	6 1.116973 -3.074593 0.51063873 0.094478812 0.00029532752 0.66974438	7 1.1290996 -2.8349269 0.29968733 0.087282204 0.00026347747 0.61056963	8 1.0663189 -2.449597 0.044645718 0.075656884 0.00020652089 0.42006912
n ₁ n ₂ n ₃ n ₄ n ₅ n ₆ n ₇	5 1.0519071 -2.8724742 0.41983153 0.087107788 0.00024105194 0.70738262 0.93513411	6 1.116973 -3.074593 0.51063873 0.094478812 0.00029532752 0.66974438 0.96438575	7 1.1290996 -2.8349269 0.29968733 0.087282204 0.00026347747 0.61056963 0.90073581	8 1.0663189 -2.449597 0.044645718 0.075656884 0.00020652089 0.42006912 0.76739111
n ₁ n ₂ n ₃ n ₄ n ₅ n ₆ n ₇ n ₈	5 1.0519071 -2.8724742 0.41983153 0.087107788 0.00024105194 0.70738262 0.93513411 -0.0096713512	1.116973 -3.074593 0.51063873 0.094478812 0.00029532752 0.66974438 0.96438575 -0.014865424	7 1.1290996 -2.8349269 0.29968733 0.087282204 0.00026347747 0.61056963 0.90073581 -0.0068788457	8 1.0663189 -2.449597 0.044645718 0.075656884 0.00020652089 0.42006912 0.76739111 0.0017897427
n ₁ n ₂ n ₃ n ₄ n ₅ n ₆ n ₇ n ₈ n ₉	5 1.0519071 -2.8724742 0.41983153 0.087107788 0.00024105194 0.70738262 0.93513411 -0.0096713512 -0.52595315	1.116973 -3.074593 0.51063873 0.094478812 0.00029532752 0.66974438 0.96438575 -0.014865424 -0.49221959	7 1.1290996 -2.8349269 0.29968733 0.087282204 0.00026347747 0.61056963 0.90073581 -0.0068788457 -0.44211186	8 1.0663189 -2.449597 0.044645718 0.075656884 0.00020652089 0.42006912 0.76739111 0.0017897427 -0.36219746

Table B.2 (Continued)

	R143a	R152a	Carbon dioxide	Ammonia
Coefficients	9	10	11	12
n_1	1.0306886	0.95702326	0.89875108	0.7302272
n_2	-2.9497307	-2.3707196	-2.1281985	-1.1879116
n_3	0.6943523	0.18748463	-0.06819032	-0.68319136
n_4	0.071552102	0.063800843	0.076355306	0.040028683
n_5	0.00019155982	0.00016625977	0.00022053253	0.00009080121
n_6	0.079764936	0.082208165	0.41541823	-0.056216175
n_7	0.56859424	0.57243518	0.71335657	0.44935601
n_8	-0.0090946566	0.0039476701	0.00030354234	0.029897121
n_9	-0.24199452	-0.23848654	-0.36643143	-0.18181684
n_{10}	-0.070610813	-0.080711618	-0.0014407781	-0.09841666
n_{11}	-0.075041709	-0.073103558	-0.089166707	-0.055083744
n ₁₂	-0.016411241	-0.015538724	-0.023699887	-0.0088983219
	Acetone	N ₂ O	Sulfur dioxide	R141b
Coefficients	13	14	15	16
n_1	0.90041	0.88045	0.93061	1.1469
n_2	-2.1267	-2.4235	-1.9528	-3.6799
n_3	-0.083409	0.38237	-0.17467	1.3469
n_4	0.065683	0.068917	0.061524	0.083329
n_5	0.00016527	0.00020367	0.00017711	0.00025137
n_6	-0.039663	0.13122	0.21615	0.3272
n_7	0.72085	0.46032	0.51353	0.46946
n_8	0.0092318	-0.0036985	0.010419	-0.029829
n_9	-0.17217	-0.23263	-0.25286	-0.31621
n_{10}	-0.14961	-0.00042859	-0.05472	-0.026219
n ₁₁	-0.076124	-0.04281	-0.059856	-0.078043
	-0.018166	-0.023038	-0.016523	-0.020498
$n_{12}^{}$	-0.018100	-0.023036	-0.010323	-0.020496

(Continued)

Table B.2 (Continued)

	R142b	R218	R245fa
Coefficients	17	18	19
n_1	1.0038	1.327	1.2904
n_2	-2.7662	-3.8433	-3.2154
n_3	0.42921	0.922	0.50693
n_4	0.081363	0.1136	0.093148
n_5	0.00024174	0.00036195	0.00027638
n_6	0.48246	1.1001	0.71458
n_7	0.75542	1.1896	0.87252
n_8	-0.00743	-0.025147	-0.015077
n_9	-0.4146	-0.65923	-0.40645
n_{10}	-0.016558	-0.027969	-0.11701
n_{11}	-0.10644	-0.1833	-0.13062
n_{12}	-0.021704	-0.02163	-0.022952

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