to the above was given to three sets of data for propane by Sage *et al.*[3], Deschner *et al.*[5] and Lu[6], and to the set of data for propene by Farrington *et al.*[15]. No weight was given to the remainders[9~14, 18] in which some data were reported only in the extremely high pressure ranges, or the data along saturated vapor pressures, and the data with scarce numbers of significant figure of data compared with the others, or the like.

Methods and results of correlation

First, the *P-V-T* data in original papers expressed in various forms were reduced to the common expression Z with the SI units of pressure, volume and temperature:

compressibility factor, $Z = PV/\boldsymbol{R}T$,

pressure, P, in 10^5 Pa (=1 bar=0.986923 atm),

specific volume, V, in cm^3/mol,

temperature, T, in K.

In these processes, the values of the atomic weights of carbon and hydrogen were adopted as C=12.011 ±0.001 and H=1.0080±0.0003 (recommended by IUPAC–1969). For the universal gas constant, $\boldsymbol{R}$= 83.143±0.004 (cm^3·bar/K·mol), recommended by IUPAC–23rd Conference, was adopted. The maximum relative uncertainties of Z due to the uncertainties of atomic weights, which amount to 1.2×10^{-4} for propane and propene, are significantly lower than the experimental errors in the most precise measurement. Also, the relative uncertainty of Z due to the uncertainty of $\boldsymbol{R}$ amounts to 5.3×10^{-5}, which can be neglected even for the most precise measurement.

It is difficult to estimate the effect of the impurities on Z. However, all of the samples used were reported to be pure above 99.9% or above 99.7% at least, except in the case of 98.27% for propane by Deschner *et al.*[5], and these impurities were the hydrocarbons such as ethane and ethene having similar *P-V-T* properties to propane and propene. It is expected that the effect of impurities on Z is significantly little from these viewpoints. No correction was made in the above calculation of Z and the considerations on purity were taken into the evaluation together with other factors.

In the present correlations of the compressibility factor of propane and propene, the so-called grid-point method used in the early works[1, 2] was employed predominantly. For the common and fixed grid-points of pressure and temperature, the following sets were employed:

temperature (°C): −25, 0, 25, 50,·········275 (interval of 25°C)

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Table 2 Most probable values and supplementary values for the compressibility factor of propane

Pressure 10^5 Pa (=bar)	Temperature K (℃)												
	248.15 (-25)	273.15 (0)	298.15 (25)	323.15 (50)	348.15 (75)	373.15 (100)	398.15 (125)	423.15 (150)	448.15 (175)	473.15 (200)	498.15 (225)	523.15 (250)	548.15 (275)
1	0.97073 (0.00040)	0.97913 (0.00040)	0.98440 (0.00040)	0.98787 (0.00040)	0.99028 (0.00040)	0.99204 (0.00040)	0.99339 (0.00040)	0.99448 (0.00040)	0.99539 (0.00040)	0.99620 (0.00040)	0.99691 (0.00040)	0.99757 (0.00040)	0.99818 (0.00040)
5			0.9119*	0.9348 (0.0022)	0.9487 (0.0017)	0.9591 (0.0009)	0.9672 (0.0001)	0.9727 (0.0006)	0.9773 (0.0008)	0.9813 (0.0005)	$0.984\bar{5}$ (0.0005)	0.9867*	0.9883*
10	0.03767*	0.03610*		0.8599 (0.0017)	0.8927 (0.0027)	0.9140 (0.0031)	0.9328 (0.0004)	0.9451 (0.0006)	0.9550 (0.0009)	0.9629 (0.0010)	0.9693 (0.0008)	0.9713*	0.9772*
20	0.07496*	0.07194*	0.07118*		$0.756\bar{5}$ (0.0037)	0.8194 (0.0041)	0.8623 (0.0008)	0.8893 $(0.000\bar{5}$	0.9096 (0.0009)	0.9257 (0.0011)	0.9389 (0.0009)	0.9484*	0.9562*
30	0.1118*	0.1078*	0.1063*	0.1075 (0.0002)		0.7057 $(0.001\bar{5})$	0.7826 (0.0004)	0.8299 $(0.000\bar{5})$	0.8629 (0.0008)	0.8891 (0.0013)	0.9097 (0.0012)	0.9240*	0.9366*
40	0.1489*	0.1431*	0.1410*	0.1419 (0.0003)		0.5380 (0.0016)	0.6894 (0.0010)	0.7663 $(0.000\bar{5})$	0.8161 (0.0009)	0.8527 (0.0009)	0.8811 (0.0008)	$0.901\bar{5}$ (0.0008)	0.9181*
50	0.1858*	0.1783*	0.1753*	0.1758 (0.0006)	0.1834 (0.0005)		0.5799 (0.0017)	0.6973 (0.0006)	0.7680 (0.0002)	0.8160 (0.0007)	0.8521 (0.0009)	0.8784 (0.0010)	0.9015 (0.0017)
60	0.2226*	0.2134*	0.2094*	0.2095 (0.0008)	0.2158 (0.0007)		0.4474 (0.0014)	0.6258 (0.0010)	0.7198 (0.0007)	0.7804 (0.0007)	0.8244 (0.0008)	0.8567 (0.0014)	0.8844 (0.0017)
70			0.2429*	0.2427 (0.0009)	0.2476 (0.0008)	0.2717 (0.0008)		0.5583 (0.0026)	0.6726 (0.0008)	0.7467 (0.0009)	0.7985 (0.0006)	$0.837\bar{5}$ $(0.000\bar{5})$	0.8688 (0.0010)
80			0.2763*	0.2753 (0.0010)	0.2794 (0.0010)	0.2999 (0.0009)		0.5028 (0.0023)	0.6284 (0.0024)	0.7160 (0.0009)	0.7753 (0.0007)	0.8206 (0.0013)	0.8549 (0.0001)
90			0.3096*	0.3077 (0.0012)	0.3108 (0.0014)	0.3277 (0.0011)	0.3726 (0.0014)	0.4753 (0.0023)	$0.594\bar{5}$ (0.0014)	$0.688\bar{5}$ (0.0000)	0.7542 (0.0013)	0.8048 (0.0019)	0.8423 (0.0009)
100			0.3427*	0.3399 (0.0013)	0.3419 (0.0016)	0.3563 (0.0010)	0.3920 (0.0022)	0.4691 (0.0019)	0.5740 (0.0003)	0.6661 (0.0004)	0.7364 (0.0006)	0.7903 (0.0018)	0.8313 (0.0013)
110			0.3755*	0.3717 (0.0014)	0.3727 (0.0017)	0.3849 (0.0009)	0.4138 (0.0018)	0.4747 (0.0012)	0.5646 (0.0007)	0.6515 (0.0006)	0.7211 (0.0007)	0.7783 (0.0010)	0.8222 (0.0014)
120			0.4082*	0.4033 (0.0015)	0.4032 (0.0019)	$0.413\bar{5}$ (0.0008)	0.4372 (0.0012)	0.4885 (0.0003)	0.5632 (0.0011)	0.6424 (0.0014)	0.7107 (0.0009)	0.7689 (0.0002)	0.8152 (0.0011)
130			0.4407*	0.4349 (0.0017)	0.4332 (0.0020)	0.4418 (0.0008)	0.4635 (0.0012)	0.5064 (0.0008)	0.5670 (0.0011)	0.6378 (0.0022)	0.7046 (0.0015)	0.7625 (0.0015)	0.8108 (0.0007)
140			0.4731*	0.4663 (0.0028)	0.4631 (0.0022)	0.4696 (0.0006)	0.4893 (0.0013)	0.5272 (0.0009)	0.5785 (0.0007)	0.6394 (0.0009)	0.7023 (0.0000)	0.7596*	0.8072*
150			0.5054*	0.4977 (0.0033)	0.4922 (0.0032)	0.4977 (0.0008)	0.5157 (0.0016)	0.5482 (0.0011)	0.5924 (0.0004)	0.6462 (0.0014)	0.7036 (0.0006)	0.7588*	0.8064*
160			~~$0.573\bar{5}$*~~ $0.537\bar{5}$*	0.5280 (0.0031)	0.5216 (0.0034)	0.5259 (0.0010)	0.5417 (0.0010)	0.5692 (0.0013)	$0.608\bar{5}$ (0.0001)	0.6573 (0.0020)	0.7089 (0.0012)	0.7607*	0.8077*
170			$0.569\bar{5}$*	0.5582 (0.0031)	0.5508 (0.0036)	0.5538 (0.0012)	0.5680 (0.0002)	0.5909 (0.0017)	$0.626\bar{5}$ (0.0002)	0.6702 (0.0018)	0.7174 (0.0011)	0.7654*	0.8109*
180			0.6013*	0.5883 (0.0030)	0.5798 (0.0037)	0.5816 $(0.001\bar{5})$	0.5942 (0.0008)	0.6131 (0.0020)	0.6451 (0.0003)	0.6844 (0.0014)	0.7286 (0.0002)	0.7726*	0.8159*
190			0.6331*	0.6182 (0.0028)	0.6086 (0.0039)	0.6086 (0.0029)	0.6205 (0.0018)	0.6355 (0.0020)	0.6641 (0.0004)	0.6992 (0.0012)	0.7406 (0.0012)	0.7820*	0.8226*
200			0.6648*	0.6484 (0.0028)	0.6371 (0.0040)	0.6354 (0.0032)	0.6466 (0.0028)	0.6586 (0.0021)	0.6843 (0.0002)	0.7158 (0.0002)	0.7538 (0.0011)	0.7931*	0.8306*
250							0.7730 (0.0036)	0.7772*	0.7878 (0.0019)	0.8072 (0.0011)	0.8309 (0.0013)	0.8558*	0.8830*
300											0.9179 (0.0007)		0.9521*

[dashed box] : The most probable values
* : The supplementary values
( ) : Value of standard deviation