Reviews

$P-\rho-T$ Data of Liquids: Summarization and Evaluation. 3. Ethers, Ketones, Aldehydes, Carboxylic Acids, and Esters

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The published experimental $P-\rho-T$ data for 21 ethers, 10 ketones, 9 aldehydes, 9 carboxylic acids, and 25 esters (74 substances) in the liquid phase are summarized and reviewed, and the parameters of the Tait equation are given for 73 substances considered. This equation allows the calculation of smoothed values of either the volume ratio, $V(P)/V(P_{ref})$, and related properties (relative density, $\rho(P)/\rho(P_{ref})$, compression, $\{1 - V(P)/V(P_{ref})\}$) or, using density data at atmospheric pressure ($P_{ref} = 0.1$ MPa) or at saturation ($P_{ref} = P_{sat}$), the liquid density of the substances over a temperature and pressure range.

Introduction

This work is a continuation of a compilation and critical evaluation of published $P-\rho-T$ data of organic substances in a liquid state. The data for two groups of substances, 1-alkanols (part 1) and *n*-alkanes (part 2), have been already reviewed and evaluated ([94-cib/zik], [96-cib/hne]). With these classes of substances, the density data at atmospheric pressure, $\rho(T,P_{\rm ref} = 0.1$ MPa), or at saturation, $\rho(T,P_{\rm ref} = P_{\rm sat})$, had been critically evaluated [93-cib]. In this work the published experimental values of relative density, $\rho(T,P)/\rho(T,P_{\rm ref} = 0.1$ MPa or $P_{\rm sat}$), were compiled from the literature and evaluated using the Tait equation.

Sources of Data

The original experimental data (5703 data points) processed were extracted from the database employed previously for 1-alkanols and *n*-alkanes to which some data obtained from the database installed at Kyoto Institute of Technology have been appended. A list of substances is presented in Table 1 along with Chemical Abstracts Registry Numbers (CASRN, supplied by the authors) and summary formulas.

The characteristics of data that were available in the database for density and related quantities (molar and specific volumes, volume or density ratios, compression) of selected members of several classes of C,H,O compounds are summarized in Table 2. The temperature ranges and numbers of experimental values are restricted up to the critical temperature; i.e., only subcritical liquid density data were taken from the source database. A significantly lower number of direct experimental data sets, compared to 1-alkanols and *n*-alkanes, was found in the literature. Therefore also values (denoted by a letter F in the "data type" column of Table 2) calculated from smoothing functions presented in the papers (mostly the Tait equation), following as much as possible the information concerning the distribution of experimental points given by authors, were included for some substances if no direct experimental (D) or smoothed values (S) were available in the papers.

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There are some data sets ([73-erm/bai], [75-gus/abd], [76-gus/sad], [77-abd/gus], [77-gus/sad], [78-gus/asl], [78-gus/asl-1], [79-bas/erm]) referenced in the journals of the former Soviet Union as being deposited in VINITI; due to difficulties in obtaining them these deposited data were not included in the evaluation.

Treatment of Data and Method of Data Evaluation

The procedures of treatment of data and the critical evaluation were essentially the same as those employed for 1-alkanols and *n*-alkanes, and the details may be found in our previous paper [94-cib/zik]. A brief summarization only is given below.

Available data on the compressed-liquid density and related quantities were fitted by a Tait equation with temperature dependent parameters C(T) and B(T) written in the form

$$\rho(T, P, \vec{c}, \vec{b}) = \frac{\rho(T, P_{\text{ref}}(T))}{1 - C(T, \vec{c}) \ln\left[\frac{B(T, \vec{b}) + P}{B(T, \vec{b}) + P_{\text{ref}}(T)}\right]}$$
(1)

where

$$C(T, \vec{c}) = \sum_{i=0}^{N_{\rm C}} c_i [(T - T_0)/100]^i$$
$$\vec{c} = \{c_i\} = \{c_0, ..., c_{N_{\rm C}}\}$$
(2)

$$B(T,\vec{b}) = \sum_{i=0}^{N_{\rm B}} b_i [(T - T_0)/100]^i$$
$$\vec{b} = \{b_i\} = \{b_0, ..., b_{N_{\rm c}}\}$$
(3)

and T_0 is a parameter with a preselected fixed value for which $C(T_0) = c_0$ and $B(T_0) = b_0$ hold. The reference values, $\rho\{T, P_{ref}(T)\}$ and $P_{ref}(T)$, were selected in the same way as previously; i.e., at temperatures below the normal boiling temperature the densities at atmospheric pressure ($P_{ref} =$ 0.101 325 MPa) were used, while for higher temperatures the values along the saturation curve, i.e., saturated liquid densities and saturated vapor pressures, were employed. Experimental values of densities at atmospheric pressure or at saturation for the same sample reported along with

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Table 1. List of Substances: Names (Alternative Names), Chemical Abstracts Registry Numbers, CASRN (Supplied by the Authors), and Summary Formulas

Ethers B2-07 C.H.GO 3-comportance (dichyl ether) 111-45-2 C.H.GO 4-dimethyl-3-comportance (disrography ether) 112-45-2 C.H.GO 5-commonace (disropenty) ether) 112-45-2 C.H.GO 5-commonace (disropenty) ether) 112-45-2 C.H.GO 8-comportance (disropenty) ether) 112-45-2 C.H.GO 8-comportance (disropenty) ether) 112-45-4 C.H.GO 3-dimethyl-3-comportance (disropenty) ether) 112-44 C.H.GO 3-dimethyl-3-comportance (disropenty) ether) 112-45-4 C.H.GO 3-dimethyl-3-comportance (disropentyl) ether) 112-44 C.H.GO 3-dimethyl-3-comportance (disropentyl) ether) 112-45-4 C.H.GO 3-dimethyl-3-comportance (disropentyl) ether) 112-45-4 C.H.GO 3-dimethyl-3-comportance (disropentyl) ether) 112-45-4 C.H.GO 3-dif-3-comportance (disropentyl-44-4)	name (alternative name)	CASRN	formula	
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	3 avapantana (diathul ather)	60.90.7	C.UO	
2.4 dmcthyl 3 asagendam: (dilsoprop) clubr)108 20 3 10 20 4 1 C clubo)5 commande: (di 2 butyl clubr)603465-2 C clubo)6 asagentalacen: (di 3 butyl clubr)603465-2 C clubo)3.3 dmcthyl 2 companie: (mcthyl arknyl sther)1134044 10 204443.3 dmcthyl 2 companie: (mcthyl arknyl sther)1134044 10 204453.3 dmcthyl 2 companie: (mcthyl arknyl sther)110-71-4 10 274-42.4 dmcthyl 2 companie: (mcthyl arknyl sther)110-71-4 10 274-42.5 dmcthylene glycol dimcthyl ether)110-71-4 10 274-42.5 dmcthylene glycol dimcthyl ether)110-71-4 10 274-42.5 dmcthylene glycol dimcthyl ether)100-66-3 10 204462.5 dmcthylene glycol dimcthyl ether)100-66-3 10 204462.5 dmcthylene glycol dimcthyl ether)100-66-3 10 204461.5 dmcthylene glycol dimcthyl ether)100-66-3 10 244601.5 dmcthylene glycol dimcthyl ether)100-66-3 10 244601.5 dmcthylene glycol dimcthyl ether)110-00-6 10 24401.7 dmcthylene glycol dimcthyl ether)110-00-6 10 24401.7 dmcthylene glycol dimcthyl ether)110-00-6 10 24401.7 dmcthylene glycol dimcthylene glycol dimcthylene12 2440 10 24401.7 dmcthylene glycol dimcthylene12 2440 10 24402 propanone (finenthyl ketone)8 4440 10 2440	5-oxapentane (diethyl ether)	00-29-7	$C_4H_{10}O$	
s communic (if <i>p</i> bity) ether) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	4-oxalleptaile (ul-1-propyretiler) 2 A-dimethyl-3-ovenentene (diisonronyl ether)	108-20-3	$C_6\Pi_{14}O$	
6 093 a5 2 Caliso 8 000000000000000000000000000000000000	5-oxanonane (di- <i>n</i> -butyl ether)	142-96-1	C ₆ H ₁₄ O	
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4.4 dimethy?1 3 sequentane (ethy) <i>tery</i> by there) 984-688 C, H ₁₀ O 3.3 dimethy?1 - Sexupertane (nethy) <i>terp</i> experimently ether) 110-71-4 2.5 A transmane (derivative) <i>terp</i> (1) 100-665 C, H ₁₄ O ₂ 2.5 A stronamene (derivative) <i>terp</i> (1) 100-66 C, H ₁₄ O ₂ 4. cost 1.6 heredative (dimethy) <i>terp</i> (1) 100-66 C, H ₁₄ O ₂ 4. cost 1.6 heredative (dimethy) <i>terp</i> (1) 100-66 C, H ₁₄ O ₂ terraly/droma (ostane) (1) 100-66 C, H ₁₄ O ₂ (1) 100-66 C, H ₁₄ O ₂	3,3-dimethyl-2-oxabutane (methyl <i>tert</i> -butyl ether)	1634-04-4	$C_5H_{12}O$	
3.3 dimethyl 2 oxigentane (nellyn (zer pentyl ether) 1994 05.8 Call 1,0 2.5 dioxAnene (chlyne glycol dimethyl (ether) 111 96 6 Call 1,0 2.5 dioxAnene (chlyne glycol dimethyl (ether) 111 96 6 Call 1,0 2.7 dioxAnene (chlyne glycol dimethyl (ether) 1202 83.3 Call 1,0 2.7 dioxAnenee (chlyne glycol dimethyl ether) 100 606-3 Cc /k 0 100 999-9 Cc /k 0 100 606-3 Cc /k 0 11.4 dioxane (chlyne) ether) 100 787-9 Cc /k 0 2 butanom (chlyn ketne) 787-9 Cc /k 0 2 butanom (chlyn ketne) 787-9 Cc /k 0 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 butanom (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 cc /k 0 2 betanane (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 cc /k 0 2 betanane (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 cc /k 0 2 betanane (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 cc /k 0 2 cc /k 0 2 betanane (chlyn ketne) 797-979 (ketne) 797-97 (chl 0, 2 2 cc /k 0 2 betanane (chl 0, 2 cc /k 0 2 cc	4,4-dimethyl-3-oxapentane (ethyl <i>tert</i> -butyl ether)	637-92-3	C ₆ H ₁₄ O	
2.5.4 trobustness CH4 $_{0}O_{1}$ 2.5.8 trobustness Call to C 4.5.8 trobustness Call to C 1.5.4 trobustness Call to C 1.6 discontrant 112.248.7 Call to C 1.7 discontrant 112.248.7 Call to C 1.6 discontrant 112.248.7 Call to C 2 perstance (dimethyl ketone) 72.84.7 Call to C 2 perstance (methyl abuyl ketone) 12.84.7 Call to C 2 perstance (methyl abuyl ketone) 12.84.7 Call to C <t< td=""><td>3,3-dimethyl-2-oxapentane (methyl <i>tert</i>-pentyl ether)</td><td>994-05-8</td><td>$C_6H_{14}O$</td></t<>	3,3-dimethyl-2-oxapentane (methyl <i>tert</i> -pentyl ether)	994-05-8	$C_6H_{14}O$	
2.5.8 trioxanomane (diethylene glycal dimethyl ether) 111-98-6 C414,0, 47.10 trioxatriceane (distrylene glycal dimethyl ether) 1232-33 CalityO, 2.5.8,11,14 pertawapertakeane (triverblylene glycal dimethyl ether) 1322-34 CalityO, 2.5.8,11,14 pertawapertakeane (triverblylene glycal dimethyl ether) 1322-35 CalityO, 1322-35 CalityO, 1322-35 CalityO, 1322-35 CalityO, 1322-35 CalityO, 14-diaxane 1223-113 CalityO, 1322-35 CalityO, 1322-35 CalityO, 1322-35 CalityO, 14-diaxane (distryl ktone) 724-45 CalityO, 24-bacane (distryl ktone) 724-45 CalityO, 1322-35 CalityO, 24-bacane (distryl ktone) 724-25 CalityO, 25-bacane (distry	2,5-dioxahexane (ethylene glycol dimethyl ether)	110-71-4	$C_4H_{10}O_2$	
4.7.10 Erioxatridecane (dirativy)cene gytool dipropy) ether) 720/2-2-32 CaHzO, 2.3.8.11.14 pentanxaperatedacene (dirativy)lene gytool dimethyl ether) 133.24.8 CaHzO, 4.xxx-1.54.beptane (duality) ether) 130.46.8 CAHzO, 4.xxx-1.54.beptane (duality) ether) 130.46.8 CAHzO, 1.3. dioxolane 646.06.0 CaHzO, 1.3. dioxolane 123.94.1 C,HzO, 1.4. dioxane 123.94.1 C,HzO, future 100.40.9 C,HzO, future 74.40.0 74.40.0 dibenzafuran 102.44.9 C,HzO, 2-propanone (dumethyl ketone) 78.35.3 C,HzO, 2-butanone (methyl ketone) 100.47.7.3 C,HzO, 2-butanone (methyl ketone) 100.47.7.3 C,HzO, 2-butanone (methyl ketone) 101.67.7.3 C,HzO, 2-botanone (methyl ketone) 103.47.8 C,HzO, 2-botanone (methyl ketone) 101.47.7.4 C,HzO, 2-cotanone (methyl ketone) 111.13.7.7 C,HzO, 2-cotanone (methyl ketone) 123.23.86 C,HzO, 2-cotanone (methyl ketone) 123.23.86 C,H	2,5,8-trioxanonane (diethylene glycol dimethyl ether)	111-96-6	$C_6H_{14}O_3$	
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- total plane methan (total) (term) 100 mm 10	2,5,8,11,14-pentaoxapentadecane (tetraethylene glycol dimethyl ether)	143-24-8	$C_{10}H_{22}O_5$	
instructury function (construction) 109 99 C - GHO 1.3. diversion 646.06.00 C - GHO 1.3. diversion 124.06.9 C - GHO 1.4. diversion 124.08.9 C - GHO furan 110.00.9 C - HO dibenzofuran 122.04.9 C - GHO 2-programme (dimethyl kertone) 78.93.3 C - HO 2-programme (methyl appropyl kertone) 96.22.0 C - GH ₁₀ O 3-pentanone (methyl appropyl kertone) 128.19.3 C - H ₁₀ O 2-broxanone (methyl appropyl ketone) 128.19.3 C - H ₁₀ O 2-broxanone (methyl appropyl ketone) 128.19.3 C - H ₁₀ O 2-octanone (methyl appropyl ketone) 128.19.3 C - H ₁₀ O 2-octanone (methyl appropyl ketone) 128.19.3 C - H ₁₀ O 2-octanone (methyl appropyl ketone) 128.23.84.6 C - H ₂₀ O 2-octanone (methyl appropyl ketone) 128.39.4.7 C - H ₁₀ O 2-octanone (methyl appropyl ketone) 128.39.4.7 C - H ₁₀ O 2-octanone (methyl appropyl ketone) 128.39.4.7 C - H ₁₀ O	4-0xa-1,0-neptaulene (utaliyi ether) mathavyhanzana (mathyl phanyl ether)	100.66.3	$C_6 H_{10} O$	
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1.4-dioxane 123-91-1 C.H.O. furan 132-64-9 C.H.O. dibenzofuran 132-64-9 C.H.O. 2 propanone (dimethyl ketone) 78-93 C.H.O. 2-butranone (methyl rhyl ketone) 107-87.9 C.H.D.O. 3-pentanone (methyl rhyl pentyl ketone) 107-87.9 C.H.D.O. 2-hexanone (methyl rhyl pentyl ketone) 121-19-3.7 C.H.n.O. 4-methyl-2-pentanone (methyl rhyl ketone) 121-19-3.7 C.H.n.O. 2-octanone (methyl rhyl ketone) 121-19-3.7 C.H.n.O. 2-octanone (methyl rhyl ketone) 121-19-3.7 C.H.N.O. 2-octanone (methyl rhyl ketone) 123-18-3.7 C.H.N.O. 2-octanone (methyl rhyl ketone) 123-38-4.7 C.H.O. propanal (propionaldehyde) 123-38-4.7 C.H.O. propanal (propionaldehyde) 123-38-4.7 C.H.O. pentanal (acetaldehyde) 123-38-4.7 C.H.O. pentanal (acetaldehyde) 123-38-4.7 C.H.O. pentanal (acetaldehyde) 123-38-4.7 C.H.O. pentanal (acetaldehyde) 123-38-4.7 C.H.O. pentanal (acenaldiachyde)	tetrahydropyran (oxane)	142-68-7	$C_5H_{10}O$	
furan110-09C,H,GKetones2-prognamon (dimethyl ketone)76-98.3C,H,G2-prognamon (dimethyl etone)79-98.3C,H,GO3-pentamon (methyl repropyl ketone)90-22.0C,H,GO3-pentamon (methyl repropyl ketone)108-10-1C,H,GO2-brognamon (methyl repropyl ketone)108-10-1C,H,GO2-brognamon (methyl repropyl ketone)111-13-7C,H,GO2-brognamon (methyl repropyl ketone)111-13-7C,H,GO2-octanone (methyl repropyl ketone)111-13-7C,H,GO2-octanone (methyl repropyl ketone)111-13-7C,H,GO2-octanone (methyl repropyl ketone)123-19-3C,H,GO2-octanone (methyl repropyl ketone)123-72-8C,H,GO2-octanone (methyl repropyl ketone)123-72-8C,H,GO2-prognamol (orpolenaldehyde)75-07-0C,H,GO2-methylpropanal (isobutyraldehyde)110-82-3C,H,GO2-methylpropanal (isobutyraldehyde)110-82-3C,H,GO2-methylpropanal (isobutyraldehyde)110-82-3C,H,GO2-methanol (calcid (ormic acid))110-82-3C,H,GO2-methanol (calcid (ormic acid))124-17-7C,H,GO2-methanol (calcid (ormic a	1,4-dioxane	123-91-1	$C_4H_8O_2$	
dibenzofuran Retones C ₁₂ H ₄ O 2 Forpanone (dimethyl kotone) 676.46.1 C ₂ H ₄ O 2 butanone (methyl retore) 78.93.3 C ₂ H ₄ O 3 portanone (methyl retore) 107.87.9 C ₂ H ₄₀ O 3 portanone (methyl retore) 591.78.4 C ₂ H ₄₀ O 4 methyl-2 pentanone (methyl retore) 123.31.9.3 C ₂ H ₄₀ O 2 cctanone (methyl retore) 123.31.9.3 C ₂ H ₄₀ O 2 cctanone (methyl retore) 123.38.4 C ₂ H ₄₀ O ycolopentanone (methyl retore) 123.38.6 C ₂ H ₄₀ O propanal (propionaldehyde) 123.38.6 C ₃ H ₄₀ O propanal (propionaldehyde) 123.38.6 C ₃ H ₄₀ O portanal (vaetaldehyde) 184.8.2 C ₄ H ₄₀ O propanal (propionaldehyde) 184.8.2 C ₄ H ₄₀ O propanal (acetaldehyde) 184.8.1 C ₄ H ₄₀ O portanal (acetaldehyde) 110.92.3 C ₄ H ₄₀ O portanal (acetaldehyde) 124.19.0 C ₄ H ₄₀ O amethylorepanal (acetaldehyde)	furan	110-00-9	C ₄ H ₄ O	
Ketones2 propanone (dimethyl ketone)78.98.3.3C.J.H.O.2 potanone (methyl / propyl ketone)96.92.0.0C.J.H.O.3 pontanone (methyl / hytone)96.92.0.0C.J.H.O.2 -breamone (methyl / hytolyl ketone)108.10.1C.J.H.O.4 -methyl-2-pentanone (methyl isobutyl ketone)128.10.3.0C.J.H.O.2 -breamone (methyl isobutyl ketone)128.10.3.0C.J.H.O.2 -cranne (methyl isobutyl ketone)121.13.7.0C.J.H.O.2 -cranne (methyl isobutyl ketone)121.13.7.0C.J.H.O.2 -cranne (methyl isobutyl ketone)123.38.6C.J.H.O.2 -vethanane (methyl isobutyl ketone)123.38.6C.J.H.O.2 -vethanane (methyl isobutyl ketone)123.38.6C.J.H.O.2 -vethanane (methyl isobutyl ketone)123.38.6C.J.H.O.2 -methyl propanal (isobutyralkehyde)123.38.6C.J.H.O.2 -methyl propanal (isobutyralkehyde)123.38.6C.J.H.O.2 -methyl propanal (isobutyralkehyde)124.33.6C.J.H.O.2 -methyl propanal (isobutyralkehyde)124.33.6C.J.H.O.3 -methyl ketone)124.13.7C.J.H.O.2 -methanale (narthaldehyde)124.13.7C.J.H.O.3 -methyl ketone)124.13.7C.J.H.O.9 -methanale (actif (isobutyria cid))79.31.2C.J.H.O.9 -methanale (actif (isobutyria cid))124.43.7C.J.H.O.9 -methanale (actif (isobutyria cid))124.43.7C.J.H.O.9 -methanale (actif (isobutyria cid))124.47.2C.J.H.O.9 -	dibenzofuran	132-64-9	$C_{12}H_8O$	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Ketones			
2-bittanone (methyl repropyl ketone)78-93-3C,H_6,O3-pentanone (methyl repropyl ketone)96-62-20C,H_1,oO3-pentanone (methyl try tyl ketone)108-10-1C,H_1,O4-methyl-2-pentanone (methyl isobutyl ketone)108-10-1C,H_1,O2-octanone (methyl isobutyl ketone)111-13-7C,H_1,O2-octanone (methyl isobutyl ketone)111-13-7C,H_1,O2-octanone (methyl isobutyl ketone)111-13-7C,H_1,O2-octanone (methyl isobutyl ketone)120-92-3C,H_4,Oycylobexanone120-92-3C,H_4,Opropanal (morplonaldehyde)123-38-6C,H_4,Opropanal (morplonaldehyde)123-38-6C,H_4,Obutanal (nationaldehyde)123-38-6C,H_4,Opentanal (valeraldehyde)123-38-6C,H_4,Opentanal (valeraldehyde)124-13-0C,H_4,Opentanal (valeraldehyde)124-13-0C,H_4,Opentanal (valeraldehyde)124-13-0C,H_4,Opentanal (valeraldehyde)124-13-0C,H_4,Oberzaldehyde100-52-7C,H_4,Opentanal (valeraldehyde)124-13-0C,H_4,Oberzaldehyde100-52-7C,H_4,Opropanol caid (norpric acid)79-09-4C,H_4,Opropanol caid (norpric acid)144-18-7C,H_4,Opropanol caid (norpric acid)143-07-7C,H_4,Opropanol caid (norpric acid)143-07-7C,H_4,Opropanol caid (norpric acid)143-07-7C,H_4,Opropanol caid (norpric acid)143-07-7C,H_4,O	2-propanone (dimethyl ketone)	67-64-1	C ₃ H ₆ O	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	2-butanone (methyl ethyl ketone)	78-93-3	C ₄ H ₈ O	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	2-pentanone (methyl <i>n</i> -propyl ketone)	107-87-9	$C_5H_{10}O$	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	3-pentanone (diethyl ketone)	96-22-0	$C_5H_{10}O$	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	2-hexanone (methyl <i>n</i> -butyl ketone)	591-78-6	$C_6H_{12}O$	
$ \begin{array}{c} 123-19-3 & C.711.0 \\ 123-19-3 & C.711.0 \\ 120-92-3 & C.816_0 \\ (ydopentanone (methyl n-hexyl ketone) \\ (ydopexanone \\ (ydopexanone \\ 108-94-1 \\ C.816_0 \\ \end{array} \\ \hline \\ \begin{array}{c} rethanal (acetaldehyde) & 123-38-6 \\ 0.848-4 \\ 0$	4-methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	$C_6H_{12}O$	
$ \begin{array}{c} 2 + 0 \text{ctanlore} (\text{interply} Ir-heavy is ketonic) \\ (cycloperation one \\ (cyclopera$	4-heptanone (di- <i>n</i> -propyl ketone)	123-19-3	$C_7H_{14}O$	
cyclopentamore 108-94-1 C GH ₁₀ O Aldehydes 75-07-0 C ₂ H ₁ O propanal (propinaldohyde) 123-38-6 C ₃ H ₄ O butamal (butyraldehyde) 123-38-6 C ₃ H ₄ O butamal (butyraldehyde) 123-37-8 C ₄ H ₄ O butamal (butyraldehyde) 123-37-8 C ₄ H ₄ O butamal (butyraldehyde) 78-84-2 C ₄ H ₄ O pentanal (valeraldehyde) 78-84-2 C ₄ H ₄ O pentanal (valeraldehyde) 110-62-3 C ₅ H ₄ O butamal (caprylic aldehyde) 110-62-3 C ₅ H ₄ O berzaldehyde 124-13-0 C ₅ H ₄ O propanoic acid (formic acid) 64-19-7 C ₅ H ₄ O rethanoic acid (formic acid) 79-09-4 C ₅ H ₆ O ethanoic acid (formic acid) 79-09-4 C ₅ H ₆ O decanoic acid (acprylic aldohyde) 124-11-7 C ₅ H ₄ O propanoic acid (formic acid) 79-09-4 C ₅ H ₆ O decanoic acid (acprylic acid) 79-09-4 C ₅ H ₆ O tetradecanoic acid (myristic acid) 124-07-2 C ₆ H ₄ O ₂ decanoic acid (myristic acid) 143-07-7 C ₁₂ H ₅ O tetradecanoic acid (myristic acid) 144-07-8 C ₁₄ H ₆ O tetradecanoic acid (myristic acid) 144-07-9 C ₁₄ H ₆ O tetradecanoic acid (myristic acid) 144-07-8 C ₁₄ H ₆ O tetradecanoic acid (myristic acid) 144-07-7 C ₁₄ H ₅ O tetradecanoic acid (myristic acid) 144-07-7 C ₁₄ H ₆ O hexadecanoic acid (myristic acid) 144-07-7 C ₁₄ H ₆ O 141-78-6 C ₄ H ₆ O ₂ tetradecanoic acid (myristic acid) 144-07-7 C ₁₄ H ₁₄ O hexadecanoic acid (myristic acid) 144-07-7 C ₁₄ H ₁₄ O 141-78-6 C ₄ H ₆ O ₂ tetradecanoic acid (myristic acid) 144-07-7 C ₁₄ H ₁₄ O 141-78-6 C ₄ H ₆ O ₂ methyl tethanoate (mothyl acetate) 141-78-6 C ₄ H ₆ O ₂ methyl tethanoate (mothyl acetate) 106-38-5 C ₄ H ₁₄ O ₂ methyl propanoate (mothyl acetate) 106-38-5 C ₄ H ₁₄ O ₂ methyl propanoate (mothyl acetate) 106-38-5 C ₄ H ₁₄ O ₂ methyl propanoate (mothyl acetate) 1638-99-7 C ₁₃ H ₄ O ₂ methyl propanoate (mothyl acetate) 1638-90-6 C ₄ H ₄ O ₂ methyl propanoate (mothyl acetate) 1638-90-6 C ₄ H ₄ O ₂ methyl propanoate (mothyl acetate) 1638-90-6 C ₄ H ₄ O ₂ methyl propanoate (mothyl acetate) 1638-70	2-octanone (metnyl <i>n</i> -nexyl ketone)	111-13-7	$C_8H_{16}O$	
AldehydeschannelAldehydesethanal (acetaldehyde)propanal (propionaldehyde)2.72-8C.HaOpropanal (propionaldehyde)2.72-8C.HaO2.72-8C.HaO2.72-8C.HaO2.72-8C.HaO3 methylbutanal (sovaleraldehyde)110-82-3C.HaOAcidsTert colspan="2">C.HaOarethylbutanal (sovaleraldehyde)111-71-7C.HaOarethylpropanoi carddC.HaOarethylpropanoi carddC.HaOarethylpropanoi cardd (sovutyric acid)124-07-2C.HaOarethylpropanoi cardd (sovutyric acid)79-90-4C.HaOarethylpropanoi cardd (sovutyric acid)79-12-2C.HaOarethylpropanoi cardd (sovutyric acid)79-12-2C.HaOarethylpropanoi cardd (sovutyric acid)79-12-2C.HaOarethylpropanoi cardd (sovutyric acid)79-20-9C.HaOarethylpropanoi cardd (sovutyric acid)141-78-6C.HaO <th< td=""><td>cyclobexanone</td><td>108-94-1</td><td>C₅H₁₀O</td></th<>	cyclobexanone	108-94-1	C ₅ H ₁₀ O	
Aldehydesethanal (acetaldehyde)75-07-0 C_2H_4O propanal (porpionaldehyde)123-38-6 C_2H_4O butanal (loutyraldehyde)123-38-6 C_2H_4O 2-methylpropanal (isobutyraldehyde)10-62-3 C_3H_4O pentanal (valeraldehyde)500-86-3 C_2H_4O heptanal (sovaleraldehyde)10-62-3 $C_3H_{10}O$ heptanal (canyrlic aldehyde)10-62-3 $C_3H_{10}O$ berzaldehyde100-52-7 C_{2H_4O} berzaldehyde100-52-7 C_{2H_4O} catal (caryrlic aldehyde)64-19-7 $C_2H_4O_2$ ethanoic acid (formic acid)64-19-7 $C_2H_4O_2$ rethanoic acid (formic acid)79-09-4 $C_3H_4O_2$ 2-methylpropanoic acid (propionic acid)79-01-2 $C_4H_4O_2$ 2-methylpropanoic acid (isobutyric acid)124-07-2 $C_3H_4O_2$ 2-methylpropanoic acid (isopric acid)143-07-7 $C_2H_4O_2$ 2-methylpropanoic acid (isopric acid)143-07-7 $C_2H_4O_2$ 2-methylpropanoic acid (isopric acid)143-07-7 $C_2H_4O_2$ 2-methylpropanoic acid (isopric acid)143-07-7 $C_{2H_4O_2}$ 2-methylpropanoic acid (isopric acid)143-07-7 $C_{2H_4O_2}$ 2-methylpropanoic acid (isopric acid)143-07-7 $C_{2H_4O_2}$ 2-methylpropanoic acid (isopric acid)144-07-2 $C_{4H_4O_2}$ 1-tradecanoic acid (isopric acid)144-07-2 $C_{4H_4O_2}$ 1-tradecanoic acid (isopric acid)144-07-2 $C_{4H_4O_2}$ 1-tradecanoic acid (isopric acid) <td></td> <td>100-04-1</td> <td>061100</td>		100-04-1	061100	
ethala (actioner)7.907-0C2H4Opropanal (propionaldehyde)123.38-6C,H ₆ Obutanal (butyraldehyde)123.38-6C,H ₆ O2-methylpropanal (sobutyraldehyde)110.62-3C,H ₁₀ O3-methylbutanal (sovaleraldehyde)110.71-7C,H ₁₄ Oottanal (caprilic aldehyde)111.71-7C,H ₁₄ Oottanal (caprilic aldehyde)124.13-0CaH ₆ Oberzaldehyde120.52.7C,H ₆ Omethanoic acid (formic acid)64.18-6CH ₂ O ₂ ethanoic acid (formic acid)64.18-6CH ₂ O ₂ ctanoic acid (acetic acid)79.09-4C,H ₆ O ₂ propanoic acid (propionic acid)79.09-4C,H ₆ O ₂ ctanoic acid (acetric acid)79.09-4C,H ₆ O ₂ ottanoic acid (acetric acid)124.07-2C,H ₁₆ O ₂ ctanoic acid (acetric acid)124.07-2C,H ₁₆ O ₂ ottanoic acid (aprilic acid)134.48-5C,H ₆ O ₂ ottanoic acid (aprilic acid)544.63.8C,H ₁₄ O ₂ decanoic acid (aprilic acid)544.63.8C,H ₁₄ O ₂ tetradecanoic acid (palmitic acid)57.10-3C,H ₁₄ O ₂ bexadecanoic acid (palmitic acid)108.21.4C,H ₁₆ O ₂ tetradecanoic acid (palmitic acid)108.36-5C,H ₁₆ O ₂ methyl ethanoate (methyl acetate)106.38-5C,H ₁₆ O ₂ i.c.3.propanetrilyl triethaoate (glyceryl triacetate; triacetin)108.21.4C,H ₁₆ O ₂ i.c.3.propanetrilyl triethaoate (glyceryl triacetate; triacetin)106.38-5C,H ₁₆ O ₂ methyl ethanoate	Aldehydes	75 07 0	C II O	
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	ethanal (acetaldenyde)	/5-0/-0 192-29-6	C_2H_4O	
Duchada (unity) atternity)12-3-2-5Cult BO2-methyl propanal (isobutyraldehyde)110-62-3Cult BO3-methyl butanal (sovaleraldehyde)100-52-3Cult BO3-methyl butanal (sovaleraldehyde)111-71-7Cult BOoctanal (caprylic aldehyde)124-13-0Cult BObernzaldehyde100-52-7Cyl H ₀ Omethanoic acid (formic acid)64-18-6CH ₀ O ₂ ethanoic acid (formic acid)64-18-7Cult Operationgentry (aldehyde)79-09-4Cyl H ₀ O ₂ 2-methyl propanoic acid (acetic acid)79-09-4Cyl H ₀ O ₂ catadi (acetic acid)79-09-4Cyl H ₀ O ₂ catadi (acetic acid)79-09-4Cyl H ₀ O ₂ catadi (acetic acid)124-07-2Cult H ₀ O ₂ catadi (acetic acid)124-07-2Cult H ₀ O ₂ catadi (acetic acid)134-48-5Cult H ₀ O ₂ octanoic acid (apric acid)34-48-5Cult H ₀ O ₂ decanoic acid (apric acid)34-48-5Cult H ₀ O ₂ decanoic acid (apric acid)57-10-3Cult H ₀ O ₂ bexadecanoic acid (palmitic acid)57-10-3Cult H ₀ O ₂ tetradecanoic acid (palmitic acid)100-21-1Cyl H ₀ O ₂ tetradecanoic acid (palmitic acid)100-21-1<	propanar (proponardenyde)	123-30-0		
$\begin{array}{cccc} & & & & & & & & & & & & & & & & & $	2-methylpropanal (isobutyraldehyde)	78-84-9	$C_{4}H_{8}O$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	pentanal (valeraldehyde)	110-62-3	C5H10O	
$\beptanal (enamthaldehyde) 111-71-7 C_7H_4O transload (enamthaldehyde) 110-71-7 C_7H_4O transload (enamthaldehyde) 124-13-0 C_8H_{16}O transload (enamthaldehyde) 110-52-7 C_7H_4O transload (enamthaldehyde) 112-00-00 transload (enamthaldehyde) 112-00$	3-methylbutanal (isovaleraldehyde)	590-86-3	C5H10O	
octanal (caprylic aldehýde)124.13.0CaH ₂ Obenzaldehýde100-52.7C7H ₀ OAcidsmethanoic acid (formic acid)64.18.6CH ₂ O ₂ ethanoic acid (acetic acid)79.09.4C3H ₀ O ₂ 2-methylpropanoic acid (propionic acid)79.09.4C3H ₀ O ₂ 2-methylpropanoic acid (rapric acid)79.09.4C3H ₁ O ₂ octanoic acid (capric acid)124.07.2C8H ₁₀ O ₂ decanoic acid (capric acid)334.48.5C10H ₂₀ O ₂ dodecanoic acid (apric acid)143.07.7C1 ₂ H ₂₄ O ₂ decanoic acid (myristic acid)544.63.8C14H ₂₀ O ₂ bexadecanoic acid (palmitic acid)57.10.3C1 ₈ H ₃₂ O ₂ Estersmethyl ethanoate (methyl acetate)108.21.4C3H ₁₀ O ₂ 1.2.3.propanetriyl triethanoate (isopropyl acetate)106.36.5C6H ₁₂ O ₂ 1.2.3.propanetriyl triethanoate (glyceryl triacetate; triacetin)106.36.5C6H ₁₂ O ₂ nethyl bexanoate (nethyl acetate)106.70.7C7H ₁₄ O ₃ propyl propanoate (<i>n</i> -propyl propionate)106.70.7C7H ₁₄ O ₃ nonyl hexanoate (isopentyl triponate)61597.96.4C7H ₁₄ O ₃ pentyl burganoate (nethyl caprate)104.52.99.7C1 ₁₄ H ₃₀ O ₂ 1.2.3.propanetriyl tribexanoate (isobutyl lactate)61597.96.4C7H ₁₄ O ₃ pentyl berzencearboxylate (isobutyl lactate)61597.96.4C7H ₁₄ O ₃ pentyl 2-hydroxybenzencearboxylate (nethyl salicylate)193.83.8C4H ₆ O ₃ pentyl 2-hydroxybenzencearboxylate (nethyl sali	heptanal (enanthaldehyde)	111-71-7	$C_7H_{14}O$	
benzaldehyde100-52-7 C_7H_9O Acidsmethanoic acid (formic acid)methanoic acid (acetic acid)64-19-7 $C_2H_0O_2$ propanoic acid (propionic acid)79-09-4 $C_3H_8O_2$ 2-methylpropanoic acid (isobutyric acid)79-31-2 $C_4H_8O_2$ octanoic acid (caprylic acid)124-07-2 $C_8H_16O_2$ decanoic acid (caprylic acid)133448-5 $C_{10}H_{20}O_2$ decanoic acid (isobutyric acid)143-07-7 $C_{12}H_{24}O_2$ tetradecanoic acid (ipalmitic acid)544-63-8 $C_{14}H_{28}O_2$ tetradecanoic acid (ipalmitic acid)544-63-8 $C_{14}H_{28}O_2$ methyl ethanoate (methyl acetate)79-20-9 $C_3H_6O_2$ ethyl ethanoate (ipalmitic acid)514-63-8 $C_{14}H_{28}O_2$ 1.methyl ethanoate (isopropyl acetate)106-36-5 $C_6H_{14}O_2$ 1.amethyl ethanoate (isopropyl acetate)106-36-5 $C_8H_{16}O_2$ 1.amethyl ethanoate (isopropyl acetate)106-70-7 $C_7H_4O_2$ 1.amethyl benzenecatic (isopentyl propionate)106-70-7 $C_7H_4O_2$ amethyl hexanoate (isopentyl propionate)101452-99-7 $C_{14}H_0O_2$ 1.amethyl hexanoate (isopentyl propionate)631-70-5 $C_{21}H_{30}O_2$ 1.amethyl herzenecarboxylate (isobutyl lactate)6382-06-5 $C_8H_16O_3$ methyl henzenecarboxylate (isobutyl lactate)6382-06-5 $C_8H_16O_3$ methyl henzenecarboxylate (in-thyl salicylate)6382-06-5 $C_8H_16O_3$ methyl henzenecarboxylate (in-thyl salicylate)6382-06-5 <td< td=""><td>octanal (caprylic aldehyde)</td><td>124-13-0</td><td>$C_8H_{16}O$</td></td<>	octanal (caprylic aldehyde)	124-13-0	$C_8H_{16}O$	
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terr adecanoic acid (nalmitic acid)547-05-8 $Cl_{14}H_{28}O_2$ Estersmethyl ethanoate (methyl acetate)79-20-9 $C_{3}H_6O_2$ ethyl ethanoate (methyl acetate)141-78-6 $C_{4}H_8O_2$ 1-methylethyl ethanoate (isopropyl acetate)108-21-4 $C_{5}H_{10}O_2$ 1.amethylethyl ethanoate (glyceryl triacetate; triacetin)102-76-1 $C_{9}H_{14}O_6$ propyl propanoate (<i>n</i> -propyl propionate)106-36-5 $C_{6}H_{12}O_2$ 3-methylbutyl propanoate (isopentyl propionate)106-36-5 $C_{8}H_{16}O_2$ 3-methylbutyl propanoate (isopentyl propionate)101452-99-7 $C_{15}H_{30}O_2$ 1,2,3-propanetriyl trihexanoate (glyceryl trihexanoate, tricaproin)621-70-5 $C_{2}H_{14}O_3$ pentyl 2-hydroxypropanoate (isobutyl lactate)6382-06-5 $C_{8}H_{16}O_3$ methyl benzenecarboxylate (methyl benzoate)93-58-3 $C_{8}H_{6}O_3$ pentyl 2-hydroxypropanoate (isobutyl lactate)6382-06-5 $C_{8}H_{6}O_3$ pentyl 2-hydroxypropanoate (isobutyl lactate)93-58-3 $C_{8}H_{8}O_2$ 2-ethylhexyl benzenecarboxylate (methyl benzoate)94-75-7 $C_{15}H_{22}O_2$ methyl benzenecarboxylate (methyl salicylate)2050-08-0 $C_{12}H_{16}O_3$ pentyl 2-hydroxybenzenecarboxylate (methyl salicylate)6259-76-3 $C_{13}H_{18}O_3$ methyl 2-methyl-2-propenoate (methyl salicylate)80-62-6 $C_{5}H_{6}O_2$ methyl 12-methyl-2-propenoate (methyl methacrylate)80-62-6 $C_{5}H_{6}O_2$ methyl 2-methyl-2-propenoate (methyl salicylate)6259-76-3 $C_{13}H_{16}O_$	dodecanoic acid (nurristic acid)	143-07-7	$C_{12}H_{24}O_2$	
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a) <td>propyl propanoste (<i>p</i>-propyl propionate)</td> <td>106-36-5</td> <td>CeH12O2</td>	propyl propanoste (<i>p</i> -propyl propionate)	106-36-5	CeH12O2	
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Internyl 2-hydroxybenzenecarboxylate (inethyl salicylate)119-30-8 $C_8H_8O_3$ pentyl 2-hydroxybenzenecarboxylate (in-pentyl salicylate)2050-08-0 $C_{12}H_16O_3$ hexyl 2-hydroxybenzenecarboxylate (in-hexyl salicylate)6259-76-3 $C_{13}H_{18}O_3$ methyl 2-methyl-2-propenoate (methyl methacrylate)80-62-6 $C_5H_8O_2$ nonyl 2-methyl-2-propenoate (methyl methacrylate)2696-43-7 $C_{13}H_{24}O_2$ methyl (Z)-9-octadecenoate (methyl oleate)112-62-9 $C_{19}H_{36}O_2$ diethyl 2,2-bis(phenylmethyl)propane-1,3-dioate (diethyl dibenzylmalonate)597-55-7 $C_{21}H_{24}O_4$	z-etnyinexyi benzenecarboxylate (Z-etnyihexyi benzoate)	5444-75-7	$C_{15}H_{22}O_2$	
pentyl 2-hydroxybenzenecarboxylate (n-hexyl salicylate) $2030-06-0$ $C_{12}H_{16}O_3$ hexyl 2-hydroxybenzenecarboxylate (n-hexyl salicylate) $6259-76-3$ $C_{13}H_{18}O_3$ methyl 2-methyl-2-propenoate (methyl methacrylate) $80-62-6$ $C_5H_8O_2$ nonyl 2-methyl-2-propenoate (n-nonyl methacrylate) $2696-43-7$ $C_{13}H_{24}O_2$ methyl (Z)-9-octadecenoate (methyl loleate) $112-62-9$ $C_{19}H_{36}O_2$ diethyl 2,2-bis(phenylmethyl)propane-1,3-dioate (diethyl dibenzylmalonate) $597-55-7$ $C_{21}H_{24}O_4$	metnyi 2-nyaroxybenzenecarboxylate (metnyi salicylate)	119-30-8 2050 00 0		
Inclusion 0239^{-70-5} $C_{13}H_{18}O_3$ methyl 2-methyl-2-propenoate (methyl methacrylate) $80-62-6$ $C_5H_8O_2$ nonyl 2-methyl-2-propenoate (<i>n</i> -nonyl methacrylate) $2696-43-7$ $C_{13}H_{24}O_2$ methyl (Z)-9-octadecenoate (methyl oleate) $112-62-9$ $C_{19}H_{36}O_2$ diethyl 2,2-bis(phenylmethyl)propane-1,3-dioate (diethyl dibenzylmalonate) $597-55-7$ $C_{21}H_{24}O_4$	pentyr 2-nyuruxybenzenecarboxylate (7-pentyr salicylate) hevyl 2-hydroxybenzenecarboxylate (7 hevyl salicylate)	2000-08-0 8950-78-2	$C_{12}H_{16}O_3$	
Inclusive internet int	methyl 2-methyl-2-propenoate (methyl methacrylate)	0239-70-3 80_69_6	$C_{13} I_{18} O_3$ $C_r H_0 O_2$	
methyl (Z)-9-octadecenoate (methyl oleate)112-62-9 $C_{19}H_{36}O_2$ diethyl 2,2-bis(phenylmethyl)propane-1,3-dioate (diethyl dibenzylmalonate)597-55-7 $C_{21}H_{24}O_4$	nonvl 2-methyl-2-propenoate (<i>n</i> -nonvl methacrylate)	2696-43-7	C12H24O2	
diethyl 2,2-bis(phenylmethyl)propane-1,3-dioate (diethyl dibenzylmalonate) $597-55-7$ $C_{21}H_{24}O_4$	methyl (Z)-9-octadecenoate (methyl oleate)	112-62-9	C10H24O2	
	diethyl 2,2-bis(phenylmethyl)propane-1,3-dioate (diethyl dibenzylmalonate)	597-55-7	$C_{21}H_{24}O_{4}$	

Table 1 (Continued)

name (alternative name)
diethyl butane-1,4-dioate (diethyl succinate)
dipropyl butane-1,4-dioate (di- <i>n</i> -propyl succinate)
dinonyl butane-1,4-dioate (di- <i>n</i> -nonyl succinate)
dibutyl benzene-1,2-dicarboxylate (di-n-butyl phthalate)
4-methyl-1,3-dioxolan-2-one (propylene carbonate)

compressed-liquid density data were preferably used for the reference density, $\rho(T, P_{ref})$, and thus the values of relative density, $\rho(T, P) / \rho(T, P_{ref} = 0.1 \text{ MPa or } P_{sat})$, reported by the authors were correlated by eq 1. If the reference values were not available in the original source, then densities obtained from the equations summarized in Appendix I were employed in the correlations. In those few cases where the correlations were performed in the temperature region above the normal boiling temperature (i.e., where either both the reference density values $\rho(T, P_{ref})$ $= P_{\text{sat}}$) and the compressed-liquid density data or relative quantities at temperatures above the normal boiling point were available), saturated vapor pressures were calculated from the smoothing functions taken from the literature (see Appendix I) and used in the correlations. Reference densities, $\rho(T, P_{ref})$ reported in the papers are presented in the form of smoothing functions of temperature in Appendix II.

Adjustable parameters \vec{c} and \vec{b} of function 1 were obtained by minimizing the objective function

$$\phi(\vec{c},\vec{b}) = \sum_{j=1}^{N_{\rm p}} w_j [\rho_j - \rho(T_{j}, P_{j}, \vec{c}, \vec{b})]^2$$
(4)

where ρ_j , T_j , P_j is the *j*th experimental data point, $\rho(T_j, P_j, \vec{c}, \vec{b})$ is the value calculated from function 1 with parameters \vec{c} and \vec{b} for the values T_j and P_j , and N_p is the number of experimental values of density taken into the correlation. Adjustable parameters were calculated by the Marquardt algorithm in double precision to minimize the influence of rounding errors. Statistical weights, w_j , in eq 4, defined as

$$W_j = \mu_j / (\delta \rho_j)^2 \tag{5}$$

where $\delta \rho_j$ is the experimental uncertainty taken from the source database and either given by the authors (preferably) or estimated by a compiler for the *j*th density value in a correlated data set, were adjusted by varying the parameter μ_j ($\mu_j = 0$ for rejected values). The calculations of the parameters \vec{c} and \vec{b} were repeated until the final fit was obtained where the deviations between retained experimental and smoothed values were roughly equal to the modified experimental uncertainties, $\delta \rho_j / \mu_j^{1/2}$, i.e., where the weighted standard deviation of the fit was close to unity.

Results

Table 3 records the values of the parameters of eq 1 for each substance (except for 1,3-dioxolane where only one experimental compressed-liquid data point was available) along with some statistical information of the fits defined as follows:

RMSD = {
$$\sum_{j=1}^{N_{\rm p}} [\rho_j - \rho(T_{j}, P_j, \vec{c}, \vec{b})]^2 / N_{\rm p}$$
}^{1/2} (6)

$$\text{RMSD}_{\rm r}/\% = 100 \{ \sum_{j=1}^{n_{\rm p}} \left[1 - \rho(T_j, P_j, \vec{c}, \vec{b}) / \rho_j \right]^2 / N_{\rm p} \}^{1/2}$$
(7)

CASRNformula123-25-1
$$C_8H_{14}O_4$$
925-15-5 $C_{10}H_{18}O_4$ 15805-77-3 $C_{22}H_{42}O_4$ 84-74-2 $C_{16}H_{22}O_4$ 108-32-7 $C_{16}H_{6}O_2$

bias =
$$\sum_{j=1}^{N_{\rm p}} [\rho_j - \rho(T_j, P_j, \vec{c}, \vec{b})]/N_{\rm p}$$
 (8)

$$\pm = \sum_{j=1}^{N_{p}} \operatorname{sign}[\rho_{j} - \rho(T_{j}, P_{j}, \vec{c}, \vec{b})] \cdot 1$$
(9)

$$s_{\rm w} = \left[\phi/(N_{\rm p} - N_{\rm C} - B_{\rm B} - 2)\right]^{1/2}$$
 (10)

where N_p is the overall number of experimental data points retained for the correlation. The characteristics are given in an absolute density scale (kgm⁻³), which is more illustrative than in a relative density scale. Temperature and pressure ranges of validity of the fits given in the table allow one to avoid extrapolation using eq 1 with the parameters from Table 3 beyond P-T areas of retained data. The T-P areas that are not rectangular are shown in the figures (Figure 1) which provide crude information on the distribution of the retained data points. Nonrectangular T-P areas appeared mostly for measurements where the T-P range approached the vicinity of a solid– liquid equilibrium line.

Additional correlations were performed for several substances, mostly in those cases where two contradictory data sets were available. The results (parameters and characteristics) of those fits are given for each particular substance in the text below.

Table 4 summarizes some statistical information derived from the fits. Only those subsets for which the temperature and pressure ranges are displayed in the table were retained in the correlations. The statistical characteristics of these subsets refer only to the points retained in the correlation. On the other hand, the characteristics of the rejected subsets, i.e. those for which no *T* and *P* ranges are given in the table, illustrate the deviations of the rejected points from eq 1, but only for those values within *T*-*P* areas of the retained data (see Table 3 and Figure 1).

Values at high temperatures of some retained sets were rejected in those cases where large deviations from the Tait equation were observed and it was not possible to improve the fit by additional parameters b_i and c_i . Thus the P-Tranges of some fits do not cover the entire original range of retained data sets. Often the values at temperatures above the normal boiling temperature were rejected since no reference values, $\rho(T,P_{sat})$, were available. The temperature and/or pressure ranges were sometimes enlarged by retaining less accurate and less reliable values in the ranges beyond those of more accurate data sets but only in those cases where the representation of accurate data was not affected by the enlargement (e.g., 2-butanone; see Table 4) and the enlargement did not result in a distortion of the B(T) function.

As in our previous paper [96-cib/hne] the absence of extremes and inflection points on the function B(T) (eq 3) of all final fits was checked. For 8-oxapentadecane the inflection point was found at the temperature 529 K, which is close to the upper temperature limit of the fit (553 K).

Unlike with 1-alkanols and *n*-alkanes, where a rather large number of sets was available for nearly all selected members of the two homologous series ([94-cib/zik], [96cib/hne]), the data for the C,H,O compounds considered are, the critical evaluation and the selection of recommended values rather difficult. The final fits presented in Table 3 should be regarded as smoothed representations of data from one or two sources in many cases. A comparison of isothermal compressibilities, $\beta_T = -(1/V)(\partial V/\partial P)_T =$ $(1/\rho)(\partial \rho/\partial P)_T$, calculated from the fits with available independent values published in the literature can be a guide to estimate the reliability of the $P-\rho-T$ data. The values at atmospheric pressure were selected for the comparison presented in Table 5 since the compressibility values published for elevated pressures are usually evaluated from $P-\rho-T$ data and thus they are not independent of data used in the correlations. The literature values of isothermal compressibility used for the comparison in Table 5 are the values obtained mostly from speed of sound measurements and were either taken directly from the papers or calculated from the equation

$$\beta_T = \frac{1}{\rho} \left[\frac{1}{u^2} + \frac{TM\alpha_P^2}{c_P} \right] \tag{11}$$

where M, u, α_P , and c_P are molar mass, speed of sound, isobaric thermal expansivity ($\alpha_P = (1/V)(\partial V/\partial T)_P = -(1/\rho)(\partial \rho/\partial T)_P$), and molar isobaric heat capacity, respectively. Values of input quantities in eq 11 were taken from different sources cited in Table 5. A substantial part of the speed of sound data used was obtained from the TRC Source Database (Thermodynamics Research Center, College Station, TX). It is obvious from Table 5 that the scatter of isothermal compressibilities taken from the literature is rather large: the average deviation between literature values from different sources is 2.6%; the maximum one is 8%. Outstanding values of deviations, $\delta \beta_T$, obtained from the comparison given in Table 5 may, however, indicate significant inconsistency.

In the following a brief commentary is given for each class of substances.

Ethers. Surprisingly, no sufficiently accurate data were found for 3-oxapentane (diethyl ether), the substance widely used in any branch of chemistry. The only two sets which are in relatively reasonable mutual agreement (within 2 kg·m⁻³) are those indicated as retained in Table 4 ([31-bri], [69-bra/fre]). The results of Brazier and Freeman [69-bra/fre] for *n*-alkanes were mostly rejected in previous evaluation (see 96-cib/hne). On the other hand, the isothermal compressibilities calculated from the fit in Table 3 differ from literature values by about 4% on average (see Table 5). The need for new precise $P-\rho-T$ measurements for this common substance is, however, obvious.

Data for 4-oxaheptane (di-n-propyl ether) reported by Safarov et al. [92-saf/mad-1] for larger temperature intervals seem to be slightly less precise than the values given by Skinner et al. [68-ski/cus] for one isotherm with a precision of 1 kg·m⁻³. However, the Safarov values for 3-oxapentane are, on average (see bias in Table 4), lower than those by Skinner et al. The situation for 4-oxaheptane is the opposite and thus it is difficult to attribute a systematic error to any of the sets. The fit in Table 3 corresponds to Safarov's data covering a broader temperature range, the calculated isothermal compressibility at P = 0.1 MPa differs, however, significantly from a value taken from the literature (Table 5). The fit of eq 1 to Skinner's data alone resulted in $c_0 = 0.084590$, $b_0 =$ 57.6582 MPa, $T_{\min} = T_{\max} = 303.15$ K, $P_{\max} = 499.53$ MPa, RMSD = 0.680 kg·m^{-3}, $RMSD_r$ = 0.083%, bias = 0.055 kg·m^{-3}, N_p = 10, and \pm = 4. The isothermal compressibility calculated from this fit, β_T (303.15 K, 0.1 MPa) =

data [92-saf/mad-1]. In the case of 2,4-dimethyl-3-oxapentane (diisopropyl ether) the deviations of the magnitude in the range from 1.6 to 2.0 kg·m⁻³ were observed for the data measured by Govender et al. [96-gov/let] at T = 308.15 K when the original experimental value of reference density, $\rho_{ref}(T =$ 308.15 K, $\dot{P} = 0.1$ MPa) = 708.28 kg m⁻³, was used. After this value was replaced by that obtained from the smoothing equation reported by the authors, $\rho_{ref}(T = 308.15 \text{ K}, P)$ = 0.1 MPa) = 709.83 kg·m⁻³, the deviations along the isotherm T = 308.15 K decreased to the average value 0.22 kg·m⁻³. The experimental density at T = 308.15 K and P = 0.1 MPa was also rejected when the data were fit for P = 0.1 MPa (Appendix II) due to a large deviation (-1.3) kg·m⁻³) from a smooth curve. Therefore, the smoothed reference density value 709.83 kg·m⁻³ at T = 308.15 K was used for the final fit (Table 3). The thermal expansivity, $\alpha_P = (1/V)(\partial V/\partial T)_P$, at T = 298.15 K and P = 0.1 MPa evaluated from the fit in Appendix II is, however, significantly lower (1.17 kK⁻¹) than the value by Obama et al. [85-oba/ood] (1.45 kK⁻¹); this disagreement is similar to that observed for data for other ethers reported by Govender et al. [96-gov/let] (see below). Compressed-liquid density data reported by Schornack and Eckert [70-sch/ eck] seem to be inconsistent with the original reference values (at P = 0.1 MPa) and thus the values at lower

be more reasonable than that calculated from Safarov's

the low pressure range ([96-gov/let]) was negligible. There was only one $P-\rho-T$ data set available for 5-oxanonane (di-*n*-butyl ether). The agreement of isothermal compressibility calculated from the fit with the value taken from the literature is -1.1% (Table 5), indicating a reliability of data measured by Senger [94-sen], which is evident also in the case of 2,5,8-trioxanonane (deviation in isothermal compressibility below 1%).

pressures were rejected while those at the high pressure

range were retained since the effect on the fit of data at

The two data sets available for 6-oxaundecane (di-npentyl ether) agree within the experimental error in the range of lower pressures but deviations above 10 kg·m⁻³ were observed for Bridgman's [49-bri] values at high pressures. Since the experimental temperature of Bridgman's measurements is uncertain (room temperature reported to be about 298 K) and data at high pressures were obtained using a lead capsule to separate the sample from a hydraulic fluid, his all high-pressure data were rejected. On the other hand, all values reported by Safarov et al. [92-saf/mad] for the isobar 19.62 MPa were also rejected due to large negative deviations (-4.8 kg·m⁻³ in an average) from a smooth fit, indicating an erroneous pressure value. Besides that, an obvious typographical error in Safarov's data was corrected; the original value $\rho(T = 414.36 \text{ K}, P = 0.101 \text{ MPa}) = 579.2 \text{ kg} \text{m}^{-3} \text{ was}$ replaced by 679.2 kg·m⁻³. The deviation between the calculated and literature value of isothermal compressibility at P = 0.1 MPa is rather large (-14%; see Table 5).

The only data set available for 8-oxapentadecane (di-*n*-heptyl ether, [93-saf/oso]) seems to be internally inconsistent since large deviations (10 kg·m⁻³ in an average) were observed at pressures below 19.6 MPa, indicating an inconsistency of compressed liquid data with densities reported for atmospheric pressure. This may be the reason why the inflection point appeared on the B(T) curve, as mentioned above. Similarly, the values for 4-oxa-1,6-heptadiene reported by Safarov et al. [92-saf/gus] for pressure P = 9.81 MPa were rejected due to large deviations (about 4 kg·m⁻³ in an average).









480



т/к



т/к







Methyl (Z)-9-octadecenoate





Figure 1. Temperature and pressure coordinates of data points retained in the correlations for the fits where T-P areas of retained data points are not rectangular.

The deviations between the two data sets available for 2,5-dioxahexane (ethylene glycol dimethyl ether) exceed experimental uncertainties declared by the authors (0.3 kg m⁻³ [94-sen], 0.4 kg m⁻³ [78-sha/bai]) in the common temperature range. The fit in Table 3 corresponds to values by Senger [94-sen] over a much larger pressure range than that reported by Sharipov and Bairamova [78sha/bai] which, being correlated alone, resulted in (the maximum temperature of original smoothed reference densities was 330 K, see Appendix I) $c_0 = 0.272$ 862, $b_0 =$ 299.2118 MPa, $b_1 = -225.3534$ MPa·K⁻¹, $T_0 = 298.15$ K, $T_{min} = 298.15$ K, $T_{max} = 323.15$ K, $P_{max} = 35.91$ MPa, RMSD = 0.386 kg·m⁻³, RMSD_r = 0.046%, bias = -0.107 kg·m⁻³, $N_{\rm p} = 12$, $\pm = 0$. The isothermal compressibility, $\beta_T(T = 303.15 \text{ K}, P = 0.1 \text{ MPa})$, calculated from this fit differs from that calculated from the fit in Table 3 by -18%. The parameter c_0 (and of b_i as well) of this fit has a value unusually high for the Tait equation. Similarly high values were obtained for 4,7,10-trioxatridecane (diethylene glycol dipropyl ether; see Table 3) for the fit of data from the same laboratory [81-sha/abd].

Senger [94-sen] measured $P-\rho-T$ data for several ethers using a bellows piezometer and presented all the experimental values along each isotherm on the increase of pressure up to the maximum one and then on the decrease to a low pressure range. A hysteresis was observed when correlating his data for 3,3-dimethyl-2-oxabutane (methyl *tert*-butyl ether) and 4,4-dimethyl-3-oxapentane (ethyl *tert*butyl ether); the deviations from the eq 1 were negative for the pressure-on-increase data points and positive for decreasing pressure. The hysteresis resulted in rather higher values of RMSD for these two ethers compared to those measured by Senger for other ethers where the hysteresis was much less pronounced. The effect seems to be symmetrical since the values of bias for all ethers are comparable. The agreement of relative densities, $\rho(T,P)/\rho(T,P_{ref} = 0.1 \text{ MPa})$ reported by Senger [94-sen] and Govender et al. [96-gov/let] for 3,3-dimethyl-2-oxabutane (methyl tert-butyl ether) and 3,3-dimethyl-2-oxapentane (methyl tert-pentyl ether) is satisfactory (see Table 4). Large discrepancies were, however, observed for reference values (densities at P = 0.1 MPa) where maximum deviations between the two sets were as high as 10 kg·m⁻³; the data [96-gov/let] yield lower values of thermal expansivity, $\alpha_P = (1/V)(\partial V/\partial T)_P$, than other sources (see also discussion for cyclic ethers below). At T = 298.15 K and P = 0.1 MPa the values of α_P for 3,3-dimethyl-2-oxabutane and 3,3dimethyl-2-oxapentane are $\alpha_P = 1.11 \text{ kK}^{-1}$ [96-gov/let], 1.47 kK⁻¹ [94-sen], 1.42 kK⁻¹ [85-oba/ood], and $\alpha_P = 0.96$ kK⁻¹ [96-gov/let], 1.25 kK⁻¹ [94-sen], respectively. Senger's values of α_P are in good agreement with the literature data also for 4,4-dimethyl-3-oxapentane (ethyl *tert*-butyl ether); $\alpha_P(T = 298.15 \text{ K}, P = 0.1 \text{ MPa}) = 1.45 \text{ kK}^{-1}$ [94-sen], 1.40 kK⁻¹ [85-oba/ood]. Since Senger's values are not currently available and are in better agreement with other literature data, the fits of data at P = 0.1 MPa by Senger [94-sen] are presented in Appendix II; the values reported by Govender et al. [96-gov/let] are easily available from the original source.

Similarly as for 4-oxaheptane, the negative deviations of values reported by Skinner et al. [68-ski/cus] for methoxybenzene from the data measured by Kuss and Taslimi [70-kus/tas] were observed. The final fit corresponds to the latter data set; the fit of Skinner's data resulted in $c_0 = 0.081446$, $b_0 = 125.8382$ MPa, $T_{min} = T_{max} = 303.15$ K, $P_{max} = 497.51$ MPa, RMSD = 1.808 kg·m⁻³, RMSD_r = 0.166%, bias = 0.022 kg·m⁻³, $N_p = 10$, $\pm = 0$. The isothermal compressibility, $\beta_T(T=303.15$ K, P=0.1 MPa), calculated from this fit differs from that calculated from the fit in Table 3 by -4.2%.

The $P-\rho-T$ data for cyclic ethers are scarce. One experimental value was found for 1,3-dioxolane ([83-nak/ miy]; { $\rho(P = 101.3 \text{ MPa})/\rho(P = 0.1 \text{ MPa}) - 1$ } = 0.055 39 at T = 298.15 K), and therefore no correlation was performed. Data for tetrahydrofuran reported by Schornack and Eckert [70-sch/eck] are of low accuracy and show an internal inconsistency, particularly at lower pressures. The data at higher pressures were, however, retained in the final fit to enlarge the pressure range. Two values presented for 1,4-dioxane in reference 68-pea/str for T =298.15 K are reasonably consistent with the data measured by Govender et al. [96-gov/let] in the lower pressure range. The rejected value reported by Korpela and Koskikallio [66kor/kos] for T = 298.15 K and P = 67.3 MPa differs from the final fit (Table 3) by 5.4 kg·m⁻³. Deviations of isothermal compressibilities, $\beta_T(T, P = 0.1 \text{ MPa})$, calculated from the fits presented for tetrahydrofuran and 1,4-dioxane in Table 3 from the values obtained from the literature data are below 6 and 8%, respectively, except for those cases where density and thermal expansivity used in eq 11 were evaluated from the $\rho(T, P = 0.1 \text{ MPa})$ data by Govender at al. [96-gov/let] (see Table 5). Similarly as in the case of 2,4-dimethyl-3-oxapentane, 3,3-dimethyl-2-oxabutane, and 3,3-dimethyl-2-oxapentane (see above), large deviations of the $\rho(T,P = 0.1 \text{ MPa})$ values [96-gov/let] from other available data were observed, resulting in significantly lower values of thermal expansivity, α_P . Therefore the values of isothermal compressibility, β_T , calculated from eq 11 using the $\rho(T,P=0.1 \text{ MPa})$ data by Govender at al. [96-gov/let] are lower (compared to other literature values in Table 5) and not consistent even with relative densities, $\rho(T,P)/\rho(T,P_{ref} = 0.1 \text{ MPa})$ reported in 96-gov/let; the values

Table 2. Characteristics of Data Sets: Overall Number of Data Points, N_p , Temperature and Pressure Ranges within the Liquid State, T_{min} , T_{max} , P_{min} , and P_{max} , Experimental Method Used, Types of Data, and Purities of Measured Samples

ref	$N_{ m p}$	T_{\min}/\mathbf{K}	$T_{\rm max}/{ m K}$	P _{min} /MPa	P _{max} /MPa	meth ^a	data type ^b	sample purity ^c %
			3	-Oxapentane (I	Diethyl Ether)			
13-bri	119	293.15	353.15	49.0	1176.8	vs	D	
31-bri	26	303.15	348.15	49.1	1176.9	vb	D	
57-wal/ric	2	294.15	305.15	4180.0	9610.0	SW	D	
68-ski/cus	11	303.15	303.15	82.1	500.6	vl	D	
69-bra/fre	8	303.15	303.15	50.0	400.0	vb	D	
92-saf/mad	88	296.71	462.18	4.9	98.1	bu	D	
total	254	293.15	462.18	4.9	9610.0			
			1.0)vahontano (Di	n propyl Ethor)			
68-ski/cus	11	303 15	303 15	49 7	499 5	vl	D	
92-saf/mad-1	110	294.30	524.80	4.9	98.1	bu	D	
totol	101	204.20	594.90	4.0	400 5		_	
total	121	294.30	524.80	4.9	499.5			
70 1 / 1			2,4-Dime	thyl-3-oxapenta	ne (Diisopropyl I	Ether)		
70-sch/eck	12	303.15	323.15	45.7	511.3	vb	D	00.0
96-gov/let	45	288.15	328.15	0.5	8.0	mo	\mathbf{D}^{I}	99.8m ^e
total	57	288.15	328.15	0.5	511.3			
			5-	Oxanonane (Di	- <i>n</i> -butyl Ether)			
94-sen	90	298.15	328.15	5.1	203.7	vb	D	99^d
			6.0	voundocono (Di	n nontril Ethon)			
10 hri	11	208 15	208 15			VC	D	
45-011 92-səf/məd	132	296.15	290.13	49.0	980.7	vs bu	D	
52-sai/mau	152	230.04	501.57	4.5	50.1	bu	D	
total	143	296.64	561.57	4.9	980.7			
			8-Ox	apentadecane (l	Di- <i>n</i> -heptyl Ethe	r)		
93-saf/oso	154	293.00	553.00	4.9	98.1	bu	D	
			3.3-Dimethy	/l-2-oxabutane (Methyl <i>tert</i> -Buty	d Ether)		
94-sen	90	298.15	328.15	5.4	207.7	vb	D	99^d
96-gov/let	45	288.15	328.15	0.5	8.0	mo	\mathbf{D}^{f}	>99.9m ^e
totol	195	900 15	220 15	0.5	907 7			
totai	155	200.15	328.13	0.5	201.1			
			4,4-Dimeth	yl-3-oxapentane	e (Ethyl <i>tert</i> -Buty	l Ether)	_	1
94-sen	90	298.15	328.15	5.6	207.2	vb	D	>994
			3,3-Dimethyl	-2-oxapentane	(Methyl <i>tert</i> -Pent	tyl Ether)		
94-sen	90	298.15	328.15	5.6	203.8	vb	D	98^d
96-gov/let	45	288.15	328.15	0.5	8.0	mo	\mathbf{D}^{f}	>99.9m ^e
total	135	288.15	328.15	0.5	203.8			
			2 5-Diovah	wana (Ethyland	Clycol Dimethy	l Ethor)		
78-sha/hai	48	298 15	473 15		36.6	ni	D	99 94we
94-sen	90	298.15	328.15	5.6	204.8	vb	D	99 ^d
totol	100	909.15	479.15	1.0	904.9			
total	138	298.15	473.15	1.8	204.8			
			2,5,8-Trioxan	onane (Diethyle	ene Glycol Dimet	hyl Ether)		0.0.1
94-sen	90	298.15	328.15	5.1	202.8	vb	D	99 ^{<i>d</i>}
		4	,7,10-Trioxatr	idecane (Diethy	lene Glycol Dipr/	opyl Ether)		
81-sha/abd	69	298.15	523.15	2.2	35.9	pi	D	
		2,5,8,11,	14-Pentaoxap	entadecane (Te	traethylene Glyc	ol Dimethyl	Ether)	
90-sve/sid	5	293.15	293.15	2.0	10.0	mo	\mathbf{D}^{f}	99.5^{e}
			4.0	va 1.6 hontadio	no (Dially) Ethor)		
92-saf/gus	121	291 70	552 30	4 9		, bu	D	
oz sulgus	1~1	201.70	002.00	1.0		, ,	D	
00 -1-:/	10	000.15	Metho	xybenzene (Me	thyl Phenyl Ethe	er)	D	
68-SKI/CUS	10	303.15	303.15	59.3	497.5	VI	D	
70-Kus/tas	20	298.15	333.15	39.2	190.1	VI	D	
total	30	298.15	353.15	39.2	497.5			
				Tetrahydrofura	an (Oxolane)			
70-sch/eck	12	303.15	323.15	4 6.7	517.0	vb	D	
71-ham/smi	1	303.15	303.15	101.3	101.3	va	D	99^d
83-nak/miy	1	298.15	298.15	101.3	101.3	va	D	
87-hol/goe	5	293.15	293.15	2.0	10.0	mo	\mathbf{D}^{f}	>99d
96-gov/let	45	288.15	328.15	0.5	8.0	mo	\mathbf{D}^{f}	>99.9m ^e
total	64	288.15	328.15	0.5	517.0			
	-			1 2 Dia	alana			
83-nak/miv	1	298 15	298 15	גסוים-ג,ס- 101 פ	101 3	va	Л	
55 hui/illy	1	200.10	200.10	т. <u>1</u>	101.0	vu	D	
00	A 17	000 17	200 1 "	Tetrahydropy	ran (Oxane)		\mathbf{D}^{f}	> 00 0 4
90-gov/let	45	288.15	328.15	0.5	8.0	mo	D'	≥99.9m°

ref	$N_{ m p}$	T_{\min}/\mathbf{K}	$T_{\rm max}/{ m K}$	P_{\min}/MPa	P _{max} /MPa	meth ^a	data type ^{b}	sample purity ^c %
				1,4-Di	oxane			
66-kor/kos	1	298.15	298.15	67.3	67.3	va	D	
68-pea/str	2	298.15	298.15	25.0	50.0	va	S	
96-gov/let	45	288.15	328.15	0.5	8.0	mo	\mathbf{D}^{f}	>99.9m ^e
total	48	288.15	328.15	0.5	67.3			
				Fu	ran	_	_	
78-fig/szw	191	209.00	257.00	11.0	897.0	vb	D	>99e
	40	004 55	500.45	Dibenz	ofuran		P	
84-nas/siv	42	391.55	563.15	0.5	25.5	vs	D	99.99m ^e
12 hri	100	202 15	252 15	2-Propanone (Di	imethyl Ketone)	VC	D	
13-011 51-now/woo	109	293.15	208 15	49.0	101.3	vs va	D	
56-stu	1	303 15	303 15	101.3	101.3	va	D	
57-wal/ric	2	299.15	303.15	4640.0	10580.0	sw	D	
66-win/pow	4	273.15	273.15	34.5	206.8	vb	F	
66-win/pow	4	273.15	273.15	34.5	206.8	vb	F	
66-win/pow	9	273.15	273.15	34.5	586.1	vb	F	
67-ada/lai	7	299.76	299.76	40.0	100.0	vs	D	
76-ato/mam	48	273.15	473.15	20.3	162.1	hp	D	
//-gup/han	24	2/3.15	363.15	2.8	ZZ.1	VS vb	D	
87 hol/goo 1	49	290.15	396.13	1.0	411.9	VD mo	D Df	>00 8me
87-nbu/bba	5	293.15	293.15	2.0	10.0	mo	D	99.811 00 00e
91-mal/woo	105	278 15	323 15	2.5	392.3	vb	D	99.9m ^d
91-nan/zia	9	298.15	298.15	2.0	33.8	mo	D	99.5^{d}
92-ego/gru	5	298.15	298.15	5.0	60.0	va	D	0010
total	387	273.15	473.15	1.0	10580.0			
			2-	Butanone (Metl	nyl Ethyl Ketone)		
63-and	9	283.15	308.15	167.9	305.1	, va	F	
74-ato/mam	243	283.15	473.15	9.8	127.5	hp	D	
76-ato/bag	77	273.15	473.15	40.5	162.1	hp	D	
77-lam/hun	15	303.15	343.15	35.0	172.0	vs	D	
92-mal/woo	138	278.15	338.15	2.3	282.5	vb	D	>99.9m ^d
total	482	273.15	473.15	2.3	305.1			
			2-Pe	entanone (Meth	yl <i>n</i> -Propyl Ketor	ne)		
77-apa/ker	36	273.00	472.24	5.0	78.6	bu	D	99.86 ^e
				3-Pentanone (E	Diethyl Ketone)			
82-ato/mam	90	293.00	473.00	9.8	156.8	hp	D	
93-mal/pri	128	278.15	338.15	2.5	389.8	vb	D	> 99.0m ^d
total	218	278.15	473.00	2.5	389.8			
			2-F	Iexanone (Meth	yl <i>n</i> -Butyl Keton	e)		
79-ato	90	293.15	473.15	9.8	156.9	hp	D	
			4-Methy	l-2-pentanone (I	Methyl Isobutyl F	Ketone)		
63-and	13	295.55	295.55	245.2	484.8	va	D	
			4	Heptanone (Di-	n-propyl Ketone)	_		
91-ato	108	273.00	473.00	10.0	160.0	hp	D	
			2-0	Octanone (Methy	yl <i>n</i> -Hexyl Keton	e)		
75-ato/mam	88	273.15	473.15	20.3	162.1	bu	D	
78-apa/ker	44	273.15	566.08	5.0	78.6	bu	D	
total	132	273.15	566.08	5.0	162.1			
				Cyclope	ntanone			
69-bra/fre	8	298.15	298.15	5Ŏ.O	400.0	vb	D	
				Cyclohe	xanone			
63-and	3	296.45	296.45	158.7	266.1	va	F	
82-wis/wue	93	253.20	303.40	10.0	220.0	vs	S	99.9 ^e
total	96	253.20	303.40	10.0	266.1			
				Ethanal (Ac	etaldehvde)			
68-cha/sta	10	295.15	295.15	13.9	138.0	vs	D	
				Propanal (Pro	pionaldehvde)			
68-cha/sta	10	296.65	296.65	13.9	138.0	vs	D	
				Butanal (But	tvraldehvde)			
68-cha/sta	10	302.04	302.04	13.9	138.0	vs	D	
71-run/sta	32	303.15	333.15	34.9	276.6	vs	D	
total	42	302.04	333.15	13.9	276.6			
			9.1	[ethylpropaga]	(Isobutyraldobyd	ല		
68-cha/sta	10	301.37	301.37	13.9	138.0	vs	D	

Table 2 (Continued)

Table 2 (Continued)

ref	N _p	$T_{\rm min}/{ m K}$	T _{max} /K	P _{min} /MPa	P _{max} /MPa	meth ^a	data type ^b	sample purity ^c %
				Pentanal (Val	eraldehyde)			
75-mam/gus	48	248.15	545.15	5.0	50.1	bu	D	$99.8m^d$
	40	000.07	3-	Methylbutanal (Is	sovaleraldehyde))	D	
68-cha/sta	10 52	300.37	300.37	13.9	138.0	VS bu	D	>00 8md
75-mani/gus	32	204.93	500.50	5.0	50.1	bu	D	> 55.011
total	62	284.95	580.36	5.0	138.0			
68-cha/sta	10	295.21	295.21	Heptanal (Enar 13.9	nthaldehyde) 138.0	vs	D	
				Octanal (Capry	lic Aldehyde)			
68-cha/sta	10	293.87	293.87	13.9	138.0	vs	D	
				Benzald	ehyde			
68-cha/sta	10	295.21	295.21	13.9	138.0	vs	D	
_				Methanoic Acid	(Formic Acid)			,
63-and	2	295.55	295.55	76.5	107.5	va	F	98 ^{<i>d</i>}
/1-KOF	4	298.15	298.15	50.7	202.7	va	Г	
total	6	295.55	298.15	50.7	202.7			
				Ethanoic Acid	(Acetic Acid)		_	
71-kor	12	298.15	328.15	50.7	253.3	va	F	
				Propanoic Acid (F	Propionic Acid)		_	
71-kor	15	298.15	328.15	50.7	253.3	va	F	
			2-M	ethylpropanoic Ac	id (Isobutyric Ac	cid)	-	
71-kor	15	298.15	328.15	50.7	253.3	va	F	99.8^{e}
				Octanoic Acid (C	Caprylic Acid)		- 6	,
92-ban/gar	30	343.15	373.15	1.0	9.0	mo	\mathbf{D}^{t}	>99.5m ^d
				Decanoic Acid ((Capric Acid)		- 1	
92-ban/gar	30	343.15	373.15	1.0	9.0	mo	\mathbf{D}^{f}	$>99m^d$
				Dodecanoic Acid	(Lauric Acid)			
92-ban/gar	30	343.15	373.15	1.0	9.0	mo	\mathbf{D}^{f}	$>99.5m^{d}$
			Т	etradecanoic Acid	l (Myristic Acid)			
92-ban/gar	25	353.15	373.15	1.0	9.0	mo	\mathbf{D}^{f}	>99.5m ^d
			H	Iexadecanoic Acid	l (Palmitic Acid)		- 6	,
92-ban/gar	25	353.15	373.15	1.0	9.0	mo	\mathbf{D}^{t}	$>99m^d$
			Ν	lethyl Ethanoate ((Methyl Acetate)	_		,
78-kum/iwa	32	253.15	313.15	19.7	156.8	vl	D	97.0 ^{<i>d</i>}
				Ethyl Ethanoate ((Ethyl Acetate)		_	
49-bri	17	298.15	298.15	49.0	3922.7	vs	D	
53-and 70-sch/eck	1 12	298.15	298.15	400.1	400.1	va vb	S D	
75-gus/kad	42	300.06	499.21	5.0	49.1	bu	D	99.8 ^e
79-kum/iwa	32	253.15	313.15	19.7	156.8	vl	D	99^d
total	104	253.15	499.21	5.0	3922.7			
			1 Mot	hvlothvl Ethanoat	to (Isopropyl Aco	tata)		
75-gus/kad	48	297.17	531.22	5.0	49.1	bu	D	99.8 ^e
		199	Propapotr	ivl Triothanoato (Clycoryl Triacot	ato: Triacotin)	_	
32-bri	32	273.15	368.15	49.0	1176.8	vb	D	
			Drot	vl Propanoato (n	Propyl Propiona	to)		
78-gus/kli	66	300.00	550.00	5.0	50.0	bu	S	$99.8 w^e$
0			3-Methy	lbutyl Propanoate	(Isopentyl Prop	ionate)		
76-gus/kli	78	298.15	598.15	5.0	50.1	bu	S	99.7^{e}
0			м	ethyl Heyanoate ()	Methyl Canroate	2)		
92-mus/gus	90	294.99	589.63	4.9	58.8	bu	D	99.88 ^e
0			No	nvl Hexanoate (<i>n</i>	Nonvl Caproate	.)		
92-mus/gus-1	119	289.00	604.82	4.9	58.8	bu	D	99.32^{e}
0		123-P	ronanetriv	Tribevanoate (G	lvcervl Trihevan	oate: Tricanroi	n)	
32-bri	36	273.15	368.15	49.0	1176.8	vb	D	
		9	P-Methylnro	nyl 2-Hydroxynro	nanoate (Isobut	vII actate)		
91-gus/kul	121	294.36	533.89	4.9	98.1	bu	D	99.68 ^e
0			Pontul	 2-Hydroyypropana	nate (<i>n</i> -Pontul I	actate)		
91-gus/kul-1	121	296.71	535.03	4.9	98.1	bu	D	99.48 ^e
0			Mothyl	Benzenecarbovul	ate (Methyl Ren	zoate)	-	
94-mus/tag	105	300.48	604.58	5.0	58.9	bu	D	99.3^{e}
0		9	Ethylhovyl	Benzenecarhovyl	ate (2-Ethylbovy	(Benzoate)		
88-wal/lam	60	253.15	373.15	50.0	450.0	nd	D	> 99.8 ^d

Table 2 (Continued)

ref	$N_{ m p}$	T_{\min}/K	$T_{\rm max}/{ m K}$	P_{\min}/MPa	$P_{\text{max}}/\text{MPa}$	meth ^a	data type ^b	sample purity ^c %
		Μ	lethyl 2-Hydr	oxybenzenecarb	oxylate (Methyl	Salicylate)		
90-mus/gan-1 ^g	72	298.15	573.15	10.0	60.0	bu	D	99.7 ^e
		Pe	entyl 2-Hydro	xybenzenecarbo	xylate (<i>n</i> -Penty	l Salicylate)		
90-mus/gan-1	72	298.15	573.15	10.0	60.0	bu	D	99.7^{e}
		Н	lexyl 2-Hydro	xybenzenecarbo	xylate (<i>n</i> -Hexyl	Salicylate)		
90-mus/gan-1	72	298.15	573.15	10.0	60.0	bu	D	99.7^{e}
			Methyl 2-Met	thyl-2-propenoa	te (Methyl Meth	nacrylate)		
87-gus/bai	142	289.34	424.77	5.0	98.1	bu	D	99.92^{d}
			Nonyl 2-Meth	nyl-2-propenoate	e (<i>n</i> -Nonyl Meth	acrylate)		_
89-gus/bai	78	292.37	473.43	5.0	98.2	bu	D	$99.94^{e,h}$
			Methyl (Z)-9-Octadecen	oate (Methyl Ol	eate)		
32-bri	22	273.15	368.15	49.0	980.7	vb	D	
		Diethyl 2,2-	Bis(phenylme	thyl)-propane-1	,3-dioate (Dieth	yl Dibenzyln	nalonate)	
32-bri	13	273.15	368.15	49.0	490.3	vb	D	
			Diethyl E	Butane-1,4-dioat	e (Diethyl Succi	inate)	_	
90-mus/gan-3	54	295.65	498.15	5.0	49.1	bu	D	98.6^{e}
			Dipropyl Bu	itane-1,4-dioate	(Di-n-propyl Su	(ccinate)	_	
90-mus/gan-2	60	288.15	502.75	5.0	49.1	bu	D	98.7^{e}
o. /	~~	000.45	Dinonyl Bu	tane-1,4-dioate	(Di-n-nonyl Suc	cinate)	5	00.07
91-mus/gan	72	298.15	573.15	10.0	60.0	bu	D	99.37 ^e
001	07	D	ibutyl Benzer	ne-1,2-dicarboxy	late (Di- <i>n</i> -butyl	Phthalate)	5	
32-bri	37	273.15	368.15	49.0	1176.8	vb	D	
00 /1.1		000.15	4-Methyl-1,3	3-dioxolan-2-one	e (Propylene Ca	rbonate)	D	
92-uos/kit	4	298.15	298.15	50.0	200.0	va	D	

^{*a*} Method used for measurements: bu, buoyancy method; mo, mechanical oscillator method; nd, not described or stated in the reference; pi, piezometer of unspecified type; sw, shock wave method; va, Aime method; vb, variable-volume cell with bellows; vl, variable-volume cell with liquid piston; vs, variable-volume cell with solid piston. For the classification and description of the methods, see [85-tek/cib]. ^{*b*} D, direct experimental data; S, smoothed data presented in the reference; F, values calculated from smoothing equation reported by the researchers. ^{*c*} No letter, unspecified percent; m, mole percent; w, mass percent. ^{*d*} Only purity of source material is given. ^{*e*} Final purity of the sample. ^{*f*} IPTS-68 declared by the researchers. ^{*s*} Same data are presented also in 90-mus/gan. ^{*h*} Purified sample was stabilized with 0.05 mass % of hydrochinone to prevent a polymerization.

of $\beta_T(T = 298.15 \text{ K}, P = 0.1 \text{ MPa})$ evaluated by Govender et al. [96-gov/let] from their data are 0.960 GPa⁻¹ (tetrahydrofuran) and 0.739 GPa⁻¹ (1,4-dioxane). It might be concluded that while the compression data (relative densities) along the isotherms seem to be correct, the temperature dependencies of density itself need to be reexamined.

There was one data set available for tetrahydropyran [96-gov/let]. The agreement of the value of $\beta_T(T = 298.15)$ K, P = 0.1 MPa) calculated from the fit with the value selected from the literature is very good (-0.4%, Table 5). Table A2 (Appendix II) presents the fit of data at P = 0.1MPa; it is likely that the value of the parameter v_1 of the smoothing equation presented in the original source [96gov/let] is in error; the correct value should be probably 0.076 166 (not 0.761 66), as deduced from tentative calculations of densities at P = 0.1 MPa. Besides that, it should be pointed out that, similarly as with other ethers measured by Govender et al. [96-gov/let], the values of thermal expansivity α_P are significantly lower (e.g., $\alpha_P(T = 298.15$ K, P = 0.1 MPa) = 0.776 kK⁻¹) than those evaluated from other literature data (83-ing/gro: $\alpha_P(T = 298.15 \text{ K}, P =$ $0.1 \text{ MPa} = 1.15 \text{ kK}^{-1}$.

Data of furan measured by Figuiere and Szwarc [78-fig/ szw] are of low accuracy (RMSD = 2.4 kg·m⁻³); the authors primarily investigated solid—liquid equilibrium and the $P-\rho-T$ measurements were of secondary importance. Experimental data of dibenzofuran [84-nas/siv] correlated by the authors using a modified Chueh equation with 20 parameters resulted in the relative RMSD_r slightly lower (0.07%) than that of the fit by eq 1 with four adjustable parameters (Table 3). It was, however, impossible to improve the fit by additional parameters since the extreme appeared on the B(T) curve.

Ketones (Alkanones and Cyclohexanone). There is a rather large number of data sets available for 2-pro-

panone. The evaluation revealed that only a few data sets measured recently in a close-to-ambient temperature range are in a mutual agreement. It was not possible to extend the temperature range by an inclusion of some less accurate data sets since inflection points appeared on the B-(T) curve indicating the inconsistency of data. The extension was possible in the case of 2-butanone by retaining the high-temperature data points from the set of Atoyan et al. [76-ato/bag] but the expected uncertainty in this temperature range might be rather high (RMSD = 2.5 $kg \cdot m^{-3}$; see Table 4). The agreement between values of $\beta_T(T,P = 0.1 \text{ MPa})$ calculated from the fits for those two alkanones and data taken from the literature is satisfactory (see Table 5), even for 2-butanone at temperatures beyond Malhotra's [92-mal/woo] experimental temperature range.

There is only one data set available for 2-pentanone: a comparison of smoothed values with those from the generalized Tait equation (see below and Table 6) shows a satisfactory agreement (0.16%); however, the isothermal compressibilities (Table 5) calculated from the fit in Table 3 are lower than selected literature values. The data set by Atoyan and Mamedov [82-ato/mam] for 3-pentanone is inconsistent with data measured by Malhotra et al. [93-mal/pri] and since the data from Malhotra's laboratory proved to be of high quality in the case of 2-propanone and 2-butanone, the latter set only was retained.

Data available for 2-hexanone seem to be of poor accuracy. The values of isothermal compressibility calculated from the fit for P = 0.1 MPa differ from the values taken from the literature by nearly -20% at lower temperatures (see Table 5) and are even out of a monotonous decrease within the homologous series of 2-alkanones indicated by the literature data. Besides that, the deviations of relative density from the generalized Tait equation (see below and Table 3. Parameters c_i , b_i , and T_0 of Eq 1, Temperature and Pressure Ranges, $^a T_{min}$, T_{max} , P_{min} , and P_{max} , Absolute, RMSD, and Relative, RMSD_r, Root Mean Square Deviations, Biases, bias, Number of Data Points, N_p , \pm , and Weighted Standard Deviations, s_w

Ethers															
			2,4-di-				8-02	xa-	3,3	-di-	4,	4-di-		3,3-di-	
	3-oxa-	4-oxa-	methyl-3-	5-oxa	- 6	3-oxa-	pen	ta-	meth	ıyl-2-	me	thyl-3-	m	ethyl-2-	2,5-dioxa-
	pentane	heptane	oxapentane	nonar	ie un	idecane	deca	ane o	oxabi	utane	oxap	entane	0Xa	apentane	hexane
C_0	0.095070	0.085992	2 0.088836	0.0906	42 0.1	33853 0	0.156	481	0.091	1636	0.0	86511	0.	.087240	0.092603
D_0/MPa	46.6780	50.2436	45.5640	/4.896	9 143	3.6450 I	152	315 7196	52.62	240	48.	4404	64	4.0/16	83.5587
$D_1/MPa\cdot K^{-2}$	-43.4590	-38.723	2 -55.9497	-47.30	87 -1 97	03.3338 -	-100.	18	-41. 25 0/	0220 452	-3	5.0754	19	49.9401 3 /133	-65.9447
$b_2/MPa \cdot K^{-3}$		13.3234	14.5100		21.		-7 81	76	20.0	452			1.	5.4155	
T_0/K	303.15	294.30	303.15	298.15	298	8.15 2	293.0	0	298.1	15	298	3.15	29	98.15	298.15
$T_{\rm min}/{\rm K}$	303.15	294.30	288.15	298.15	296	6.64 2	93.0	0	288.	15	298	8.15	28	88.15	298.15
$T_{\rm max}/{ m K}$	348.15	374.50	328.15	328.15	456	6.82 5	53.0	0	328.1	15	328	8.15	32	28.15	328.15
P _{min} /MPa	49.13	4.91	0.50	5.08	4.9	1 1	9.62		0.50		5.5	6	0.	.50	5.58
P _{max} /MPa	1176.90	98.10	511.29	203.68	98.	10 9	8.10		207.7	72	207	'.16	20	03.79	204.75
RMSD/kg·m ⁻	³ 1.220	1.361	1.172	0.233	1.4	29 1			0.76	5	0.4	83	0.	.290	0.225
kMSD _r /%	0.138	0.183	0.135	0.029	0.1	.89 U 142 -).228 _0.00	5	0.093	5 4	0.0	02 15	0.	.030	0.025
N.	-0.098	0.224 40	52	0.020 90	80	40 -	-0.09 13	5	0.034 134	+	90	15	19	35	90
+	-1	6	4	-2	6	-	-13		-10		0		7	00	10
$S_{\rm W}$	0.957	1.000	1.031	0.955	1.0	69 1	.020		1.066	6	1.1	22	1.	.170	0.920
	258 tri	1710	2,5,8,1	1,14-	1 ovo 1	6 moth	0.1/1./	tetra	1- 0	tetra	a-	1 /			dihanza
	2,3,6-01	e oxatrid	ecane pentad	ecane h	entadie	ene benz	ene	fura	0- n	nyui	0- n	dioxan	e	furan	furan
	0.000070	0.000		177	0 10500		000	0.0000		0.0554		0.04000	0	0.004450	0.017047
c_0 b_0/MP_2	100 6533	0.3037	(18 U.U80 273 1371	726	0.18300 163 525	58 U.U95 50 142 0	902 376	0.0929	102 19	0.0004	109 1	5/ 3581	00	0.094400	0.017847
$h/MPa\cdot K^{-1}$	-82702	$2 -250^{\circ}$	7135	120	-95.27	72 - 777	516	-90.08	809	-59.82	283	-47.08	32	$-68\ 6050$	-64553
$b_2/MPa\cdot K^{-2}$	25.4503	~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	/100		50.3120	,	010	75.826	9 9	49.530	~00)8	33.6213	5~	00.0000	1.2142
$\tilde{T_0}/\mathbf{K}$	298.15	348.15	5 293.1	5	291.70	303.1	5	303.15		298.15	5	298.15		257.00	423.15
$T_{\rm min}/{ m K}$	298.15	298.15	5 293.1	5	291.70	298.1	5	288.15		288.15	5	288.15		209.00	391.55
$T_{\rm max}/{\rm K}$	328.15	348.15	5 293.1	5	365.00	353.1	5	328.15		328.15	j –	328.15		257.00	563.15
P _{min} /MPa	5.08	2.18	2.00		4.91	39.23	•	0.50		0.50		0.50		11.00	0.51
P _{max} /MPa	202.81 3 0.172	35.94	10.00		98.10	196.1	3	516.96)	8.00		50.00		897.00	25.53
RMSD/kg·III	0.173	0.392	0.007		1.000	0.158		0.907		0.094		0.273		2.385 0.213	0.103
bias/kg·m ⁻³	0.013	-0.11	4 -0.001	01	0.140	0.000		-0.022	7	-0.009	9	0.020		0.001	0.037
$N_{\rm p}$	90	22	5		38	20		58		45		47		185	38
±	8	-6	-1		6	2		16		-5		3		49	-2
$S_{ m W}$	1.040	1.094	0.973		1.030	1.086		1.280		0.991		1.007		0.955	1.324
				Ke	etones a	and Aldehy	des								
	2-	2-	2-	3-		2-	4-m	ethyl-		4-		2-		cyclo-	cyclo-
	propanon	e butanoi	ne pentanone	pentar	one h	exanone	2-per	ntanone	e hej	ptanon	e o	ctanone	р	entanone	hexanone
<i>c</i> ₀	0.099239	0.09500	9 0.087406	0.0946	603 0.	085246	0.0	99088	0.1	02388	0.	113614	(0.098473	0.091558
$c_1/{ m K}^{-1}$		-0.0032	91												
b_0 /MPa	80.3063	71.7822	107.5762	90.675	53 10	06.7265	99.	9725	150	0.4746	15	55.4195	, ę	95.7265	135.5573
$b_1/MPa\cdot K^{-1}$	-75.432	1 -62.615	-87.2636	-69.3	353 -	106.2848			-1	21.916	8 -	103.9260	U		-52.1027
$b_2/WF a K^{-3}$	31.3329	20.0019 	1	19.037	J 59 	16 7670			30.	.0029	17	.J040			130.4980
$b_4/MPa\cdot K^{-4}$		1.6959				10.7070									
T_0/K	293.15	313.15	273.00	298.15	5 29	93.15	295	5.55	273	3.00	27	73.15	2	298.15	303.40
T_{\min}/\mathbf{K}	278.15	278.15	273.00	278.15	5 29	93.15	295	5.55	273	3.00	27	73.15	2	298.15	253.20
$T_{\rm max}/{\rm K}$	323.15	473.15	315.66	338.15	5 39	93.15	295	5.55	403	3.00	37	4.31	2	298.15	303.40
$P_{\rm min}/{\rm MPa}$	2.00	2.32	5.01	2.53	9.8	81	245	5.21	10.	.00	5.	01	5	50.00	10.00
P _{max} /MPa	392.25	282.45	/8.58	389.82	2 15	000	484	1.84 02	160	0.00	/ 2	5.58 550	4	400.00 5 047	266.08
RMSD/Kg·III	0.200	1.079	0.279	0.307	0.3	990 195	0.0	02 85	1.1	20	0.	33U 067	2 (0.847	0.699
hias/kg·m ^{-3}	0.052	0.003	-0.053	0.030	-(0 1 3 2	0.0	29	-0	012		0 070	-	-0.318	-0.033
N _n	124	165	18	128	53	3	13	20	71	.012	25	5	8	8	96
±	26	3	-2	36	3		-3		17		_	7	()	8
$S_{ m W}$	1.028	0.931	1.163	1.025	0.9	921	0.9	99	1.1	33	1.	006	1	1.017	1.003
	ethanal	propanal	butanal 2-r	nethylpr	opanal	pentana	1 3-	methyl	buta	nal h	epta	nal oc	tana	al benz	aldehyde
<i>c</i> ₀	0.107840	0.120241	0.091785	0.1030	47	0.071630)	0.094	111	0	.1022	239 0.1	027	38 0.0	94041
b ₀ /MPa	72.5470	110.1100	102.7158	79.818	2	74.4381		82.18	58	1	12.99	950 121	1.62	01 15	4.0605
$b_1/MPa\cdot K^{-1}$			-38.5961			-20.429	4	-45.	1467						
$b_2/MPa\cdot K^{-2}$	005 15	000.07	-97.6281	004 07		-12.206	3	-19.	1201	-	0		· · · ·		5 01
I_0/K T_{\perp}/K	295.15	296.65 206.65	302.04	301.37		248.15 249.15		300.3	5	2	95.2] 05 91	1 293	5.87 2 07	29	5.21 5.21
4 min/ 11	~00.10	~00.00	505.15	501.57		⊷ 1 0.1J		204.S		2	55.6			29	0.61

Table 3 (Continued)

	Ketones and Aldehydes (Continued)										
	ethanal	propanal	butanal 2	-methylpropan	al pentanal	3-methylbutar	al heptana	l octanal	benzaldehyde		
T _{max} /K	295.15	296.65	333.15	301.37	374.15	362.35	295.21	293.87	295.21		
$P_{\rm min}/{\rm MPa}$	13.89	13.89	35.61	13.89	5.00	5.00	13.89	13.89	13.89		
P _{max} /MPa	138.00	138.00	276.58	138.00	50.08	50.08	138.00	138.00	138.00		
RMSD/kg·m ⁻³	0.158	0.130	0.592	0.258	0.586	0.343	0.073	0.098	0.180		
RMSD _r /%	0.019	0.016	0.069	0.031	0.075	0.044	0.009	0.012	0.017		
bias∕kg•m ⁻³	0.001	-0.002	-0.075	-0.033	0.005	-0.015	-0.007	0.005	0.032		
$N_{\rm p}$	10	10	25	10	24	16	10	10	10		
±	-2	0	-5	0	-6	-4	-2	0	-2		
$S_{ m W}$	0.989	1.021	1.140	1.028	1.092	0.963	0.924	1.016	1.035		
					Acids						
	methanoi	c ethand	oic propano	ic 2-methy	l- octanoic	decanoic	dodecanoic	tetra-	hexa-		
	acid	acid	acid	propanoic	acid acid	acid	acid	decanoic	decanoic acid		
<i>C</i> ₀	0.096327	0.0924	18 0.091314	4 0.08737	5 0.066987	0.093916	0.067638	0.173801	0.115340		
b ₀ /MPa	148.7378	90.671	4 98.6259	86.9541	66.0320	101.8285	75.0552	198.6292	136.1333		
$b_1/MPa\cdot K^{-1}$	-443.7460	0 -62.23	802 -69.568	0 -55.029	6 -56.5565	-59.7045	-39.1829	-105.5458	-85.2892		
$b_2/MPa\cdot K^{-2}$		19.421	6 20.6000		73.2502						
T_0/K	298.15	313.15	298.15	298.15	343.15	343.15	343.15	353.15	353.15		
T_{\min}/\mathbf{K}	295.55	298.15	298.15	298.15	343.15	343.15	343.15	353.15	353.15		
$T_{\rm max}/{\rm K}$	298.15	328.15	328.15	328.15	373.15	373.15	373.15	373.15	373.15		
P_{\min}/MPa	50.66	50.66	50.66	50.66	1.00	1.00	1.00	1.00	1.00		
P _{max} /MPa	202.65	253.31	253.31	253.31	9.00	9.00	9.00	9.00	9.00		
RMSD/kg⋅m ⁻³	0.047	0.098	0.091	0.272	0.068	0.059	0.054	0.054	0.043		
RMSD _r /%	0.004	0.009	0.009	0.027	0.008	0.007	0.006	0.006	0.005		
bias/kg·m ⁻³	0.002	0.000	0.003	0.004	0.006	-0.001	0.000	0.001	0.000		
Np	6	12	15	15	30	30	30	25	25		
±	2	2 0.000	3	-1	4	0	- <u>z</u>	1			
$S_{ m W}$	0.036	0.086	0.088	0.266	0.956	1.017	0.939	0.929	0.855		
Esters											
				1,2,3-propa	ne-			_	1,2,3-propane-		
	methyl	ethyl	1-methyleth	yl triyl tri-	propyl	3-methylbuty	l methyl	nonyl	triyl tri-		
	etnanoate	etnanoate	etnanoate	etnanoat	e propanoate	propanoate	nexanoate	nexanoate	nexanoate		
<i>c</i> ₀	0.087851	0.089409	0.106954	0.098843	0.103066	0.085373	0.091386	0.093890	0.095581		
<i>b</i> ₀ /MPa	94.1389	91.8722	94.1343	145.0897	95.8443	89.9136	70.7425	85.5588	130.3507		
$b_1/MPa\cdot K^{-1}$	-74.2636	-81.9526	-103.4575	-53.7953	3 -71.1831	-67.6642	-44.7245	-48.2382	-59.5821		
$b_2/MPa\cdot K^{-2}$		49.0679	53.7186	31.4770	22.9642	16.2675	9.1129	12.2476	26.2163		
$b_3/MPa\cdot K^{-3}$		-18.2587						-1.6815			
T_0/K	273.15	273.15	297.17	368.15	300.00	298.15	294.99	289.00	323.15		
$I_{\rm min}/{\rm K}$	253.15	253.15	297.17	2/3.15	300.00	298.15	294.99	289.00	2/3.15		
$I_{\text{max}}/\mathbf{K}$	313.15	545.15	367.20	308.15	400.00	423.15	408.85	530.72	308.15		
$P_{\rm min}/MPa$	19.00	0.00 156 75	5.00	49.03	5.00	5.00	4.90	4.90	49.03		
Pmax/MPa PMSD/kg·m ⁻³	130.75	100.75	49.10	1 3 1 /	1 884	0 704	0.60	0 758	0 769		
RMSD/Kg/III	0.035	0.352	0.023	0 102	0.215	0.794	0.000	0.758	0.703		
hias/kg·m ^{-3}	-0.003	-0.206	-0.088	0.102	0.118	-0.031	0.020	0.058	0.070		
N _n	30	49	18	32	30	32	33	86	36		
±	0	-1	0	0	-6	-2	-1	-2	0		
$S_{ m W}$	1.020	1.018	0.999	1.016	0.960	0.908	1.044	0.939	0.990		
						mother	nentri	hover			
	2-met	hvl-	nentvl	methyl	2-ethyl-	2-hydroxy-	2-bydroxy-	2-hydroxy-	methyl		
	propyl 2-h	vdroxv-	2-hvdroxy-	benzene- l	hexyl benzene-	benzene-	benzene-	benzene-	2-methyl-2-		
	propan	oate	propanoate	carboxylate	carboxylate	carboxylate	carboxylate	carboxylate	propenoate		
<i>c</i> ₀	0.060	907	0.034262	0.110587	0.097846	0.134172	0.165532	0.228551	0.094277		
b ₀ /MPa	110.5	039	42.2839	193.5738	157.7459	240.8968	204.0698	150.5257	98.2396		
$b_1/MPa\cdot K^{-1}$	-3.59	79	-12.9463	-105.9694	-82.1159	-153.0592	-92.0613	-34.7764	-73.7312		
$b_2/MPa\cdot K^{-2}$				17.6617	14.0075	53.3590	23.1511	3.1064	8.3110		
b_3 /MPa·K ⁻³						-8.3332	-2.6619				
T_0/K	294.3	6	296.71	300.48	273.15	298.15	298.15	298.15	300.06		
T_{\min}/\mathbf{K}	294.3	6	296.71	300.48	253.15	298.15	298.15	298.15	289.34		
$T_{\rm max}/{ m K}$	343.4	1	371.82	440.59	373.15	498.15	573.15	573.15	349.29		
P _{min} /MPa	4.91		4.90	5.00	50.00	10.00	10.00	10.00	5.00		
P _{max} /MPa	98.10		98.10	58.90	450.00	60.00	60.00	60.00	98.10		
RMSD/kg⋅m ⁻³	0.554		0.920	0.466	0.543	0.372	0.484	0.213	0.430		
RMSD _r /%	0.055		0.095	0.044	0.050	0.034	0.049	0.028	0.045		
bias/kg·m ⁻³	0.079		0.089	-0.020	0.005	0.035	-0.019	-0.023	-0.008		
⊥v _p	29 E		১। _2	49 1	วษ 5	04 9	/1 _1	12 	10 0		
ے د	5 1 102		-3 0 949	1 000	J 0 897	0 0 957	-1 1 090	-0 0 934	—9 0.978		
5W	1.195		0.343	0.333	0.007	0.331	1.033	0.334	0.370		

Table 3 (Continued)

			L	Sters (Contin	lucu)			
			diethyl					
	nonyl	methyl	2,2-bis(pȟenyl-	diethyl	dipropyl	dinonyl	dibutyl	
	2-methyl-2-	(Z)-9-octa-	methyl)propane-	butane-1,4-	butane-1,4-	butane-1,4-	1,2-dibenzene-	4-methyl-
	propenoate	decenoate	1,3-dioate	dioate	dioate	dioate	dicarboxylate	1,3-dioxolan-2-one
<i>c</i> ₀	0.093482	0.096785	0.103806	0.057476	0.073591	0.495408	0.091695	0.092963
<i>b</i> ₀ /MPa	124.1357	107.1134	180.8024	81.6161	115.1185	376.2686	140.4724	181.5743
$b_1/MPa\cdot K^{-1}$	-73.4228	-79.1092	-31.3735	-62.4077	-72.1588	-82.6642	-75.1749	
$b_2/MPa\cdot K^{-2}$	13.7277	-27.3425				8.5461	-14.5783	
T_0/K	292.37	368.15	368.15	295.65	288.15	298.15	323.15	298.15
$T_{\rm min}/{\rm K}$	292.37	273.15	273.15	295.65	288.15	298.15	273.15	298.15
$T_{\rm max}/{\rm K}$	473.43	368.15	368.15	347.15	347.95	573.15	368.15	298.15
P _{min} /MPa	5.00	49.03	49.03	5.00	5.00	10.00	49.03	50.00
P _{max} /MPa	98.20	980.67	490.33	49.10	49.10	60.00	1176.80	200.00
RMSD/kg⋅m ⁻³	0.461	0.388	1.225	0.429	0.858	0.275	0.929	0.095
RMSD _r /%	0.055	0.041	0.106	0.042	0.085	0.031	0.080	0.008
bias/kg∙m ⁻³	-0.019	-0.009	0.066	-0.025	0.083	-0.029	0.036	0.001
N _p	77	21	12	18	22	72	34	4
±	1	-5	2	-4	8	-6	2	-2
$S_{ m W}$	1.102	0.949	1.060	1.037	0.981	1.183	1.058	0.861

Estors (Continued)

^{*a*} The low limit of pressure ranges is 0.1 MPa or a saturation pressure (whichever is higher) for all fits; P_{\min} is the lowest pressure in a particular set of compressed-liquid density data retained for the correlation.

Table 6) are also significantly higher (0.5%) compared to other alkanones.

In the case of 2-octanone two available data sets are mutually inconsistent. A more precise data set by Apaev et al. [78-apa/ker] (lower RMSD and the experimental uncertainty about 0.1% in density declared by the authors) was, however, retained, taking into account that the values from Atoyan's laboratory were rejected for most of the other alkanones. The values of isothermal compressibility calculated from the fit are also reasonable, yielding an average deviation from literature values (see Table 5) of -5.7%, while those calculated from a tentative fit of data by Atoyan and Mamedov [75-ato/mam] showed an average deviation -8.5% with a maximum at 273.15 K (-14.1%).

The data sets available for cyclohexanone are in good mutual agreement. It is, however, worth mentioning that the values retained in the evaluation were not direct experimental ones (Table 2). The isothermal compressibility calculated from the fit differs from the value obtained from literature data (Table 5) by -6.6%.

Recently, Malhotra and Woolf [92-mal/woo] proposed generalized formulas for the parameters C and B of the Tait equation to calculate the volume ratio of liquid alkanones derived on the basis of their data for 2-propanone and 2-butanone [91-mal/woo, 92-mal/woo] in the reduced temperature range $0.54 \leq T/T_c \leq 0.62$. The formulas proved to be successful also for 3-pentanone [93mal/pri]. In Table 6 the values of relative density, $\rho_{rel} =$ $\rho(T,P)/\rho(T,P_{ref})$ calculated from the fits in Table 3 are compared with those calculated from the generalized relations of Malhotra and Woolf. The deviations $\{\rho_{rel}(Table$ 3) $- \rho_{rel}$ [92-mal/woo] ρ_{rel} [92-mal/woo] observed for 2-propanone and 2-butanone are either within or close to the experimental error. Larger deviations for 2-butanone are found in the temperature range that exceeds the experimental range of Malhotra's data [92-mal/woo]. Since the generalized formulas were derived from data measured for the first two members only of the homologous series (2propanone, 2-butanone) in a limited temperature range, the comparison presented in Table 6 for other alkanones is the comparison with the values obtained by an extensive extrapolation (in the sense of extrapolation beyond both the temperature range and particularly the range within the homologous series). Therefore, the significance of this comparison is, taking also into account the fact that one experimental data set only was available for some alkanones (see Table 2), rather low. However, the predictions using the Malhotra and Woolf generalized equations agree with the existing experimental data within about 0.5% (on average) and similar uncertainty might be expected for other members of the alkanone homologous series.

Aldehydes (Alkanals and Benzaldehyde). Data for members of the homologous series of aldehydes are very scarce. The analysis of literature data shows that values reported by Chaudhuri et al. [68-cha/sta] are likely to be systematically higher (by 10 kg·m⁻³ in density) since they show large positive deviations from both the repeated measurements performed in the extended temperature range in the same laboratory for butanal [71-run/sta] and the values for 3-methylbutanal reported by Mamedov et al. [75-mam/gus]. Therefore the data from [68-cha/sta] were not retained in the fits for these two alkanals. However, to provide an internally consistent set of the parameters of eq 1 for all data reported in the paper [68cha/sta] the additional correlations, where only values from this source were retained, were performed yielding the following results.

Butanal: $c_0 = 0.099$ 158, $b_0 = 81.6468$ MPa, $T_{\min} = T_{\max} = 302.04$ K, $P_{\max} = 138.00$ MPa, RMSD = 0.226 kg m⁻³, RMSD_r = 0.027%, bias = 0.023 kg m⁻³, $N_p = 10, \pm 2$.

3-Methylbutanal: $c_0 = 0.077$ 919, $b_0 = 51.0029$ MPa, $T_{min} = T_{max} = 300.37$ K, $P_{max} = 138.00$ MPa, RMSD = 1.081 kg·m⁻³, RMSD_r = 0.131%, bias = 0.148 kg·m⁻³, $N_p = 10, \pm 2$.

Carboxylic Acids. The situation is similar to that for aldehydes. Except for methanoic acid, one data set only was found for each carboxylic acid. Two sets for methanoic acid, generated using the reported parameters of the Tait equation ([63-and], [71-kor]), were correlated together. Low deviations of the fit (Table 3) and apparent agreement of the two sets (Table 4) are rather artificial, since values for two isotherms, close each other, were correlated. The large absolute value of the parameter b_1 , which is, however, qualitatively correct being negative, indicates that the temperature dependence of density at elevated pressures might be incorrect and thus any extrapolation in temperature using the final fit is not advisable. The fits of data reported by Korpela [71-kor] for other acids (ethanoic, propanoic, 2-methylpropanoic) are recorrelations of the values generated using Tait parameters reported in the original paper for each temperature separately. The characteristic deviations of these fits (RMSD, RMSD_r, bias) should not be, therefore, regarded as criteria of the quality

Table 4. Statistical Characteristics of Individual Data Sets for the Fits in Table 3: Temperature and Pressure Ranges Taken into the Correlations, T_{min} , T_{max} , P_{min} , and P_{max} , Absolute, RMSD, and Relative, RMSD_r, Root Mean Square Deviations, Biases, bias, Number of Data Points, N_{p} , \pm , and Origin of the Reference Density Values Used in the Correlations, RD^a

ref	T_{\min}/K	$T_{\rm max}/{\rm K}$	P _{min} /MPa	P _{max} /MPa	RMSD/kg∙m ⁻³	RMSD _r /%	bias/kg∙m ⁻³	$N_{ m p}$	±	RD^{a}
				3-Oxapentar	ne (Diethvl Ether)					
13-bri				· · · · ·	4.884	0.560	-4.411	85	-75	0
31-bri	303.15	348.15	49.1	1176.9	1.118	0.123	0.183	26	4	е
57-wal/ric								0	0	0
68-ski/cus					4.213	0.477	-3.223	11	-7	0
69-bra/fre	303.15	303.15	100.0	400.0	1.541	0.184	-1.144	7	-5	0
92-saf/mad					13.994	1.910	-9.168	22	-12	(o)
				4-Oxaheptane	(Di- <i>n</i> -propyl Ethe	er)				
68-ski/cus				1	8.482	1.072	-8.309	2	-2	0
92-saf/mad-1	294.30	374.50	4.9	98.1	1.361	0.183	0.224	40	6	0
			2 4 -D	imethyl_3_ovang	ontano (Diisonron	vl Ethor)				
70-sch/eck	303 15	323 15	106.8	511 3	3 161	0 363	0 134	7	1	0
96-gov/let	288.15	328.15	0.5	8.0	0.179	0.025	0.051	45	3	0
oo gomee	200.10	020.10	0.0	5.0		、	0.001	10	Ū	Ū
04	909 15	000 15	F 1	5-Oxanonane	(Di- <i>n</i> -butyl Ether	r) 0.090	0.090	00	0	
94-Sell	296.15	320.15	5.1	203.7	0.233	0.029	0.020	90	-2	0
				6-Oxaundecane	e (Di- <i>n</i> -pentyl Eth	er)				
49-bri	298.15	298.15	49.0	98.1	1.070	0.129	-0.284	2	0	0
92-saf/mad	296.64	456.82	4.9	98.1	1.437	0.190	0.051	78	6	0
			8	-Oxapentadeca	ne (Di- <i>n</i> -heptyl Et	her)				
93-saf/oso	293.00	553.00	19.6	98.1	1.793	0.228	-0.095	113	-13	0
			2 2 Dim	othyl 2 ovobuto	no (Mothul tart P	utul Ethor)				
94 son	208 15	328 15	5.4	207 7		0.113	0.077	80	_11	0
94-Sell 96-gov/let	288 15	328.15	0.5	207.7	0.915	0.113	0.077	09 45	-11	0
30-g0v/let	200.15	520.15	0.5	0.0	0.237	0.040	0.000	45	1	U
			4,4-Din	nethyl-3-oxapent	tane (Ethyl <i>tert</i> -B	utyl Ether)			_	
94-sen	298.15	328.15	5.6	207.2	0.483	0.062	0.015	90	0	0
			3,3-Dime	ethyl-2-oxapenta	ane (Methyl <i>tert</i> -P	entyl Ether)				
94-sen	298.15	328.15	5.6	203.8	0.341	0.042	-0.040	90	-16	0
96-gov/let	288.15	328.15	0.5	8.0	0.140	0.018	0.046	45	23	0
			2 5-Dio	xahexane (Ethv	lene Glycol Dimet	hvl Ether)				
78-sha/hai			2,0 010	Autoxutic (Etity	1 859	0 216	-1 841	12	-12	P
94-sen	298.15	328.15	5.6	204.8	0.225	0.025	0.028	90	10	0
			0 7 0 7	(D!		and Ealers)				
04 com	202 15	990 15	2,3,8-110	anonane (Diet	nyiene Giycoi Din	nethyl Ether)	0.012	00	o	
94-Sell	296.15	320.15	5.1	202.0	0.175	0.018	0.015	90	0	0
			4,7,10-Trio	xatridecane (Di	ethylene Glycol D	ipropyl Ether)				
81-sha/abd	298.15	348.15	2.2	35.9	0.392	0.045	-0.114	22	-6	е
		2,5,8	11,14-Pentad	oxapentadecane	(Tetraethylene G	lycol Dimethy	Ether)			
90-sve/sid	293.15	293.15	2.0	10.0	0.007	0.001	-0.001	5	-1	0
				1 Ova 1 6 honta	diono (Diallyl Eth	nor)				
92-saf/gus	291 70	365.00	49	4-0xa-1,0-nepta 98 1	1 680	0 230	0 140	38	6	0
52-Sal/gus	201.70	505.00	4.5	50.1	1.000	0.230	0.140	50	0	0
00.11/			Μ	lethoxybenzene	(Methyl Phenyl E	ther)	0.711	0	ō	
68-ski/cus	000 15	050 15	00.0	100.1	4.194	0.403	-3.711	3	-3	0
/0-kus/tas	298.15	353.15	39.2	196.1	0.158	0.015	0.000	20	z	0
				Tetrahydro	ofuran (Oxolane)					
70-sch/eck	303.15	323.15	212.3	517.0	2.554	0.254	-0.202	7	-1	0
71-ham/smi		_			6.825	0.727	-6.825	1	-1	0
83-nak/miy	298.15	298.15	101.3	101.3	1.248	0.132	-1.248	1	-1	0
87-hol/goe	293.15	293.15	2.0	10.0	0.011	0.001	-0.002	5	-1	0
96-gov/let	288.15	328.15	0.5	8.0	0.108	0.012	0.025	45	19	0
				Tetrahydr	opyran (Oxane)					
96-gov/let	288.15	328.15	0.5	8.0 [°]	0.094	0.011	-0.009	45	-5	0
				14.	Diovane					
66-kor/kos				1,1	Dioxune			0	0	0
68-pea/str	298.15	298.15	25.0	50.0	1.241	0.118	0.338	2	ŏ	0
96-gov/let	288.15	328.15	0.5	8.0	0.097	0.009	0.010	45	3	0
0										
78 fig/com	200.00	257 00	11.0	807.0	9 205	0.919	0.001	195	40	0
10-11g/52W	203.00	۵J1.00	11.0	037.0	2.000	0.213	0.001	100	49	U
				Dibe	enzofuran			<i>c</i> -	_	
84-nas/siv	391.55	563.15	0.5	25.5	1.080	0.103	0.037	38	-2	0
				2-Propanone	(Dimethyl Ketone	e)				
13-bri				•	7.784	0.880	-7.528	28	-28	0
51-new/wea					1.569	0.183	-1.569	1	-1	0
56-stu					6.248	0.738	-6.248	1	-1	0
57-wal/ric								0	0	0
66-win/pow ^b						_		0	0	0
67-ada/lai					2.558	0.305	-2.471	7	-7	0

Table 4 (Continued)

ref	$T_{\rm min}/{ m K}$	T _{max} /K	P _{min} /MPa	P _{max} /MPa	RMSD/kg·m ⁻³	RMSD _r /%	bias/kg∙m ⁻³	$N_{\rm p}$	±	RD ^a
				2-Propanone	(Dimethyl Ketone)				
76-ato/mam					7.201	0.837	-3.856	16	-14	(0)
77-gup/han					2.203	0.283	2.188	8	8	е
80-rae/fin					15.986	1.799	-13.019	17	-17	е
87-hol/goe-1	293.15	293.15	2.0	10.0	0.160	0.020	0.142	5	5	0
87-nhu/bha	293.15	293.15	2.0	10.0	0.115	0.014	0.100	5	5	0
91-mal/woo	278 15	323 15	2.5	392.3	0.267	0.031	0.083	105	25	0
91-nan/zia	298 15	298 15	2.0	33.8	0 349	0.043	-0.309	9	_9	0
02-000/gru	200.10	200.10	2.0	55.0	1 205	0.043	-1.054	5	-5	0
52-ego/giu					1.235	0.157	1.034	5	5	0
				2-Butanone (M	lethyl Ethyl Ketor	ne)				
63-and					2.848	0.313	-2.820	6	-6	0
74-ato/mam					12.678	1.649	8.745	243	67	(0)
76-ato/bag	373.15	473.15	60.8	162.1	2.533	0.324	-0.177	28	-4	(0)
77-lam/hun					3.288	0.391	-2.028	15	-5	ò
92-mal/woo	278.15	338.15	2.3	282.5	0.300	0.034	0.040	137	7	0
~~ 0			2	2-Pentanone (Me	ethyl <i>n</i> -Propyl Ket	one)				
77-apa/ker	273.00	315.66	5.0	78.6	0.279	0.033	-0.054	18	-2	0
				3-Pentanone	e (Diethyl Ketone)					
82-ato/mam					6.740	0.781	-5.871	27	-27	0
93-mal/nri	278 15	338 15	25	389.8	0 307	0.036	0.087	128	36	Õ
oo marpii	270.10	000.10	2.0	000.0	0.007	0.000	0.007	120	00	U
				2-Hexanone (M	ethyl <i>n</i> -Butyl Keto	one)				
79-ato	293.15	393.15	9.8	156.9	0.990	0.125	-0.132	53	3	0
			4 Mo	thyl 9 nontonon	o (Mothyl Icobuty	(Kotopo)				
69 and	205 55	205 55	4-IVIE	404 0			0.090	10	0	
63-and	295.55	295.55	245.Z	484.8	0.802	0.085	0.029	13	-3	0
				4-Heptanone (Di-n-propyl Keton	e)				
91-ato	273.00	403.00	10.0	160.0	1.102	0.129	-0.012	71	17	0
				0.01 01		`				
				2-Octanone (Me	ethyl <i>n</i> -Hexyl Keto	ne)				<i>(</i>)
75-ato/mam					2.207	0.263	-1.004	18	-14	(0)
78-apa/ker	273.15	374.31	5.0	78.6	0.550	0.067	-0.070	25	-7	(0)
				Cycle	nentanone					
69 bra/fro	208 15	208 15	50.0	400.0	5 817	0 565	-0.318	8	0	0
03-b1a/11e	230.15	230.15	50.0	400.0	3.047	0.303	0.510	0	U	U
				Cycl	ohexanone					
63-and	296.45	296.45	158.7	266.1	0.261	0.025	-0.231	3	-3	0
82-wis/wue	253.20	303.40	10.0	220.0	0.709	0.072	-0.027	93	11	0
				Ethonol	(A aataldahada)					
00 -l/-+-	005 15	005 15	10.0	Ethanai	(Acetaldenyde)	0.010	0.001	10	0	
68-cha/sta	295.15	295.15	13.9	138.0	0.158	0.019	0.001	10	-2	0
				Propanal (I	Propionaldehvde)					
68-cha/sta	296.65	296.65	13.9	138.0	0.130	0.016	-0.002	10	0	0
00 1 / .				Butanal (Butyraldehyde)					
68-cha/sta								0	0	0
71-run/sta	303.15	333.15	35.6	276.6	0.592	0.069	-0.075	25	-5	0
				2-Methylpropan	al (Isobutyraldeby	(ahv				
68 cha/sta	301 37	301 37	13.0	138 0	0 258	0.021	-0.033	10	0	0
00-011a/30	501.57	501.57	15.5	130.0	0.230	0.031	0.033	10	0	U
				Pentanal	(Valeraldehyde)					
75-mam/gus	248.15	374.15	5.0	50.1	0.586	0.075	0.005	24	-6	0
0				2 Mathulhutan	al (Icovalaraldahy	da)				
				3-Methylbutan	al (Isovaleraideny	de)	0.100	0	0	
68-cha/sta	004.07	000.05	~ 0	50.4	6.168	0.754	6.162	3	3	0
75-mam/gus	284.95	362.35	5.0	50.1	0.343	0.044	-0.015	16	-4	0
				Heptanal (Enanthaldehvde)					
68-cha/sta	295.21	295.21	13 9	138.0	0.073	0.009	-0.007	10	-2	0
00 010/500	200.21	200.21	10.0	100.0	0.070	0.000	0.007	10	~	U
				Octanal (Ca	aprylic Aldehyde)	_				
68-cha/sta	293.87	293.87	13.9	138.0	0.098	0.012	0.005	10	0	0
				Bon	zaldobydo					
68 cha/sta	205 21	205 21	12.0	128.0	0 190	0.017	0.022	10	_9	0
00-0110/Sta	295.21	295.21	15.9	130.0	0.160	0.017	0.032	10	-2	0
				Methanoic A	Acid (Formic Acid)					
63-and	295.55	295.55	76.5	107.5	0.070	0.006	0.008	2	0	0
71-kor	298.15	298.15	50.7	202.7	0.028	0.002	-0.001	4	2	0
				T (1) · A	• 1 (4 . • • • • • • • •					
711	000 17	000 17	FO F	Ethanoic A	Acid (Acetic Acid)	0.000	0.000	4.0	~	
71-kor	298.15	328.15	50.7	253.3	0.098	0.009	0.000	12	2	0
				Propanoic Ac	d (Propionic Acid)				
71-kor	298 15	328 15	50 7	253.3	0 091	Ó 0.009	0.003	15	3	0
				200.0			0.000		Ŭ	~
			2-	Methylpropanoi	c Acid (Isobutyric	Acid)	_			
71-kor	298.15	328.15	50.7	253.3	0.272	0.027	0.004	15	-1	0
				Octanoic Ac	id (Caprylic Acid)					
92-han/gar	343 15	373 15	1.0	Q A	0.068	0 008	0.006	30	1	Ω
or parga	010.10	070.10	1.0		0.000	0.000	0.000	50	т	v
				Decanoic A	cid (Capric Acid)					
92-ban/gar	343.15	373.15	1.0	9.0	0.059	0.007	-0.001	30	0	0

ref	T_{\min}/K	T_{max}/K	P _{min} /MPa	P _{max} /MPa	RMSD/kg∙m ⁻³	RMSD _r /%	bias/kg•m ⁻³	$N_{ m p}$	\pm	RD ^a
92-ban/gar	343.15	373.15	1.0	Dodecanoic 9.0	Acid (Lauric Acid) 0.054	0.006	0.000	30	-2	0
92-ban/gar	353.15	373.15	1.0	Tetradecanoic 9.0	Acid (Myristic Acid) 0.054	0.006	0.001	25	1	0
92-ban/gar	353.15	373.15	1.0	Hexadecanoic 9.0	Acid (Palmitic Acid) 0.043	0.005	0.000	25	1	0
78-kum/iwa	253.15	313.15	19.7	Methyl Ethano 156.8	ate (Methyl Acetate) 0.356) 0.035	-0.003	30	0	0
49-bri 63-and				Ethyl Ethano	ate (Ethyl Acetate) 1.540	0.157	-1.402	3	-3	0
70-sch/eck					7.710	0.832	-7.150	4	-4	0
75-gus/kad	300.06	343.15	5.0	49.1	1.480	0.167	-0.781	17	-5^{-1}	0
79-kum/iwa	253.15	313.15	19.7	156.8	0.473	0.050	0.100	32	4	0
			1-Me	ethvlethvl Etha	noate (Isopropyl Ace	etate)				
75-gus/kad	297.17	367.20	5.0	49.1	0.625	0.071	-0.088	18	0	0
-		1	.2.3-Propane	trivl Triethano	ate (Glyceryl Triacet	ate: Triacetir	ı)			
32-bri	273.15	368.15	49.0	1176.8	1.314	0.102	0.084	32	0	0 ^{<i>c</i>}
78-gus/kli	300.00	400.00	5.0	opyl Propanoat 50.0	e (<i>n</i> -Propyl Propiona 1.884	o.215	0.118	30	-6	0
76-gus/kli	298.15	423.15	3-Meth 5.0	ylbutyl Propan 50.1	oate (Isopentyl Prop 0.794	oionate) 0.102	-0.031	32	-2	0
92-mus/gus	294.99	408.85	4.9 N	/lethyl Hexanoa 58.8	ate (Methyl Caproato 0.660	e) 0.078	0.020	33	-1	0
92-mus/gus-1	289.00	530.72	N 4.9	Nonyl Hexanoat 58.8	e (<i>n</i> -Nonyl Caproate 0.758	e) 0.094	0.058	86	-2	0
32-bri	273.15	1,2, 368.15	3-Propanetri 49.0	yl Trihexanoato 1176.8	e (Glyceryl Trihexan 0.769	ioate; Tricapr 0.070	oin) 0.057	36	0	0 ^{<i>c</i>}
91-gus/kul	294.36	343.41	2-Methylp 4.9	ropyl 2-Hydrox 98.1	ypropanoate (Isobut 0.554	yl Lactate) 0.055	0.079	29	5	0
91-gus/kul-1	296.71	371.82	Penty 4.9	l 2-Hydroxypro 98.1	panoate (<i>n</i> -Pentyl La 0.920	actate) 0.095	0.089	37	-3	0
94-mus/tag	300.48	440.59	Methy 5.0	yl Benzenecarb 58.9	oxylate (Methyl Ben 0.466	zoate) 0.044	-0.020	49	1	0
88-wal/lam	253.15	373.15	2-Ethylhexy 50.0	yl Benzenecarb 450.0	oxylate (2-Ethylhexy 0.543	yl Benzoate) 0.050	0.005	59	5	0
90-mus/gan-1	298.15	498.15	Methyl 2-H 10.0	lydroxybenzene 60.0	carboxylate (Methyl 0.372	l Salicylate) 0.034	0.035	54	8	0
90-mus/gan-1	298.15	573.15	Pentyl 2-Hy 10.0	droxybenzeneo 60.0	arboxylate (<i>n</i> -Penty 0.484	l Salicylate) 0.049	-0.019	71	-1	0
90-mus/gan-1	298.15	573.15	Hexyl 2-Hy 10.0	droxybenzeneo 60.0	arboxylate (<i>n</i> -Hexyl 0.213	Salicylate) 0.028	-0.023	72	-6	0
87-gus/bai	289.34	349.29	Methyl 2 5.0	-Methyl-2-prop 98.1	enoate (Methyl Meth 0.430	hacrylate) 0.045	-0.008	61	-9	0
89-gus/bai	292.37	473.43	Nonyl 2-1 5.0	Methyl-2-prope 98.2	noate (<i>n</i> -Nonyl Meth 0.461	nacrylate) 0.055	-0.019	77	1	0
32-bri	273.15	368.15	Metl 49.0	hyl (<i>Z</i>)-9-Octad 980.7	ecenoate (Methyl Ol 0.388	eate) 0.041	-0.009	21	-5	0 ^{<i>c</i>}
32-bri	273.15	Diethyl 368.15	2,2-Bis(pheny 49.0	ylmethyl)propa 490.3	ne-1,3-dioate (Dieth 1.225	yl Dibenzylm 0.106	alonate) 0.066	12	2	0 ^{<i>c</i>}
90-mus/gan-3	295.65	347.15	Dieth 5.0	yl Butane-1,4-0 49.1	dioate (Diethyl Succ 0.429	inate) 0.042	-0.025	18	-4	0
90-mus/gan-2	288.15	347.95	Dipropy 5.0	l Butane-1,4-di 49.1	oate (Di- <i>n</i> -propyl Su 0.858	iccinate) 0.085	0.083	22	8	0
91-mus/gan	298.15	573.15	Dinony 10.0	l Butane-1,4-di 60.0	oate (Di- <i>n</i> -nonyl Su 0.275	ccinate) 0.031	-0.029	72	-6	0
32-bri	273.15	368.15	Dibutyl Be 49.0	nzene-1,2-dicar 1176.8	boxylate (Di- <i>n</i> -butyl 0.929	Phthalate) 0.080	0.036	34	2	0 ^{<i>c</i>}
92-uos/kit	298.15	298.15	4-Methy 50.0	l-1,3-dioxolan-2 200.0	2-one (Propylene Ca 0.095	rbonate) 0.008	0.001	4	-2	0

Table 4 (Continued)

^{*a*} o, (o), from the same source as the compressed-liquid density data, available for a part of the temperature range only, respectively; e, from the smoothing equation (see Appendix I). ^{*b*} All three sets (see Table 2). ^{*c*} Relative volumes V(T,P)/V(T = 273.15 K, P = 0.1 MPa) presented in 32-bri were recalculated to V(T,P)/V(T,P = 0.1 MPa), T > 273.15 K, using both $\rho(T = 273.15 \text{ K}, P = 0.1 \text{ MPa})$ given in the paper and V(T = 368.15 K, P = 0.1 MPa)/V(T = 273.15 K, P = 0.1 MPa) obtained by extrapolation of values for the isotherm T = 368.15 K using the Tait equation.

Table 5.	Comparison of Values of Isothermal Compressibility	, $\beta_{\rm T} = (1/\rho)(\partial \rho/\partial \mathbf{P})_T$, at	P = 0.1 MPa Ca	lculated from the F	its
in Table	3 (Eq 1) with Literature Data				

	$\beta_{ m T}/ m GPa^{-1}$			
<i>T</i> /K	eq 1 ^a	lit.	$\delta\beta_{\rm T}/\%^b$	ref
	1	2	Ovenentano	
303 15	2.03 ± 0.03	ۍ و 110	-Oxapentane -3.8	$[72 - dri/wi]]$ ^c $[83 - ha]/gun]^d$
505.15	2.03 ± 0.03	2.082	-2.5	$[82-bro/lon]^e$
308.15	2.13 ± 0.03	2.269	-6.1	$[72 - dri/wil]^{c} [83 - hal/gun]^{d}$
000110		4	Ovehentene	[/2 dr 2 (m]) [00 mar San]
208 15	1.76 ± 0.07	4· 1 / 9/	-Oxaneptane	$[72 dri/wi]] \in [85 obc/ood]d$
230.15	1.70 ± 0.07	1.464	10.0 99 1	$[72 - 017 \text{ wir}], [63 - 00a/000]^{*}$ [83-kim/trol ^f [92-sef/mad-1] ^g [96-zeh/ruz] ^h
		1.442	22.1	[65-kiii/(i'e), [52-sai/iiau-1], ⁵ [50-zab/(uz)
000 15	1 000 1 0 004	1 000	-Oxanonane	
298.15	1.209 ± 0.004	1.223	-1.1	$[72-dri/wil],^{c}$ [85-0ba/00d] ^a
		6-	Oxaundecane	
298.15	0.93 ± 0.02	1.080	-13.9	[72-dri/wil], ^c [85-oba/ood] ^d
		4,4-Dim	ethyl-3-oxapentane	
298.15	1.782 ± 0.012	1.771	0.9	[95-mie/osw] ^e
313.15	2.083 ± 0.015	1.990	4.7	[95-mie/osw] ^e
		2.5.8	8-Trioxanonane	
298.15	0.817 ± 0.002	0.823	-0.7	[82-tre/hal]. ^f [94-sen]. ^g [96-zab/ruz] ^h
		0.814	0.3	[93-ami/pha], ^f [94-sen], ^g [96-zab/ruz] ^h
303.15	0.848 ± 0.002	0.853	-0.6	[93-ami/pha], ^f [94-sen], ^g [96-zab/ruz] ^h
308.15	0.881 ± 0.002	0.877	0.4	[93-ami/pha], ^f [94-sen], ^g [96-zab/ruz] ^h
313.15	0.916 ± 0.002	0.911	0.5	[93-ami/pha], ^f [94-sen], ^g [96-zab/ruz] ^h
		Tet	trahvdrofuran	
293.15	0.957 ± 0.002	0.933	2.6	$[71-des/bha]$, ^f i, $[96-zab/ruz]^h$
298.15	1.010 ± 0.006	0.992	1.8	[89-ram/kud], ^f i, [96-zab/ruz] ^h
		0.859	17.6	[89-ram/kud], ^f [96-gov/let], ^{g,j} [96-zab/ruz] ^h
		0.979	3.2	$[79-kiy/dar], fi$, $[96-zab/ruz]^h$
		0.846	19.4	[79-kiy/dar], ^f [96-gov/let], ^{gj} [96-zab/ruz] ^h
303.15	1.06 ± 0.01	1.016	4.3	[49-wei], ^{<i>t</i>} <i>i</i> , [96-zab/ruz] ^{<i>h</i>}
308.15	1.12 ± 0.02	1.057	6.0	$[71\text{-des/bha}], i, i, [96\text{-zab/ruz}]^n$
		Tet	trahydropyran	
298.15	0.99 ± 0.02	0.994	-0.4	[91-spa/lep] ^e
			1.4-Dioxane	
293.15	0.75 ± 0.02	0.701	7.0	[44-sch]. ^f [92-sak]. ^g [96-zab/ruz] ^h
		0.601	24.8	[44-sch], ^f [96-gov/let], ^{g,k} [96-zab/ruz] ^h
298.15	0.79 ± 0.02	0.738	7.0	[71-des/bha] ^e
		0.744	6.2	[90-aic/cos], f [92-sak], g [96-zab/ruz] ^h
		0.627	26.0	[90-aic/cos], ^f [96-gov/let], ^{g,j} [96-zab/ruz] ^h
		0.637	24.0	[90-aic/cos], ^{<i>f</i>} [96-gov/let], ^{<i>g</i>,<i>k</i>} [96-zab/ruz] ^{<i>h</i>}
303.15	0.82 ± 0.02	0.768	6.8	[49-wei], ^{<i>t</i>} [92-sak], ^{<i>g</i>} [96-zab/ruz] ^{<i>h</i>}
000.15		0.650	26.2	$[49-wei],^{T}$ $[96-gov/let],^{g,\kappa}$ $[96-zab/ruz]^{T}$
308.15	0.86 ± 0.03	0.797	7.9	$[71 \text{-des/bha}], [92 \text{-sak}], [96 \text{-zab/ruz}]^{\prime\prime}$
		0.009	28.0	[71-des/bna], ² [96-gov/let], ^{5,*} [96-zab/ruz] ²
		2	2-Propanone	
293.15	1.234 ± 0.004	1.269	-2.8	[78-ric] ^e
000 15	1 000 + 0 004	1.271	-2.9	[71-ric/rog] ^e
298.15	1.293 ± 0.004	1.324	-2.3	$[78-ric]^{e}$
200.15	1 410 + 0 004	1.286	0.5	[/l-des/bha] ^e
308.13	1.419 ± 0.004 1.485 ± 0.004	1.398	1.5	$[71-\cos/\sin^2]$
515.15	1.405 ± 0.004	1.536	-3.3	[23-fic/find] ^e
318 15	1.553 ± 0.004	1.523	2.0	$[71 \text{ des/bha}]^e$
323.15	1.623 ± 0.001	1.657	-2.0	$[29-\text{fre/hub}]$, $f[91-\text{trc}]$, $g[96-\text{zab/ruz}]^h$
			9 Dutonono	
283 15	1.032 ± 0.002	1 022	2-Butanone	$[40 \log/mem] f [01 tre] g [06 zab/mz]h$
203.15	1.052 ± 0.002 1 120 + 0 002	1 1 1 6	1.0	[49-142/11011], [91-00],8 [90-240/142] [78_ric]e
200.10	1.120 ± 0.002	1 117	0.4	[76-16] [76-20] f [91-trc] g [96-zab/ruz] ^h
298.15	1.167 ± 0.002	1.188	-1.8	[78-ric] ^e
303.15	1.216 ± 0.003	1.214	0.2	$[78 \text{-red/nail}]^{f}$ [91-trc]. ^g [96-zab/ruz] ^h
313.15	1.322 ± 0.003	1.328	-0.5	[76-ato/bag], ^f [91-trc], ^g [96-zab/ruz] ^h
333.15	1.566 ± 0.005	1.593	-1.6	[76-ato/bag], ^f [91-trc], ^g [96-zab/ruz] ^h
353.15	1.87 ± 0.01	1.940	-3.6	[76-ato/bag], ^f [91-trc], ^g [96-zab/ruz] ^h
		2	2-Pentanone	
293.15	0.97 ± 0.02	1.051	-7.7	[78-ric] ^e
298.15	1.02 ± 0.02	1.092	-6.6	[78-ric] ^e
303.15	1.07 ± 0.02	1.141	-6.2	[78-sre/nai], ^f [91-trc], ^g [96-zab/ruz] ^h
313.15	1.20 ± 0.02	1.234	-2.7	[78-sre/nai], ^f [91-trc], ^g [96-zab/ruz] ^h
		9	3-Pentanone	
293.00	1.002 ± 0.003	1.018	-1.6	[82-ato/mam], ^f [93-mal/pri], ^g [96-zab/ruz] ^h
303.15	1.083 ± 0.004	1.114	-2.7	$[76\text{-red/nai}], f[93\text{-mal/pri}], g[96\text{-zab/ruz}]^h$
313.00	1.169 ± 0.004	1.190	-1.8	[82-ato/mam], ^f [93-mal/pri], ^g [96-zab/ruz] ^h
313.15	1.171 ± 0.004	1.209	-3.1	[76-red/nai], ^f [93-mal/pri], ^g [96-zab/ruz] ^h
333.00	1.373 ± 0.006	1.405	-2.3	[82-ato/mam], ^{<i>f</i>} [93-mal/pri], ^{<i>g</i>} [96-zab/ruz] ^{<i>h</i>}

Table 5 (Continued)

	$\beta_{ m T}/ m GPa^{-1}$			
<i>T</i> /K	eq 1 ^a	lit.	$\delta\beta_{\rm T}/\%^b$	ref
	- 1			
000 15	0.00 + 0.00	2	2-Hexanone	[70
293.15	0.80 ± 0.02	0.995	-19.8	$[78-\text{ric}]^{\circ}$
000.45		0.973	-17.8	[79-ato], ² [91-trc], ⁸ [96-zab/ruz] ²
298.15	0.84 ± 0.02	1.014	-17.3	$[78-ric]^e$
313.15	0.97 ± 0.02	1.131	-14.2	[79-ato], ^{<i>t</i>} [91-trc], ^{<i>g</i>} [96-zab/ruz] ^{<i>t</i>}
333.15	1.17 ± 0.03	1.326	-11.8	$[79-ato], [91-trc], [96-zab/ruz]^{''}$
353.15	1.40 ± 0.03	1.570	-10.8	$[79-ato],^{T}[91-trc],^{g}[96-zab/ruz]^{T}$
3/3.15	1.66 ± 0.04	1.882	-11.8	[79-ato], ¹ [91-trc], ^g [96-zab/ruz] ¹¹
		4	-Heptanone	
303.00	0.87 ± 0.02	1.020	-14.7	$[91-ato], f, g$ $[96-zab/ruz]^h$
323.00	1.04 ± 0.02	1.177	-11.6	[91-ato], ^{f,g} [96-zab/ruz] ^h
343.00	1.24 ± 0.03	1.366	-9.2	[91-ato], ^{f,g} [96-zab/ruz] ^h
		<i>.</i>	2 Ostanana	
979 15	0.72 ± 0.02	0 707		[75 ato/mam] f [01 tro] g [06 rab/muz]h
273.13	0.73 ± 0.02 0.84 ± 0.02	0.797	-0.4	[75-at0/mam],* [91-trc],* [90-zab/ruz]**
293.15	0.84 ± 0.02	0.003	-3.2 -9.1	$[76-110]^{2}$
208 15	0.87 ± 0.02	0.914	-0.1	[79 ric]e
290.13	0.87 ± 0.02	0.099	-3.2	$[76-110]^{\circ}$
313.13	0.97 ± 0.02	1.000	-7.9	$[75 \text{ ato/mam}] f [01 \text{ trol}]^{\sigma} [96 \text{ gab/mg}]^{h}$
333.13	1.14 ± 0.03 1.26 ± 0.04	1.419	-0.3	$[75 \text{ ato/mam}] f [01 \text{ trol}]^{\sigma} [96 \text{ gab/mg}]^{h}$
333.15	1.36 ± 0.04	1.421	-4.3	$[75-ato/mam], [91-trc], [90-zab/ruz]^{n}$
373.15	1.64 ± 0.06	1.073	-2.0	[75-ato/mam],* [91-trc],* [96-zab/ruz]**
		Су	clohexanone	
303.15	0.67 ± 0.01	0.717	-6.6	[76-rao/nai], ^f [82-wis/wue], ^g [96-zab/ruz] ^h
		D.	onzoldobydo	
205 21	0.61 ± 0.01	0.573	6 5	1
233.21	0.01 ± 0.01	0.575	0.5	1
		Me	ethanoic Acid	
295.55	0.601 ± 0.001	0.617	-2.6	[64-lut/sol] ^e
		0.613	-2.0	[83-goo/whi], [†] [84-trc], ^g [96-zab/ruz] ^h
298.15	0.647 ± 0.002	0.627	3.2	[64-lut/sol] ^e
		0.620	4.4	[83-goo/whi], ^{<i>t</i>} [84-trc], ^{<i>g</i>} [96-zab/ruz] ^{<i>h</i>}
		E	thanoic Acid	
298.15	0.919 ± 0.003	0.954	-3.7	[64-lut/sol] ^e
200110		0.918	0.1	$[65-for/moo] f [83-ha]/gun] g [96-zab/ruz]^h$
313.15	1.018 ± 0.003	1.045	-2.6	[64-lut/sol] ^e
		1.003	1.5	$[83-goo/whi].^{f}$ [83-hal/gun]. ^g [96-zab/ruz] ^h
323.15	1.091 ± 0.004	1.112	-1.9	[71-ric/rog] ^e
		1.118	-2.4	$[64-lut/sol]^e$
		1.069	2.1	[83-goo/whi], f [83-ha]/gun], g [96-zab/ruz] ^h
328.15	1.129 ± 0.004	1.158	-2.5	[64-lut/sol] ^e
		1.072	5.3	[83-goo/whi], f [83-hal/gun], g [96-zab/ruz] ^h
		 D		[8], [8], []
000 15	0.005 + 0.000	Pr	opanoic Acid	$[0, 1]_{-+} + [0, -1]_{0}$
298.15	0.925 ± 0.002	0.939	-1.5	$[64-101/S01]^{\circ}$
010.15	1 000 1 0 000	0.930	-0.5	[83-g00/wn1], ² [83-nal/gun], ⁵ [96-zab/ruz] ²
313.15	1.029 ± 0.003	1.043	-1.3	$[64-Iut/S01]^{\circ}$
000 15	1 1 4 6 + 0 004	1.022	0.7	[83-g00/wn], ⁴ [83-nal/gun], ⁵ [96-zad/ruz] ⁴
328.13	1.146 ± 0.004	1.104	-1.5	$[04-100/S01]^{\circ}$
		1.124	2.0	[85-g00/wni],' [85-nai/gun], ^s [96-zab/ruz]''
		Met	hyl Ethanoate	
298.15	1.16 ± 0.01	1.158	0.2	[93-ami/pha], ^f [78-kum/iwa], ^g [96-zab/ruz] ^h
299.15	1.17 ± 0.01	1.174	-0.4	[53-par/bak], ^f [78-kum/iwa], ^g [96-zab/ruz] ^h
303.15	1.22 ± 0.01	1.212	0.6	[93-ami/pha], ^f [78-kum/iwa], ^g [96-zab/ruz] ^h
308.15	1.29 ± 0.02	1.273	1.3	[93-ami/pha], ^f [78-kum/iwa], ^g [96-zab/ruz] ^h
313.15	1.36 ± 0.02	1.337	1.7	[93-ami/pha], ^f [78-kum/iwa], ^g [96-zab/ruz] ^h
		Eth	vl Ethanoato	
973 15	0.97 ± 0.01	0.080		[71 ric/rog] ^e
203 15	1.16 ± 0.02	1 1 2 2	2.4	$[71-ric/rog]^{e}$
298 15	1.10 ± 0.02 1.20 ± 0.02	1 206	-0.5	$[93-ami/rai] f [69-trc] g [96-zab/ruz]^h$
323 15	1.20 ± 0.02 1.47 ± 0.02	1 480	-0.7	$[71-ric/rog]^e$
0~0.10	1.17 ± 0.02	1.100		[, 1 110/106]
		Methyl E	Benzenecarboxylate	
298.15	0.56 ± 0.01^m	0.618	-9.4	[93-ami/rai], ^r [91-gar/mir], ^g [96-zab/ruz] ^h
		4-Methvl	-1.3-dioxolan-2-one	
298.15	0.512 ± 0.003	0.518	-1.2	[86-bot/bre] ^{<i>e</i>,<i>n</i>}
		0.480	6.6	[86-bot/bre] ^{e,o}

^{*a*} Uncertainty is estimated as $\pm 2s$, where *s* is a standard deviation derived from a covariance matrix of each fit. ^{*b*} [$\beta_{T}(eq 1) - \beta_{T}(lit.)$]100/ $\beta_{T}(lit.)$. ^{*c*} Thermal pressure coefficient, $\gamma_{V} = (\partial P/\partial T)_{V}$. ^{*d*} Thermal expansivity, $\alpha_{P} = (1/V)(\partial V/\partial T)_{P}$. ^{*e*} Isothermal compressibility, $\beta_{T} = -(1/V)(\partial V/\partial P)_{T}$. ^{*f*} Speed of sound. ^{*g*} Density and thermal expansivity. ^{*h*} Isobaric heat capacity. ^{*i*} Density and thermal expansivity were obtained from smoothed density data from 83-ing/gro, 87-hol/goe, and 89-ram/kud. ^{*j*} α_{P} taken from the text in 96-gov/let. ^{*k*} α_{P} calculated from the smoothing equation presented in Appendix II. ^{*i*} Literature value was obtained by linear interpolation between $\beta_{T}(T = 293.15 \text{ K}) = 0.566 \text{ GPa}^{-1}$ and $\beta_{T}(T = 299.75 \text{ K}) = 0.587 \text{ GPa}^{-1}$ evaluated from speeds of sound from 44-sch and 53-par/bak, smoothed densities from 75-amb/con, and heat capacities from 96-zab/ruz. ^{*m*} Extrapolated. ^{*n*} Evaluated from piezometric measurements. ^{*o*} Evaluated from densitometric measurements.

Table 6. Comparison of Relative Densities, $\rho_{rel} = \rho(T, P) / \rho(T, P_{ref})$, (See Eq.	Eq 1), of Alkanones Calculated from the Fits in
Table 3 with the Generalized Tait Equation of Malhotra and Woolf [92-1	mal/woo]

alkanone	T range ^a /K	$T_{\rm r}$ range ^b	P _{max} ^a /MPa	RMSD _r /%	bias _r ¢/%	max. dev ^c /%
2-propanone	278-323	0.55 - 0.64	309	0.070	-0.012	-0.177
2-butanone	278 - 353	0.52 - 0.66	280	0.074	0.019	-0.225
2-pentanone	273-313	0.49 - 0.56	78	0.156	-0.108	-0.362
3-pentanone	278 - 338	0.50 - 0.60	390	0.165	-0.124	-0.305
2-hexanone	293 - 393	0.50 - 0.67	160	0.531	-0.444	-1.195
4-methyl-2-pentanone	296	0.51	480	0.308	0.297	0.388
4-heptanone	273 - 403	0.45 - 0.67	160	0.384	0.163	0.840
2-octanone	273 - 373	0.43 - 0.59	80	0.615	0.490	1.715

^{*a*} The temperature and pressure ranges are up to T_{max} (Table 3) or normal boiling temperature, whichever is lower, and P_{max} (Table 3), respectively. The relative density values used in a comparison were generated in 5 K and P_{max} (10 increments. ^{*b*} Critical temperatures were taken from 95-pul/gud; that of 4-methyl-2-pentanone (575.5 \pm 0.5 K) was from 93-cda. ^{*c*} { ρ_{rel} (Table 3) – ρ_{rel} [92-mal/woo]}100/ ρ_{rel} [92-mal/woo].

Table A1. Parameters, a_b of Functions A1 and A2 Used for the Fits in Table 3, Critical Densities, ρ_c , Critical Temperatures, T_c , Temperature Ranges of Validity, T_{\min} and T_{\max} , Absolute, RMSD, and Relative, RMSD_r, Root Mean Square Deviations, Biases, bias, Number of Data Points, N_p , \pm , References to the Density Data, ref(ρ), and References to Saturated Vapor Pressure Data, ref(P_{ref})

	3-oxapentane	2,5-dioxahexane	4,7,10-trioxatridecane	2-propanone	2-butanone	2-octanone
eq	A1	A1	A2	A1	A1	A1
a_0	1.877396	-1.951904	1123.8823	1.838053	2.132989	5.598593
a_1	0.220896	9.590776	-69.3648	0.582830	0.934622	-12.662290
a_2	0.621815	-5.635101	-3.15008	-0.100291	-1.953535	15.459716
a_3				0.570410	1.940789	-5.297409
$\rho_{\rm c}/{\rm kg}\cdot{\rm m}^{-3}$ a	264.724	332.554		277.895	270.064	258.000
$T_{\rm c}/{\rm K}$	466.74	536.00		508.10	536.78	632.70
T_{\min}/K	293.15	288.00	298.15	178.50	193.15	273.15
$T_{\rm max}/{ m K}$	370.00	333.00	348.15	508.10	536.78	433.15
RMSD/kg·m ⁻³	0.035	0.605	0.112	0.107	0.135	0.024
RMSD _r /%	0.005	0.070	0.013	0.025	0.026	0.003
bias/kg·m ⁻³	0.000	0.000	0.000	0.000	-0.005	0.001
Np	8	9	7	35	36	18
±	0	-1	-1	1	2	-4
$ref(\rho)$	83-hal/gun	78-sha/bai	81-sha/abd	91-trc	91-trc	91-trc
$ref(P_{ref})$	83-mcg				83-mcg	

^{*a*} Given with three decimal points since critical densities were calculated from rounded values of critical molar volumes recorded in the database.

of data. Low scatter of the generated $P-\rho-T$ values used in correlations results also in low values of standard deviations of values of isothermal compressibility calculated from the fits. The agreement with the values from the literature is quite satisfactory (the deviations below 6% for ethanoic acid and below 2% for propanoic acid; see Table 5).

Esters. One experimental data set only was available for all but one ester. In the case of ethyl ethanoate two data sets ([79-kum/iwa], [75-gus/kad]) are in acceptable agreement at lower temperatures; the values reported by Guseinov and Kadzarov [75-gus/kad] for higher temperatures (where no original reference densities were available) are not, however, consistent with smoothed saturatedliquid densities from 69-trc, and thus the temperature range of the fit was limited up to 343 K to avoid an inflection point on the B(T) curve. The agreement of calculated values of isothermal compressibility at atmospheric pressure with data from the literature is satisfactory (see Table 5). An obvious typographical error was found in the data table presented for propyl propanoate by Guseinov and Klimova [78-gus/kli]; the value of $\rho(T =$ 300 K, P = 0.1 MPa) should be 873.8 kg·m⁻³. With this value of the reference density all values along the isotherm 300 K become consistent with other reported data. Similarly, the reference density $\rho(T = 311.48 \text{ K}, P = 0.1 \text{ MPa})$ = 932.4 kg·m⁻³ reported for methyl 2-methyl-2-propenoate by Guseinov et al. [87-gus/bai] is erroneous; the correct value 923.4 kg·m⁻³, deduced from a comparison with the smoothed value at atmospheric pressure (see Table A2 in Appendix II), was used in the correlations. Values at lower pressures (up to 10 MPa) for 3-methylbutyl propanoate [76gus/kli], 2-methylpropyl 2-hydroxypropanoate [91-gus/kul], and pentyl 2-hydroxypropanoate [91-gus/kul-1] were mostly rejected due to large deviations compared to other isobars. Unusually high uncertainty $(\pm 5\%)$ is declared by the authors [88-wal/lam] for measurements of density of 2-ethylhexyl benzenecarboxylate; fitting their data showed, however, low scatter and good consistency, contrary to the declared accuracy of measurements. The value reported by Mustafaev et al. [90-mus/gan-1] for pentyl 2-hydroxybenzenecarboxylate at T = 298.15 K and P = 60 MPa was rejected, being obviously erroneous (typographical error, correct value should be probably 1086.1 kg m^{-3}). With the original value it was impossible to find reasonable values of adjustable parameters \vec{c} and \vec{b} for the entire data set. Data measured for 4-methyl-1,3-dioxolan-2-one (propylene carbonate) were correlated by 92-uos/kit using the Tait equation; our parameters c_0 and b_0 differ slightly from their values since the weighted least squares fit using experimental uncertainties declared by Uosaki and Kitaura was performed.

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Table A2. Parameters a_i of Smoothing Functions A1 or A2 Fitted to Original Reference Density Values ($\rho(T, P_{ref})$),
Critical Densities, $a \rho_{c}$, Critical Temperatures, $a T_{c}$, Temperature Ranges of Validity, T_{min} and T_{max} , and RMSD of the Fits

		, , e,	1		1	0	J ,		max,	
eq	a_0	a_1	a_2	a_3	$ ho_{ m c}/{ m kg}{ m \cdot}{ m m}^{-3}$	$T_{\rm c}/{ m K}$	T_{\min}/K	$T_{\rm max}/{ m K}$	RMSD/kg·m ⁻³	ref
A1	5.58970	-9.79084	7.29440		4-Oxaheptane 261.991	530.60	294.30	374.50	0.173	92-saf/mad-1
A2	1072.556	-153.742	11.667	2,4-D	imethyl-3-oxap	entane	288.15	328.15	0.035	96-gov/let
A1	3.86694	-5.02658	4.11614		5-Oxanonane 260.461	580.00	293.15	328.15	0.039	94-sen
A2	1057.381	-96.713	1.388		6-Oxaundecan	e	296.64	456.82	1.085	92-saf/mad
A2	1045.472	-83.989	-0.061	8	-Oxapentadeca	ne	293.00	553.00	0.252	93-saf/oso
A1	5.11100	-9.01518	6.95032	3,3-E	Dimethyl-2-oxat 277.200	outane 497.10	293.15	328.15	0.111	94-sen
A2	1099.724	-137.703	5.184	4,4-D	imethyl-3-oxap	entane	293.15	328.15	0.165	94-sen
A2	1025.918	-78.203	-2.932	3,3-D	imethyl-2-oxap	entane	293.15	328.15	0.035	94-sen
A1	2.38730	-2.12662	2.26726		2,5-Dioxahexar 332.554	ne 536.00	293.15	328.15	0.049	94-sen
A1	3.12088	-3.47744	3.22672	2,	5,8-Trioxanona, 318.706	nne 625.30	293.15	328.15	0.031	94-sen
A2	1011.110			2,5,8,11,	14-Pentaoxape	ntadecane	293.15	293.15		90-sve/sid
A2	1008.412	-104.677	2.626	4-0	Oxa-1,6-heptad	iene	291.70	365.00	0.842	92-saf/gus
A1	0.28525	3.87691	-1.58385		Methoxybenzer 335.839	ne 645.60	298.15	353.15	0.071	70-kus/tas
A1	2.83393	-2.57687	2.41398		Tetrahydrofura 321.906	n 540.10	278.15	318.15	0.185	b, i
A1	10.04322	-20.40679	13.18624		Tetrahydropyra 327.505	n 572.20	288.15	328.15	0.327	96-gov/let
A1	9.28035	-17.86459	11.34313		1,4-Dioxane 370.195	587.00	288.15	328.15	0.300	96-gov/let
A2	1464.660	-294.417	42.262		Furan		209.00	257.00	1.414	78-fig/szw ^c
A2	1720.181	-259.830	32.168	-1.953	Dibenzofuran		391.55	563.15	0.009	84-nas/siv
A1	2.69374	-2.45770	2.54994		2-Pentanone 286.159	561.08	233.15	373.15	0.059	91-trc ^{<i>d,i</i>}
A1	4.17653	-4.95315	4.06914		3-Pentanone 256.000	560.60	278.15	338.15	0.003	93-mal/pri
A1	4.13574	-5.57604	4.59059		2-Hexanone 267.095	587.00	293.15	393.15	0.019	79-ato
A2	1080.148	-88.701	-0.353		4-Heptanone		273.00	403.00	0.648	91-ato
A2	943.000				Cyclopentanon	e	298.15	298.15		69-bra/fre
A1	0.87043	2.31845	-0.47564		Cyclohexanono 314.567	653.00	253.20	303.40	0.135	82-wis/wue
A1	2.58929	0.22314			Butanal 259.378	524.00	303.15	333.15	0.290	71-run/sta
A2	560.204	224.899	-48.533		Pentanal		248.15	374.15	1.714	75-mam/gus
A2	913.687	11.1330	-17.428	:	3-Methylbutan	al	284.95	362.35	0.000 ^e	75-mam/gus
A2	1213.6				Methanoic Aci	d	298.15	298.15		71-kor
A1	0.50162	7.48628	-11.10569	6.09003	Ethanoic Acid 351.185	592.71	293.15	490.00	0.063	83-hal/gun ^{f,i}
A1	-1.08282	13.12210	-18.34957	9.33221	Propanoic Acio 333.691	ł 612.00	288.15	490.00	0.040	83-hal/gun ^{g,i}
A2	1245.170	-101.337		2-M	lethylpropanoic	Acid	298.15	328.15	0.047	71-kor

Table A2 (Continued)

eq	a_0	a_1	a_2	a_3	$ ho_{\rm c}/{\rm kg}{\cdot}{\rm m}^{-3}$	$T_{\rm c}/{ m K}$	$T_{\rm min}/{ m K}$	$T_{\rm max}/{ m K}$	RMSD/kg·m ⁻³	ref
A2	1120.486	-67.062	-1.762		Octanoic Acid		343.15	373.15	0.060	92-ban/gar
A2	1028.591	-23.715	-7.286		Decanoic Acid		343.15	373.15	0.081	92-ban/gar
A2	1016.266	-21.787	-7.285		Dodecanoic Aci	1	343.15	373.15	0.054	92-ban/gar
A2	1114.020	-76.200		Т	'etradecanoic Ac	id	353.15	373.15	0.078	92-ban/gar
A2	1109.558	-75.740		H	Iexadecanoic Ac	id	353.15	373.15	0.081	92-ban/gar
A1	1.47530	1.35621		Ν	Methyl Ethanoa 324.910	te 506.80	253.15	313.15	0.408	78-kum/iwa
A1	1.69043	2.64150	-4.70476	3.52368	Ethyl Ethanoat 308.064	e 523.20	273.15	473.15	0.106	69-trc ^{<i>i</i>}
A2	1298.373	-162.582	6.2022	1-Me	ethylethyl Etha	noate	297.17	367.20	0.000 ^e	75-gus/kad
A1	4.99964	-8.04117	6.23552	P	Propyl Propanoa 294.076	te 571.00	300.00	400.00	1.677	78-gus/kli
A2	1100.050	-66.234	-4.333	3-Me	ethylbutyl Propa	noate	298.15	423.15	0.157	76-gus/kli
Δ2	1170 294	-101 267	0.376	Ν	Methyl Hexanoa	te	204 00	408.85	0.536	92-mus/dus
۸2	1248 402	-211 201	36.084	_3 277	Nonyl Hexanoat	e	289.00	540 37	0.235	02-mus/gus_1
A2	1240.402	-211.231	30.064	-3.277 2-Mathylm	ropyl 2-Hydroyy	nronand	205.00	549.57	0.235	92-mus/gus-1
A2	959.494	38.991	-10.133	2-weenyip	10py1 2-11yuroxy	propano	294.36	371.42	0.078	91-gus/kul
A2	1178.221	-67.054		Penty	l 2-Hydroxyprop	anoate	296.71	371.82	1.279	91-gus/kul-1
A2	1265.729	-38.365	-7.623	Methy	yl Benzenecarbo	xylate	300.48	440.59	0.292	94-mus/tag
A2	1192.191	-77.500		2-Ethylh	nexyl Benzeneca	rboxylat	te 253.15	373.15	0.000 ^h	88-wal/lam
A1	3.91754	-4.77123	4.28255	Methyl 2-H	Hydroxybenzene 336.615	carboxy 763.00	late 298.15	498.15	0.178	90-mus/gan-1
A2	1288.069	-83.477	-0.009	Pentyl 2-H	Iydroxybenzene	arboxyl	ate 298.15	573.15	0.195	90-mus/gan-1
A2	983.795	-60.237	-0.229	Hexyl 2-H	ydroxybenzeneo	arboxyl	ate 298.15	573.15	0.050	90-mus/gan-1
A2	1101.229	0.316	-18.439	Methyl	2-Methyl-2-pro	penoate	289.34	349.29	0.162	87-gus/bai
A2	1182.666	-117.059	4.949	Nonyl	2-Methyl-2-proj	oenoate	292.37	473.43	1.192	89-gus/bai
A2	1382.302	-126.452	3.541	Dietl	hyl Butane-1,4-0	lioate	295.65	347.15	0.000 ^e	90-mus/gan-3
	1002.002	100.700	0.011	Dipro	pyl Butane-1,4-	dioate	200.00	017.10	0.000	an intersection
A2	806.562	196.733	-43.665	Dino	nyl Butano 1 4	lioato	288.15	347.95	0.147	90-mus/gan-2
A2	1075.179	-55.159	-0.080	1110	nyi Dutane-1,4-	nuate	298.15	573.15	0.109	91-mus/gan

^{*a*} Taken from 93-cda. ^{*b*} [83-ing/gro], [87-hol/goe], and [89-ram/kud]. ^{*c*} The data from 78-fig/szw differ significantly from recommended values published in 85-trc. ^{*d*} Reference 77-apa/ker presents two values of density at atmospheric pressure only, but compressed-liquid density data are inconsistent with the reference line from 91-trc and thus only original reference values were used for the fit in Table 3. ^{*e*} Polynomial interpolation. ^{*f*} Data from 71-kor are lower by 0.5 kg·m⁻³ in average. ^{*g*} Data from 71-kor are lower by 0.2 kg·m⁻³ in average. ^{*h*} The fit of all seven data points reported yielded a straight line. ^{*i*} Densities from the source other than that of compressed-liquid data.

Appendix I

Equations Used for $\rho(T, P_{ref}(T)) = \rho(T)$ in Fits by Eq 1 and References to Saturated Vapor Pressure Data. In those cases where the reference density values $\rho(T, P_{ref}(T))$ (see eq 1) either were not available in original papers or the values at atmospheric pressure were reported for different temperatures than compressed-liquid density data, the two following functions were used for the data sets denoted by letter "e" or "(o)" in the last column of Table 4 to calculate reference density values

$$\rho(T/K)/kg \cdot m^{-3} = \rho_c \{1 + a_0(1 - T_r)^{1/3} + a_1(1 - T_r)^{2/3} + a_2(1 - T_r) + a_3(1 - T_r)^{4/3}\} \qquad T_r = T/T_c \quad (A1)$$

$$\rho(T/K)/kg \cdot m^{-3} = a_0 + a_1(T/100) + a_2(T/100)^2 + a_3(T/100)^3$$
 (A2)

The values of adjustable parameters a_i obtained by fitting to available data using a weighted least squares method are recorded in Table A1 along with some characteristics of the fits. Equation A1 was preferably used in those cases where respective critical parameters (ρ_c , T_c) were available. The references to the saturated vapor pressure data, $P_{ref}(T)$, used in eq 1 are also given in Table A1 in those cases when the upper temperature limit, T_{max} , of the corresponding fit in Table 3 is above the normal boiling temperature. It should be pointed out that the fits in Table A1 do not represent a critical evaluation of density data at atmospheric pressure or at saturation (except for the fits of recommended density values taken from the TRC Thermodynamic Tables) which is beyond the scope of the present review. On the other hand, reliable and highquality experimental data were selected where possible (see, e.g., 3-oxapentane).

The values of reference density, $\rho(T,P_{\rm ref})$, $P_{\rm ref} = 0.101$ 325 MPa in most cases, reported for the same samples in original literature sources of compressed-liquid density data, were exclusively employed for the fits in Table 3 for the substances which are not listed in Table A1 except for 2,5-dioxaheptane [78-sha/bai] and 4,7,10-trioxatridecane [81-sha/abd] where original reference density values, $\rho(T,P_{\rm ref} = 0.101$ 325 MPa), were smoothed (Table A1) before the use for fits by eq 1 for respective compressed-liquid density data sets since in those two cases the experimental densities at atmospheric pressure and those for the compressed liquid were reported for different temperatures.

Appendix II

Parameters of Smoothing Functions for Original Reference Density Data. Table A2 summarizes values of adjustable parameters a_i of functions A1 and A2 (see Appendix I) fitted mostly to the values of experimental densities at atmospheric pressure reported for the same samples as compressed-liquid density data retained in correlations by the Tait equation (Tables 3 and 4). The functions were not, unlike the equations summarized in Table A1, employed in smoothing the compressed-liquid density data and are presented as auxiliary information here, which may be useful particularly for less common substances. The functions enable us to calculate smoothed reference density values to be used in evaluation of compressed-liquid densities from eq 1.

The fits in Table A2 are not the fits of critically selected experimental data. Only in several cases are the parameters a_i obtained using either recommended density values taken from the TRC Thermodynamic Tables or data from other reliable sources presented.

Original reference density values for substances not listed in Tables A1 and A2 were not reported in original sources; i.e., relative quantities as relative density, $\rho(T,P)/\rho(T,P_{ref})$, volume ratio, $V(T,P)/V(T,P_{ref})$, or compression, $\{1 - V(T,P)/V(T,P_{ref})\}$, only were presented by researchers.

Literature Cited

13-bri	 Bridgman, P. W. Thermodynamic Properties of Twelve Liquids between 20 degrees and 80 degrees and up to 12000 kg/cm². <i>Proc. Am. Acad. Arts Sci.</i> 1913, <i>49</i>, 3–114.
29-fre/hub	Freyer, E. B.; Hubbard, J. C.; Andrews, D. H. Sonic Studies of the Physical Properties of Liquids. I. The Sonic Interferometer. The Velocity of Sound in Some Organic Liquids and Their Compressibilities. <i>J. Am. Chem. Soc.</i> 1929 , <i>51</i> , 759–770.
31-bri	Bridgman, P. W. The Volume of Eighteen Liquids as a Function of Pressure and Temperature. <i>Proc.</i> <i>Am. Acad. Arts Sci.</i> 1931 , <i>66</i> , 185–233.
32-bri	Bridgman, P. W. Volume-Temperature-Pressure Relations for Several Non-Volatile Liquids. <i>Proc.</i> <i>Am. Acad. Arts Sci.</i> 1932 , <i>67</i> , 1–27.
44-sch	Schaaffs, W. Investigations on the Velocity of Sound and Constitution. I. The Velocity of Sound in Organic Liquids. Z. Phys. Chem. (Leipzig) 1944 , 194, 28.

49-bri	Bridgman, P. W. Further Rough Compressions to 40,000 kg/cm ² , Especially Certain Liquids. <i>Proc. Am. Acad. Arts Sci.</i> 1949 , <i>77</i> , 129–146.
49-lag/mcm	Lagemann, R. T.; McMillan, D. R.; Woolf, W. E. Temperature Variation of Ultrasonic Velocity in Liquids. <i>J. Chem. Phys.</i> 1949 , <i>17</i> , 369–373.
49-wei	Weissler, A. Ultrasonic Investigation of Molecular Properties of Liquids. IV. Cyclic Compounds. <i>J. Am.</i> <i>Chem. Soc.</i> 1949 , <i>71</i> , 419–421.
51-new/wea	Newitt, D. M.; Weale, K. E. Pressure-Volume- Temperature Relations in Liquids and Liquid Mix- tures. Part II. The Compression Isotherms of Some Organic Liquids up to 1000 Atmospheres, and the Compressions of Some Aqueous and Non-aqueous Binary Liquid Mixtures. <i>J. Chem. Soc.</i> 1951 , 3092– 3098.
53-par/bak	Parthasarathy, S.; Bakhshi, N. N. Sound Velocity Measurements in Organic Liquids. <i>Indian J. Phys.</i> 1953 , <i>27</i> , 73.
56-stu	Stutchbury, J. E. Compressions of Organic Liquids and their Mixtures with Water. <i>Aust. J. Chem.</i> 1956 , <i>9</i> , 536–540.
57-wal/ric	Walsh, J. M.; Rice, H. M. Dynamic Compression of Liquids from Measurements on Strong Shock Waves. <i>J. Chem. Phys.</i> 1957 , <i>26</i> , 815–823.
63-and	Andersson, G. R. A Study of the Pressure Depen- dence of the Partial Specific Volume of Macromol- ecules in Solution by Compression Measurements in the Range 1-8000 atm. <i>Ark. Kemi</i> 1963 , <i>20</i> , 513– 571.
64-lut/sol	Lutskii, A. E.; Solonko, V. N. Hydrogen Bond and Compressibility of Liquids. II. Monocarboxylic Acids of the Fatty Acid Series. <i>Zh. Fiz. Khim.</i> 1964 , <i>38</i> , 1421–1428 (in Russian).
65-for/moo	Fort, R. J.; Moore, W. R. Adiabatic Compressibilities of Binary Liquid Mixtures. <i>Trans. Faraday Soc.</i> 1965 , <i>61</i> , 2102–2111.
66-kor/kos	Korpela, J.; Koskikallio, J. Compressibilities of Dioxan - Water Mixtures at 25 °C. <i>Suom. Kemistil.</i> <i>B</i> 1966, <i>39</i> , 165–168.
66-win/pow	Winnick, J.; Powers, J. E. The P-V-X Behavior of the Liquid System Acetone-Carbon Disulfide at Elevated Pressures. <i>AIChE J.</i> 1966 , <i>12</i> , 460–465.
67-ada/lai	Adams, W. A.; Laidler K. J. Effects of Pressure and Temperature on the Structure of Liquid Acetone. <i>Can. J. Chem.</i> 1967 , <i>45</i> , 123–139.
68-cha/sta	Chaudhuri, P. M.; Stager, R. A.; Mathur, G. P. Properties of Aliphatic and Aromatic Aldehydes under High Pressure. Compressibility and Viscosity Determination. <i>J. Chem. Eng. Data</i> 1968 , <i>13</i> , 9–11.
68-pea/str	Pearce, P. J.; Strauss, W. Effect of Pressure on the Density of Dioxan and Dioxan-Water Mixtures at 25 °C. <i>Aust. J. Chem.</i> 1968 , <i>21</i> , 1213–1219.
68-ski/cus	Skinner, J. F.; Cussler, E. L.; Fuoss, R. M. Pressure Dependence of Dielectric Constant and Density of Liquids. <i>J. Phys. Chem.</i> 1968 , <i>72</i> , 1057–1064.
69-bra/fre	Brazier, D. W.; Freeman, G. R. The Effect of Pressure on the Density, Dielectric Constant, and Viscosity of Several Hydrocarbons and Other Or- ganic Liquids. <i>Can. J. Chem.</i> 1969 , <i>47</i> , 893–899.
69-trc	TRC Table 23-2-1-(1.1320)-d, C-H-O. n-Alkyl Ethanoates (Acetates), C_3 to C_{22} . TRC Thermodynamic Tables - Non-Hydrocarbons, Thermodynamics Research Center, College Station, TX, 1969, 5550–5551.
70-kus/tas	Kuss, E.; Taslimi, M. p,V,T-Messungen an zwanzig organischen Flussigkeiten (p,V,T Measurement of Twenty Organic Liquids). <i>ChemIngTech.</i> 1970 , <i>42</i> , 1073–1081.
70-sch/eck	Schornack, L. G.; Eckert, C. A. The Effect of Pressure on the Density and Dielectric Constant of Polar Solvents. <i>J. Phys. Chem.</i> 1970 , <i>74</i> , 3014–3020.
71-des/bha	Deshpande, D. D.; Bhatgadde, L. G. Heat Capacities at Constant Volume, Free Volumes, and Rotational Freedom in Some Liquids. <i>Aust. J. Chem.</i> 1971 , <i>24</i> , 1817–1822.
71-ham/smi	Hamann, S. D.; Smith, F. The Effect of Pressure on the Volumes and Excess Volumes of Aqueous Solutions of Organic Liquids. <i>Aust. J. Chem.</i> 1971 ,

24, 2431-2438.

71-kor	Korpela, J. The Densities and Compression Iso- therms of Formic Acid-, Acetic Acid-, Propionic Acid-, and Isobutyric Acid-Water Mixtures. <i>Acta</i> <i>Chem. Scand.</i> 1971 , <i>25</i> , 2852–2864.	77 с
71-ric/rog	Richard, A. J.; Rogers, K. S. The Isothermal Com- pressibility of Organic Liquids by Ultracentrifuga- tion. Correlation with Surface Tension. <i>Can. J.</i> <i>Chem.</i> 1971 , <i>49</i> , 3956–3959.	77-gi
71-run/sta	Rungta, K. K.; Stager, R. A.; Mathur, G. P. Proper- ties of n-Butyraldehyde under High Pressure. Vis- cosity and Compressibility Determination. <i>Can. J.</i> <i>Chem. Eng.</i> 1971 , <i>49</i> , 886–888.	77-gi
72-dri/wil	Driver, G. R.; Williamson, A. G. Thermal Pressure Coefficients of Di-n-alkyl Ethers. <i>J. Chem. Eng.</i> <i>Data</i> 1972 , <i>17</i> , 65–66.	77-la
73-erm/bai	Ermakov, G. V.; Baidakov, V. G.; Skripov, V. P. Density of Overheated Diethyl Ether and the Bound- ary of Stability of Liquid State. <i>Zh. Fiz. Khim.</i> 1973 , <i>47</i> , 1026–1027 (in Russian). Deposited in VINITI No. 5144-72 since November 29, 1972.	78-aj
74-ato/mam	Atoyan, V. A.; Mamedov, I. A. Apparatus for De- termination of Density of Liquids and Gases at High Temperatures and Pressures Using a Weighing Method. <i>Izv. Akad. Nauk Azerb. SSR, Ser. Fiz.</i> <i>Tekn. Mat. Nauk</i> 1974 , <i>17</i> (10), 119–123 (in Rus- sian).	78-fi
75-amb/con	Ambrose, D.; Connett, J. E.; Green, J. H. S.; Hales, J. L.; Head, A. J.; Martin, J. F. Thermodynamic Properties of Organic Oxygen Compounds. 42. Physical and Thermodynamic Properties of Benzal- dehyde. <i>J. Chem. Thermodyn.</i> 1975 , <i>7</i> , 1143–1157.	78-gi
75-ato/mam	Atoyan, V. A.; Mamedov, I. A. Observation of Dependence of Velocity and Absorption of Sound, Viscosity, and Density of Methyl Hexyl Ketone on Temperature and Pressure. <i>Izv. Vyssh. Ucheb.</i> <i>Zaved., Neft Gaz</i> 1975 , <i>18</i> (5), 74–78 (in Russian).	78-gi
75-gus/abd	Guseinov, K. D.; Abdullaeva, R. I. Observation of Thermal Conductivity and Density of Isoamyl Val- erate at High Parameters of State. <i>Zh. Fiz. Khim.</i> 1975 , <i>49</i> , 3002–3002 (in Russian). Deposited in VINITI No. 2378-75 since August 4, 1975.	78-gi 78-ki
75-gus/kad	Guseinov, K. D.; Kadzarov, V. T. Experimental Observation of P-V-T Dependence of Isopropyl Acetate and Ethyl Acetate. <i>Izv. Vyssh. Ucheb.</i> <i>Zaved., Neft Gaz</i> 1975 , <i>18</i> (1), 56–56 (in Russian).	78-re
75-mam/gus	Mamedov, M. N.; Guseinov, K. D.; Kerimov, A. M. Experimental Observation of P-V-T Dependence of Liquid Aldehydes. <i>Izv. Vyssh. Ucheb. Zaved., Neft</i> <i>Gaz</i> 1975 , <i>18</i> (6), 70–80 (in Russian).	78-ri
76-ato/bag	Atoyan, V. A.; Bagdasaryan, S. S.; Mamedov, I. A. Observation of Acoustic and Viscous Properties of Methyl Ethyl Ketone in a Wide Interval of Tem- peratures and Pressures. <i>Izv. Vyssh. Ucheb. Zaved.</i> , <i>Neft Gaz</i> 1976 , <i>19</i> (6), 65–68 (in Russian).	78-sl
76-ato/mam	Atoyan, V. A.; Mamedov, I. A. Observation of Acoustic and Viscous Properties of Dimethyl Ketone in a Wide Interval of Temperatures and Pressures. <i>Zh. Fiz. Khim.</i> 1976 , <i>50</i> , 2976–2978 (in Russian).	78-sı
76-gus/kli	Guseinov, K. D.; Klimova, T. F. Experimental Observation of Density of Isoamyl Propionate in a Wide Interval of Temperatures and Pressures. <i>Izv.</i> <i>Vyssh. Ucheb. Zaved., Neft Gaz</i> 1976 , <i>19</i> (8), 58– 58 (in Russian).	79-ai
76-gus/sad	Guseinov, K. D.; Sadykhova, A. A. Observation of p-V-T Dependence of Amyl Ester of Caproic Acid. <i>Zh. Fiz. Khim.</i> 1976 , <i>50</i> , 3000–3001 (in Russian). Deposited in VINITI No. 2766–76 since July 20, 1976.	79-ba
76-rao/nai	Rao, M. V. P.; Naidu, P. R. Excess Volumes and Isentropic Compressibilities of Binary Mixtures of Alcohol + Cyclohexanone. Part II. <i>J. Chem. Ther-</i> <i>modyn.</i> 1976 , <i>8</i> , 96–98.	79-k
76-red/nai	Reddy, K. S.; Naidu, P. R. Isentropic Compressibili- ties of Mixtures of an Alcohol + Diethylketone. J. Chem. Thermodyn. 1976 , 8, 1208–1210.	
77-abd/gus	Abdullaeva, R. I.; Guseinov, K. D. Experimental Observation of Density of Butyl Valerate in a Wide Interval of Temperatures and Pressures. <i>Zh. Fiz.</i> <i>Khim.</i> 1977 , <i>51</i> , 1012–1012 (in Russian). Deposited in VINITI No. 4295-76 since December 14, 1976.	79-k
77-apa/ker	Apaev, T. A.; Kerimov, A. M.; Dzhanakhmedov, N. K. Observation of P-v-T Dependence of Methyl	80-ra

77-gup/han	Gupta, A. C.; Hanks, R. W. Liquid Phase PVT Data for Binary Mixtures of Toluene with Nitroethane and Acetone, and Benzene with Acetonitrile, Nitromethane, and Ethanol. <i>Thermochim. Acta</i> 1977 , <i>21</i> , 143–152.
77-gus/sad	Guseinov, K. D.; Sadykhova, A. A. Observation of p-V-T Dependence of Ethyl Ester of Caproic Acid. <i>Zh. Fiz. Khim.</i> 1977 , <i>51</i> , 2406–2406 (in Russian). Deposited in VINITI No. 951-77 since March 14, 1977.
77-lam/hun	Lamb, J. A.; Hunt, A. F. Volumes of Mixing of Metyl Ethyl Ketone with Water at Elevated Pressures. <i>Chem. Eng. J. (Lausanne)</i> 1977 , <i>14</i> , 73–76.
78-apa/ker	Apaev, T. A.; Kerimov, A. M.; Dzhanakhmedov, N. Kh. Observation of P-V-T Dependence of Methyl Hexyl Ketone in a Wide Interval of Temperatures and Pressures. <i>InzhFiz. Zh.</i> 1978 , <i>35</i> (1), 166–167 (in Russian).
78-fig/szw	Figuiere, P.; Szwarc, H. P-V-T Relations for Liquid and Crystalline Furan from 210 to 260 K, up to 1000 MPa. <i>High Temp High Pressures</i> 1978 , <i>10</i> , 473–476.
78-gus/asl	Guseinov, K. D.; Aslanov, G. A. Observation of p-V-T Dependence and Dynamic Viscosity of Hexyl Formiate. <i>Zh. Fiz. Khim.</i> 1978 , <i>52</i> , 483–483 (in Russian). Deposited in VINITI No. 2487-77 since July 23, 1977.
78-gus/asl-1	Guseinov, K. D.; Aslanov, G. A. Observation of p-V-T Dependence of Octyl Formiate. <i>Zh. Fiz. Khim.</i> 1978 , <i>52</i> , 807–807 (in Russian). Deposited in VIN- ITI No. 3856-77 since October 5, 1977.
78-gus/kli	Guseinov, K. D.; Klimova, T. F. Experimental Observation of P-v-T Dependence of Propyl Propi- onate at High State Parameters. <i>Izv. Vyssh. Ucheb.</i> <i>Zaved., Neft Gaz</i> 1978 , <i>21</i> (2), 67–70 (in Russian).
78-kum/iwa	Kumagai, A.; Iwasaki, H. Pressure-Volume-Tem- perature Relationships of Several Polar Liquids. <i>J.</i> <i>Chem. Eng. Data</i> 1978 , <i>23</i> , 193–195.
78-red/nai	Reddy, K. S.; Naidu, P. R. Isentropic Compressibili- ties of Mixtures of an Alcohol + Methylethylketone. <i>J. Chem. Thermodyn.</i> 1978 , <i>10</i> , 201–202.
78-ric	Richard, A. J. Isothermal Compressibility of Methyl Ketones and the Density Coefficient of Polarizabil- ity for Several Compounds by Ultracentrifugation. <i>J. Phys. Chem.</i> 1978 , <i>82</i> , 1265–1268.
78-sha/bai	Sharipov, K.; Bairamova, N. N. Experimental Observation of P-v-T and P_s -T _s Dependencies of Ethylene Glycol Dimethyl Ether. <i>Izv. Vyssh. Ucheb. Zaved., Neft Gaz</i> 1978 , <i>21</i> (8), 62–64 (in Russian).
78-sre/nai	Sreenivasulu, M.; Naidu, P. R. Isentropic Com- pressibilities of n-Butylamine + Methyl Ethyl Ke- tone, + Methyl n-Propyl Ketone, and + Diethyl Ketone at 303.15 and 313.15 K. <i>J. Chem. Thermo-</i> <i>dyn.</i> 1978 , <i>10</i> , 1019–1022.
79-ato	Atoyan, V. A. Observation of Velocity and Coeffcient of Absorption of Sound in Methyl Butyl Ketone, its Density and Viscosity in Dependence on Tempera- ture and Pressure. <i>Zh. Fiz. Khim.</i> 1979 , <i>53</i> , 2784– 2789 (in Russian).
79-bas/erm	Bashkatov, N. V.; Ermakov, G. V. Experimental Device and Results of Measurements of P-V-T Properties of Overheated Liquid Acetone. <i>Teplofiz.</i> <i>Vys. Temp.</i> 1979 , <i>17</i> , 1115–1115 (in Russian). Deposited in VINITI No. 2134-79 since June 12, 1979.
79-kiy/dar	Kiyohara, O.; D'Arcy, P. J.; Benson, G. C. Ultrasonic Velocities, Compressibilities, and Heat Capacities of Water + Tetrahydrofuran Mixtures at 298.15 K. <i>Can. J. Chem.</i> 1979 , <i>57</i> , 1006–1010.
79-kum/iwa	Kumagai, A.; Iwasaki, H. Pressure-Volume-Temperature Relationships of $CH_3COOC_2H_5$ and Generalized Tait Equation for Liquids at High Pressures. <i>J. Chem. Eng. Data</i> 1979 , <i>24</i> , 261–263.

Propyl Ketone in a Wide Range of Temperatures and Pressures. *Ukr. Fiz. Zh. (Ukr. Ed.)* **1977**, *22*, 408–412 (in Russian).

D-rae/fin Raetzsch, M.; Findeisen, R. PVT-Messungen an Flussigkeiten und Gasen mit einem Faltenbalgpiezometer (PVT-Measurements of Liquids and Gases

Journal of Chemical and Engineering Data, Vol. 42, No. 1, 1997 25

	with a Bellows Piezometer). Z. Phys. Chem. (Leipzig) 1980, 261, 935–945 (in German).	
81-sha/abd	Sharipov, K.; Abdullaev, F. G.; Akhundov, T. S. Density of Diethylene Glycol Dipropyl Ether in a Wide Interval of Pressures and Temperatures. <i>Izv.</i> <i>Vyssh. Ucheb. Zaved., Neft Gaz</i> 1981 , <i>24</i> (1), 44– 46 (in Russian).	87-
82-ato/mam	Atoyan, V. A.; Mamedov, I. A. A Study of Acoustic and Viscous Properties of Diethyl Ketone in the Interval of Temperature 293–473 K and Pressures up to 156.8 MPa. <i>Izv. Vyssh. Ucheb. Zaved., Neft</i> <i>Gaz</i> 1982 , <i>25</i> (6), 45–48 (in Russian).	87-
82-bro/lop	Brostow, W.; Lopez, D. M. M.; Maynadier, P. Isothermal Compressibility of Liquids: New Results on Temperature Dependence. <i>Proc. 8th Symp. Ther-</i> <i>mophys. Prop., Vol 1: Thermophysical Properties of</i> <i>Liquids</i> 1982 , (1), 122–127.	88-
82-tre/hal	Treszczanowicz, A. J.; Halpin, C. J.; Benson, G. C. Excess Volumes and Isentropic Compressibilities of 2,5,8-Trioxanonane-n-Heptane Mixtures. <i>J. Chem.</i> <i>Eng. Data</i> 1982 , <i>27</i> , 321–324.	89-
82-wis/wue	Wisotzki, K. D.; Wuerflinger, A. PVT Data for Liquid and Solid Cyclohexane, Cyclohexanone and Cyclopentanol up to 3000 bar. J. <i>Phys. Chem. Solids</i> 1982 , <i>43</i> , 13–20.	89-
83-goo/whi	Goodman, M. A.; Whittenburg, S. L. Sound Velocity in Simple Carboxylic Acids. <i>J. Chem. Eng. Data</i> 1983 , <i>28</i> , 350–351.	
83-hal/gun	Hales, J. L.; Gundry, H. A.; Ellender, J. H. Liquid Densities from 288 to 490 K of Four Organic Oxygen Compounds. <i>J. Chem. Thermodyn.</i> 1983, <i>15</i> , 211– 215.	00
83-ing/gro	Inglese, A.; Grolier, JP. E.; Wilhelm, E. Excess Volumes of Mixtures of Oxolane, Oxane, 1,3-Diox- olane, and 1,4-Dioxane with n-Alkanes at 298.15, 308.15, and 318.15 K. <i>J. Chem. Eng. Data</i> 1983 , <i>28</i> , 124–127.	90-
83-kim/tre	Kimura, F.; Treszczanowicz, A. J.; Halpin, C. J.; Benson, G. C. Excess Volumes and Ultrasonic Speeds for (Di-n-propylether + n-Heptane). <i>J. Chem.</i> <i>Thermodyn.</i> 1983 , <i>15</i> , 503–510.	90-
83-mcg	McGarry, J. Correlation and Prediction of the Vapor Pressures of Pure Liquids over Large Pressure Ranges. Ind. Eng. Chem., Process Des. Dev. 1983 , 22, 313–332.	90-
83-nak/miy	Nakagawa, M.; Miyamoto, Y.; Moriyoshi T. Com- pression of Aqueous Binary Mixtures Containing Alcohols and Cyclic Ethers at 298.15 K and 101.3 MPa. <i>J. Chem. Thermodyn.</i> 1983 , <i>15</i> , 15–21.	90-
84-nas/siv	Nasir, P.; Sivaraman, A.; Kobayashi, R. The Molar Volume and Fugacity of Liquid Dibenzofuran at High Temperatures and High Pressures. <i>J. Chem.</i> <i>Thermodyn.</i> 1984 , <i>16</i> , 199–205.	90-
84-trc	TRC Table 23-2-1-(1.1210)-d, C-H-O. Alkanoic Ac- ids, C ₁ to C ₅ . TRC Thermodynamic Tables - Non- Hydrocarbons, Thermodynamics Research Center, College Station, TX, 1984, 5450–5451.	90-
85-oba/ood	Obama, M.; Oodera, Y.; Kohama, N.; Yanase, T.; Saito, Y.; Kusano, K. Densities, Molar Volumes, and Cubic Expansion Coefficients of 78 Aliphatic Ethers. <i>J. Chem. Eng. Data</i> 1985 , <i>30</i> , 1–5.	91-
85-tek/cib	Tekáč, V.; Cibulka, I.; Holub, R. PVT Properties of Liquids and Liquid Mixtures: A Review of the Experimental Methods and the Literature Data. <i>Fluid Phase Equilib.</i> 1985 , <i>19</i> , 33–149.	91-
85-trc	TRC Table 23-2-1-(9.2152)-d, C-H-O. Alkyl Furans, C ₄ to C ₆ . TRC Thermodynamic Tables - Non- Hydrocarbons, Thermodynamics Research Center, College Station, TX, 1985, 6360.	91-
86-bot/bre	Bottomley, G. A.; Bremers, M. T. Electrolyte Molar Volumes at 273–373 K in Propylene Carbonate, N-Methylformamide, Formamide, and Methanol: Their Relation to Solvent Compressibility. Ion As- sociation Constants in Acetonitrile at 298 K. Aust. J. Chem. 1986 , 39, 1959–1981	91- 91-
87-gus/bai	Guseinov, K. D.; Bairamov, N. M.; Aliev, A. E. P-V-T Dependence of Methyl Ester of Methacrylate Acid. <i>Izv. Vyssh. Ucheb. Zaved., Neft Gaz</i> 1987 , <i>30</i> (5), 85–87 (in Russian).	91-
87-hol/goe	Holzapfel, K.; Goetze, G.; Kohler F. Volume and Isothermal Compressibility of Oxolane + Some	

Normal Alkanes	$(C_5 - C_{16}).$	Int. Data Ser.,	Sel. Data
Mixtures, Ser. A	1987, No	. 4, 263–268.	

- hol/goe-1 Holzapfel, K.; Goetze, G.; Demiriz, A. M.; Kohler, F. Volume and Isothermal Compressibility of Some Normal Alkanes (C₅-C₁₆) + 2,3-Dimethylbutane, + Methylcyclopentane, + Butylcyclohexane, + Benzene, + 2-Propanone, or + Tetrachloromethane. *Int. Data Ser., Sel. Data Mixtures, Ser. A* 1987, No. 1, 30–56.
- 7-nhu/bha Nhu, N. V.; Bhat, S. N.; Kohler, F. Calculation of Isothermal Compressibilities of Mixtures. The Example Acetone + Chloroform. Ber. Bunsen-Ges. Phys. Chem. 1987, 91, 525–528.
- 8-wal/lam Walker, N. A.; Lamb, D. M.; Adamy, S. T.; Jonas, J.; Dare-Edwards, M. P. Self-diffusion in the Compressed, Highly Viscous Liquid 2-Ethylhexyl Benzoate. J. Phys. Chem. 1988, 92, 3675–3679.

9-gus/bai Guseinov, K. D.; Bairamov, N. M.; Aliev, A. E. P-V-T Dependence and Heat Capacity at Constant Pressure of Nonyl Ester of Methacrylic Acid. *Izv. Vyssh. Ucheb. Zaved., Neft Gaz* **1989**, *32* (1), 50–52 (in Russian).

- Ramkumar D. H. S.; Kudchadker, A. P. Mixture Properties of the Water + γ-Butyrolactone + Tetrahydrofuran System. 1. Densities of γ-Butyrolactone + Water at 303.15 - 343.15 K and of Tetrahydrofuran + γ-Butyrolactone at 278.15 - 298.15 K; Ultrasonic Velocities at 298.15 K for the Three Binary Systems Inclusive of Tetrahydrofuran + Water and the Ternary System Tetrahydrofuran + Water + γ-Butyrolactone. J. Chem. Eng. Data 1989, 34, 459-463.
- O0-aic/cos Aicart, E.; Costas, M.; Junquera, E.; Tardajos, G. Ultrasonic Speeds and Isentropic Compressibilities of (1,4-Dioxane + n-Heptane or n-Decane or n-Tetradecane). J. Chem. Thermodyn. 1990, 22, 1153– 1158.
- 0-mus/gan Mustafaev, R. A.; Ganiev, D. K.; Raginov, R. S.; Bairamov, N. M.; Mamedov, M. B.; Gasanov, G. T. P-ρ-T Dependence of Methyl Ester of Salicylic Acid in a Wide Interval of State Parameters. *Izv. Vyssh.* Ucheb. Zaved., Neft Gaz 1990, 33 (10), 27–28 (in Russian).
- 0-mus/gan-1 Mustafaev, R. A.; Ganiev, D. K.; Ragimov, R. S. P-ρ-T Dependence of Esters of Salicylic Acid. *Izv. Vyssh. Ucheb. Zaved., Neft Gaz* **1990**, *33* (6), 95– 96 (in Russian).
- 90-mus/gan-2 Mustafaev, R. A.; Ganiev, D. K.; Ragimov, R. S. P-ρ-T Dependence of Dipropyl Ester of Succinic Acid. Izv. Vyssh. Ucheb. Zaved., Neft Gaz 1990, 33 (2), 28-58 (in Russian).
 - -mus/gan-3 Mustafaev, R. A.; Ganiev, D. K.; Ragimov, R. S. P-ρ-T Dependence of Diethyl Ester of Succinic Acid. *Inzh.-Fiz. Zh.* **1990**, *59* (2), 259–261 (in Russian).
- D-sve/sid Svejda, P.; Siddiqi, M. A.; Hahn, G.; Christoph, N. Excess Volume, Isothermal Compressibility, and Excess Entalpy of Binary Liquid System 2,2,2-Trifluoroethanol + 2,5,8,11,14-Pentaoxapentade cane. J. Chem. Eng. Data 1990, 35, 47-49.
- Atoyan, V. A. Acoustic and Viscous Properties of Dipropyl Ketone in the Ranges 273–473 K and 0.1 - 156.8 MPa. *Russ. J. Phys. Chem. (Engl. Transl.* of Zh. Fiz. Khim.) **1991**, 65, 100–104.
- 1-gar/mir Garcia, B.; Miranda, M. J.; Leal, J. M.; Ortega, J.; Matos, J. S. Densities and Viscosities of Mixing for the Binary Systems of Methyl Benzoate with n-Nonane at Different Temperatures. *Thermochim. Acta* **1991**, *186*, 285–292.
- 1-gus/kul Guseinov, K. D.; Kuliev E. M. Thermal Properties of Iso-Butyl Ester of Lactic Acid. *Izv. Vyssh. Ucheb. Zaved., Neft Gaz* **1991**, *34* (5), 68–72 (in Russian).
- 1-gus/kul-1 Guseinov, K. D.; Kuliev, E. M. P-v-T Dependence of Amyl Ester of Lactic Acid. *Izv. Vyssh. Ucheb. Zaved., Neft Gaz* **1991**, *34* (3), 38–68 (in Russian).
- 1-mal/woo Malhotra, R.; Woolf, L. A. Thermodynamic Properties of Propanone (Acetone) at Temperatures from 278 K to 323 K and Pressures up to 400 MPa. *J. Chem. Thermodyn.* **1991**, *23*, 867–876.
- 91-mus/gan Mustafaev, R. A.; Ganiev, D. K.; Bairamov, N. M.; Ragimov, R. S. Experimental Observation of P-p-T Dependence of Dinonyl Ester of Succinic Acid. *Izv. Vyssh. Ucheb. Zaved., Neft Gaz* 1991, *34* (5), 66– 67 (in Russian).

91-pap/zia	Papaioannou, D.; Ziakas, D.; Panayiotou, C. Volu- metric Properties of Binary Mixtures. 1. 2-Pro- panone + 2,2,4-Trimethylpentane and n-Heptane + Ethanol Mixtures. <i>J. Chem. Eng. Data</i> 1991 , <i>36</i> , 35–30	93-cda
91-spa/lep	Spaneda, A.; Lepori, L.; Matteoli, E. Volumes of Mixing of Ethers with Tetrachloromethane at 298.15 K. <i>Fluid Phase Equilib.</i> 1991 , <i>69</i> , 209–222.	93-cib
91-trc	TRC Table 23-2-1-(1.2000)-d, C-H-O. 2-Alkanones. TRC Thermodynamic Tables - Non-Hydrocarbons, Thermodynamics Research Center, College Station, TX, 1991, 5870–5872.	93-mal
92-ban/gar	Banipal, T. S.; Garg, S. K.; Ahluwalia, J. C. Densi- ties of Some Higher Alkan-1-oic Acids at Temper- atures from 343.15 K to 373.15 K and at Pressures up to 9 MPa. <i>J. Chem. Thermodyn.</i> 1992 , <i>24</i> , 729– 735.	93-saf/
92-ego/gru	Egorov, G. I.; Gruznov, E. L.; Kolker, A. M. p-V-x Properties of Mixture Water-Acetone at 298.15 K in the Interval from 1 to 600 bars. <i>Zh. Fiz. Khim.</i> 1992 , <i>66</i> , 1458–1465 (in Russian).	94-010/2
92-mal/woo	Malhotra, R.; Woolf, L. A. Thermodynamic Proper- ties of Butan-2-one at Temperatures from 278 K to 338 K and Pressures from 0.1 MPa to 280 MPa; Prediction for Higher Ketones. <i>J. Chem. Thermo- dyn.</i> 1992 , <i>24</i> , 1207–1217.	94-mus
92-mus/gus	Mustafaev, R. A.; Guseinov, M. A.; Abbasov, R. M. Experimental Observation of Density of Methyl Caproate at High Temperatures and Pressures. <i>Izv.</i> <i>Vyssh. Ucheb. Zaved., Neft Gaz</i> 1992 , <i>35</i> (7), 72– 96 (in Russian).	94-sen
92-mus/gus-1	Mustafaev, R. A.; Guseinov, M. A. Experimental Observation of Density of Nonyl Caproate in De- pendence on Temperature and Pressure. <i>Izv. Vyssh.</i> <i>Ucheb. Zaved., Neft Gaz</i> 1992 , <i>35</i> (8), 33–34 (in Russian).	95-mie
92-saf/gus	Safarov, M. M.; Guseinov, K. D.; Madzhidov, K.; Asoev, R. Sh. Density of Liquid Diallyl Ether in a Wide Range of Pressures and Temperatures. <i>Zh.</i> <i>Fiz. Khim.</i> 1992 , <i>66</i> , 1697–1701 (in Russian).	95-pul/
92-saf/mad	Safarov, M. M.; Madzhidov, Kh.; Asoev, R. Sh. Generalized Equation of State of Liquid Simple Ethers. <i>Zh. Fiz. Khim.</i> 1992 , <i>66</i> , 2595–2603 (in Russian).	96-cib/
92-saf/mad-1	Safarov, M. M.; Madzhidov, Kh.; Asoev, R. Sh. P- ρ Dependencies of Dipropyl Ether in Wide Interval of Temperatures and Pressures. <i>Teplofiz. Vys. Temp.</i> 1992 , <i>30</i> , 190–192 (in Russian).	96-gov/
92-sak	Sakurai, M. Partial Molar Volumes for 1,4-Dioxane + Water. <i>J. Chem. Eng. Data</i> 1992 , <i>37</i> , 492–496.	96-zab/
92-uos/kit	Uosaki, Y.; Kitaura, S.; Moryioshi, T. Compressions of 4-methyl-1,3-dioxolan-2-one and some alkanols at presures up to 200 MPa and at the temperature 298.15 K. J. Chem. Thermodyn. 1992 , <i>24</i> , 559–560.	
93-ami/pha	Aminabhavi, T. M.; Phayde, H. T. S.; Aralaguppi, M. I.; Khinnavar, R. S. Densities, Viscosities, and Speeds of Sound for Diethylene Glycol Dimethyl Ether + Methyl Acetate. <i>J. Chem. Eng. Data</i> 1993 , <i>38</i> , 540–541.	Receive Provisi Univer acknow
93-ami/rai	Aminabhavi, T. M.; Raikar, S. K.; Balundgi, R. H. Densities, Viscosities, Refractive Indices, and Speeds of Sound in Methyl Acetoacetate + Methyl Acetate, + Ethyl Acetate, + n-Butyl Acetate, + Methyl Benzoate, and + Ethyl Benzoate at 298.15, 303.15, and 308.15 K - Cham. Erg. Dect. 1992 , 28, 441	Czech JE960
	anu 500.15 K. J. Chem. Eng. Data 1995 , 30, 441– 445.	⊗ Abstı

93-cda	CDATA, Database of Physical and Transport Properties of Pure Fluids. Department of Physical Chemistry, Institute of Chemical Technology: Prague; FIZ CHEMIE GmbH: Berlin, 1993.
93-cib	Cibulka, I. Saturated Liquid densities of 1-Alkanols from C_1 to C_{10} and n-Alkanes from C_5 to C_{16} : A Critical Evaluation of Experimental Data. <i>Fluid Phase Equilib.</i> 1993 , <i>89</i> , 1–18.
93-mal/pri	Malhotra, R.; Price, W. E.; Woolf, L. A. Thermody- namic Properties of Pentan-3-one at Temperatures from 278 K to 338 K and Pressures from 0.1 MPa to 380 MPa. <i>J. Chem. Thermodyn.</i> 1993 , <i>25</i> , 361– 366.
93-saf/oso	Safarov, M. M.; Osoev, R. Sh. Density of Diheptyl Ether in Liquid Phase. <i>InzhFiz. Zh.</i> 1993 , <i>64</i> (4), 440 (in Russian).
94-cib/zik	Cibulka. I.; Ziková, M. Liquid Densities at Elevated Pressure of 1-Alkanols from C ₁ to C ₁₀ : A Critical Evaluation of Experimental Data. <i>J. Chem. Eng.</i> <i>Data</i> 1994 , <i>39</i> , 876–886.
94-mus/tag	Mustafaev, R. A.; Tagiev, S. I.; Bairamov, N. M.; Gabulov, D. M. Experimental Observation of Den- sity of Methyl Benzoate in a Wide Interval of Temperatures and Pressures. <i>Teplofiz. Vys. Temp.</i> 1994 , <i>32</i> , 135–138 (in Russian).
94-sen	Senger, M. Bestimmung der P,V,T-Reinstoffdaten verschiedener aliphatischer Ether bei unterschiedli- chen Temperaturen und Drucken bis 2000 bar (Determination of PVT Data of Various Pure Ali- phatic Ethers at Different Temperatures and Pres- sures up to 2000 bar). Thesis, Heidelberg Univer- sity, Germany, 1994, 97 pp (in German).
95-mie/osw	Mier, W.; Oswald, G.; Tusel-Langer, E.; Lichtentha- ler, R. N. Excess Enthalpy H ^E of Binary Mixtures Containing Alkanes, Ethanol, and Ethyl-Tert. Butyl Ether (ETBE). <i>Ber. Bunsen-Ges. Phys. Chem.</i> 1995 , <i>99</i> , 1123–1130.
95-pul/gud	Pulliam, M. K.; Gude, M. T.; Teja, A. S. Critical Temperatures and Densities of n-Alkanones. <i>J.</i> <i>Chem. Eng. Data</i> 1995 , <i>40</i> , 455–458.
96-cib/hne	Cibulka, I.; Hnědkovský, L. Liquid Densities at Elevated Pressure of n- Alkanes from C_5 to C_{16} : A Critical Evaluation of Experimental Data. <i>J. Chem. Eng. Data</i> 1996 , <i>41</i> , 657–668.
96-gov/let	Govender, U. P.; Letcher, T. M.; Garg, S. K.; Ahluwalia, J. C. Effect of Temperature and Pressure on the Volumetric Properties of Branched and Cyclic Ethers. <i>J. Chem. Eng. Data</i> 1996 , <i>41</i> , 147–150.
96-zab/ruz	Zábranský, M.; Růžička, V.; Majer, V.; Domalski, E. S. Heat Capacities of Liquids. Review and Recommended Values. <i>J. Phys. Chem. Ref. Data</i> ; Monograph No. 6, American Chemical Society: Washington, DC, 1996.

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