

5.2 Unsaturated Carboxylic Acids

Propenoic acid [79-10-7] $\text{C}_3\text{H}_4\text{O}_2$ MW = 72.06 492

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
285.15	1060.0 ± 2.0	1920-mou/bou ¹⁾
293.00	1051.1 ± 2.0	1920-mou/bou ¹⁾
293.15	1045.3 ± 0.8	1957-ano-10
293.15	1045.5 ± 0.6	1968-ano
293.15	1045.4 ± 0.6	Recommended

¹⁾ Not included in calculation of recommended value.

2-Butenoic acid [3724-65-0] $\text{C}_4\text{H}_6\text{O}_2$ MW = 86.09 493

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	1008.3 ± 0.8	1955-ano-13

(E)-2-Butenoic acid [107-93-7] $\text{C}_4\text{H}_6\text{O}_2$ MW = 86.09 494

Table 1. Experimental values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
<i>crystal</i>		
293.15	1018.0 ± 3.0	1955-ano-13
<i>liquid</i>		
353.15	968.0 ± 0.5	1955-ano-13

3-Butenoic acid [625-38-7] $\text{C}_4\text{H}_6\text{O}_2$ MW = 86.09 495

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{\text{c,w}} = 6.0175 \cdot 10^{-1}$ (combined temperature ranges, weighted), $\sigma_{\text{c,uw}} = 2.4349 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	$T = 293.15 \text{ to } 357.85 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.29606 \cdot 10^3$
B	$-9.75763 \cdot 10^{-1}$

cont.

3-Butenoic acid (cont.)

Table 2. Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
293.15	1009.10 ± 1.00	-0.92	1924-bru(Δ)	314.55	989.50 ± 0.60	0.36	1948-jef/vog(\square)
293.15	1009.60 ± 1.00	-0.42	1933-lin/nob(\circ)	334.95	969.30 ± 0.60	0.07	1948-jef/vog(\square)
293.15	1010.80 ± 0.60	0.78	1948-jef/vog(\square)	357.85	947.00 ± 0.60	0.12	1948-jef/vog(\square)

Further references: [1902-fic/son, 1948-let/tra].

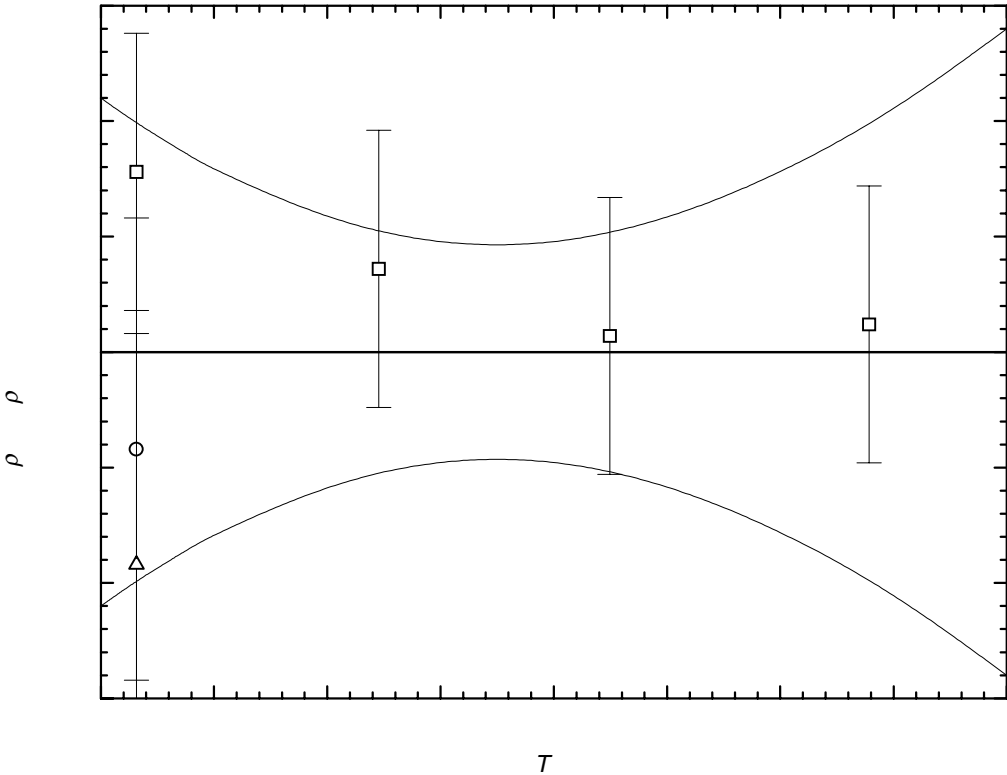


Fig. 1. The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

cont.

Table 3. Recommended values (fit to the reliable experimental values according to the equations $\rho = A + BT + CT^2 + DT^3 + \dots$ or $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$).

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	1013.09 ± 1.10	310.00	993.58 ± 0.57	350.00	954.54 ± 0.77
293.15	1010.02 ± 0.99	320.00	983.82 ± 0.46	360.00	944.79 ± 1.04
298.15	1005.14 ± 0.84	330.00	974.06 ± 0.46	370.00	935.03 ± 1.40
300.00	1003.33 ± 0.79	340.00	964.30 ± 0.57		

2-Methyl-2-propenoic acid [79-41-4] $\text{C}_4\text{H}_6\text{O}_2$ MW = 86.09 496

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	1015.3 ± 2.0	1880-bru-3

(E)-2-Methyl-2-butenic acid [80-59-1] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 497

Table 1. Fit with estimated B coefficient for 3 accepted points. Deviation $\sigma_w = 0.303$.

Coefficient	$\rho = A + BT$
A	1271.05
B	-0.880

Table 2. Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
349.15	964.1 ± 2.0	0.31	1893-eyk
354.15	959.5 ± 2.0	0.11	1919-eyk
372.65	942.7 ± 2.0	-0.41	1923-von-1

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
340.00	971.8 ± 2.6
350.00	963.0 ± 2.0
360.00	954.2 ± 1.8
370.00	945.4 ± 2.1
380.00	936.6 ± 2.8

(Z)-2-Methyl-2-butenic acid [565-63-9] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 498

Table 1. Fit with estimated B coefficient for 2 accepted points. Deviation $\sigma_w = 0.486$.

Coefficient	$\rho = A + BT$
A	1289.57
B	-0.960

Table 2. Experimental values with uncertainties and deviation from calculated values.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ $\text{kg} \cdot \text{m}^{-3}$	$\rho_{\text{exp}} - \rho_{\text{calc}}$ $\text{kg} \cdot \text{m}^{-3}$	Ref.
349.15	953.9 ± 2.0	-0.49	1893-eyk
319.85	983.0 ± 2.0	0.49	1919-eyk
372.75	929.8 ± 3.0	-1.93	1923-von-1 ¹⁾

¹⁾ Not included in calculation of linear coefficients.

Table 3. Recommended values.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ $\text{kg} \cdot \text{m}^{-3}$
310.00	992.0 ± 2.8
320.00	982.4 ± 1.9
330.00	972.8 ± 1.4
340.00	963.2 ± 1.4
350.00	953.6 ± 2.0

3-Methyl-2-butenic acid [541-47-9] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 499

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ $\text{kg} \cdot \text{m}^{-3}$	Ref.
353.15	948.3 ± 2.0	1919-eyk

3-Methyl-3-butenic acid [1617-31-8] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 500

Table 1. Experimental and recommended values with uncertainties.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ $\text{kg} \cdot \text{m}^{-3}$	Ref.
293.15	980.0 ± 1.0	1945-boe
293.15	982.4 ± 2.0	1946-moo/clo
293.15	987.3 ± 4.0	1950-mor/mar ¹⁾
293.15	980.5 ± 1.0	Recommended

¹⁾ Not included in calculation of recommended value.

2-Methylenebutanoic acid [3586-58-1] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 501

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	991.0 ± 1.0	1952-pri/cyp

(E)-2-Pentenoic acid [13991-37-2] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 502

Table 1. Fit with estimated B coefficient for 5 accepted points. Deviation $\sigma_w = 1.230$.

Coefficient	$\rho = A + BT$
A	1279.97
B	-1.000

Table 2. Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
273.15	1007.4 ± 1.0	0.58	1893-men/pan	293.15	990.3 ± 2.0	3.48	1933-boo/lin ¹⁾
288.15	992.1 ± 1.0	0.28	1893-men/pan	293.15	988.6 ± 1.0	1.78	1937-sch-4
323.15	955.0 ± 1.0	-1.82	1893-men/pan	296.15	983.0 ± 1.0	-0.82	1962-sli/mai
289.70	993.5 ± 2.0	3.23	1923-von-1 ¹⁾				

¹⁾ Not included in calculation of linear coefficients.

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	1010.0 ± 2.8
280.00	1000.0 ± 2.0
290.00	990.0 ± 1.5
293.15	986.8 ± 1.4
298.15	981.8 ± 1.4
310.00	970.0 ± 2.1
320.00	960.0 ± 2.9
330.00	950.0 ± 3.8

(Z)-2-Pentenoic acid [16666-42-5] $\text{C}_5\text{H}_8\text{O}_2$ MW = 100.12 503

Table 1. Fit with estimated B coefficient for 3 accepted points. Deviation $\sigma_w = 1.007$.

Coefficient	$\rho = A + BT$
A	1204.04
B	-0.740

cont.

(Z)-2-Pentenoic acid (cont.)**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
288.15	992.0 ± 2.0	1.19	1929-bou-1
294.15	988.0 ± 2.0	1.63	1929-bou-1
293.15	986.4 ± 1.0	-0.71	1938-sch-5

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	996.8 ± 2.2
290.00	989.4 ± 1.8
293.15	987.1 ± 1.8
298.15	983.4 ± 1.9

(E)-3-Pentenoic acid

[1617-32-9]



MW = 100.12

504

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
291.95	988.5 ± 2.0	1923-von-1 ¹⁾
293.15	985.0 ± 1.0	1933-lin/nob
293.15	984.9 ± 1.0	1937-sch-4
293.15	985.0 ± 1.0	Recommended

¹⁾ Not included in calculation of recommended value.**(Z)-3-Pentenoic acid**

[33698-87-2]



MW = 100.12

505

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	982.4 ± 2.0	1938-sch-5

4-Pentenoic acid

[591-80-0]



MW = 100.12

506

Table 1. Fit with estimated B coefficient for 8 accepted points. Deviation $\sigma_w = 1.275$.

Coefficient	$\rho = A + BT$
A	1265.99
B	-0.980

cont.

Table 2. Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	973.8 ± 2.0	-0.01	1886-per	273.15	998.7 ± 2.0	0.39	1896-mar
288.15	983.2 ± 2.0	-0.37	1886-per	291.15	984.3 ± 2.0	3.63	1896-mar
285.15	986.0 ± 2.0	-0.55	1886-per	290.00	984.9 ± 2.0	3.11	1919-eyk
280.65	990.3 ± 0.6	-0.66	1891-gla	293.15	979.8 ± 2.0	1.09	1933-lin/ryd

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	1001.4 ± 2.5
280.00	991.6 ± 2.1
290.00	981.8 ± 2.2
293.15	978.7 ± 2.3
298.15	973.8 ± 2.5

2,3-Dimethyl-2-butenic acid

[4411-97-6]

 $\text{C}_6\text{H}_{10}\text{O}_2$

MW = 114.14

507

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
351.95	927.2 ± 1.0	1919-eyk

(E)-2-Hexenoic acid

[13419-69-7]

 $\text{C}_6\text{H}_{10}\text{O}_2$

MW = 114.14

508

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
295.65	972.0 ± 2.0	1893-eyk
350.55	912.0 ± 1.0	1919-eyk

(E)-3-Hexenoic acid

[1577-18-0]

 $\text{C}_6\text{H}_{10}\text{O}_2$

MW = 114.14

509

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
296.15	964.0 ± 2.0	1893-eyk

2-Heptenoic acid [18999-28-5] $C_7H_{12}O_2$ MW = 128.17 510

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
285.75	957.6 ± 1.0	1919-eyk

2-Octenoic acid [1470-50-4] $C_8H_{14}O_2$ MW = 142.2 511

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
289.15	927.0 ± 2.0	1938-van-5

(Z)-2-Octenoic acid [1577-96-4] $C_8H_{14}O_2$ MW = 142.2 512

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	923.4 ± 1.0	1959-kni/dia

(E)-3-Octenoic acid [5163-67-7] $C_8H_{14}O_2$ MW = 142.2 513

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	937.8 ± 1.0	1959-kni/dia

(Z)-3-Octenoic acid [5169-51-7] $C_8H_{14}O_2$ MW = 142.2 514

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	935.2 ± 1.0	1959-kni/dia

(E)-4-Octenoic acid [18776-92-6] $C_8H_{14}O_2$ MW = 142.2 515

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	931.3 ± 1.0	1959-kni/dia

(Z)-4-Octenoic acid [18654-81-4] $\text{C}_8\text{H}_{14}\text{O}_2$ MW = 142.2 516

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	930.1 ± 1.0	1959-kni/dia

(E)-6-Octenoic acid [1577-21-5] $\text{C}_8\text{H}_{14}\text{O}_2$ MW = 142.2 517

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	942.2 ± 1.0	1959-kni/dia

(Z)-6-Octenoic acid [96962-86-6] $\text{C}_8\text{H}_{14}\text{O}_2$ MW = 142.2 518

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	937.8 ± 1.0	1959-kni/dia

2-Decenoic acid [3913-85-7] $\text{C}_{10}\text{H}_{18}\text{O}_2$ MW = 170.25 519

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
291.15	928.0 ± 2.0	1951-gor

(Z)-3-Decenoic acid [2430-93-5] $\text{C}_{10}\text{H}_{18}\text{O}_2$ MW = 170.25 520

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
291.15	914.0 ± 3.0	1951-gor

9-Undecenoic acid [593-25-9] $\text{C}_{11}\text{H}_{20}\text{O}_2$ MW = 184.28 521

Table 1. Fit with estimated B coefficient for 2 accepted points. Deviation $\sigma_w = 0.012$.

Coefficient	$\rho = A + BT$
A	1130.08
B	-0.750

cont.

9-Undecenoic acid (cont.)**Table 2.** Experimental values with uncertainties and deviation from calculated values.

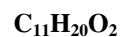
T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m ⁻³	Ref.
297.15	907.2 ± 1.0	-0.01	1893-eyk
353.05	865.3 ± 1.0	0.01	1893-eyk

Table 3. Recommended values.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³
290.00	912.6 ± 3.6
293.15	910.2 ± 3.3
298.15	906.5 ± 2.8
310.00	897.6 ± 1.8
320.00	890.1 ± 1.0
330.00	882.6 ± 1.0
340.00	875.1 ± 1.7
350.00	867.6 ± 2.6
360.00	860.1 ± 3.6

10-Undecenoic acid

[112-38-9]



MW = 184.28

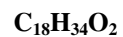
522

Table 1. Experimental values with uncertainties.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
307.75	897.0 ± 1.0	1919-eyk
351.75	846.2 ± 1.0	1919-eyk

(E)-9-Octadecenoic acid

[112-79-8]



MW = 282.47

523

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
352.55	850.5 ± 1.0	1893-eyk

(Z)-9-Octadecenoic acid**[112-80-1]****C₁₈H₃₄O₂****MW = 282.47****524**

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction): $\sigma_{c,w} = 4.2957 \cdot 10^{-1}$ (combined temperature ranges, weighted), $\sigma_{c,uw} = 1.2047 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	T = 288.15 to 363.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.01172 \cdot 10^3$
B	$-2.03481 \cdot 10^{-1}$
C	$-7.19791 \cdot 10^{-4}$

Table 2. Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
288.15	893.90 ± 0.50	0.58	1935-kef/mcl(○)	298.15	886.60 ± 0.40	-0.47	1990-ber/esq(□)
293.15	890.50 ± 0.50	0.29	1935-kef/mcl(○)	303.15	883.90 ± 0.40	0.01	1990-ber/esq(□)
298.15	887.00 ± 0.50	-0.07	1935-kef/mcl(○)	308.15	880.70 ± 0.40	0.03	1990-ber/esq(□)
303.15	883.50 ± 0.50	-0.39	1935-kef/mcl(○)	313.15	877.00 ± 0.40	-0.41	1990-ber/esq(□)
333.15	863.40 ± 0.50	-0.64	1935-kef/mcl(○)	318.15	874.70 ± 0.40	0.57	1990-ber/esq(□)
363.15	842.90 ± 0.60	-0.00	1935-kef/mcl(○)	323.15	871.40 ± 0.40	0.60	1990-ber/esq(□)
293.15	890.10 ± 0.40	-0.11	1990-ber/esq(□)				

Further references: [1893-eyk, 1980-edu/boy, 1993-yan/mae].

Table 3. Recommended values (fit to the reliable experimental values according to the equations $\rho = A + BT + CT^2 + DT^3 + \dots$ or $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$).

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	898.31 ± 0.76	300.00	885.89 ± 0.46	340.00	859.33 ± 0.50
290.00	892.18 ± 0.57	310.00	879.47 ± 0.41	350.00	852.33 ± 0.65
293.15	890.21 ± 0.53	320.00	872.90 ± 0.40	360.00	845.18 ± 0.88
298.15	887.07 ± 0.48	330.00	866.19 ± 0.43	370.00	837.89 ± 1.21

cont.

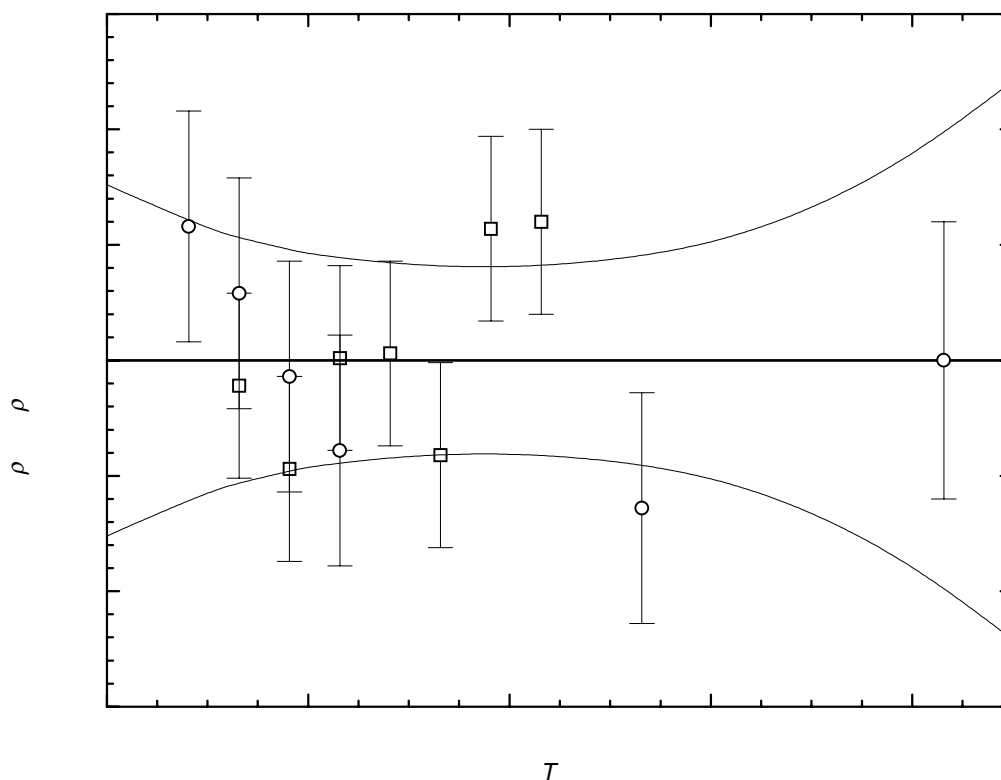
(Z)-9-Octadecenoic acid (cont.)

Fig. 1. The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

(E)-13-Docosenoic acid [506-33-2] $C_{22}H_{42}O_2$ MW = 338.57 525

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
330.25	858.5 ± 2.0	1893-eyk

(Z)-13-Docosenoic acid [112-86-7] $C_{22}H_{42}O_2$ MW = 338.57 526

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
328.55	860.2 ± 1.0	1893-eyk