

## 4.3 Fluorocycloalkanes

**Octafluorocyclobutane** [115-25-3] **C<sub>4</sub>F<sub>8</sub>** **MW = 200.03** **861**

$T_c = 388.37$  K [1959-dou/moo]

$\rho_c = 615.90$  kg·m<sup>-3</sup> [1959-dou/moo]

**Table 1.** Coefficients for the polynomial expansion equations. Standard deviations (see introduction):

$\sigma_t = 1.0007$  (low temperature range),  $\sigma_{c,w} = 1.1443$  (combined temperature ranges, weighted),

$\sigma_{c,uw} = 4.2011 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

| Coefficient | $T = 235.44$ to $310.00$ K<br>$\rho = A + BT + CT^2 + DT^3 + \dots$ | $T = 310.00$ to $388.37$ K<br>$\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)]$<br>$[\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$ |
|-------------|---|--|
| <i>A</i>    | $2.11254 \cdot 10^{-3}$   | 3.07861  |
| <i>B</i>    | $-1.50403 \cdot 10^{-1}$  | $-8.74197 \cdot 10^{-2}$   |
| <i>C</i>    | $-6.41223 \cdot 10^{-3}$  | $1.14575 \cdot 10^{-3}$  |
| <i>D</i>    |   | $-5.46272 \cdot 10^{-6}$   |

**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)    | $\frac{T}{K}$ | $\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$ | $\frac{\rho_{\text{exp}} - \rho_{\text{c}}}{\text{kg} \cdot \text{m}^{-3}}$ | Ref. (Symbol in Fig. 1) |
|---------------|--|--|----------------------------|---------------|--|---|-------------------------|
| 303.15        | $1450.60 \pm 4.00$   | -27.07   | 1959-dou/moo <sup>1)</sup> | 388.37        | $615.90 \pm 6.00$  | 0.00  | 1959-dou/moo(□)         |
| 323.15        | $1377.70 \pm 4.00$   | -10.71   | 1959-dou/moo <sup>1)</sup> | 235.44        | $1723.00 \pm 2.00$   | 1.31  | 1977-gun/kar(○)         |
| 348.15        | $1248.70 \pm 4.00$   | -2.21  | 1959-dou/moo(□)            | 243.44        | $1696.00 \pm 2.00$   | 0.08  | 1977-gun/kar(○)         |
| 373.15        | $1050.10 \pm 4.00$   | 0.71   | 1959-dou/moo(□)            | 252.96        | $1663.00 \pm 2.00$   | -1.19   | 1977-gun/kar(○)         |
| 388.15        | $709.40 \pm 5.00$  | 3.29   | 1959-dou/moo(□)            | 263.81        | $1625.00 \pm 2.00$   | -1.60   | 1977-gun/kar(○)         |

<sup>1)</sup> Not included in Fig. 1.

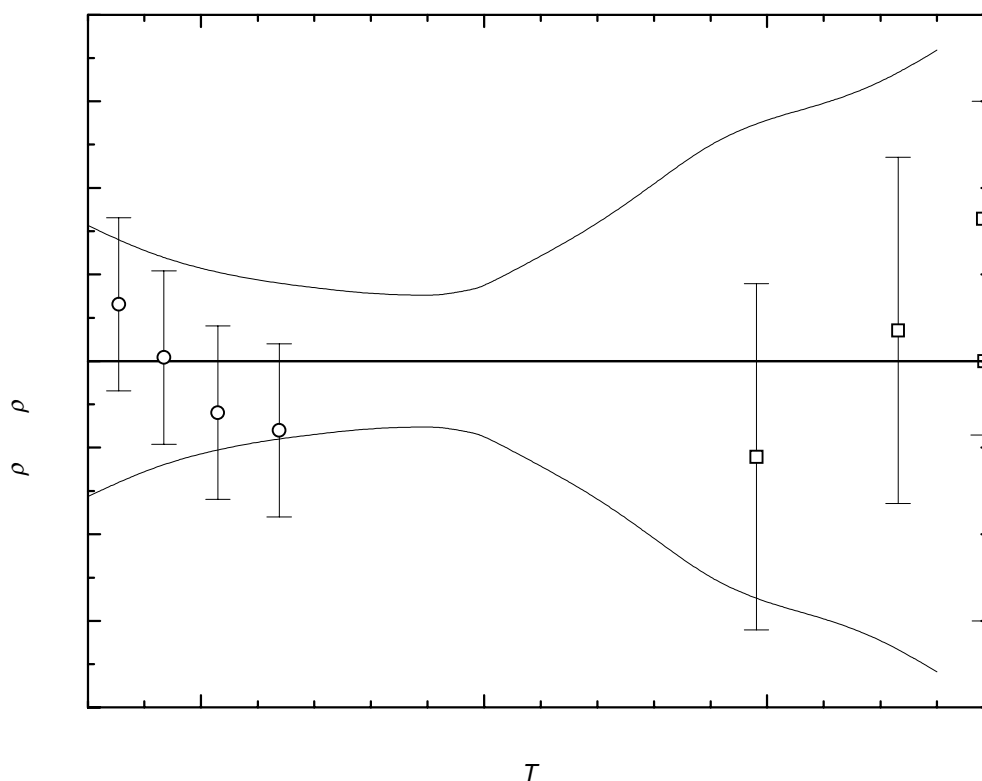
**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4].$$

| $\frac{T}{K}$ | $\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$ | $\frac{T}{K}$ | $\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$ | $\frac{T}{K}$ | $\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$ |
|---------------|--|---------------|--|---------------|--|
| 230.00        | $1738.74 \pm 3.13$   | 290.00        | $1529.66 \pm 1.51$   | 330.00        | $1352.97 \pm 4.09$   |
| 240.00        | $1707.10 \pm 2.52$   | 293.15        | $1517.41 \pm 1.54$   | 340.00        | $1298.53 \pm 5.06$   |
| 250.00        | $1674.18 \pm 2.12$   | 298.15        | $1497.70 \pm 1.66$   | 350.00        | $1239.47 \pm 5.60$   |
| 260.00        | $1639.97 \pm 1.86$   | 300.00        | $1490.32 \pm 1.73$   | 360.00        | $1170.95 \pm 5.93$   |
| 270.00        | $1604.48 \pm 1.69$   | 310.00        | $1449.70 \pm 2.42$   | 370.00        | $1083.49 \pm 6.41$   |
| 280.00        | $1567.71 \pm 1.55$   | 320.00        | $1404.09 \pm 3.16$   | 380.00        | $956.30 \pm 7.18$  |

cont.

## Octafluorocyclobutane (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.)

**Tetradecafluoroethylcyclopentane** [374-81-2]  $\text{C}_7\text{F}_{14}$  MW = 350.05 862

**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               | $1770.70 \pm 2.00$   | 1947-fow/ham |

**(Trifluoromethyl)undecafluorocyclohexane** [355-02-2]  $\text{C}_7\text{F}_{14}$  MW = 350.05 863

**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.         |
|----------------------|--|--------------|
| 293.15               | $1799.60 \pm 2.00$   | 1947-fow/ham |
| 298.15               | $1787.51 \pm 2.00$   | 1948-lag/woo |
| 298.15               | $1784.10 \pm 2.00$   | 1989-nar/swa |

**Decafluoro-5,6-  
bis(trifluoromethyl)cyclohexane****[306-98-9]****C<sub>8</sub>F<sub>16</sub>****MW = 400.06****864****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               | 1867.20 $\pm$ 2.00   | 1947-fow/ham |

**Decafluoro-4,6-  
bis(trifluoromethyl)cyclohexane****[335-27-3]****C<sub>8</sub>F<sub>16</sub>****MW = 400.06****865****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               | 1856.00 $\pm$ 2.00   | 1947-fow/ham |

**Decafluoro-3,6-  
bis(trifluoromethyl)cyclohexane****[374-77-6]****C<sub>8</sub>F<sub>16</sub>****MW = 400.06****866****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               | 1850.30 $\pm$ 2.00   | 1947-fow/ham |

**Nonafluoro-1,3,5-  
tris(trifluoromethyl)cyclohexane****[374-76-5]****C<sub>9</sub>F<sub>18</sub>****MW = 450.07****867****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               | 1902.50 $\pm$ 2.00   | 1947-fow/ham |