THERMAL PROPERTIES OF MERCURY

Lev R. Fokin

The first of these tables gives the molar heat capacity at constant pressure of liquid and gaseous mercury as a function of temperature. To convert to specific heat in units of J/g K, divide these values by 200.59, the atomic weight of mercury.

	C_p/(J/mol K)			C_p/(J/mol K)			C_p/(J/mol K)	
t/°C	**Liquid**	**Gas**	***t***/°C	**Liquid**	**Gas**	***t***/°C	**Liquid**	**Gas**
–38.84	28.2746	20.786	140	27.3675	20.786	340	27.1500	20.836
–20	28.1466	20.786	160	27.3090	20.786	356.73	27.1677	20.849
0	28.0190	20.786	180	27.2588	20.790	360	27.1709	20.853
20	27.9002	20.786	200	27.2169	20.790	380	27.1981	20.870
25	27.8717	20.786	220	27.1834	20.794	400	27.2324	20.891
40	27.7897	20.786	240	27.1583	20.794	420	27.2738	20.916
60	27.6880	20.786	260	27.1412	20.799	440	27.3207	20.941
80	27.5952	20.786	280	27.1320	20.807	460	27.3742	20.974
100	27.5106	20.786	300	27.1303	20.815	480	27.4332	21.008
120	27.4349	20.786	320	27.1366	20.824	500	27.4985	21.046

Reference

Douglas, T. B., Ball, A. T., and Ginnings, D. C., *J. Res. Natl. Bur. Stands.*, 46, 334, 1951.

The second table gives the molar heat capacity of solid mercury in its rhombohedral (α–mercury) form.

t/°C	C_p/(J/mol K)	***t***/°C	C_p/(J/mol K)	***t***/°C	C_p/(J/mol K)	***t***/°C	C_p/(J/mol K)
–268.99	0.99*	–248.15	12.74	–193.15	23.16	–93.15	26.69
–268.99	0.97**	–243.15	14.78	–183.15	23.76	–73.15	27.28
–268.15	1.6	–233.15	17.90	–173.15	24.24	–53.15	27.96
–263.15	4.6	–223.15	19.94	–153.15	25.00	–38.87	28.5
–258.15	7.6	–213.15	21.40	–133.15	25.61		
–253.15	10.33	–203.15	22.42	–113.15	26.15		

* Superconducting state
**Normal state

References

1. Busey and Giaque, *J. Am. Chem. Soc.*, 75, 806, 1953.
2. Amitin, Lebedeva, and Paukov, *Rus. J. Phys. Chem.*, 2666, 1979.

The final table gives the cubic thermal expansion coefficient α, the isothermal compressibility coefficient κ_T, and the speed of sound U for liquid mercury as a function of temperature. These properties are defined as follows:

$$\alpha = \frac{1}{v}\left(\frac{\partial v}{\partial T}\right)_p \qquad \kappa_T = -\frac{1}{v}\left(\frac{\partial v}{\partial P}\right)_T \qquad U^2 = \left(\frac{\partial P}{\partial \rho}\right)_s \qquad \rho = v^{-1}$$

where v is the specific volume (given in the table on the preceding page).

		$\kappa_T \times 10^6$/bar^{-1}				$\kappa_T \times 10^6$/bar^{-1}			
t/°C	**α × 10⁴/K⁻¹**	**At 1 bar**	**At 1000 bar**	***U*/m s⁻¹**	***t***/°C	**α × 10⁴/K⁻¹**	**At 1 bar**	**At 1000 bar**	***U*/m s⁻¹**
–20	1.818	3.83		1470	120	1.8058	4.513	4.33	1404.7
0	1.8144	3.918	3.78	1460.8	140	1.8074	4.622		1395.4
20	1.8110	4.013	3.87	1451.4	160	1.8100	4.731	4.53	1386.1
40	1.8083	4.109	3.96	1442.0	180	1.8136	4.844		1376.7
60	1.8064	4.207		1432.7	200	1.818	4.96		1367
80	1.8053	4.308	4.14	1423.4	250	1.834	5.26		1344
100	1.8051	4.410		1414.1	300	1.856	5.59		1321

Reference

Vukalovich, M. P., et al., *Thermophysical Properties of Mercury*, Moscow Standard Press, 1971.