

PROPERTIES OF ICE AND SUPERCOOLED WATER

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The common form of ice at ambient pressure is hexagonal ice, designated as ice Ih (see phase diagram in Section 12). The data given here refer to that form, at standard atmospheric pressure (101.325 kPa). Data have been taken from the references indicated, which in most cases are formulations based on critical evaluation of available experimental data. Most properties are sensitive to the method of preparation of the sample, since air and other gases are sometimes occluded. For this reason, there is often disagreement among values in the literature. For all properties except the dielectric constant of ice, the cited reference contains information on the uncertainty of the property.

Density of supercooled water (Refs. 1, 2)

$t / ^\circ\text{C}$	$\rho / \text{g cm}^{-3}$
0	0.99984
-5	0.9993
-10	0.9981
-15	0.9963
-20	0.9935
-25	0.9896
-30	0.9839
-35	0.9754

Phase Transition Properties (Ref. 3)

$$\Delta_{\text{fus}}H(0^\circ\text{C}) = 333.4 \text{ J/g}$$

$$\Delta_{\text{subl}}H(0^\circ\text{C}) = 2834 \text{ J/g}$$

Thermophysical Properties of Ice Ih

ρ : mass density (Refs. 3, 4)

α_V : cubic expansion coefficient, $\alpha_V = -(1/V)(\partial V/\partial T)_p$ (Refs. 3, 4)

κ_S : isentropic compressibility, $\kappa_S = -(1/V)(\partial V/\partial p)_S$ (Refs. 3, 4)

c_p : specific heat capacity at constant pressure (Refs. 3, 4)

k : thermal conductivity (Refs. 5, 6)

ε : static dielectric constant (relative permittivity) (Ref. 7)

$t / ^\circ\text{C}$	$\rho / \text{g cm}^{-3}$	$10^3 \alpha_V / \text{K}^{-1}$	$\kappa_S / \text{GPa}^{-1}$	$c_p / \text{J g}^{-1} \text{K}^{-1}$	$k / \text{W m}^{-1} \text{K}^{-1}$	ε
0	0.9167	0.160	0.114	2.10	2.16	91.2
-10	0.9182	0.155	0.113	2.02	2.26	95.1
-20	0.9196	0.150	0.111	1.95	2.38	99.4
-30	0.9209	0.144	0.110	1.88	2.50	104.1
-40	0.9222	0.138	0.108	1.80	2.63	109.2
-50	0.9235	0.132	0.107	1.73	2.77	115.0
-60	0.9247	0.126	0.106	1.66	2.93	121.4
-80	0.9269	0.111	0.103	1.52	3.27	136.6
-100	0.9288	0.095	0.101	1.38	3.69	
-120	0.9304	0.078	0.099	1.25	4.2	
-140	0.9317	0.060	0.097	1.11	4.9	
-160	0.9326	0.041	0.096	0.97	5.7	
-180	0.9332	0.025	0.095	0.82	7.0	
-200	0.9336	0.013	0.095	0.65	8.9	
-220	0.9337	0.0050	0.095	0.47	12.2	
-240	0.9338	0.0012	0.095	0.27	20	
-260	0.9338	0.00008	0.095	0.036		

References

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