PROPERTIES OF ICE AND SUPERCOOLED WATER

The common form of ice at ambient temperature and pressure is hexagonal ice, designated as ice I_h (see phase diagram in Section 12). The data given here refer to that form. Data have been taken from the references indicated; values have been interpolated and smoothed in some cases. All properties are sensitive to the method of preparation of the sample, since air or other gases are sometimes occluded. For this reason there is often disagreement among values found in the literature.

Density values (except at 0°C) and the thermal expansion coefficient were calculated from the temperature variation in the crystal lattice constants of ice (see Ref. 1). The thermal expansion coefficient appears to become negative around –200°C, but there is considerable scatter in the data.

Density of ice I_h and supercooled water in g cm^{-3}

t/°C	ρ (ice)	ρ (supercooled water)
0	0.9167	0.9998
–10	0.9187	0.9982
–20	0.9203	0.9935
–30	0.9216	0.9839
–40	0.9228	
–50	0.9240	
–60	0.9252	
–80	0.9274	
–100	0.9292	
–120	0.9305	
–140	0.9314	
–160	0.9331	
–180	0.9340	
Ref.	1	8

Phase transition properties:

$\Delta_{fus}H$(0°C) = 333.6 J/g (Ref. 2)
$\Delta_{sub}H$(0°C) = 2838 J/g (Ref. 2)

Other properties of ice I_h:

α_V: cubic thermal expansion coefficient, $\alpha_V = -(1/V)(\partial V/\partial t)_p$
κ : adiabatic compressibility, $\kappa = -(1/V)(\partial V/\partial p)_S$
ε : relative permittivity (dielectric constant)
k : thermal conductivity
c_p: specific heat capacity at constant pressure

t/°C	$\alpha_V/10^{-6}$ °C^{-1}	κ/10^{-5} MPa^{-1}	ε	k/W cm^{-1} °C^{-1}	c_p/J g^{-1} °C^{-1}
0	159	13.0	91.6	0.0214	2.11
–10	155	12.8	94.4	0.023	2.03
–20	149	12.7	97.5	0.024	1.96
–30	143	12.5	99.7	0.025	1.88
–40	137	12.4	101.9	0.026	1.80
–50	130	12.2	106.9	0.028	1.72
–60	122	12.1	119.5	0.030	1.65
–80	105	11.9		0.033	1.50
–100	85	11.6		0.037	1.36
–120	77	11.4		0.042	1.23
–140	60	11.3		0.049	1.10
–160	45	11.2		0.057	0.97
–180	30	11.1		0.070	0.83
–200		11.0		0.087	0.67
–220		10.9		0.118	0.50
–240		10.9		0.20	0.29
–250		10.9		0.32	0.17
Ref.	1,2,3,5	1,5	6	7	1

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