Supporting Information

Experimental details of conductivity measurements

The conductivity of frozen NaCl/water was measured at 5 kHz with a Hioki chemical impedance mater Model 3532-80. Two Pt electrodes with a diameter of 0.2 mm and a Pt resistance thermometer were tightly held between two acrylic frames (20mm×20mm and 3mm thickness). The gap between two electrodes was ca. 1 mm. The cell was fixed on the copper plate, which was glued on a Peltier array with silver paste. The surface of copper plate was electrically insulated with Teflon tape. The Peltier array was controlled by a Cell System PID controller Model TDC-2030R. An appropriate amount of an aqueous NaCl solution was put on the gap between the electrodes and was frozen by sufficient cooling. After complete freezing, the temperature dependence of the conductivity was studied.

Table S 1　Data for the FDC and liquid phase in NaCl-water system

freezing point / ℃	Conc. of NaCl in liquid phase			Density of liq. phase / g cm^{-3} [a]
	wt %	M	x	
0	0	0.000	0	0.9998
-0.58	1	0.172	0.003102	1.007
-1.13	2	0.347	0.006247	1.014
-1.72	3	0.524	0.009436	1.021
-2.35	4	0.704	0.012671	1.028
-2.97	5	0.886	0.015952	1.036
-3.63	6	1.071	0.019281	1.043
-4.32	7	1.259	0.022658	1.051
-5.03	8	1.450	0.026085	1.059
-5.77	9	1.643	0.029562	1.067
-6.54	10	1.838	0.033091	1.074
-7.34	11	2.037	0.036672	1.082
-8.17	12	2.236	0.040308	1.089
-9.03	13	2.440	0.043999	1.097
-9.94	14	2.645	0.047747	1.104
-10.88	15	2.854	0.051552	1.112
-11.9	16	3.064	0.055417	1.119
-12.93	17	3.278	0.059342	1.127
-14.03	18	3.496	0.063330	1.135
-15.21	19	3.716	0.067381	1.143
-16.46	20	3.943	0.071497	1.152
-17.78	21	4.165	0.075679	1.159
-19.19	22	4.397	0.079930	1.168
-20.69	23	4.628	0.084251	1.176

a, Density data were taken from “Lange’s Hand book of Chemistry”, Dean,J.A. Ed; McGraw-Hill: New York; 1985, 13th Edition. The comparison of the density data at the freezing points with those at 25 ˚C (ref.21) indicates that the temperature dependence of the density of the liquid phase is not larger than 0.5 %.

The relation between x and the freezing point (t) is represented by

$$x = -1.85\times10^{-9}\,t^5 - 9.96\times10^{-8}\,t^4 - 2.45\times10^{-6}\,t^3 - 1.00\times10^{-4}\,t^2 - 5.64\times10^{-3}\,t$$

Table S 2　Data for the FDC and liquid phase in KCl-water system

freezing point / ℃	Conc. of KCl in liquid phase			Density of liq. phase / g cm^{-3} [a]
	wt %	M	x	
0	0	0	0.000000	0.9998
-0.46	1.00	0.135	0.002435	1.0034
-0.96	2.09	0.283	0.005126	1.0103
-1.39	2.99	0.408	0.007392	1.0161
-1.85	4.01	0.550	0.009990	1.0226
-2.30	5.02	0.693	0.012600	1.0291
-2.83	6.07	0.844	0.015366	1.0359
-3.33	7.07	0.988	0.018031	1.0424
-3.78	7.98	1.121	0.020495	1.0483
-4.40	9.09	1.287	0.023573	1.0557
-4.80	10.04	1.430	0.026239	1.0620
-5.50	11.11	1.593	0.029293	1.0691
-5.97	12.08	1.742	0.032097	1.0756
-6.60	13.25	1.926	0.035566	1.0836
-7.00	13.81	2.014	0.037245	1.0874
-7.82	15.23	2.241	0.041563	1.0971
-8.14	15.74	2.325	0.043169	1.1007
-8.88	17.03	2.535	0.047218	1.1097
-9.50	18.00	2.696	0.050333	1.1165
-10.00	19.00	2.864	0.053600	1.1236
-10.60	20.09	3.049	0.057227	1.1314

The density data at 25 ˚C were taken from ref.21.　On the basis of the inspection on the density data of NaCl solutions, it is assumed that the temperature dependence of KCl solutions is negligible in this temperature range.

The relation between x and t is represented by

$$x = 1.94\times10^{-6}\,t^4 + 3.45\times10^{-5}\,t^3 + 1.67\times10^{-4}\,t^2 - 5.18\times10^{-3}\,t$$

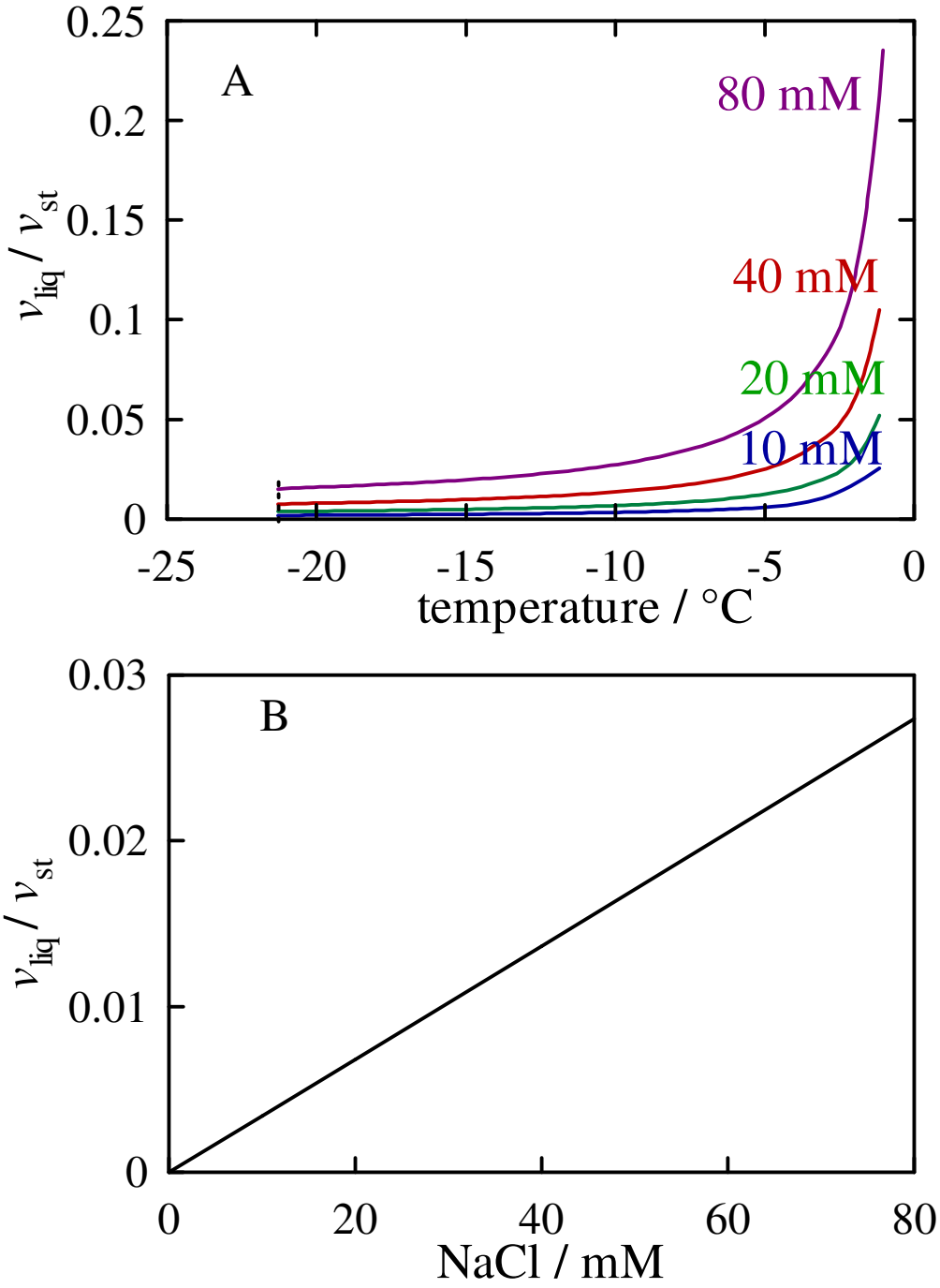

Figure S1 Simulated changes in ν_{liq}/ν_{st} formed in NaCl-doped ice as functions of (A) the temperature and (B) NaCl concentration at -10 ˚C. The vertical broken line indicates the eutectic temperature of the NaCl/water system. The phase diagram predicts that no liquid phase is present at the temperature lower than t_{eu}.

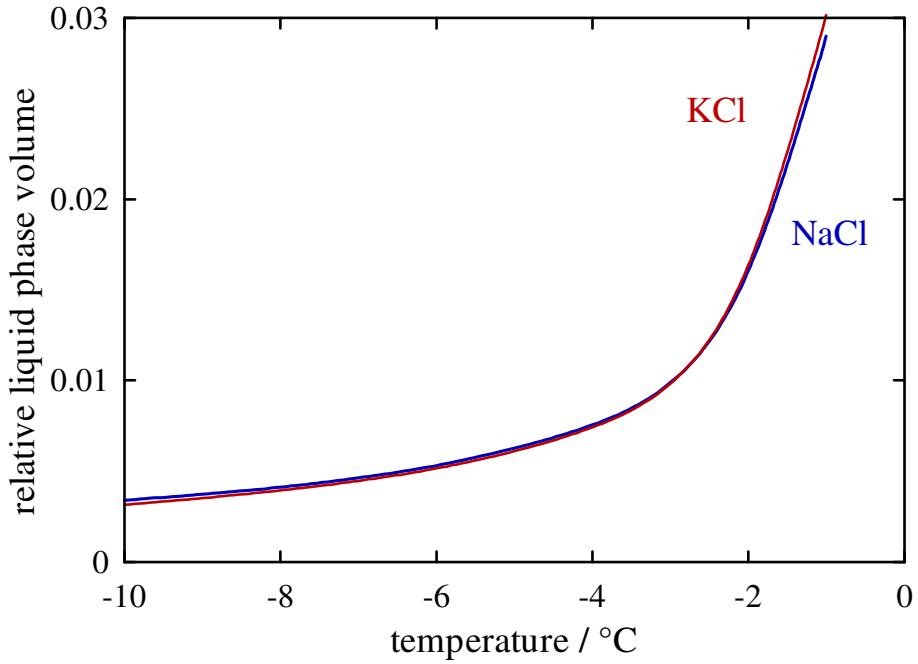

Figure S2 Comparison of the temperature dependences of the relative liquid phase volumes developed in the 10 mM NaCl- and KCl- doped ice

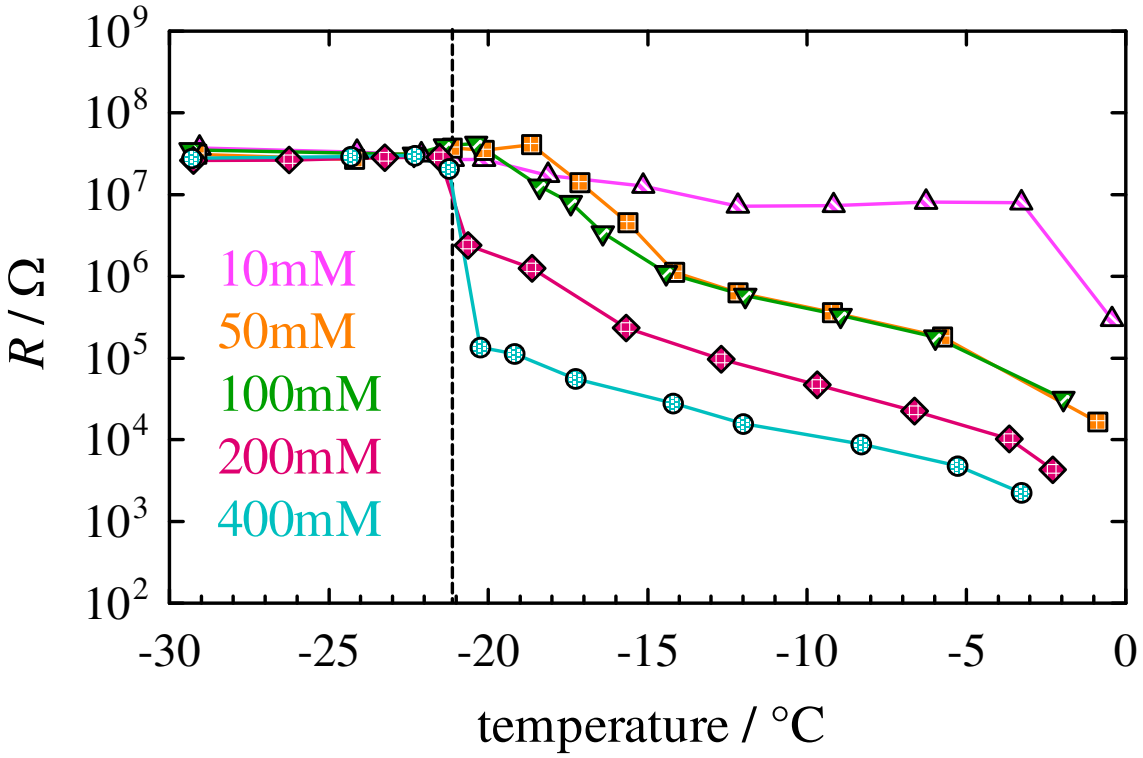

Figure S3 Changes in the resistance of NaCl-doped ice with temperature.

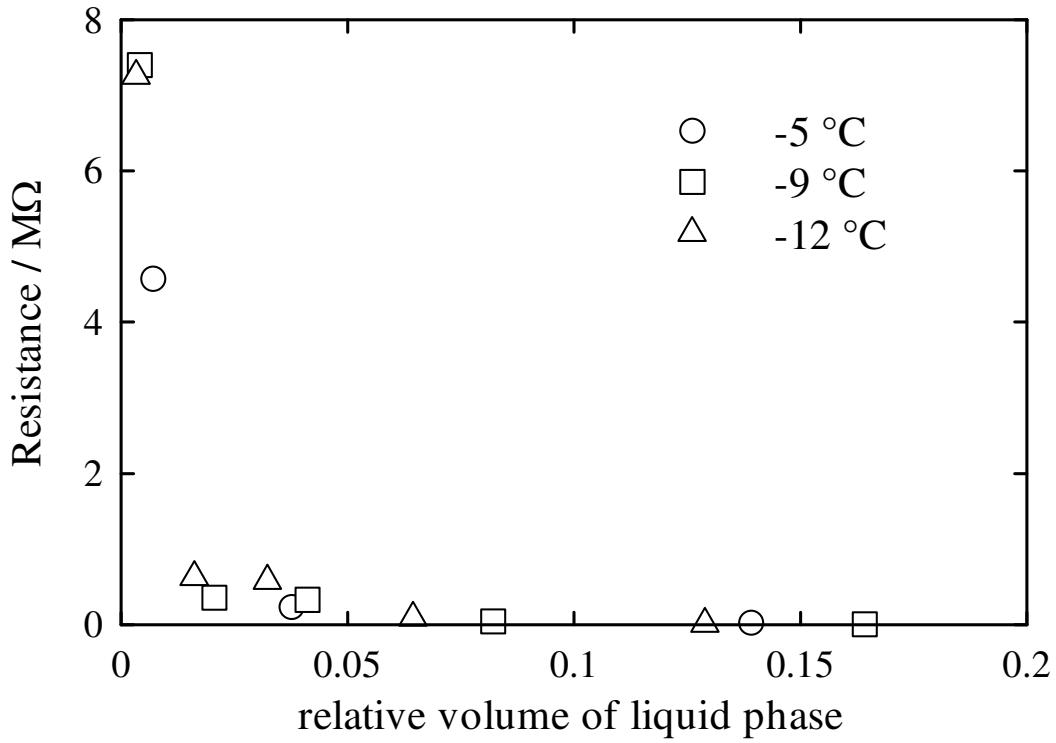

Figure S4 Change in the resistance of NaCl-doped ice as a function of the relative liquid phase volumes of the liquid phase. The resistances measured at -5, -9, and -12 ºC are plotted vs the relative volume of the liquid phase estimated from the NaCl concentration and temperature.