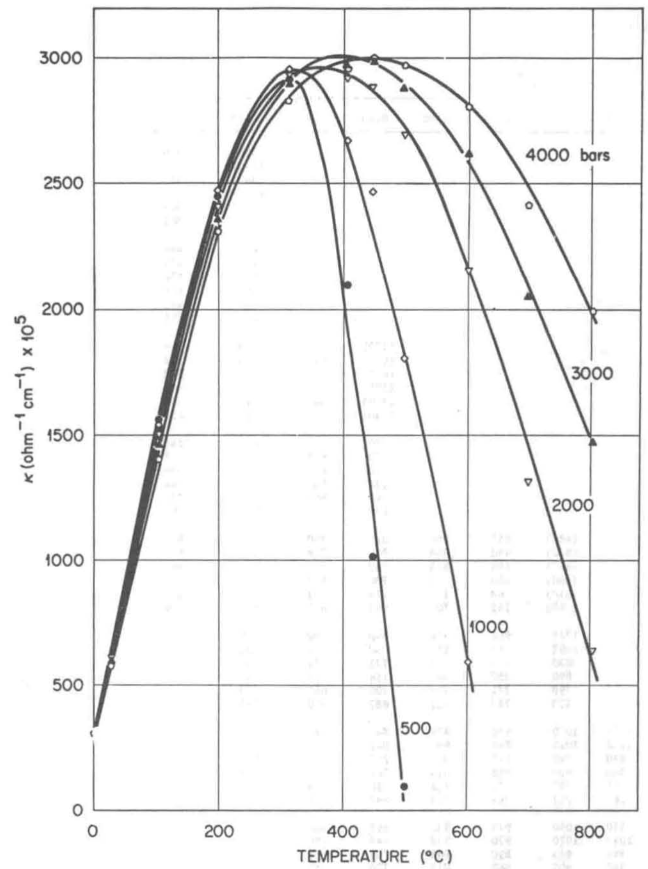

Figure 2. Isobaric variation of the specific conductances of 0.05000 m NaI solutions as a function of temperature at pressures from 500 to 4000 bars.

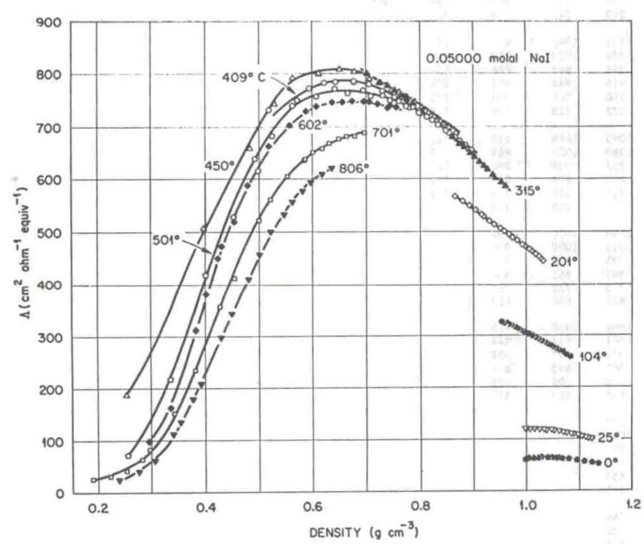

Figure 3. Equivalent conductances of 0.05000 m NaI solutions as a function of density at several temperatures.

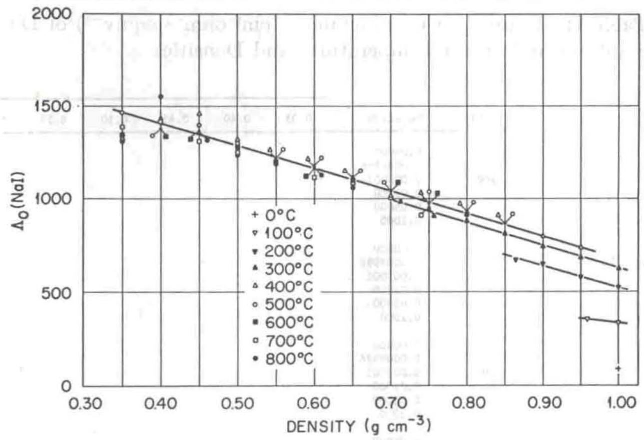

Figure 4. Limiting equivalent conductances of NaI as a function of density at temperatures to 800°.

Fuoss–Onsager–Skinner equation,[11] and the Shedlovsky equation (including an ionization constant)[12] gave essentially identical limiting equivalent conductances. As found previously for NaCl[4] and NaBr,[5] at densities below 0.70 g cm^{-3} the Robinson–Stokes equation did not represent the data as well as the other equations, while below about 0.60 g cm^{-3} only the Shedlovsky equation, which includes an ionization constant, fitted the data satisfactorily.

Limiting equivalent conductances calculated for NaI at the various temperatures and densities are included in Table I, where the (limiting) molality of NaI is set equal to zero. At densities of 0.65 g cm^{-3} and above, the standard errors associated with the Λ_0(NaI) values of Table I are less than 1%. Below this density the uncertainty in the limiting equivalent conductances increases with increasing temperature and decreasing density. Figure 4 shows the linear relationship observed when isothermal values of Λ_0(NaI) from Table I are plotted against the density of the solvent. As found previously with NaCl[4] and NaBr,[5] the limiting equivalent conductance of NaI at constant density increases steadily with temperature, reaching a maximum, constant value at about 400° and above. The deviations from linearity (Figure 4) at high temperatures and at densities below 0.45 g cm^{-3} may be due to difficulty in making accurate experimental measurements at sufficiently low electrolyte concentrations for reliable extrapolation to infinite dilution. The limitation under these conditions is the relatively high solvent conductance.[3]

A linear equation describing the variation of the limiting equivalent conductance of NaI with solvent density (d) in the temperature range 400–800° is given as

$$\Lambda_0(\mathrm{NaI}) = 1897 - 1210d \quad (1)$$

Similar relationships were found previously for $KHSO_4$ (considered as a 1–1 electrolyte),[3] NaCl,[4] NaBr,[5] and HBr.[6]

$$\Lambda_0(\mathrm{KHSO_4}) = 1740 - 1100d \quad (2)$$

$$\Lambda_0(\mathrm{NaCl}) = 1876 - 1160d \quad (3)$$

$$\Lambda_0(\mathrm{NaBr}) = 1880 - 1180d \quad (4)$$

$$\Lambda_0(\mathrm{HBr}) = 1840 - 560d \quad (5)$$

(11) R. M. Fuoss, L. Onsager, and J. F. Skinner, *J. Phys. Chem.*, **69**, 2581 (1965).

(12) T. Shedlovsky, *J. Franklin Institute*, **225**, 739 (1938); R. M. Fuoss and T. Shedlovsky, *J. Amer. Chem. Soc.*, **71**, 1496 (1949).

Table I: Equivalent Conductances ($cm^2\ ohm^{-1}\ equiv^{-1}$) of Dilute Aqueous NaI Solutions at Various Temperatures and Densities

T(°C)	Molality	Density, g cm^{-3} 0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00
	0.00000													(356)	336
	0.0009996													(345)	329
100	0.005001													(340)	320
	0.01000													(336)	315
	0.05000													(322)	309
	0.1000													(315)	301
	0.00000													496	444
	0.0009996													481	434
150	0.005001													472	424
	0.01000													457	414
	0.05000													438	402
	0.1000													432	391
	0.00000											(670)	653	583	526
	0.0009996											(655)	645	563	512
200	0.005001											(630)	602	554	502
	0.01000											(595)	589	545	488
	0.05000											(570)	548	512	469
	0.1000											(540)	540	507	458
	0.00000											780	708	644	586
	0.0009996											770	698	621	569
250	0.005001											720	656	610	559
	0.01000											694	640	602	544
	0.05000											640	605	562	516
	0.1000											629	596	556	505
	0.00000								(986)	955	888	815	750	687	632
	0.0009996								(970)	950	868	805	738	666	611
300	0.005001								(920)	884	822	747	694	645	600
	0.01000								(860)	840	780	730	677	638	586
	0.05000								(810)	768	722	678	641	593	550
	0.1000								(760)	742	707	665	631	585	538
	0.00000								1013	964	910	840	780	718	
	0.0009996								1002	960	888	830	767	701	
350	0.005001								930	888	838	772	721	666	
	0.01000								890	850	802	754	702	659	
	0.05000								798	771	733	700	661	609	
	0.1000								773	748	717	687	650	599	
	0.00000	1320	1430	1460	1310	1220	1180	1115	1030	970	934	867	799	739	
	0.0009996	1076	1175	1190	1200	1180	1155	1102	1015	968	907	847	785	724	
400	0.005001	825	1000	1045	1030	1025	1020	990	940	890	846	790	735	679	
	0.01000	695	820	920	925	940	965	945	900	858	814	766	716	669	
	0.05000	495	655	645	705	760	792	798	795	770	738	710	668	613	
	0.1000	475	600	590	655	720	755	765	767	749	724	697	658	604	
	0.00000	1440	1420	1440	1300	1220	1170	1110	1040	975	936	869	806		
	0.0009996	935	1100	1145	1185	1175	1152	1097	1020	970	908	848	790		
450	0.005001	695	875	980	1005	1015	1010	988	945	890	846	789	738		
	0.01000	575	715	860	900	930	955	940	905	860	817	770	719		
	0.05000	400	550	590	680	745	780	790	788	768	740	712	666		
	0.1000	380	500	545	630	705	741	758	758	746	726	698	658		
	0.00000	1430	1380	1400	1290	1220	1170	1110	1040	975	934	863			
	0.0009996	825	1010	1100	1165	1170	1150	1092	1025	971	906	838			
500	0.005001	590	780	925	980	1005	1000	980	945	890	844	784			
	0.01000	480	630	800	880	920	942	930	900	856	811	764			
	0.05000	320	465	550	655	725	762	778	775	762	738	706			
	0.1000	305	425	500	610	685	722	743	742	738	724	694			
	0.00000	1390	1370	1380	1290	1220	1179	1105	1040	975	927				
	0.0009996	730	945	1060	1150	1160	1145	1088	1023	968	899				
550	0.005001	510	710	870	960	990	987	968	940	886	836				
	0.01000	410	565	755	855	905	920	918	888	851	804				
	0.05000	265	400	505	630	705	745	760	760	751	732				
	0.1000	250	365	460	585	665	701	722	728	726	718				
	0.00000	1340	1370	1360	1280	1210	1160	1095	1040	970	917				
	0.0009996	660	895	1025	1130	1150	1140	1080	1020	964	8				
600	0.005001	450	655	825	930	970	972	955	938	880	824				
	0.01000	350	520	705	830	885	908	903	878	844	790				
	0.05000	220	355	465	605	680	720	735	743	735	721				
	0.1000	205	315	425	555	640	675	700	710	710	707				
	0.00000	1330	1390	1340	1270	1210	1170	1090	1020	960					
	0.0009996	610	855	1000	1105	1135	1130	1071	1008	956					
650	0.005001	405	610	780	900	950	955	935	912	870					
	0.01000	310	480	665	795	865	890	885	862	834					
	0.05000	190	315	435	570	650	692	710	722	717					
	0.1000	175	280	395	520	605	640	672	688	693					
	0.00000	1390	1420	1360	1250	1200	1160	1080	1010	955					
	0.0009996	570	825	980	1075	1115	1120	1061	992	944					
700	0.005001	370	575	740	860	920	935	915	892	858					
	0.01000	285	445	630	760	835	870	865	843	824					
	0.05000	165	280	400	535	610	665	688	700	698					
	0.10000	150	250	360	485	570	612	638	663	674					
	0.00000	1200	1460	1360	1240	1190	1160	1070							
	0.0009996	535	775	950	1045	1090	1110	1048							
750	0.005001	340	545	705	820	885	915	897							
	0.01000	245	415	595	720	800	848	845							
	0.05000	140	250	370	490	570	632	653							
	0.1000	125	220	330	445	525	577	612							
	0.00000	1310	1550	1370	1240	1190	1160	1060							
	0.0009996	505	750	935	1010	1060	1095	1032							
800	0.005001	310	520	670	775	850	892	875							
	0.01000	220	390	560	680	765	825	820							
	0.05000	122	225	345	445	525	595	620							
	0.1000	110	195	305	400	480	540	578							

The significance of this similarity in behavior of 1–1 electrolytes has already been discussed.[4–6]

Calculation of the Complete Ionization Constant of NaI. The ionization of NaI in aqueous solutions can be represented by the equations[7,8]

$$NaI(H_2O)_j + kH_2O \overset{K^0}{\rightleftharpoons} Na(H_2O)_m^+ + I(H_2O)_n^- \quad (6)$$

$$K^0 = a_{Na(H_2O)_m^+}a_{I(H_2O)_n^-}/a_{NaI(H_2O)_j}a_{H_2O}^k \quad (7a)$$

$$= K/a_{H_2O}^k \quad (7b)$$

$$\log K = \log K^0 + k \log a_{H_2O} \quad (8)$$

where K^0 is the complete ionization constant including the hydration reaction and K is the conventional constant. The integers j, m, and n represent hydration