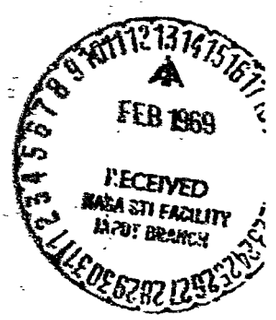
NATIONAL BUREAU OF STANDARDS REPORT

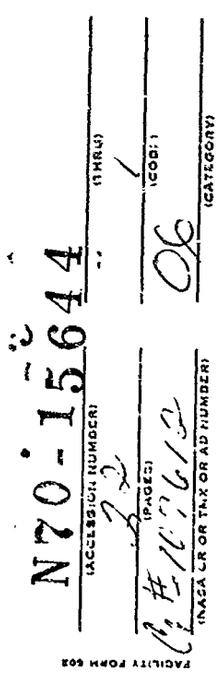
9979

ELECTROCHEMICAL DATA

PART XII

ELECTROLYTIC CONDUCTIVITY OF AQUEOUS SOLUTIONS OF THE SODIUM HALIDES





Prepared for

National Aeronautics and Space Administration

NASA Contract Number: R-09-022-029

NBS

U.S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards[1] was established by an act of Congress March 3, 1901. Today, in addition to serving as the Nation's central measurement laboratory, the Bureau is a principal focal point in the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. To this end the Bureau conducts research and provides central national services in three broad program areas and provides central national services in a fourth. These are: (1) basic measurements and standards, (2) materials measurements and standards, (3) technological measurements and standards, and (4) transfer of technology.

The Bureau comprises the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, and the Center for Radiation Research.

THE INSTITUTE FOR BASIC STANDARDS provides the central basis within the United States of a complete and consistent system of physical measurement, coordinates that system with the measurement systems of other nations, and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of an Office of Standard Reference Data and a group of divisions organized by the following areas of science and engineering:

Applied Mathematics—Electricity—Metrology—Mechanics—Heat—Atomic Physics—Cryogenics[2]—Radio Physics[2]—Radio Engineering[2]—Astrophysics[2]—Time and Frequency.[2]

THE INSTITUTE FOR MATERIALS RESEARCH conducts materials research leading to methods, standards of measurement, and data needed by industry, commerce, educational institutions, and government. The Institute also provides advisory and research services to other government agencies. The Institute consists of an Office of Standard Reference Materials and a group of divisions organized by the following areas of materials research:

Analytical Chemistry—Polymers—Metallurgy—Inorganic Materials—Physical Chemistry.

THE INSTITUTE FOR APPLIED TECHNOLOGY provides for the creation of appropriate opportunities for the use and application of technology within the Federal Government and within the civilian sector of American industry. The primary functions of the Institute may be broadly classified as programs relating to technological measurements and standards and techniques for the transfer of technology. The Institute consists of a Clearinghouse for Scientific and Technical Information,[3] a Center for Computer Sciences and Technology, and a group of technical divisions and offices organized by the following fields of technology:

Building Research—Electronic Instrumentation—Technical Analysis—Product Evaluation—Invention and Innovation—Weights and Measures—Engineering Standards—Vehicle Systems Research.

THE CENTER FOR RADIATION RESEARCH engages in research, measurement, and application of radiation to the solution of Bureau mission problems and the problems of other agencies and institutions. The Center for Radiation Research consists of the following divisions:

Reactor Radiation—Linac Radiation—Applied Radiation—Nuclear Radiation.

---

[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D. C. 20234.
[2] Located at Boulder, Colorado 80302.
[3] Located at 5285 Port Royal Road, Springfield, Virginia 22161.

NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT		NBS REPORT
2110432	January 15, 1969	9979

ELECTROCHEMICAL DATA
PART XII

ELECTROLYTIC CONDUCTIVITY OF AQUEOUS SOLUTIONS OF THE SODIUM HALIDES

by
Harold J. DeWane
and
Walter J. Hamer

Prepared for
National Aeronautics and Space Administration
NASA Contract Number: R-09-022-029

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Electrochemical Data XII. Electrolytic Conductivity of Aqueous Solutions of the Sodium Halides

ABSTRACT

This report gives a critical evaluation of the available data on the electrolytic conductivity of aqueous solutions of sodium chloride at 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 and 55 °C, of sodium iodide at 0, 25, 29.92 and 49.3 °C, and of sodium bromide and fluoride at 25 °C.

I. Introduction

This report gives a critical evaluation of the available data on the electrolytic conductivity of aqueous solutions of the sodium halides. Of the sodium halides the conductivity of sodium chloride solutions has been investigated the most. Thus, we were able to study data on the conductivity of sodium chloride solutions at concentrations ranging from 0.0001 to 5.0 N and at temperatures at 5°C intervals ranging from 0 to 55 °C. Work on the other halides has been confined to 25 °C in the period since 1930, with the exception of one paper in which the measurements were made on sodium iodide at 0, 29.92 and 49.3 °C in the concentration range 1.0 to 7.5 N.

Rounded values of the equivalent conductance are given for the concentration and temperature ranges covered by the experimental data reported in the literature. In addition, in the case of sodium chloride some interpolated results were obtained to fill some gaps at certain concentrations or temperatures. The data was evaluated by the methods described in Part III of this series.

II. Theoretical Constants

The equivalent conductance at infinite dilution Λ_o of solutions of NaCl at 5, 15, 25, 35, 45 and 55 °C were obtained from a paper by R. L. Kay [1]. His results are based on the data of F. W. Tober [2], H. E. Gunning and A. R. Gordon [3], and G. C. Benson and A. R. Gordon [4], B. Saxton and T. W. Langer [5], and T. Shedlovsky et al [6]. They were fitted to the revised Fuoss-Onsager equation by means of a computer program. We used a least squares fit of the above Λ_o values to obtain values at 0, 10, 20, 30, 40 and 50 °C. At 25 °C, we also included the more recent data of C. G. Swain and D. F. Evans [7], F. Accascina [8], and R. W. Kunze and R. M. Fuoss [9] in arriving at the Λ_o value.

The relation between Λ_o and t for NaCl solutions can be expressed by the following equations:

0 - 35 °C

$$\Lambda_o^t = 67.243 + 2.0519\ t + 0.0147\ t^2 - 0.000076667\ t^3 \qquad s = 3.6 \times 10^{-6}$$

35 - 55 °C

$$\Lambda_o^t = 65.514 + 2.2419\ t + 0.007825\ t^2 + 0.000095\ t^3 \qquad s = 6.3 \times 10^{-6}$$

Table I summarizes the constants used in fitting the NaCl data. These are in absolute units and are based on the fundamental constants as given in Part I of this series.

TABLE 1 - Theoretical Constants used in this study of NaCl solutions.

t °C	Λ_o	s	S	E	*J(a)c	s
0	67.24	----	44.69	23.37	87	3.3
5	77.86	0.01	52.55	27.30	100	1.2
10	89.16	----	61.01	31.61	---	---
15	101.07	0.02	70.02	36.28	145	1.6
20	113.55	----	79.61	41.36	---	---
25	126.53	0.02	89.74	46.82	182	0.6
30	139.95	----	100.39	52.64	---	---
35	153.78	0.03	111.54	58.90	238	2.5
40	168.03	----	123.21	65.59	---	---
45	182.70	0.04	135.39	72.79	290	3.7
50	197.80	----	148.09	80.50	---	---
55	213.32	0.03	161.31	88.81	327	1.7

*Obtained from the best fit of the data at concentrations below 0.01 N.

Tables 2, 3 and 4 illustrate the process followed in arriving at Λ_o values for electrolytic solutions of NaBr, NaI, and NaF at 25 °C. These tables summarize the results obtained on applying the Fuoss-Accascina extrapolation [10] to the available data up to 0.01 N. Where possible, the Λ_o value obtained on data in the 0.002 - 0.01 N range was used, to avoid the effect of errors due to the application of the solvent correction to data below 0.002 as pointed out by Kunze and Fuoss [9]. Table 5 lists the constants used in fitting the data at 25 °C for aqueous solutions of sodium bromide, sodium iodide, and sodium fluoride.

TABLE 2 - Results of Fuoss-Accascina extrapolations on data for dilute NaBr aqueous solutions.

Reference	Λ_o	s	J(a)c	s	Fit	Range (N)	No.*
[11]	128.18	0.02	196	5	0.03	0.000992 - 0.00536	10
"	128.18	.02	196	5	.03	" - "	10
"	128.13	.01	196	3	.01	" - "	6
[12]	128.19	.01	199	3	.01	0.0005 - 0.005	5
"	128.19	.01	199	3	.01	" - "	5
[13]	128.52	.02	186	2	.03	0.00197 - 0.0118	14
"	128.53	.02	186	2	.03	" - "	14
"	128.50	.01	191	2	.02	0.00197 - 0.00972	12
Combined	128.19	.05	225	9	.12	0.0005 - 0.00972	27
"	128.19	.05	224	9	.12	" - "	27
"	128.12	.02	233	4	.06	" - "	19
"	128.05	.05	241	8	.09	0.002 - "	18
"	128.06	.03	232	5	.05	" - "	13
"	128.07	.03	233	4	.04	" - "	11
"	128.08	.02	232	2	.03	" - "	10
"	128.08	.02	232	2	.03	" - "	10

*Number of experimental observations.

TABLE 3 - Results of Fuoss-Accascina extrapolations on data for dilute NaI aqueous solutions.

Author	Λ_o	s	J(a)c	s	Fit s	Range (N)	No.*
[14]	127.19	0.01	239	3	0.02	0.000204 - 0.00540	6
"	127.19	.01	239	3	.02	" - "	6
"	127.20	.01	236	3	.02	0.000416 - 0.00540	5
[15]	127.04	.10	205	2	.18	0.000237 - 0.00915	8
"	127.04	.10	205	2	.18	" - "	8
"	126.93	.08	217	1	.09	" - "	5
Combined	127.16	.06	198	1	.17	0.000204 - "	14
"	127.16	.06	197	1	.17	" - "	14
"	127.25	.02	190	5	.05	" - "	9
"	127.25	.04	196	9	.09	" - "	8
"	127.24	.03	192	5	.05	" - "	7
"	127.22	.02	193	2	.04	" - "	6
"	127.22	.02	193	2	.04	" - "	6
"	127.22	.02	193	2	.04	" - "	6

*Number of experimental observations.

TABLE 4 - Results of Fuoss-Accascina extrapolations to dilute NaF aqueous solution data.

Author	Λ_o	s	J(a)c	s	Fit s	Range (N)	No.*
[16]	105.52	0.04	142	10	0.09	0.000293 - 0.00783	8
"	105.52	.04	142	10	.09	" - "	8
"	105.54	.02	140	4	.03	0.000359 - "	5
[13]	105.45	.06	156	9	.07	0.00209 - 0.0101	8
"	105.45	.06	156	9	.07	" - "	8
"	105.34	.03	170	4	.02	" - 0.00998	5
Combined	105.50	.03	148	6	.08	0.000293 - 0.0101	16
"	105.50	.03	148	6	.08	" - "	16
"	105.54	.02	139	3	.03	0.000359 - "	10
"	105.47	.04	153	6	.06	0.00209 - "	12
"	105.47	.04	153	6	.06	" - "	12
"	105.47	.04	151	2	.06	" - "	11

TABLE 5 - Theoretical Constants used in this study of NaBr, NaI and NaF solutions.

Solute	Λ_o	s	S	E	J(a)c	s
NaBr	128.08	0.02	90.10	47.64	232	2
NaI	127.22	.02	89.90	47.18	193	2
NaF	105.47	.04	84.90	35.60	151	2

III. Results

The equivalent electrolytic conductance of the sodium halides at round concentrations are given in Tables 6 - 10. Table 5 gives this information for the temperature range 0 to 55 °C. Values in parentheses were obtained by interpolation across the table of values derived from measurements at intermediate temperatures.

Tables 7 and 8 gives the equivalent conductance of aqueous solutions of sodium bromide and sodium iodide at 25 °C. Inspection of these tables shows that at lower concentrations the equivalent conductance of the bromide is greater, but that in the vicinity of 0.3 N the conductance of the iodide becomes greater. Heydweiller, Annalen der Physik., 30, 873, 1909 also observed this in measurements at 18 °C.

The equivalent conductance of sodium iodide solutions at an odd assortment of temperatures and at concentrations from 1 - 7.5 N are presented in Table 9. The results obtained for sodium fluoride solutions are shown in Table 10.

TABLE 6 - Equivalent conductance of aqueous solutions of sodium chloride at various temperatures.

c \ t °C	0	5	10	15	20	25	30	35	40	45	50	55
0.0001	66.79	77.[illegible]	*(88.54)	100.37	(112.75)	125.63	(138.93)	152.66	(166.80)	181.35	(196.32)	211.70
.0005	66.[illegible]3	76.69	(87.80)	99.52	(111.78)	124.54	(137.71)	151.31	(165.30)	179.70	(194.51)	209.73
.001	65.84	76.22	(87.26)	98.89	(111.07)	123.73	(136.81)	150.31	(164.20)	178.49	(193.18)	208.28
.005	64.25	74.33	(85.08)	96.43	(108.26)	120.56	(133.28)	146.40	(159.89)	173.74	(187.96)	202.53
.01	63.16	73.05	83.76	94.78	106.51	118.44	130.91	143.82	(157.03)	170.61	184.57	198.69
.02	61.71	71.[illegible]	8[illegible].89	92.58	104.07	115.68	(127.7)	140.2	(153.0)	166.2	179.98	193.6
.03	60.70	[illegible]	80.58	91.05	102.36	113.76	(125.5)	137.6	(150.1)	163.1	176.77	190.0
.04	59.92		79.54	89.87	101.01	112.26	(123.8)	135.6	(147.9)	160.7	174.26	187.1
.05	59.28	[illegible]	78.68	88.89	99.88	111.01	(122.4)	134.0	(146.0)	158.7	172.19	184.6
.06	58.74	6[illegible]	77.94	88.06	98.92	109.94	(121.1)	132.5	(144.4)	157.0	170.41	182.6
.07	58.26	67.40	77.29	84.34	98.07	108.99	(120.0)	131.2	(142.9)	155.4	168.86	180.7
.08	57.85	66.93	76.71	86.69	97.31	108.15	(119.0)	130.1	(141.7)	154.0	167.47	179.1
.09	57.48	66.51	76.19	86.11	96.62	107.38	(118.1)	129.1	(140.5)	152.8	166.21	177.6
.1	57.14	66.13	75.71	85.58	95.98	106.69	116.3	128.1	138.9	151.6	165.06	176.2
.2	54.79	63.40	72.30	81.78	91.48	101.61	110.1	121.3	131.1	143.6	[illegible].76	166.5
.3	53.22	61.45	70.09	79.13	88.52	98.28	106.3	117.3	126.3	138.6	151.12	160.4
.4	51.97	59.90	68.37	77.06	86.24	95.72	103.6	114.2	122.9	134.8	146.86	155.8
.5	51.02	58.90	66.93	75.59	84.33	93.57	101.4	111.7	120.1	131.8	143.33	152.1
.6	-----	-----	-----	-----	-----	91.69	99.6	109.6	117.8	129.2	140.24	149.0
.7	-----	-----	-----	-----	-----	89.99	98.1	107.7	115.8	126.9	137.46	146.2
.8	-----	-----	-----	-----	-----	88.43	96.7	105.9	114.0	124.7	134.92	143.6
.9	-----	-----	-----	-----	-----	86.97	95.4	104.3	112.3	122.8	132.56	141.2

*Values in parentheses obtained by interpolation.

TABLE 6 - Equivalent conductance of aqueous solutions of sodium chloride at various temperatures (continued).

c \ t °C	0	5	10	15	20	25	30	35	40	45	50	55
1.0	-----	-----	-----	-----	-----	85.61	94.2	102.8	110.7	120.9	130.35	138.9
2.0	-----	-----	-----	-----	-----	74.74	83.4	89.4	96.9	104.7	112.86	119.8
3.0	-----	-----	-----	-----	-----	65.51	73.0	77.8	84.1	90.9	99.01	104.0
4.0	-----	-----	-----	-----	-----	57.29	63.3	67.5	73.0	79.0	86.92	90.9
5.0	-----	-----	-----	-----	-----	49.55	55.3	58.6	65.2	68.6	75.90	79.8

TABLE 7 - Equivalent conductance of aqueous solutions of sodium bromide at 25 °C.

c	Λ	c	Λ
0.0001	127.18	0.2	105
.0005	126.10	.3	102
.001	125.32	.4	100
.005	122.32	.5	98
.01	120.44	.6	96
.02	117.6	.7	94
.03	115.7	.8	93
.04	114.3	.9	91
.05	113.1	1.0	90
.06	112.1	2.0	77
.07	111.2	3.0	67
.08	110.4	4.0	59
.09	109.7	5.0	52
.1	109.1	6.0	43

TABLE 3 - Equivalent conductance of aqueous solutions of sodium iodide at 25 °C.

c	Λ	c	Λ
0.0001	126.32	0.3	102
.0005	125.23	.4	101
.001	124.43	.5	99
.005	121.28	.6	98
.01	119.22	.7	97
.02	116.7	.8	96
.03	114.8	.9	95
.04	113.4	1.0	94
.05	112.2	2.0	84
.06	111.3	3.0	73
.07	110.4	4.0	62
.08	109.6	5.0	52
.09	109.0	6.0	42
.1	108.4	7.0	33
.2	104.0	---	---

TABLE 9 - Equivalent conductance of aqueous solutions of sodium iodide at various temperatures.

0.0 °C		29.92 °C	49.3 °C
c	Λ	Λ	Λ
1.0	52.28	138.05	-------
1.5	49.70	104.47	127.02
2.0	47.24	88.61	119.26
2.5	44.78	81.27	111.87
3.0	42.21	77.03	104.74
3.5	39.51	73.14	97.80
4.0	36.65	68.61	91.00
4.5	33.68	63.45	84.30
5.0	30.62	58.05	77.72
5.5	27.55	52.81	71.28
6.0	24.52	47.92	65.03
6.5	21.61	43.29	59.07
7.0	18.88	38.69	53.48
7.5	16.36	34.06	48.12

TABLE 10 - Equivalent conductance of aqueous solutions of sodium fluoride at 25 °C.

c	Λ	c	Λ
0.0001	104.62	0.05	90.1
.0005	103.59	.06	89.0
.001	102.83	.07	88.0
.005	99.81	.08	87.2
.01	97.78	.09	86.5
.02	94.9	.1	85.8
.03	92.9	.2	80.5
.04	91.4	----	----

IV. Interpolation Formulas and Data Sources

NaCl 0 °C ∞ - 0.01 N

$\Lambda = 67.24 - 44.69c^{1/2} + 23.37c \log c + 87.12c$ s = 0.04

Reference: [17]

NaCl 0 °C 0.01 - 0.5 N

$\Lambda = 67.24 - 44.69c^{1/2} + 32.59c + 72.103c^{3/2} - 187.3c^{2} + 115.47c^{5/2}$ s = 0.02

Reference: [18]

NaCl 5 °C ∞ - 0.01 N

$\Lambda = 77.86 - 52.55c^{1/2} + 27.30c \log c + 99.55c$ s = 0.02

Reference: [2]

NaCl 5 °C 0.01 - 0.5 N

$\Lambda = 77.86 - 52.55c^{1/2} + 34.111c + 129.53c^{3/2} - 329.96c^{2} + 214.06c^{5/2}$ s = 0.06

Reference: [18]

NaCl 10 °C 0.01 - 0.5 N

$\Lambda = 89.16 - 61.01c^{1/2} + 76.516c - 63.834c^{3/2} + 20.875c^{2}$ s = 0.01

Reference: [18]

NaCl 15 °C ∞ - 0.01 N

$\Lambda = 101.07 - 70.02c^{1/2} + 36.28c \log c + 144.92c$ s = 0.02

References: [3], [4]

NaCl 15 °C 0.01 - 0.5 N

$\Lambda = 101.07 - 70.02c^{1/2} + 66.544c + 58.096c^{3/2} - 236.05c^{2} + 165.35c^{5/2}$ s = 0.06

Reference: [18]

IV. Interpolation Formulas and Data Sources (continued).

NaCl 20 °C 0.01 - 0.5 N

$\Lambda = 113.55 - 79.61c^{1/2} + 100.9c - 88.457c^{3/2} + 31.588c^{2}$ s = 0.01

Reference: [18]

NaCl 25 °C ∞ - 0.01 N

$\Lambda = 126.53 - 89.74c^{1/2} + 46.82c \log c + 182.34c$ s = 0.02

References: [2], [3], [4], [5], [6], [7], [8], [9]

NaCl 25 °C 0.01 - 0.1 N

$\Lambda = 126.53 - 89.74c^{1/2} + 68.046c + 335.67c^{3/2} - 1414.8c^{2} + 1664.9c^{5/2}$ s = 0.01

References: [5], [6], [8], [17]

NaCl 25 °C 0.1 - 1.0 N

$\Lambda = 126.53 - 89.74c^{1/2} + 113.85c - 104.03c^{3/2} + 47.224c^{2} - 8.2288c^{5/2}$ s = 0.01

References: [6], [18], [19]

NaCl 25 °C 1.0 - 5.0 N

$\Lambda = 126.53 - 89.74c^{1/2} + 99.142c - 71.15c^{3/2} + 23.962c^{2} - 3.1411c^{5/2}$ s = 0.03

References: [19], [20]

NaCl 30 °C 0.1 - 5.0 N

$\Lambda = 139.95 - 100.39c^{1/2} + 96.477c - 51.484c^{3/2} + 9.8644c^{2} - 0.24188c^{5/2}$ s = 0.11

Reference: [21]

IV. Interpolation Formulas and Data Sources (continued).

NaCl 35 °C ∞ - 0.01 N

$\Lambda = 153.78 - 111.54c^{1/2} + 58.90c \log c + 237.63c$ s = 0.03

References: [3], [4]

NaCl 35 °C 0.01 - 5.0 N

$\Lambda = 153.78 - 111.54c^{1/2} + 119.03c - 80.188c^{3/2} + 24.498c^{2} - 2.805c^{5/2}$ s = 0.15

Reference: [21]

NaCl 40 °C 0.1 - 5.0 N

$\Lambda = 168.03 - 123.21c^{1/2} + 116.5c - 61.905c^{3/2} + 11.29c^{2}$ s = 0.15

Reference: [21]

NaCl 45 °C ∞ - 0.01 N

$\Lambda = 182.70 - 135.39c^{1/2} + 72.79c \log c + 290.08c$ s = 0.05

References: [3], [4]

NaCl 45 °C 0.01 - 5.0 N

$\Lambda = 182.70 - 135.39c^{1/2} + 146.5c - 101.54c^{3/2} + 32.19c^{2} - 3.8759c^{5/2}$ s = 0.15

Reference: [21]

NaCl 50 °C ∞ - 0.3 N

$\Lambda = 197.80 - 148.09c^{1/2} + 158.82c + 21.882c^{3/2} - 332.41c^{2} + 266.16c^{5/2}$ s = 0.03

NaCl 50 °C 0.3N - 2.0 N

$\Lambda = 197.80 - 148.09c^{1/2} + 188.55c - 176.61c^{3/2} + 85.523c^{2} - 16.822c^{5/2}$ s = 0.03

NaCl 50 °C 2.0 - 5.0 N

$\Lambda = 197.80 - 148.09c^{1/2} + 155.94c - 106.01c^{3/2} + 34.163c^{2} - 4.2811c^{5/2}$ s = 0.02

Reference: [22]

IV. Interpolation Formulas and Data Sources (continued).

NaCl 55 °C ∞ - 0.01 N

$\Lambda = 213.32 - 161.31c^{1/2} + 88.81c \log c + 327.27c$ s = 0.02

Reference: [2]

NaCl 55 °C 0.01 - 5.0 N

$\Lambda = 213.32 - 161.31c^{1/2} + 172.94c - 119.94c^{3/2} + 38.635c^{2} - 4.6943c^{5/2}$ s = 0.23

Reference: [21]

NaBr 25 °C ∞ - 0.01 N

$\Lambda = 128.08 - 90.10c^{1/2} + 47.64c \log c + 231.79c$ s = 0.03

References: [11], [12], [13]

NaBr 25 °C 0.01 - 6.0 N

$\Lambda = 128.08 - 90.10c^{1/2} + 126.37c - 114.19c^{3/2} + 46.384c^{2} - 6.9637c^{5/2}$ s = 0.20

References: [13], [23]

NaI 25 °C ∞ 0.01 N

$\Lambda = 127.22 - 89.90c^{1/2} + 47.18c \log c + 192.92c$ s = 0.03

References: [14], [15]

NaI 25 °C 0.01 - 7.0 N

$\Lambda = 127.22 - 89.90c^{1/2} + 120.85c - 87.758c^{3/2} + 26.831c^{2} - 3.0493c^{5/2}$ s = 0.20

References: [15], [23]

IV. Interpolation Formulas and Data Sources (continued).

NaI 0 °C 1.0 - 7.5 N

$\Lambda = 50.657 - 7.7591c + 1.8248c^2 - 0.49881c^3 + 0.053773c^4 - 0.0019573c^5$ s = 0.05

NaI 29.92 °C 1.0 - 7.5 N

$\Lambda = 322.25 - 307.91c + 162.38c^2 - 44.855c^3 + 6.6776c^4 - 0.51148c^5 + 0.015843c^6$ s = 0.08

NaI 49.3 °C 1.0 - 7.5 N

$\Lambda = 153.95 - 20.478c + 2.0922c^2 - 0.29728c^3 + 0.017633c^4$ s = 0.08

Reference: [24]

NaF 25 °C ∞ - 0.01 N

$\Lambda = 105.47 - 84.90c^{1/2} + 35.60c \log c + 150.9c$ s = 0.05

References: [13], [16]

NaF 25 °C 0.01 - 0.2 N

$\Lambda = 105.47 - 84.90c^{1/2} + 88.237c - 203.91c^{3/2} + 827.01c^2 - 1091.1c^{5/2}$ s = 0.10

References: [13], [16], [25]

V. References

[1] R. L. Kay, J. Am. Chem. Soc., 82, 2099 (1959).

[2] F. W. Tober, Dissertation, Yale University (1948).

[3] H. E. Gunning and A. R. Gordon, J. Chem. Phys., 10, 126 (1942).

[4] G. C. Benson and A. R. Gordon, J. Chem. Phys., 13, 473 (1945).

[5] B. Saxton and T. W. Langer, J. Am. Chem. Soc., 55, 3638 (1933).

[6] T. Shedlovsky, A. S. Brown and D. A. MacInnes, Trans. Electrochem. Soc., 66, 165 (1934).

[7] C. G. Swain and D. F. Evans, J Am. Chem. Soc., 88, 383 (1966).

[8] F. Accascina, AD 432997, Clearinghouse, USDC, NBS, IAT (1963).

[9] R. W. Kunze and R. M. Fuoss, J. Phys. Chem., 67, 911 (1963).

[10] R. M. Fuoss and F. Accascina, "Electrolytic Conductance," pp. 191 - 205, Interscience Publishers, Inc., New York, 1959.

[11] F. Accascina and A. D'Aprano, Ric. Sci., 36, 257 (1966).

[12] R. E. Jervis, D. R. Muir, J. P. Butler and A. R. Gordon, J. Am. Chem. Soc., 75, 2855 (1953).

[13] A. F. Reynolds, Dissertation, Yale University (1966).

[14] E. G. Baker, Dissertation, Brown University (1951).

[15] P. A. Lasselle and J. G. Aston, J. Am. Chem. Soc., 55, 3067 (1933).

[16] T. Erdey-Grúz, L. Majthenyi and E. Kugler, Acta Chim. Hung., 37, 394 (1963).

[17] C. R. Johnson and G. A. Hulett, J. Am. Chem. Soc., 57, 256 (1935).

[18] R. W. Bremner, T. G. Thompson and C. L. Utterback, J. Am. Chem. Soc., 61, 1219 (1939).

[19] J. F. Chambers, J. M. Stokes and R. H. Stokes, J. Phys. Chem., 60, 985 (1956).

[20] H. H. Lim, Australian J. of Chem., 9, 443 (1956).

V. References (continued)

[21] C. V. Suryanarayana and V. K. Venkatesan, Acta Chim. Acad. Sci. Hung., 17, 327 (1958).

[22] J. F. Chambers, J. Phys. Chem., 62, 1136 (1958).

[23] J. Molénet and J. Salvimen, comp. rend. Acad. Sci., Paris, Ser. C265, 649 (1967).

[24] M. L. Miller, J. Phys. Chem., 60, 189 (1956).

[25] H. Kahlweit, Z. für Physik. Chemie Neue Folge, Bd. 21, 436 (1959).

USCOMM-NBS-DC