Molten Salts Data: Diffusion Coefficients in Single and Multi-Component Salt Systems

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The property of diffusion is one of the basic properties of fluid systems. In molten salts, more than 700 studies have been reported to August, 1980, with more than 15 diffusion measurement techniques. A critical examination of these studies with a review of the techniques is presented. The results for more than 140 salt systems are reported in this communication as a series of data tables, with numerical values, value judgements, and literature citations. Silicates, slags, and oxide melts are excluded.

Key words: diffusion; diffusion coefficients; diffusion techniques; fused salts; molten salts; self-diffusion coefficients.

Contents

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1. Introduction

The property of diffusion is one of the basic transport properties of fluid systems; and as such is important to various theoretical and practical considerations in materials science and technology.

The diffusion data for molten salts are largely in the primary scientific literature, and are thus rather widely dispersed (more than 100 journals) and not readily accessed. Our survey showed that more than 700 diffusion studies had been reported to date (1980), and that some 15 different measurement techniques had been applied. The need for a review of the diffusion data for molten salts was thus clearly apparent. In the present work we report the results of such a study. Silicates, slags and oxide solvent systems have not been included in the present work.

For closely related publications is this series, see [1–9][1] and table 1.

TABLE 1. NSRDS molten salts data series

Molten Salts	Contents	Ref.
Vol. 1 (1968)	Single salts (κ,η,ρ)	[1]
Vol. 2 (1969)	Single salts (γ)	[2]
Vol. 3 (1972)	Binary mixtures: nitrates, nitrites	[3]
Vol. 4, Pt. 1 (1974)	Binary mixtures of fluorides	[4]
Vol. 4, Pt. 2 (1976)	Binary mixtures of chlorides	[5]
Vol. 4, Pt. 3 (1977)	Binary mixtures: bromides, iodides	[6]
Vol. 4, Pt. 4 (1979)	Binary mixtures: mixed halides	[7]
Vol. 5, Pt. 1	Binary mixtures: mixed anions other than nitrates, nitrites, halides	[8]
Vol. 5, Pt. 2	Additional systems	[9]

2. Symbols and Units

The fundamental constants, symbols and units used in this work are in tables 2 and 3 respectively.

TABLE 2. Fundamental constants

Symbol	Name	Values
N	Avogadro constant	$6.022045(31) \times 10^{23}$ mol^{-1}
F	Faraday constant	$9.648456(27) \times 10^{4}$ C mol^{-1}
e	Electron charge	$1.6021892(46) \times 10^{-19}$ C
R	Gas constant	8.31343 ± 0.0012 J K^{-1} mol^{-1}
		1.98716 ± 0.00029 cal K^{-1} mol^{-1}

Fundamental constants from CODATA Bulletin No. 11 (Dec. 1973). In each case the digits in parentheses following a numerical value represent the standard deviation of that value in the decimal places indicated for its final digits.

3. Statistical Analysis

The recommended data values were selected on the basis of our estimates of precision and accuracy of the data in

[1]Numbers in brackets refer to literature references.

TABLE 3. Symbols and units

Symbol	Physical quantity	Units
A	Pre-exponential factor	as in text
C	Concentration	mol %
E	Energy of activation	cal mol^{-1}
t	Temperature	°C
T	Temperature	K
X	Mole fraction	dimensionless
D	Diffusion coefficient	$cm^2\ s^{-1}$

For conversion to SI units: 1 cal mol^{-1} = 4.184 J mol^{-1}.

the literature.

All calculations were made on the digital computer facilities at Rensselaer Polytechnic Institute. The data of each recommended study, were fitted by a one-dimensional analysis, using the method of least squares, to establish the variation of the physical quantities with temperature at the experimental compositions.

The criterion for choosing the equation of best fit in the one-dimensional analysis was the standard error of estimate. This was defined by

$$s = \left[\frac{\sum^{n}(D_e - D)^2}{n - q}\right]^{1/2},$$

where D_e is the experimental value of the diffusion coefficient at each temperature, D is the value calculated from the least squares equation at the same temperature, n is the number of experimental data points, and q is the number of coefficients in the fitting equation. The standard error of estimate was computed from the residuals in the least-squares routine.

4. Value Judgments

Precision

Estimates of precision were based on standard error of estimate analysis. The standard error of estimate is the end result of a statistical analysis of the numerical data, and the statistical analysis depends on various factors, such as the number of the data points, the nature of the concentration dependence, and the temperature dependence of the particular physical property.

The precision is defined here as the standard error expressed as a percent value. Assuming a normal distribution, about 68% of the data points lie within this estimate of precision, 95% within twice this value, and approximately 99% within three times this value. Where the preceding approach was not possible, we refer to the published error estimate of the original authors.

Accuracy

Accuracy estimates were based on assessments of experimental details including method of measurements, techniques, analytical characterization of chemicals, and intercomparisons with results from the same and/or different laboratories. The accuracy estimates are more subjective than the estimates of precision.

5. Experimental Techniques

For basic principles and practice in diffusion measurements, see [10-12]. For fused salts, the various methods may be collected under two broad headings, namely electrochemical and analytical-transport, i.e.:

Electrochemical methods
- chronopotentiometry
- chronoamperometry
- linear sweep voltammetry
- polarography
- rotating disc electrode
- faradaic impedance

Analytical-transport coupled methods
- interferometric method
- capillary method
- porous frit technique
- diffusion couple method
- diaphragm cell
- gravimetric technique
- chromatographic method
- cylindrical thin layer method

Other
- NMR line width technique
- conductance method

A brief description of the basic principles for each technique as applicable to molten salts measurements follows herewith.

Electrochemical Methods

For a review of the various electrochemical techniques as used in molten salt systems, see Lesko [13].

Chronopotentiometry. Chronopotentiometry has been most widely applied for the determination of diffusion coefficients in fused salts. Basically, a constant current electrolysis of a dilute solution is carried out and the variations in the potential of the indicator electrode, against a suitable reference, are monitored as a function of time. The time span between the onset of electrolysis and when the depolarizer concentration at the electrode surface becomes zero is called the transition time. For the case where the mass transport is controlled by semi-infinite linear diffusion, the transition time is related to other experimental parameters by the Sand equation:

$$D = \left[\frac{4\tau I^2}{\pi n^2 F^2 A^2 C_0^2}\right] \qquad (7.1)$$

where τ is the transition time (s), I is the constant electrolysis current (A), n is the number of electrons involved in the electron transfer step, F is the Faraday constant (C mol^{-1}), A is the area of the indicator electrode (cm^2), C_0 is the concentration of the depolarizer in the bulk of the solution (mol cm^{-3}), and D is the diffusion coefficient ($cm^2\ s^{-1}$).

Diffusion coefficients of the electroactive species may be calculated from equation 7.1. For further details of chronopotentiometry, see [15, 16, 18–20]. It has been shown by Laity and McIntyre [14], that the chronopotentiometric diffusion coefficient of an ion is identical to both the interdiffusion and self-diffusion coefficients for dilute molten salt solutions.

In recent work it has been shown that the above restriction to dilute solute ions is not limiting. Thus Braunstein et al. [279, 280, 282], through a rigorous theoretical examination of the basic principles, have derived equations and computational methods which extend the chronopotentiometric

technique for the determination of diffusion coefficients in the concentrated solution range. The diffusion data for Be^{2+} in LiF-BeF_2 mixtures (95 mol% BeF_2), were thus determined (see system 67).

Chronoamperometry. In chronoamperometry a potential-step function is applied to the working electrode and the resulting current is measured as a function of time. The potential step is selected such that at the initial potential no faradaic current flows, and at the final potential the current is diffusion limited. For semi-infinite linear diffusion control the instantaneous current, I_t, is given by the Cottrell equation:

$$I_t = \left[\frac{nFAD^{1/2}C_0}{\pi^{1/2}t^{1/2}} \right] \tag{7.2}$$

where t is the time (s), and the other terms have the same significance as described earlier. From the above equation it is apparent that the product $I_t t^{1/2}$ is constant. Diffusion coefficients of the electroactive species can be evaluated from equation (7.2). Values of the correction factor to be applied to equation (7.2) for diffusion toward spherical and cylindrical electrodes have been tabulated by Bansal and Plambeck [17]. For greater details of this technique references [16], [19–20] may be consulted.

Linear Sweep Voltammetry. For linear sweep voltammetry, a rapidly changing ramp potential (> 10 mV s^{-1}) is applied to the indicator electrode, and the resulting current is measured as a function of this potential. The solution is unstirred and mass transport is diffusion controlled. The current increases to a maximum and then decays, yielding a peak shaped curve. The peak current, I_p, for a reversible system is given by the Randles-Sevćik equation:

$$I_p = \left[\frac{0.447(nF)^{3/2}AC_0D^{1/2}V^{1/2}}{(RT)^{1/2}} \right] \tag{7.3}$$

where V is the voltage sweep rate (V s^{-1}), R is the gas constant, T is the temperature (K), and other terms have the same meaning as above. From the above equation it is clear that $I_p V^{-1/2}/C_0$ should be constant, and values of the diffusion coefficient may be calculated from equation (7.3). For further details of rapid scan voltammetry, see references [16], [18–20].

Polarography. Polarography is an electrochemical technique in which the current flowing at a dropping mercury electrode (dme) is measured as a function of the applied potential. The current-potential plot is known as the polarogram. The current corresponding to the plateau of the wave is the diffusion current.

The instantaneous faradaic current at any time during the life of the drop is given by the Ilkovic equation:

$$I(t) = [708nD^{1/2}C_0m^{2/3}t^{1/6}] \tag{7.4}$$

where $I(t)$ is the current (μA) at any time t since the beginning of the drop formation, n is the number of electrons involved in the reduction or oxidation of the electroactive species, C_0 is the bulk concentration (mmol L^{-1}), m is the rate of flow of mercury (mg s^{-1}), and other terms have the conventional significance. (If $t = t_d$, i.e., the drop time of the dme, then the value of current obtained from the above equation is the maximum diffusion current obtained during the drop life).

The mean diffusion current is obtained by integrating $I(t)$ with respect to time over the total drop life and then dividing by the drop time, t. Thus the Ilkovic equation for the mean diffusion current becomes:

$$I_d = [607nC_0D^{1/2}m^{2/3}t_d^{1/6}] \tag{7.5}$$

where I_d is the average current, t_d is the drop time and other terms are the same as defined above. The diffusion coefficients may be evaluated from equation (7.5). In the higher temperature range, the dme cannot be used because of the high vapor pressure of mercury. Dropping electrodes of other metals, Bi, Pb, Zn, have been tried. For additional information, see [16], [18], [20], and [21].

Rotating Disc Electrode. The presence of natural convection complicates the study of electrode processes at stationary electrodes. Forced convection, however, may be used to advantage as a mass transport process. Under forced convective mass transport, a steady-state current is observed, i.e., the current is independent of time. These conditions are achieved by rotating electrode technique.

The limiting current at a rotating disc electrode is given by Levich equation [22, 23]:

$$I_L = [0.62nFAD^{2/3}C_0\nu^{-1/6}\omega^{1/2}] \tag{7.6}$$

where I_L is the limiting current (A); $\omega (= 2\pi f)$ is the angular velocity of the disc, f is the number of rotations per second; ν is the kinematic viscosity (cm^2 s^{-1}) of the solution, and the other quantities are the same as before. The kinematic viscosity is the viscosity of the solution divided by its density. When the viscosity is in poise (g cm^{-1} s^{-1}) and the density in g cm^{-3}, the kinematic viscosity is in units of cm^2 s^{-1}. The above equation, thus, is used to obtain the values of D for electrochemically active species. See [16, 22, 23] for additional details.

Faradaic Impedance. This technique has found most applications to reactions in aqueous solutions and was first applied to molten salt systems by Laitinen and coworkers [24, 25].

Under conditions where the electrode impedance is determined entirely by the discharge and diffusion of ions, the resistive and capacitative impedances of the electrode (R_f, C_r, respectively), are linearly related to $f^{-1/2}$, i.e.:

$$R_f = \left[R_r' + \frac{b}{\sqrt{f}} \right] \tag{7.7}$$

and

$$\left(\frac{1}{\omega C_r} \right) = \left(\frac{b}{\sqrt{f}} \right) \tag{7.8}$$

where f is the frequency of the ac signal (Hz), $\omega = 2\pi f$, and R_r' and b are given, respectively, by (RT/nFi) and $(RT/n^2F^2AC_0\pi^{1/2}D^{1/2})$, and i is the exchange current. From measurements of R_r and C_r over a series of f, the value of the diffusion coefficient of the potential determining ion, D, is gained from the above equations.

For additional details see [18, 19, 26–32].

Advantages and Limitations. From a consideration of the molten salts diffusion literature (> 760 publications), it is apparent that approximately 75% of the diffusion data were obtained by the preceding electrochemical techniques. A comparison of the frequency that specific electrochemical techniques have been used is summarized in table 4. Inspec-

tion shows that the chronopotentiometric technique, by far, has seen widest application for molten salts diffusion data.

Some of the advantages and limitations of the electrochemically based techniques may be summarized as follows.

The electrochemical methods are quite rapid compared to other techniques. This is of greatest significance for systems where the values of diffusion coefficients are small ($\sim 10^{-6}$ to 10^{-8} cm^2 s^{-1}). The technique, thus, appears suitable for studies in which the measurements are to be extended into the metastable supercooled region (KNO_3-$Ca(NO_3)_2$) or highly viscous melts (BeF_2, $ZnCl_2$ containing melts).

The diffusion data available from electrochemical experiments are frequently affected by the nature of the electrode reactions and by variations of the effective area of the working electrode.

The diffusion species must be electroactive to be sensed by the electrochemical approach, and the oxidation or reduction of the species must be possible within the potential span of stability of the solvent system. The electrode process should be clearly understood and the mass transport should be diffusion-controlled.

Analytical-Transport Coupled Methods

Some of the salient principles of the various methods in this category, together with the working equations, are briefly examined. The advantages and limitations of each method are assessed, and an analysis of the frequency of use (based on this study) is also reported.

Interferometry. Interdiffusion coefficients are measured by recording the phase variations introduced on an initially plane wave front when passing through a diffusion cell. The path differences are observed by wave front-shearing interferometry. The variations of refractive index in the test region thus monitored enable one to investigate processes directly related to a density gradient, such as diffusion. The theory and practice of this technique are well established at ambient temperatures ($\sim$ 25 °C), and the extension to high temperatures awaited the work by Gustafsson et al. [33–42]. For experimental details, i.e., the design of light channels into the hot zone, and the (stainless steel) diffusion cells, see [33, 34]. With appropriate cell dimensions, and relatively small shears, it has been shown [40] that the working equation reduces to:

$$D = [0.10857(x_i^2 - x_j^2)/[t \log_{10}(x_i/x_j)]] \quad (7.9)$$

where x_i and x_j are the positions of the two fringes having identical path difference values, and t is the time.

Capillary Technique. Two variations of this technique have been developed for molten salts studies: (i) diffusion out of the capillary, and (ii) diffusion into the capillary. The working equations, based on solutions of Fick's second law of diffusion are as follows:

(i) "diffusion out of"

$$D = \left[\frac{4L^2}{\pi^2 t} \ln\left(\frac{8}{\pi^2 \Delta}\right)\right] \quad (7.10)$$

and

$$D = (0.7854(1 - \Delta^2)L^2/t) \quad (7.11)$$

for $\Delta \leqslant 0.4$ and $\Delta \geqslant 0.5$, respectively. Here Δ is the ratio $(C_f - C_0)/(C_r - C_0)$, and C_f is the final mean activity within the capillary; C_r is the reservoir activity, and C_0 is the bath activity (which is constant). The length of the capillary is L, and t, the diffusion time. The diffusion equations, above, are accurate to $\sim$0.2% and $\sim$0.3%, respectively [43,44].

(ii) "diffusion into"

$$Q = [2C_0 A (Dt/\pi)^{1/2}] \quad (7.12)$$

where Q is the total diffusate after time t, C_0 the constant bath concentration, and A, the capillary cross-sectional area [45-49].

For details on experimental assemblies, and capillary filling techniques see [43–55]. The "diffusion out of" appears to be more accurate than the "diffusion into" variation of the capillary methods [53]. Additional observations on the limitations follow later in this work.

Porous Frit Technique. This modification of the capillary method was advanced by Djordjevic and Hills [56] so that the diffusion times could be reduced drastically. Instead of a single capillary, a fritted disc (which can be regarded as composed of many small, irregularly shaped capillaries) is employed.

This porous frit is impregnated with the active species so that diffusion occurs from both disc faces. The diffusion coefficient D, of the active species is calculated from:

$$D = (D'\phi) \quad (7.13)$$

where ϕ is the porous frit labyrinth constant, and D', the apparent diffusion constant is obtained from the concentration of the diffusate $\bar{c}$ in the frit after the time, t, of the measurements and the thickness, L, of the frit, viz:

$$\bar{c} = \left\{\frac{8C_0}{\pi^2} \sum_{n=0}^{n=\infty} \frac{1}{(2n+1)^2} \times \exp\left[\frac{-(2n+1)^2\pi^2 D't}{L^2}\right]\right\} \quad (7.14)$$

If $D't/L^2 > 0.2$, the series expansion in (7.14) converges so rapidly that only the first term of the series needs to be considered.

For details on the experimental assemblies used with molten salts, labyrinth constant calibration, and related procedural aspects see [53, 56–59]. For use of the porous frit with gravimetric analysis, see later.

Diffusion Couple Method. In this technique, two columns of fluids are "coupled" in the diffusion capillary through a "vanishing bubble" technique so that the boundary is sharply defined at the meniscus of the lower column. On completion of the measurements, the capillary is broken at this junction "in situ," and the total diffusate in the upper part is determined by standard radiochemical methods. The

TABLE 4. Percent application of electrochemical diffusion techniques in molten salts measurements.

Experimental technique	% Application
Chronopotentiometry	44
Linear sweep voltammetry	11
dc polarography	5
Rotating disc electrode	5
Chronoamperometry	3
Faradaic impedance	2
Others	3

method has been used for molten oxides [61, 62] and was adapted for molten salts diffusion studies by Angell and Bockris [63 ,64] both in theory and practice. The diffusion equation:

$$D = [\phi^2 \pi / (C_0^2 A^2 t)] \tag{7.15}$$

requires the measurement of ϕ, the total diffusate in the originally inactive sample; t, the diffusion time; A, the capillary cross section area; and C_0, the initial radioactivity of the active sample.

Some of the negative features (lack of definition of boundary; volume change on quenching) were removed by the innovations of Angell and Bockris (vanishing bubble and in situ termination techniques); for details on filling techniques and experimental procedures see [63–65].

Diaphragm Cell Method. This technique is basically one of the simplest for diffusion measurements and has been widely used at ambient temperatures. The working equation, after Gordon [66] and Stokes [67], is:

$$\ln \frac{\Delta C_0}{\Delta C_t} = \left[\frac{1}{\beta} \left(\frac{1}{V_A} + \frac{1}{V_B} \right) Dt \right] \tag{7.16}$$

where ΔC_0 and ΔC_t are the difference in the concentrations on either side of the porous diaphragm at the initial and termination times; V_A and V_B are the volumes of the liquids; D, the diffusion coefficient; and β, the diaphragm cell constant. An underlying principle is that if V_A and V_B are relatively large volumes, and only a small amount of solute diffuses, the difference in concentration may be taken as constant, so that the conditions across the diaphragm are essentially those for steady state diffusion. For experimental assemblies, theory, and practice, see [68, 69], and for molten salts assemblies see [70, 73].

Gravimetric Diffusion Technique. In this technique, an analytical balance is used to monitor the buoyancy change of the porous frit immersed in the molten salt mixture from an under the pan suspension. The porous frit is initially saturated with the one of the molten salt mixtures. The buoyancy changes due to interdiffusion are followed as a function of time. The principles have been described in detail elsewhere [74–77], and were adapted for high temperature measurements with molten salts by Sjoblom [75, 76, 78].

The values of diffusion constant, D, are gained from:

$$[d\,[\log_{10}(w_t - w_\infty)]/dt\,] = -D/k \tag{7.17}$$

where w_t and w_∞ are two apparent porous frit weights at times t, and the final time (∞), and k is the porous frit cell constant. The latter is generally gained by an ancillary calibration experiment using a system for which the D values are known as reference values. For some additional considerations of the porous frit shapes, and the limitations of eq. (7.17), see [79, 80]. See also [510].

Chromatographic Technique. In adapting the techniques of paper-strip chromatography to molten salts systems, asbestos strips [80, 81], glass-fiber matte on glass plates [82, 83], quartz fiber matte and alumina [84–88], thin layer of porous ceramic oxides (Al_2O_3, MgO, ZrO_2) [89–92], and sintered MgO strips [93] have been used to hold the molten system. The sample is tagged with a suitable radioisotope by pressing a second small strip with the tracer in the impregnated strip briefly. On completion of the diffusion period, the activity is monitored by the conventional radiochemical techniques after the system is (rapidly) brought to room temperature. The impregnated substrate minimizes volume change corrections in this procedure. For additional experimental details, see [80, 82, 83, 86, 87, 89, 93].

The solution of Fick's law of diffusion under the boundary conditions imposed by the above procedures [81, 82, 93] leads to the expression:

$$C_i(x) = \frac{C_i}{(\pi D t)^{1/2}} \times \exp[-x^2/(4D_i t)]. \tag{7.18}$$

Accordingly, the values of D_i are determined from the slope of $\log C_i(x)$ vs x^2. Here $C_i(x)$ and C_i are the specific activity at the distance x after time t, and the total activity of the diffusate.

The expansivity of MgO is low ($\sim 1\%$ from 25–800 °C), and MgO is one of the most stable oxides. With this technique and the sintered porous MgO self-supporting substrates, diffusion in highly aggressive chloride and fluoride melts has been investigated [93].

Cylindrical Thin Layer (CTL) Method. In this technique, a thin layer of melt is held by two close fitting axially concentric graphite crucibles. Under the conditions of the experiment, eq. (7.17) holds, and the tracer diffusion coefficients are gained accordingly. For details see [93]. The technique was developed for tracer diffusion studies, especially for fluoride melts.

Advantages and Limitations. As indicated earlier, about 25% of the molten salts diffusion data surveyed in this study was gained by the preceding techniques, i.e. the non-electrochemical techniques. The frequency of use in molten salts is summarized in table 5; it is clear that the capillary techniques, and a modification thereof, namely the porous frit method, account for $\sim 80\%$ of the diffusion data from this group.

Some of the advantages and limitations of these methods should be noted as follows:

Interferometry. The advantages appear to be: the duration of each run of diffusion experiment is short (~ 1 h); the interferograms can be continuously monitored; the absence of convection can be directly confirmed through the fringes; the diffusion process can be studied in situ, i.e., without disturbing or interrupting the process under study; diffusion coefficients can be calculated from pairs of fringes, and the final value of diffusion coefficient can thus be evaluated by statistical treatments.

The salient limitations are the restriction to optically transparent liquids having large variations of refractive in-

TABLE 5. Percent application of analytical-transport coupled diffusion techniques in molten salts measurements

Experimental techniques	% Application
Capillary techniques	67
Chromatography method	7
Interferometry method	7
Porous frit techniques	13
Others	6

dex with composition and temperature. Most of the fused salts meet these requirements. The upper temperature is limited by optical disturbances due to thermal radiation from the melt; it may be possible to extend the measurements to ~1000 °C.

Capillary Techniques. Diffusion periods >6 h are required for a good degree of accuracy; the duration of the experiments increases greatly for viscous systems. In general the capillary techniques are not suitable for systems having only short-lived radioactive isotopes. For the "diffusion into the capillary" method, the times are relatively short by comparison (1–3 h); this approach, however, requires relatively larger amounts of radioactivity and also, is judged to be less accurate than the "diffusion out of the capillary" technique [18].

The "immersion effect," should be noted as a possible error source. This effect refers to the tendency to sweep out part of the active solution from the capillary in the act of immersion or removal. This error source is minimized if the diffusion times are long, and also if a drop of solution is retained on the capillary just prior to immersion. For additional information see [124, 126–127].

An additional possible error source, referred to as the "ΔL-effect," is the effect of the rate of stirring; if the rate is too rapid, this leads to D values too large; if it is too slow, this error source leads to D values too low. For diffusion times > several hours, the errors due to this effect are quite small. See [10, 12, 43, 46, 123–125] for details.

Porous Frit Technique. The porous frit technique does not seem well suited for comparatively high self-diffusion coefficients. For example the values for Na^+ and CO_3^{-2} in molten carbonate by this technique are too large (~×10~×20); the contributing factors are not understood since the porous frit technique has reproduced D values at ambient temperatures. An advantage of this technique is the relatively short times required; it is thus well suited for measurements with isotopes of short-half lives, e.g., ^{82}Br (~30 minutes). It also seems well suited for the more viscous salts, e.g. molten $ZnCl_2$, for which the times with the simple capillary technique would be prohibitively long. See also: Gravimetric Technique.

Diffusion Couple Technique. The technique requires a great deal of manual dexterity. The main sources of error lie in a small but irreproducible dilution of the radioactive column during the filling process, and statistical uncertainties in the activity analysis. An advantage is that the "ΔL-effect" and the "immersion effects" of the simple capillary method are avoided.

Diaphragm Cell Technique. This technique has seen only very limited applications with molten salts. It is a relative technique since the diaphragm pore area and length cannot be determined in an absolute manner.

Gravimetric Technique. If the porous frits are made of glass rather than quartz, this technique is not reliable owing to the relatively rapid ion-exchange. Thus while the diffusion coefficients for mono-valent cations into pyrex are relatively low (~10^{-11} $cm^2\,s^{-1}$@ ~300 °C) the large melt-frit interface leads to a significant ion-exchange during the gravimetric measurements.

Chromatographic Method. The advantages appear to be in simplicity. The end effects (of the capillary methods) are inherently absent. No special apparatus is required and the technique appears suited for measurements under difficult conditions, e.g., as in high pressure vessels.

A limitation is in the relatively large area of melt that is exposed; thus the method appears limited to systems with low vapor pressure. A further problem is in the need to impregnate the chromatographic strip uniformly; non-uniform impregnation leads to irreproducibilities of D values.

Cylindrical Thin Layer (CTL) Techniques. This variation of the capillary method appear suited for corrosive molten salts (e.g. fluorides), and for systems with relatively high vapor pressure. The salient error sources appear in the possible convection in the capillary, and the contraction during freezing (termination of measurements). For additional details see [93].

Other Methods

Two additional methods, as below, are to be noted relative to molten salts.

NMR Line Width Technique. This method has been used for some preliminary diffusion measurements in solid and molten salts, e.g., LiI [510]. The line width of the nuclear magnetic resonance (NMR) line is determined as a function of temperature. Both pulsed and steady state NMR have been used, mainly in studies of ionic crystals and metals, but also in some cases, of molten salts. The diffusion coefficients are calculated from the basic equation:

$$\frac{1}{\nu_i} = \frac{d^2}{6D_i} \tag{7.19}$$

expressing the relationship between the jump frequency, ν_i, the diffusion coefficients, D_i, and d, the jump distance or next-nearest neighbor distance in the ionic crystal. Reduction to the practical expression follows from Torrey's model of ionic diffusion [511]. It is to be noted that no macroscopic diffusional flow is measured. For details, see [510].

Conductance Method. This method uses the principles of ionic dilute solution theories to calculate the diffusion constants. Thus the Nernst–Einstein equation, relating the diffusion constant, D_i, and the equivalent ionic conductance, λ_i, is used in the form:

$$D_i = H_R(RT\lambda_i/z_iF^2) \tag{7.20}$$

where H_R is the Havens correlation factor for ionic conductors [512], and λ_i is gained from equivalent conductance data and transport numbers in the conventional manners. For additional details, see [510].

Advantages and Limitations. For these two methods, the following aspects are to be noted.

In the NMR technique, the calculation of the spin relaxation times (from the line width measurements) is limited by various problems, such as line shapes, quadrupole interactions, and magnetic field inhomogeneities.

In the conductance method, the use of the Nernst-Einstein equation implies conditions under which the ionic mobilities are independent of each other (as in infinitely dilute electrolytes). Application of this equation to molten salts is also subject to further uncertainties relative to values for the

Havens correlation factor and of transport numbers in molten salts. An uncertainty of $\sim \pm$ 10–20% has been advanced for the thus estimated values for D_i [510].

6. Intercomparisons of Diffusion Techniques

For three systems the number of investigations appears sufficient to enable meaningful intercomparison, viz.,

(a) for the self-diffusion of Na^+ in molten $NaNO_3$, some 21 independently conducted studies, by 4 different techniques.

(b) for the diffusion of Ag^+ in molten $NaNO_3$, some 11 independently conducted studies, by 7 different techniques.

(c) for the diffusion of Cd^{2+} in the molten LiCl-KCl eutectic, some 14 independently conducted studies, by 5 different techniques.

The results are illustrated in figures 1–3 and tables 6–8 herewith. Some observations thus possible, are as follows.

$Na^+/NaNO_3$: The agreement between the values from all four techniques (diffusion out of capillary, diffusion into capillary, chromatography, porous frit) is $\sim \pm$ 10%. The values from five different laboratories, each using the "diffu-

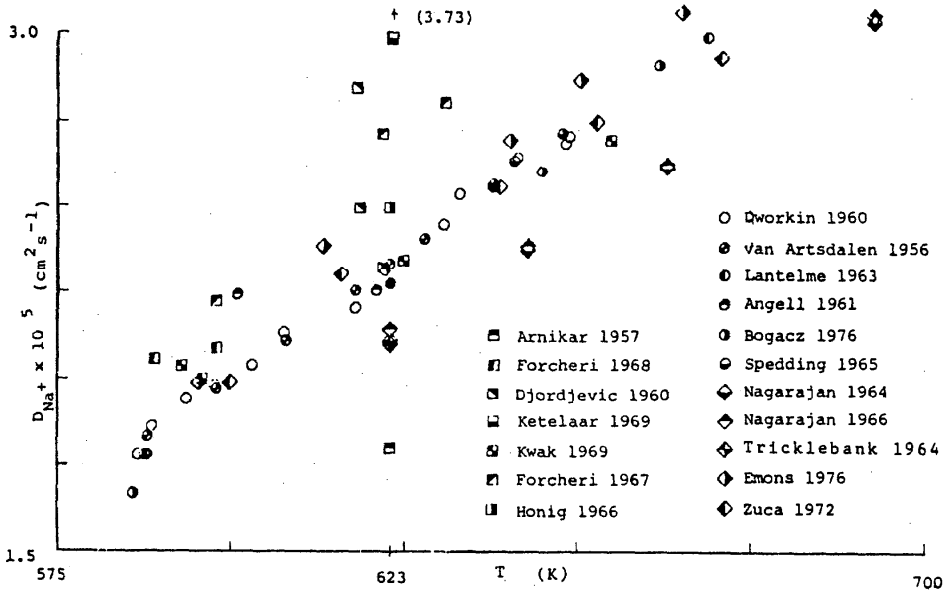

FIGURE 1. Diffusion studies of Na^+ in molten $NaNO_3$.

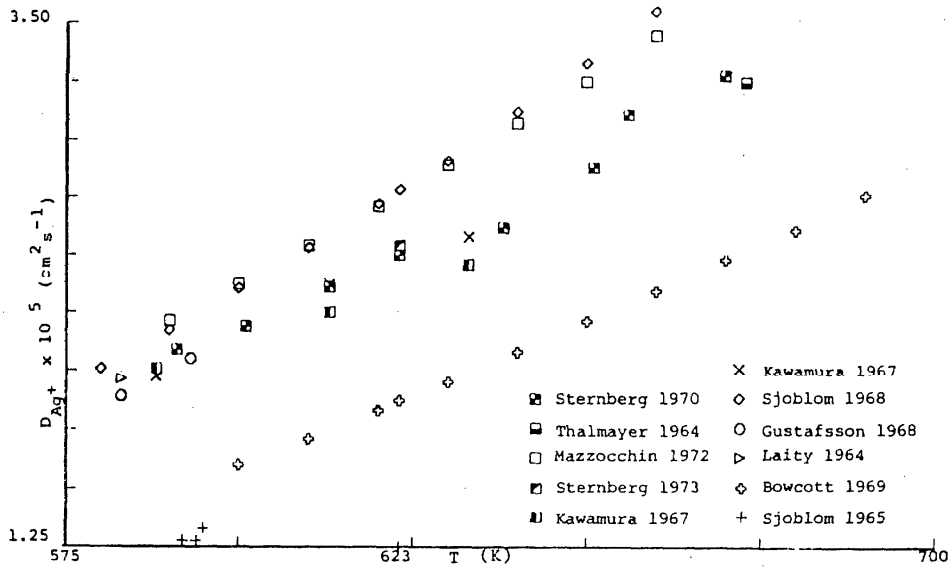

FIGURE 2. Diffusion studies of Ag^+ in molten $NaNO_3$.

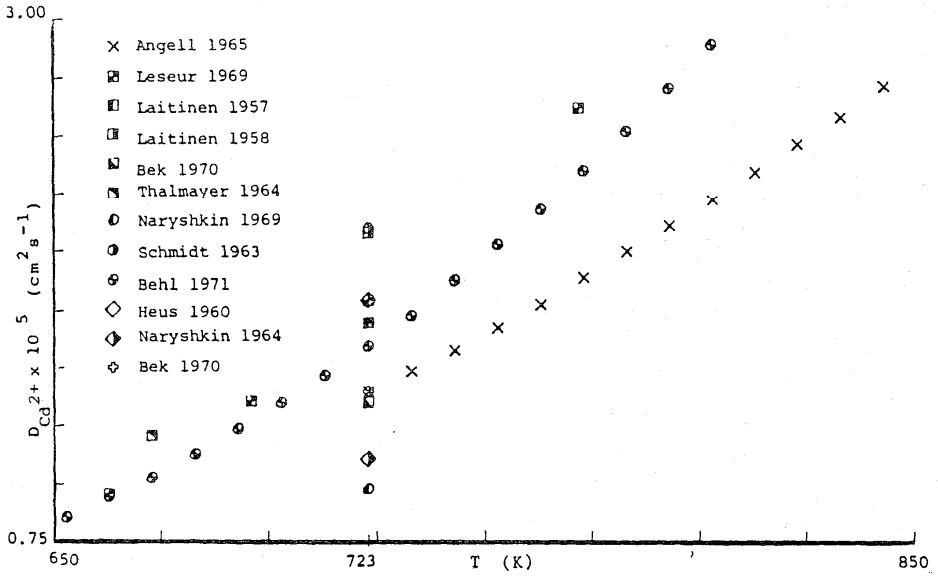

FIGURE 3. Diffusion studies of Cd^{2+} in molten LiCl-KCl.

TABLE 6. Diffusion coefficients of Na^+ in $NaNO_3$ at 350 °C

Technique	$D \times 10^5$ ($cm^2 s^{-1}$)	Reference
Diffusion out of capillary	2.33	50
	2.32	94
	2.27	95
	2.27	96
	2.27	97
	2.55[a]	52
Diffusion into capillary	2.10	49
	2.13	98
	2.14	99
	2.48	100,101
	2.38	47
Chromatography	2.49	82, 84
	2.37	86
	2.20[b]	92,102
	2.70[d]	91
	1.80[e]	81
	3.73[c]	103
Porous frit	2.44	56

[a] At $t = 365$ °C.
[b] At $t = 325$ °C.
[c] At $t = 450$ °C.
[d] Value too high.
[e] Value too low.

TABLE 7. Diffusion coefficients of Ag^+ in $NaNO_3$ at 350 °C.

Technique	$D \times 10^5$ ($cm^2 s^{-1}$)	Reference
Chronopotentiometry	2.50	104
	3.25[a]	105
	2.76	106
	2.54	107
	2.35	108
Rapid scan voltammetry	2.47	108
Porous frit	2.78	109
Optical interferometry	2.60	33
Diaphragm cell	1.96[b]	70
Linear diffusion cell	1.87	110
Gravimetric	1.32[c]	75

[a] At $t = 400$ °C.
[b] At $t = 310$ °C.
[c] At $t = 322$ °C.

TABLE 8. Diffusion coefficients of Cd^{2+} in LiCl-KCl at 450 °C.

Technique	$D \times 10^5$ ($cm^2 s^{-1}$)	Reference
Capillary	1.40	111
Chronopotentiometry	1.80	112,113
	1.70	114
	2.08[b]	122
	1.35	115
	1.21[a]	105
Linear sweep voltammetry	1.60	116,117
	2.10[b]	118
	0.98[c]	119
dc polarography	1.80	120
	1.11[c]	121
Faradaic impedance	1.40	115

[a] At $t = 400$° C.
[b] Values too high.
[c] Values too low.

sion out of the capillary" technique fall closely together ($\sim \pm 1.5\%$). Based on the preceding, the value for D_{Na^+} is recommended as:

$$D_{Na^+} = 2.30(\pm 0.03) \times 10^{-5} \text{ cm}^2 \text{ s}^{-1}. \quad (7.21)$$

at 350 °C in molten $NaNO_3$.

$Ag^+/NaNO_3$: The agreement of the D values determined by chronopotentiometry, rapid scan voltammetry, porous frit, and interferometry leaves little to be desired.

The techniques of the diaphragm cell, linear diffusion cell, and gravimetric frit, apparently yield values for D that are lower.

Based on the preceding, the value for D_{Ag^+} is recommended as:

$$D_{Ag^+} = 2.60(\pm 0.2)\times 10^{-5}\ cm^2\ s^{-1} \quad (7.22)$$

in molten $NaNO_3$ at 350 °C.

Cd^{2+}/LiCl-KCl: Inspection shows that, with the exception of some four values, the D values determined by the techniques of capillary, chronopotentiometry, linear sweep voltammetry, dc polarography, and faradaic impedance, are in close agreement. Four values, as noted, may be dismissed as inaccurate.

For $D_{Cd^{2+}}$ the value of:

$$D_{Cd^{2+}} = 1.60(\pm 0.20)\times 10^{-5}\ cm^2\ s^{-1} \quad (7.23)$$

in molten LiCl-KCl is recommended at 450 °C.

Accuracy estimates for the various measurement methods are given as part of the diffusion data tables.

7. Classification of Diffusion Solvents and Diffusing Species

Solvents

For the arrangement of the various single and multicomponent salt systems used as solvents in the diffusion measurements, the "anion family" classification of the molten salt data series [1–9] has been used. This classification is organized as follows.

Within an anion family, the salts are listed according to increasing valency of the cation; e.g., MX, MX_2, MX_3, MX_4....

Within a category, the salts are listed according to the position of the cation in the periodic table of elements.

Mixtures are listed according to increasing number of components, i.e., binary, ternary....

Mixtures with common anions; the systems are arranged according to positions of the cations in the periodic table of elements. Also the order: mono-monovalent, mono-divalent, mono-trivalent, di-divalent... has been followed.

Mixtures with dissimilar anions: these are listed under "others." However, mixed halides are listed as a separate category.

The different anion families have been ordered according to the increasing number of atoms present in the anion. Different anions with the same number of atoms are arranged according to alphabetical order of their chemical formula, e.g., CO_3, NO_3, PO_3.

Sulfur and polysulfides are listed together as a separate category.

Diffusing Species

An alphabetical order according to the elemental symbol and/or chemical formula of the species was adopted for listing the diffusing species.

8. Diffusion Data Tables

For each system the results are reported as follows:

System number and formula(e)

List of diffusing species

Diffusion equation

Measurement techniques, estimate of uncertainties, and diffusing species

Diffusion equation parameters, temperature ranges, and precisions

Diffusion coefficients: numerical values

Diffusing species and literature references number. Where two or more studies are cited, the underscore indicates the recommended study.

Literature reference citations

The molten salt systems and the diffusing species are cross-indexed in two summarizing tables.

System 1. LiF

List of diffusing species studied in LiF as solvent

Li^+, F^-

Table 1.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
conductivity	∿± 10-20%	Li^+ [510]
molecular dynamics	∿ ± 50%	Li^+, F^- [129,130]

Table 1.2. Self-diffusion coefficients

Species	T (K)	$D_{Li^+} \times 10^5$ ($cm^2 s^{-1}$)	References	Species	T (K)	$D_{Li^+} \times 10^5$ ($cm^2 s^{-1}$)	References
Li^+	1215	18	129	F^-	1215	9.0	129
	1287	13.6	130		1287	11.3	129

Values of D are calculated from molecular dynamics [129,130]. At 1124K the value for D_{Li^+} from conductivity is estimated as 12.2×10^{-5} $cm^2 s^{-1}$ [510].

System 2. NaF

List of diffusing species investigated in NaF as solvent

Na^+, *F^-*

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 2.4.

Table 2.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	Na^+, F^-

Equation:

$$D = A \exp[-E/RT] \quad (2.1)$$

precision: in table 2.2 uncertainty: in table 2.1

System 2. NaF (cont'd)

Table 2.2. Parameters of diffusion equation (2.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	3.08	8700	1290-1410	± 3%	131,132

Table 2.3. Self-diffusion coefficients from equation in table 2.2.

T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)
1290	10.34	1360	12.31
1300	10.61	1370	12.61
1310	10.89	1380	12.90
1320	11.17	1390	13.20
1330	11.45	1400	13.50
1340	11.74	1410	13.80
1350	12.02		

Table 2.4. Diffusion coefficients for species not included in table 2.3.

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
F^-	1322	9.67	133
	1325	9.15	

System 3. KF

List of diffusing species investigated in KF as solvent

K^+

Table 3.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	K^+

System 3. KF (cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (3.1)$$

precision: in table 3.2. uncertainty: in table 3.1.

Table 3.2. Parameters of diffusion equation (3.1), precision, and references

Species	A $\times 10^3$ ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
K^+	2.46	7500	1140-1290	±2.5%	132

Table 3.3. Self-diffusion coefficients from equation in table 3.2.

T (K)	$D_{K^+} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{K^+} \times 10^5$ ($cm^2 s^{-1}$)
1140	8.98	1220	11.15
1150	9.24	1230	11.44
1160	9.50	1240	11.72
1170	9.77	1250	12.01
1180	10.04	1260	12.30
1190	10.32	1270	12.60
1200	10.59	1290	13.19
1210	10.87		

System 4. $LiBeF_3$

List of diffusing species investigated in $LiBeF_3$ as solvent

Li^+, F^-

Table 4.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in valued of D)	Species
capillary	$\sim \pm$ 10%	Li^+, F^-

Equation:

$$D = A \exp[-E/RT] \quad (4.1)$$

precision: in table 4.2 uncertainty: in table 4.1

System 4. $LiBeF_3$ (cont'd)

Table 4.2. Parameters of diffusion equation (4.1), precisions, and references

Species	A x 10^3 (cm^2 s^{-1})	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
Li^+	11.2	9310	710-830		134
F^-	3.1 x10^7	34500	760-920		135

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 4.3. Self-diffusion coefficients from equations in table 4.2

T (K)	D_{Li^+} x 10^5 (cm^2s^{-1})	D_{F^-} x 10^5 (cm^2s^{-1})	T (K)	D_{Li^+} x 10^5 (cm^2s^{-1})	D_{F^-} x 10^5 (cm^2s^{-1})
710	1.53		820	3.70	1.98
720	1.67		830	3.96	2.55
730	1.83		840		3.27
740	1.99		850		4.18
750	2.17		860		5.30
760	2.35	0.38	870		6.68
770	2.55	0.50	880		8.38
780	2.76	0.67	890		10.46
790	2.98	0.89	900		12.99
800	3.21	1.17	910		16.06
810	3.45	1.52	920		19.76

System 5. Li_2BeF_4

List of diffusing species investigated in Li_2BeF_4 as solvent.

Li^+, F^-

Table 5.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Li^+
	$\sim \pm$ 25%	F^-

Equation:

$$D = A \exp[-E/RT] \qquad (5.1)$$

precision: in table 5.2 uncertainty: in table 5.1

System 5. Li_2BeF_4 (cont'd)

Table 5.2. Parameters of diffusion equation (5.1), precision and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
Li^+	9.27	7770	740-890		136
F^-	6.97×10^6	30615	790-920	± 4.7%	135,137

No entry in precision column indicates estimate not possible since results were reported as equation only.

Table 5.3. Self-diffusion coefficients from equationsin table 5.2.

T (K)	D_{Li^+} x 10^5 ($cm^2 s^{-1}$)	D_{F^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Li^+} x 10^5 ($cm^2 s^{-1}$)	D_{F^-} x 10^5 ($cm^2 s^{-1}$)
740	4.70		840	8.82	7.55
750	5.05		850	9.32	9.37
760	5.40		860	9.83	11.56
770	5.78		870	10.36	14.21
780	6.17		880	10.90	17.37
790	6.57	2.36	890	11.46	21.15
800	6.99	3.02	900		25.64
810	7.42	3.83	910		30.94
820	7.87	4.83	920		37.20
830	8.34	6.05			

System 6. $NaBF_4$

List of diffusing species investigated in $NaBF_4$ as solvent

Ti^{4+}

Table 6.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry & rapid scan voltammetry	∿ ± 50%	Ti^{4+}

Table 6.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Ti^{4+}	693	0.2[a]	138

[a] Average of values obtained by two techniques.

System 7. Na_3AlF_6

List of diffusing species investigated in Na_3AlF_6 as solvent

Na^+, *Ta(V)*, F^-, *^{26}Al*, *Al_2O_3*, *CO_2*

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients. For these species: see table 7.4.

Table 7.1. Diffusion techniques, uncertainties and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 20%	Na^+, F^-
chronopotentiometry	$\sim \pm$ 20%	Ta(V)
double-layer impedance	$\sim \pm$ 20%	CO_2
rotating disc electrode	$\sim \pm$ 20%	Al_2O_3

Equation:

$$D = A \exp[-E/RT] \quad (7.1)$$

precision: in table 7.2 uncertainty: in table 7.1

Table 7.2. Table 7.2. Parameters of diffusion equation (7.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	4.58	10200	1307-1338	$\pm$ 2.2%	140
F^-	0.877	7106	1307-1338	$\pm$ 1.3%	140

Table 7.3. Self diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 7.2

T (K)	Na^+	F^-
1310	9.10	5.72
1320	9.37	5.84
1330	9.65	5.96
1340	9.93	6.08

System 7. Na_3AlF_6 (cont'd)

Table 7.4. Diffusion coefficients for species not included in table 7.3

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Ta(V)	1273	7.0	139
Al_2O_3	1323	2.0(a)	141,142
^{26}Al	1324	6.9	144,148
^{26}Al	1325	6.77	144,148
CO_2		0.005(b)	145,147

(a) This value is a merge of the results reported by Desclaux and Rolin[141],Thonsted[518], and Shurygin et al.[143,146,149]. The values reported were, respectively:[141] 1050°C, 2.7 x 10^{-5} cm^2s^{-1}; [518] 1020°C, 1.5 x 10^{-5} cm^2s^{-1}; [143,146,149] 1050°C, 1.33 x 10^{-5} cm^2s^{-1}, respectively.

(b) This value is based on a solubility of CO_2 in molten cryolite of ∿ 5 x 10^{-6} mole cm^{-3} at 1000°C.

System 8. LiCl

List of diffusing species investigated in LiCl as solvent

Li^+, Cl^-, Na^+, Rb^+, Cs^+, Pb^{2+}, Ag^+, Zr^{2+}, Mo^{3+}, Cl_2

Table 8.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	Li^+, Cl^-, Na^+, Rb^+, Cs^+
chronopotentiometry	∿ ± 10%	Pb^{2+}, Ag^+, Zr^{2+}, Mo^{3+}
Faradaic impedance	∿ ± 50%	Cl_2

Equation:

$$D = A \exp[-E/RT] \quad (8.1)$$

precision: in table 8.2 uncertainty: in table 8.1

System 8. LiCl (cont'd)

Table 8.2. Parameters of diffusion equation (8.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Li^+	linear equation		883-1033		152
Cl^-	linear equation		883-1033		152
Na^+	2.10	5850	928-1085	± 1.5%	155
Rb^+	2.06	6740	928-1091	± 3.5%	155
Cs^+	0.93	6440	925-1089	± 4%	155
Pb^{2+}	2.74	7479	903-1150	± 3%	156,159
Ag^+	2.46	5516	911-1089	± 2%	151,160
Zr^{2+}	2.95	7596	973-1105	± 5%	150
Mo^{3+}	1.89	7194	935-1083	± 6%	153,154,158
Cl_2	1.09×10^{-7}	-32,211	935-1100	± 26%	157

No entry in precision column indicates estimates not possible since results were reported as equations only.

$D_{Li^+} = [10.6 + 0.0307\ (T-883)] \times 10^{-5}$; $D_{Cl^-} = [5.8 + 0.0117\ (T-883)] \times 10^{-5}$

Table 8.3. Self-diffusion coefficients from equations in table 8.2

T (K)	$D_{Li^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{Cl^-} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Li^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{Cl^-} \times 10^5$ ($cm^2 s^{-1}$)
880	10.51	5.76	980	13.58	6.93
900	11.12	6.00	1000	14.19	7.17
920	11.74	6.23	1020	14.81	7.40
940	12.35	6.47	1040	15.42	7.64
960	12.96	6.70			

Table 8.4. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 8.2

T (K)	Na^+	Rb^+	Cs^+	Pb^{2+}	Ag^+	Zr^{2+}	Mo^{3+}	Cl_2
910				4.38	11.65			
950	9.47	5.80	3.07	5.21	13.24		4.18	280.3
990	10.73	6.70	3.52	6.12	14.90	6.21	4.88	140.7
1030	12.05	7.65	4.00	7.09	16.62	7.21	5.62	74.5
1070	13.41	8.65	4.50	8.13	18.38	8.29	6.41	41.4
1110				9.23		9.42		
1150				10.39				

System 9. NaCl

List of diffusing species investigated in NaCl as solvent

Na^+, Cl^-, Li^+, K^+, Rb^+, Cs^+, Ca^{2+}, Pb^{2+}, Ag^+, Cd^{2+}, Zr^{2+}, Zr^{4+}, Fe^{3+}, *Co^{2+}*, *Ni^{2+}*, Th^{4+}, U^{3+}, U^{4+}, Cl_2, *HCℓ*, TiO_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species, see: table 9.5.

Table 9.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	Na^+, Cl^-, Li^+, K^+, Rb^+, Cs^+, Ca^{2+}
chronopotentiometry	∿ ± 10%	Pb^{2+}, Ag^+, Cd^{2+}, Zr^{2+}, Zr^{4+}, Th^{4+}, U^{3+}, U^{4+}, Co^{2+}, Ni^{2+}, Cl_2
rotating disc electrode	∿ ± 20%	Fe^{3+}, HCℓ, Cl_2, TiO_2

Equation:

$$D = A \exp[-E/RT] \quad (9.1)$$

precision: in table 9.2 uncertainty: in table 9.1

Table 9.2. Parameters of diffusion equation (9.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
Na^+	2.1	7140	1090-1295	± 3%	see:table S-1
Cl^-	1.9	7430	1100-1310	± 3%	see:table S-1
Li^+	1.38	5450	1090-1250	± 2.5%	123.161,182
K^+	1.92	6780	1100-1240	± 2.3%	123,161,182
Rb^+	2.04	7140	1105-1250	± 3.6%	123,161,182
Cs^+	3.57	8620	1100-1250	± 4%	123,161,182
Ca^{2+}	2.26	8270	1110-1220	± 0.04%	93,173
Pb^{2+}	3.06	8492	1085-1190	± 1.3%	156,171
Ag^+	4.66	8404	1095-1190	± 1.4%	151,159,160
Cd^{2+}	2.97	8055	1100-1155	± 3%	43,168,174
Fe^{3+}	22.9	13800	1120-1215	± 0.08%	163
Zr^{2+}	4.46	8910	960-1215		150,168
Zr^{4+}	3.63	9335	1070-1220		150,169
Th^{4+}	7.27	10666	965-1210		167,185
U^{3+}	2.19	7733	1085-1205		170,176
U^{4+}	3.80	9335	920-1205		170
Cl_2	2.02 x 10^{-2}	-7554	1100-1225	± 4.6%	166,177-179
TiO_2	43570	32305	1120-1270	± 1.2%	183

No entry in precision column indicates estimates not possible, since results were reported as equations only.

System 9. NaCl (cont'd)

Table 9.3.1. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 9.2

T (K)	Li^+	K^+	Rb^+	Cs^+	Ca^{2+}	Pb^{2+}	Ag^+	Cd^{2+}
1080						5.85		
1100	11.40	8.63	7.78	6.92		6.29	9.97	7.45
1120	11.92	9.13	8.25	7.42	5.50	6.74	10.68	7.96
1140	12.45	9.63	8.73	7.95	5.87	7.21	11.41	8.48
1160	12.97	10.14	9.21	8.48	6.25	7.69	12.16	9.02
1180	13.50	10.66	9.71	9.04	6.64	8.18	12.94	
1200	14.04	11.18	10.22	9.61	7.05			
1220	14.57	11.71	10.73	10.20	7.46			
1240	15.11	12.26	11.25	10.80				
1250	15.38		11.52	11.11				

Table 9.3.2. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 9.2

T (K)	Zr^{2+}	Zr^{4+}	Fe^{3+}	Th^{4+}	U^{3+}	U^{4+}	Cl_2	TiO_2
920						2.30		
940						2.57		
960	4.18			2.71		2.85		
980	4.60			3.04		3.15		
1000	5.04			3.39		3.46		
1020	5.50			3.77		3.80		
1040	5.98			4.17		4.15		
1060	6.49			4.60		4.52		
1080	7.02	4.69		5.05	5.96	4.91		
1100	7.57	5.07		5.53	6.37	5.31	64.00	
1120	8.14	5.47	4.64	6.03	6.78	5.73	60.17	2.16
1140	8.73	5.89	5.18	6.56	7.21	6.17	56.69	2.79
1160	9.35	6.33	5.75	7.11	7.65	6.62	53.53	3.57
1180	9.98	6.78	6.37	7.69	8.09	7.09	50.63	4.53
1200	10.63	7.24	7.02	8.30	8.55	7.58	47.99	5.70
1220	11.30	7.72	7.72				45.56	7.11
1240								8.82
1250								9.79
1270								12.02

System 9. NaCl (cont'd)

Table 9.4. Self-diffusion coefficients from equations in table 9.2

T (K)	$D_{Na^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{Cl^-} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Na^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{Cl^-} \times 10^5$ ($cm^2 s^{-1}$)
1090	7.77		1200	10.52	8.42
1100	8.01	6.35	1220	11.04	8.86
1110	8.25	6.54	1240	11.58	9.32
1120	8.49	6.74	1260	12.13	9.77
1140	8.98	7.15	1280	12.68	10.24
1160	9.48	7.57	1300	13.24	10.71
1180	10.00	7.99	1310		10.94

Table 9.5. Diffusion coefficients for species not included in tables 9.3 and 9.4

Species	T (K)	$D \times 10^5$ ($cm^2 s^{-1}$)	References
Co^{2+}	1079	2.12	180
Ni^{2+}	1078	2.81	181
HCl	1148	31.0	
	1173	25.0	164
	1223	17.0	

System 10. KCl

List of diffusing species investigated in KCl as solvent

K^+, Cl^-, Li^+, Na^+, Rb^+, Cs^+, Mg^{2+}, Ca^{2+}, Pb^{2+}, *Cu^+*, Ag^+, *Au^+*, Cd^{2+}, Zr^{2+}, Zr^{4+}, Mo^{3+}, Fe^{3+}, *Co^{2+}*, *Ni^{2+}*, Th^{4+}, U^{3+}, U^{4+}, *Cl_2*, *HCl*, TiO_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species, see table 10.6.

Table 10.1. Diffusion techniques, uncertainties and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 20%	K^+, Cl^-, Li^+, Na^+, Rb^+, Cs^+, Ca^{2+}
chronopotentiometry	$\sim \pm$ 10%	Pb^{2+}, Ag^+, Cd^{2+}, Zr^{2+}, Zr^{4+}, Mo^{3+}, Th^{4+}, U^{3+}, U^{4+}, Cl_2, Cu^+, Au^+, Co^{2+}, Ni^{2+}, Mg^{2+}
rotating disc electrode	$\sim \pm$ 20%	Fe^{3+}, HCl, TiO_2

System 10 KCl (cont'd).

Equation:

$$D = A \exp[-E/RT] \quad (10.1)$$

precision: in table 10.2 uncertainty: in table 10.1

Table 10.2. Parameters of diffusion equation (10.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
K^+	1.80	6880	1070-1260		162
Cl^-	1.80	7130	1065-1260		162
Li^+	1.46	6438	1070-1260	± 4.0%	182
Na^+	3.03	7820	1070-1275		165,184,193
Rb^+	2.06	7070	1070-1275		165
Cs^+	1.09	5600	1070-1275		165
Mg^{2+}	13.79	10068	1020-1120		195
[a] Mg^{2+}	33.09	11944	1020-1120		195
[b] Mg^{2+}	58.85	14187	1020-1120		195
[c] Mg^{2+}	54.93	15880	1020-1120		195
Ca^{2+}	1.29	7920	1055-1175	± 0.2%	173
Pb^{2+}	2.46	8165	1065-1175	± 1.9%	156,171
Ag^+	3.30	7709	1060-1190	± 2.4%	151,153,160,188
Cd^{2+}	1.12	6209	1050-1135	± 2.4%	174
Zr^{2+}	9.75	11500	965-1210		150,168
Zr^{4+}	7.94	11897	1070-1195		150,189,191
Mo^{3+}	6.64	10874	900-1100		153,154,158
Fe^{3+}	213	18830	1123-1213	± 0.1%	163
Th^{4+}	7.46	11458	1000-1200		167,185,192
U^{3+}	2.45	8877	1050-1210		176
U^{4+}	3.09	10067	920-1205		170
Cl_2	data set does not fit either exponential or linear equations				
TiO_2	29905	32019	1070-1220	± 6.8%	183

Mg^{2+}; italicized indicates studies with added F^- ions; diffusing species uncertain.

[a] Melt containing 0.318 x 10^{-2} mol % NaF. [b] Melt containing 0.701 x 10^{-2} mol % NaF.

[c] Melt containing 2.87 x 10^{-2} mol % NaF.

Table 10.3. Self-diffusion coefficients from equations in table 10.2

T (K)	D_{K^+} x 10^5 ($cm^2 s^{-1}$)	D_{Cl^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{K^+} x 10^5 ($cm^2 s^{-1}$)	D_{Cl^-} x 10^5 ($cm^2 s^{-1}$)
1060		6.10	1160	9.10	8.16
1070	7.08	6.29	1180	9.57	8.60
1080	7.30	6.49	1200	10.05	9.05
1100	7.73	6.90	1220	10.54	9.51
1120	8.18	7.31	1240	11.03	9.97
1140	8.64	7.73	1260	11.53	10.44

System 10. KCl (cont'd)

Table 10.4.1. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 10.2

T (K)	Li^+	Na^+	Rb^+	Cs^+	Ca^{2+}	Pb^{2+}	Ag^+	Cd^{2+}
1050					2.90			5.71
1060					3.00	5.10	8.49	5.88
1070	7.07	7.66	7.41	7.83	3.11	5.29	8.79	6.04
1080	7.27	7.92	7.64	8.02	3.22	5.48	9.09	6.21
1100	7.68	8.47	8.11	8.41	3.44	5.87	9.70	6.54
1120	8.09	9.03	8.60	8.80	3.67	6.28	10.33	6.88
1140	8.51	9.60	9.09	9.20	3.91	6.69	10.98	7.23
1160	8.94	10.19	9.59	9.60	4.15	7.12	11.64	
1180	9.37	10.79	10.10	10.01	4.40	7.56	12.32	
1190	9.59	11.10	10.36	10.21			12.67	
1200	9.81	11.41	10.62	10.41				
1210	10.04	11.72	10.89	10.62				
1220	10.26	12.04	11.15	10.82				
1240	10.71	12.68	11.69	11.23				
1260	11.16	13.34	12.23	11.64				
1280		14.00	12.78	12.06				

Table 10.4.2. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 10.2

T (K)	Zr^{2+}	Zr^{4-}	Mo^{3+}	Fe^{3+}	Th^{4+}	U^{3+}	U^{4+}	TiO_2
900			1.52					
920			1.73				1.25	
940			1.97				1.41	
960	2.35		2.22				1.58	
980	2.66		2.50				1.76	
1000	2.99		2.79		2.34		1.95	
1020	3.35		3.11		2.62		2.15	
1040	3.74		3.44		2.92		2.37	
1050	3.94		3.62		3.07	3.48	2.48	
1060	4.15		3.80		3.24	3.62	2.60	
1070	4.37	2.95	3.99		3.41	3.77	2.71	0.86
1080	4.59	3.11	4.18		3.58	3.92	2.84	0.99
1100	5.06	3.44	4.59		3.95	4.22	3.09	1.30
1120	5.56	3.79		4.51	4.33	4.54	3.35	1.69
1140	6.09	4.16		5.23	4.74	4.87	3.63	2.17
1160	6.64	4.55		6.04	5.18	5.21	3.92	2.77
1180	7.23	4.97		6.93	5.63	5.56	4.22	3.51
1190	7.53	5.19		7.42	5.87	5.74	4.38	3.94
1200	7.84	5.41		7.92	6.11	5.92	4.53	4.41
1210	8.16			8.46		6.11	4.70	4.93
1220								5.49

System 10. KCl (cont'd)

Table 10.5. Diffusion coefficients, $D^a \times 10^5$ ($cm^2 s^{-1}$), of magnesium(II) from equations in table 10.2

T (K)	Concentration of NaF in the melt (Mol %)			
	0.0	0.318×10^{-2}	0.701×10^{-2}	2.87×10^{-2}
1020	9.60	9.13	5.37	2.17
1040	10.56	10.23	6.14	2.53
1060	11.58	11.40	6.99	2.92
1080	12.65	12.67	7.92	3.36
1100	13.78	14.02	8.93	3.84
1120	14.96	15.45	10.03	4.38

[a]The values of diffusion coefficients appear to be improbably high.

Table 10.6. Diffusion coefficients for species not included in table 10.3 to 10.5

Species	T (K)	$D \times 10^5$ ($cm^2 s^{-1}$)	References
Cu^+	1088	2.14	188
Au^+	1088	2.20	188
Co^{2+}	1079	1.86	180
Ni^{2+}	1078	2.35	181
HCl	1123	31.0	*164,194*
	1153	35.0	
	1183	37.0	
Cl_2	1085	18.0	166,177,178,179,196
	1110	21.7	
	1117	23.2	
	1143	23.5	
	1173	24.0	

System 11. RbCl

List of diffusing species investigated in RbCl as solvent

Rb^+, Tl^+, Pb^{2+}, Ag^+, Zr^{2+}, Zr^{4+}, Th^{4+}, Th^{4+}, U^{3+}, U^{4+}, Cl^-, Cl_2, TiO_2

The italicised species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 11.5

System 11. RbCl (cont'd).

Table 11.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Rb^+, Cl^-
chronopotentiometry	∿ ± 10%	Tl^+, Pb^{2+}, Ag^+, Zr^{2+}, Zr^{4+}, Th^{4+}, U^{3+}, U^{4+},
	∿ ± 20%	Cl_2
RDE	∿ ± 25%	TiO_2

Equation:

$$D = A \exp[-E/RT] \quad (11.1)$$

precision: in table 11.2 uncertainty: in table 11.1

Table 11.2. Parameters of diffusion equation (11.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Rb^+	2.574	8058	1020-1150	± 0.6%	45
Pb^{2+}	3.359	9107	1010-1160	± 2.4%	156
Ag^+	2.420	7258	1010-1150	± 3.3%	151
Zr^{2+}	14.440	12800	1000-1220		168,191
Zr^{4+}	12.010	13225	1000-1130		169,191
Th^{4+}	8.18	12218	970-1210		167,185
U^{3+}	2.04	9015	990-1160		176
U^{4+}	6.60	12355	990-1140		198
Cl^-	1.38	6999	1010-1150	± 2.6%	45
Cl_2	0.0232	-3170	950-1150	± 2%	194,197
TiO_2	80426	34665	1020-1170	± 3.1%	183

Table 11.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 11.2

T (K)	Rb^+	Cl^-	T (K)	Rb^+	Cl^-
1010		4.22	1090	6.24	5.45
1020	4.83	4.37	1100	6.45	5.61
1030	5.02	4.52	1110	6.67	5.78
1040	5.22	4.67	1120	6.89	5.94
1050	5.41	4.82	1130	7.11	6.11
1060	5.61	4.98	1140	7.34	6.28
1070	5.82	5.13	1150	7.57	6.45
1080	6.03	5.29			

System 11. RbCl (cont'd).

Table 11.4. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 11.2

T (K)	Pb^{2+}	Ag^+	Zr^{2+}	Zr^{4+}	Th^{4+}	U^{3+}	U^{4+}	Cl_2	TiO_2
950								12.44	
970					1.45			12.01	
990					1.64	2.09	1.24	11.62	
1010	3.59	6.51	2.45	1.65	1.86	2.29	1.40	11.26	
1030	3.93	6.98	2.78	1.88	2.09	2.49	1.58	10.92	0.355
1050	4.27	7.47	3.13	2.12	2.34	2.71	1.77	10.60	0.490
1070	4.64	7.97	3.51	2.39	2.61	2.94	1.98	10.30	0.668
1090	5.01	8.48	3.92	2.68	2.90	3.18	2.20	10.03	0.901
1110	5.41	9.01	4.36	2.99	3.21	3.42	2.44	9.76	1.20
1130	5.82	9.55	4.83	3.33	3.55	3.68	2.69	9.52	1.59
1150	6.25	10.11	5.33		3.90	3.95		9.29	2.08
1190			6.44		4.66				
1210			7.04		5.08				
1220			7.36						

Table 11.5. Diffusion coefficients for species not included in tables 11.3 to 11.4

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Tl^+	1003	5.25	174
	1023	5.74	

System 12. CsCl

List of diffusing species investigated in CsCl as solvent

Li^+, Na^+, Rb^+, Cs^+, Pb^{2+}, Ag^+, Cd^{2+}, Zr^{2+}, Zr^{4+}, Mo^{3+}, *Co^{2+}*, *Ni^{2+}*, Th^{4+}, U^{3+}, U^{4+}, UO_2^{2+}, Cl^-, Cl_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients. For these species: see table 12.5.

Table 12.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Li^+, Na^+, Rb^+, Cs^+, Cd^{2+}, Cl^-
chronopotentiometry	∿ ± 10%	Pb^{2+}, Ag^+, Zr^{2+}, Zr^{4+}, Mo^{3+}, Th^{4+}, U^{3+}, U^{4+}, UO_2^{2+}, Cl_2
	∿ ± 20%	Co^{2+}, Ni^{2+}

System 12. CsCl (cont'd).

Equation:

$$D = A \exp[-E/RT] \quad (12.1)$$

precision: in table 12.2 uncertainty: in table 12.1

Table 12.2. Parameters of diffusion equation (12.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Li^+	1.126	6137	940-1140	± 2.0%	182
Na^+	1.047	5419	940-1150	± 3.9%	182
Rb^+	0.487	3938	950-1150	± 4.9%	182
Cs^+	0.399	4244	960-1150	± 3.4%	43,45,182
Pb^{2+}	2.883	8568	940-1140	± 3.1%	156
Ag^+	2.353	7194	940-1140	± 1.7%	151,160
Cd^{2+}	1.917	7674	940-1240	± 5.4%	43
Zr^{2+}	16.0	13300	970-1210		168,191
Zr^{4+}	12.013	13724	980-1110		169,191
Mo^{3+}	7.60	11822	930-1150		153,154,158
[a] Th^{4+}	11.955	13628	960-1150		167,185
U^{3+}	1.86	9198	940-1110		176
U^{4+}	15.84	14598	930-1110		198
UO_2^{2+}	1.948	10022	950-1150		199
Cl^-	2.545	7705	970-1180	± 5.4%	43,45
Cl_2	0.463	2201	990-1120	± 1.7%	166,177,194,196

No entry in precision column indicates estimate not possible since results were reported as equations only.

[a] In presence of added F^- ions as CsF.

Table 12.3. Self-diffusion coefficients from equations in table 12.2

T (K)	$D_{Cs^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{Cl^-} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Cs^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{Cl^-} \times 10^5$ ($cm^2 s^{-1}$)
980	4.51	4.87	1100	5.72	7.50
1000	4.71	5.27	1120	5.93	7.98
1020	4.92	5.69	1140	6.13	8.48
1040	5.12	6.12	1160		9.00
1060	5.32	6.56	1180		9.52
1080	5.52	7.02			

System 12. CsCl (cont'd).

Table 12.4.1. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 12.2

T (K)	Li^+	Na^+	Rb^+	Pb^{2+}	Ag^+	Cd^{2+}	Zr^{2+}	Zr^{4+}	Mo^{3+}	$^aTh^{4+}$
940	4.21	5.75		2.94	5.00	3.15			1.36	
980	4.82	6.48	6.45	3.54	5.85	3.73	1.73	1.04	1.76	1.09
1020	5.45	7.23	6.98	4.21	6.76	4.35	2.26	1.38	2.23	1.44
1060	6.11	7.99	7.51	4.94	7.73	5.02	2.90	1.78	2.78	1.85
1100	6.80	8.78	8.04	5.72	8.76	5.73	3.64	2.25	3.40	2.34
1140	7.50	9.57	8.56	6.57	9.83	6.48	4.51		4.12	2.92
1180						7.27	5.51			
1220						8.09				
1240						8.51				

[a] In presence of added F^- ions as CsF.

Table 12.4.2. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 12.2.

T (K)	U^{3+}	U^{4+}	UO_2^{2+}	Cl_2
940	1.35	0.639		
980	1.65	0.880	1.13	
1020	1.99	1.18	1.39	15.63
1060	2.36	1.55	1.67	16.28
1100	2.77	1.99	1.99	16.92
1120			2.16	17.22

Table 12.5. Diffusion coefficients for species not included in tables 12.3 to 12.4

Species	T (K)	D x 10^5 (cm^2s^{-1})	Recommended study	Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Co^{2+}	973	1.6	180	Ni^{2+}	978	2.7	181
	1079	1.4			1078	2.6	

System 13. CuCl

List of diffusing species investigated in CuCl as solvent

Cu^+, Cl^-

Table 13.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Cu^+, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (13.1)$$

precision: in table 13.2 uncertainty: in table 13.1

Table 13.2. Parameters of diffusion equation (13.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Cu^+	0.498	3142	720-1020	$\pm$ 2.4%	200
Cl^-	0.655	5285	720-1020	$\pm$ 12.5%	200

Table 13.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 13.2

T (K)	Cu^+	Cl^-	T (K)	Cu^+	Cl^-
720	5.54	1.63	880	8.27	3.19
740	5.88	1.80	900	8.59	3.41
760	6.22	1.98	920	8.93	3.64
780	6.56	2.16	940	9.26	3.87
800	6.90	2.36	960	9.59	4.10
820	7.24	2.56	980	9.92	4.34
840	7.58	2.76	1000	10.25	4.58
860	7.92	2.97	1020	10.57	4.83

System 14. AgCl

List of diffusing species investigated in AgCl as solvent

Br^-, Cl_2

The italicized species indicate study with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 14.4.

Table 14.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	(in values of D)	Species
gravimetric	$\sim \pm$ 10%	Br^-
chronopotentiometry	$\sim \pm$ 20%	Cl_2

Equation:

$$D = A \exp[-E/RT] \quad (14.1)$$

precision: in table 14.2 uncertainty: in table 14.1

Table 14.2. Parameters of diffusion equation (14.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Br^-	0.658	4280	780-1090		184

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 14.3. Diffusion coefficients from equation in table 14.2

T (K)	D_{Br^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Br^-} x 10^5 ($cm^2 s^{-1}$)
780	4.16	940	6.65
800	4.46	960	6.98
820	4.76	980	7.31
840	5.07	1000	7.64
860	5.38	1020	7.96
880	5.69	1040	8.29
900	6.01	1060	8.63
920	6.33	1080	8.96
930	6.49	1090	9.12

System 14. AgCl (cont'd).

Table 14.4. Diffusion coefficients for species not included in table 14.4

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cl_2	791	37	201

System 15. TlCl

List of diffusing species investigated in TlCl as solvent

Tl^+, Cl

Table 15.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	~ ± 10%	Tl^+, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (15.1)$$

precision: in table 15.2 uncertainty: in table 15.1

Table 15.2. Parameters of diffusion equation (15.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Tl^+	0.698	4444	760-850	± 0.8%	58,202-204
Cl^-	0.79	4560	740-820		58,202

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 15.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 15.2

T (K)	Tl^+	Cl^-	T (K)	Tl^+	Cl^-
730			800	4.26	4.49
740		3.56	810	4.41	4.65
750		3.71	820	4.56	4.81
760	3.68	3.86	830	4.72	
770	3.82	4.01	840	4.87	
780	3.97	4.17	850	5.03	
790	4.12	4.33			

System 16. $BaCl_2$

List of diffusing species investigated in $BaCl_2$ as solvent

Ba^{2+}, U^{3+}, Cl^-

Table 16.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 20%	Ba^{2+}, Cl^-
chronopotentiometry	$\sim \pm$ 20%	U^{3+}

Equation:

$$D = A \exp[-E/RT] \quad (16.1)$$

precision: in table 16.2 uncertainty: in table 16.1

Table 16.2. Parameters of diffusion equation (16.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Ba^{2+}	0.64	8960	1270-1480		162
U^{3+}	7.58	14460	1230-1330		205
Cl^-	2.00	9480	1270-1480		162

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 16.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 16.2

T (K)	Ba^{2+}	Cl^-	T (K)	Ba^{2+}	Cl^-
1270	1.84	4.67	1380	2.44	6.30
1280	1.89	4.81	1390	2.50	6.46
1290	1.94	4.95	1400	2.56	6.62
1300	1.99	5.10	1410	2.61	6.79
1310	2.05	5.24	1420	2.67	6.95
1320	2.10	5.39	1430	2.73	7.12
1330	2.16	5.54	1440	2.79	7.28
1340	2.21	5.69	1450	2.86	7.45
1350	2.27	5.84	1460	2.92	7.62
1360	2.32	5.99	1470	2.98	7.79
1370	2.38	6.15	1480	3.04	7.96

System 16. $BaCl_2$(cont'd).

Table 16.4. Diffusion coefficients from equation in table 16.2

T (K)	$D_{U3+} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{U3+} \times 10^5$ ($cm^2 s^{-1}$)
1230	2.04	1290	2.69
1240	2.14	1300	2.81
1250	2.25	1310	2.93
1260	2.35	1320	3.06
1270	2.46	1330	3.19
1280	2.57		

System 17. $SrCl_2$

List of diffusing species investigated in $SrCl_2$ as solvent

Sr^{2+}, Cl^-

Table 17.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Sr^{2+}, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (17.1)$$

precision: in table 17.2 uncertainty: in table 17.1

Table 17.2. Parameters of diffusion equation (17.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
Sr^{2+}	0.21	5380	1190-1390		162
Cl^-	0.77	6880	1190-1430		162

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 17.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 17.2

T (K)	Sr^{2+}	Cl^-	T (K)	Sr^{2+}	Cl^-
1190	2.16	4.20	1320	2.70	5.59
1210	2.24	4.40	1340	2.78	5.81
1230	2.32	4.61	1360	2.87	6.04
1250	2.41	4.83	1380	2.95	6.26
1300	2.62	5.37	1430		6.84
1310	2.66	5.48			

System 18. $CaCl_2$

List of diffusing species investigated in $CaCl_2$ as solvent

Ca^{2+}, Cl^-

Table 18.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Ca^{2+}, Cl^-

Equation:

$$D = A \exp [-E/RT] \quad (18.1)$$

precision: in table 18.2 uncertainty: in table 18.1

Table 18.2 Parameters of diffusion equation (18.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Ca^{2+}	0.38	6130	1060-1280		162,173
Cl^-	1.90	8860	1060-1290		162,173

No entry in precision column indicates estimates not possible, since results were reported as equations only.

Table 18.3. Self-diffusion coefficients from equations in table 18.2

T (K)	$D_{Ca^{2+}}$ x 10^5 ($cm^2 s^{-1}$)	D_{Cl^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	$D_{Ca^{2+}}$ x 10^5 ($cm^2 s^{-1}$)	D_{Cl^-} x 10^5 ($cm^2 s^{-1}$)
1060	2.07	2.83	1200	2.91	4.62
1080	2.18	3.06	1220	3.03	4.92
1100	2.30	3.30	1240	3.16	5.21
1120	2.42	3.55	1260	3.28	5.52
1140	2.54	3.80	1280	3.41	5.83
1160	2.66	4.07	1290		5.99
1180	2.78	4.34			

System 19. $ZnCl_2$

List of diffusion species investigated in $ZnCl_2$ as solvent

Zn^{2+}, Cl^-

Table 19.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
porous frit	$\sim \pm$ 15%	Zn^{2+}, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (19.1)$$

precision: in table 19.2 uncertainty: in table 19.1

Table 19.2. Parameters of diffusion equation (19.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Zn^{2+}	58.5	15400	600-800		162,206
Cl^-	137.0	16300	600-800		162,206

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 19.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 19.2

T (K)	Zn^{2+}	Cl^-	T (K)	Zn^{2+}	Cl^-
600	0.0144	0.0158	710	0.106	0.132
610	0.0178	0.0198	720	0.124	0.155
620	0.0218	0.0246	730	0.143	0.181
630	0.0266	0.0304	740	0.166	0.210
640	0.0322	0.0372	750	0.190	0.244
650	0.0388	0.0453	760	0.218	0.281
660	0.0465	0.0549	770	0.249	0.324
670	0.0554	0.0660	780	0.283	0.371
680	0.0657	0.0791	790	0.321	0.424
690	0.0775	0.0942	800	0.363	0.483
700	0.0910	0.112			

System 20. $CdCl_2$

List of diffusing species investigated in $CdCl_2$ as solvent

Na^+, Cs^+, Cd^{2+}, Cl^-

Table 20.1 Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Na^+, Cs^+, Cd^{2+}, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (20.1)$$

precision: in table 20.2 uncertainty: in table 20.1

Table 20.2. Parameters of diffusion equation (20.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	3.38	7093	890-1080	$\pm$ 0.8%	43
Cs^+	3.21	7728	870-1080	$\pm$ 1.9%	43
Cd^{2+}	0.868	6203	860- 940	$\pm$ 4.8%	43,96,162
Cl^-	1.043	6147	840-1010	$\pm$ 1.7%	43,96,162

Table 20.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 20.2

T (K)	Cd^{2+}	Cl^-	T (K)	Cd^{2+}	Cl^-
840		2.62	930	3.03	3.75
850		2.74	940	3.14	3.88
860	2.30	2.86	950		4.02
870	2.40	2.98	960		4.16
880	2.50	3.10	970		4.30
890	2.60	3.23	980		4.44
900	2.71	3.35	990		4.58
910	2.81	3.48	1000		4.73
920	2.92	3.61	1010		4.88

System 20. $CdCl_2$(cont'd).

Table 20.4. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 20.2

T (K)	Na^+	Cs^+	T (K)	Na^+	Cs^+
870		3.67	980	8.85	6.07
880		3.87	990	9.19	6.32
890	6.13	4.06	1000	9.52	6.57
900	6.40	4.26	1010	9.86	6.83
910	6.69	4.47	1020	10.21	7.09
920	6.98	4.68	1030	10.57	7.36
930	7.28	4.90	1040	10.92	7.63
940	7.58	5.13	1050	11.29	7.91
950	7.89	5.35	1060	11.65	8.19
960	8.21	5.59	1070	12.03	8.47
970	8.53	5.83	1080	12.40	8.76

System 21. $PbCl_2$

List of diffusing species investigated in $PbCl_2$ as solvent

$$Pb^{2+},\ Cl^-,\ \mathit{Cl_2}$$

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 21.4.

Table 21.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Pb^{2+}, Cl^-
chronopotentiometry	$\sim \pm$ 20%	Cl_2

Equation:

$$D = A \exp[-E/RT] \qquad (21.1)$$

precision: in table 21.2 uncertainty: in table 21.1

Table 21.2. Parameters of diffusion equation (21.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Pb^{2+}	1.47	7760	790-850		202,207
Cl^-	2.55	7740	790-850		202,207

No entry in precision column indicates estimates not possible since results were reported as equations only.

System 21. $PbCl_2$(cont'd)

Table 21.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 21.2

T (K)	Pb^{2+}	Cl^-	T (K)	Pb^{2+}	Cl^-
790	1.05	1.84	830	1.33	2.34
800	1.12	1.96	840	1.41	2.47
810	1.18	2.08	850	1.49	2.61
820	1.26	2.21			

Table 21.4. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Cl_2	853	35	201

System 22. $ThCl_4$

List of diffusing species investigated in $ThCl_4$ as solvent

Th^{4+}

Table 22.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
calculated	$\sim \pm$ 50%	Th^{4+}

Table 22.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Th^{4+}	1100	8.8	192

System 23. LiBr

List of diffusing species investigated in LiBr as solvent

Li^+, Br_2

Table 23.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
conductivity	$\sim\pm$ 10-20%	Li^+ [510]
chronopotentiometry	$\sim \pm$ 20%	Br_2 [208]

System 23. LiBr (cont'd)

Table 23.2. Diffusion coefficients

T (K)	$D_{Br_2} \times 10^5$	T (K)	$D_{Br_2} \times 10^5$
861	26.5	993	24.9
923	24.4	1055	25.2

The above data do not fit a linear or exponential equation [208]. For LiBr at 825K, the value of D_{Li^+}, as calculated from conductivity, is 11.9 x 10^{-5} cm^2 s^{-1} [510].

System 24. NaBr

List of diffusion species investigated in NaBr as solvent

Br_2

Table 24.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Br_2

Equation:

$$D = A \exp[-E/RT] \quad (24.1)$$

precision: in table 24.2 uncertainty: in table 24.1

Table 24.2. Parameters of diffusion equation (24.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Br_2	2.513	5303	1060-1150	$\pm$ 2.7%	196

Table 24.3. Diffusion coefficients from equations in table 24.2

T (K)	$D_{Br_2} \times 10^5$	T (K)	$D_{Br_2} \times 10^5$
1060	20.27	1110	22.70
1070	20.75	1120	23.20
1080	21.24	1130	23.69
1090	21.72	1140	24.19
1100	22.21	1150	24.68

System 25. KBr

List of diffusing species investigated in KBr as solvent

Tl^+, Ag^+, Zr^{4+}, Br_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients. For these species: see table 25.4

Table 25.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	Zr^{4+}, Br_2
not cited	∿ ± 50%	Tl^+, Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (25.1)$$

precision: in table 25.2 uncertainty: in table 25.1

Table 25.2. Parameters of diffusion equation (25.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
[a] Zr^{4+}	0.338	5491	920-1070		210
Br_2	32.8	11120	1050-1140	± 0.7%	196

No entry in precision column indicates estimates not possible since results reported as equations only.

[a] Diffusing species probably $[ZrBr_6]^{2-}$

Table 25.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equation in table 25.2

T (K)	Zr^{4+}	Br_2	T (K)	Zr^{4+}	Br_2
920	1.68		1040	2.37	
940	1.79		1060	2.49	16.72
960	1.90		1080		18.43
980	2.02		1100		20.25
1000	2.13		1120		22.18
1020	2.25		1140		24.21

System 25. KBr (cont'd)

Table 25.4. Diffusion coefficients for species not included in table 25.3

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Tl^+	1053	3.8	209
Ag^+	1053	4.9	209

System 26. CsBr

List of diffusing species investigated in CsBr as solvent

Zr^{4+}, Br_2

Table 26.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Zr^{4+}, Br_2

Equation:

$$D = A \exp[-E/RT] \quad (26.1)$$

precision: in table 26.2 uncertainty: in table 26.1

Table 26.2. Parameters of diffusion equation (26.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
[a]Zr^{4+}	0.323	5995	920-1070		210
Br_2	0.749	2855	970-1120	$\pm$ 3.1%	196

[a]Diffusing species probably $[ZrBr_6]^{2-}$.

Table 26.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 26.2

T (K)	Zr^{4+}	Br_2	T (K)	Zr^{4+}	Br_2
920	1.22		1040	1.78	18.82
940	1.30		1060	1.88	19.31
960	1.39		1080		19.80
980	1.49	17.29	1100		20.29
1000	1.58	17.80	1120		20.77
1020	1.68	18.31			

System 27. $ZnBr_2$

List of diffusing species investigated in $ZnBr_2$ as solvent

Zn^{2+}, Br^-

Table 27.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Zn^{2+}, Br^-

Equation:

$$D = A \exp[-E/RT] \quad (27.1)$$

precision: in table 27.2 uncertainty: in table 27.1

Table 27.2. Parameters of diffusion equation (27.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Zn^{2+}	58	15606	680-910	± 10.7%	58,65,212
Br^-	109	16987	690-820	± 4.4%	211

Table 27.3. Self-diffusion coefficients from equations in table 27.2

T (K)	$D_{Zn^{2+}}$ x 10^5	D_{Br^-} x 10^5	T (K)	$D_{Zn^{2+}}$ x 10^5	D_{Br^-} x 10^5
680	0.0559		800	0.316	0.249
700	0.0778	0.0542	820	0.402	0.324
720	0.106	0.0761	840	0.505	
740	0.143	0.105	860	0.627	
760	0.189	0.142	880	0.772	
780	0.246	0.190	900	0.941	

System 28. $PbBr_2$

List of diffusing species investigated in $PbBr_2$ as solvent

Pb^{2+}, Br^-

Table 28.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
porous frit	∿ ± 10%	Pb^{2+}, Br^-

System 28. $PbBr_2$(cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (28.1)$$

precision: in table 28.2 uncertainty: in table 28.1

Table 28.2. Parameters of diffusion equation (28.1), precisions, and references

Species	A X 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Pb^{2+}	0.74	6500	650-810		59
Br^-	0.83	6100	650-830		59

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 28.3. Self-diffusion coefficients from equation in table 28.2

T (K)	$D_{Pb^{2+}} \times 10^5$	$D_{Br^-} \times 10^5$	T (K)	$D_{Pb^{2+}} \times 10^5$	$D_{Br^-} \times 10^5$
650	0.48	0.74	750	0.94	1.39
670	0.56	0.85	770	1.06	1.54
690	0.65	0.97	790	1.18	1.70
710	0.74	1.10	810	1.30	1.88
730	0.84	1.24	830		2.06

System 29. $BiBr_3$

List of diffusing species investigated in $BiBr_3$ as solvent

Bi^{3+}

Table 29.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Bi^{3+} [213]

Table 29.2. Diffusion coefficients ($cm^2 s^{-1}$)

T (K)	$D_{Bi^{3+}} \times 10^5$
513	0.30
558	0.62

System 30. LiI

List of diffusing species investigated in LiI as solvent

Li^+, I_2

Table 30.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
conductivity	∿± 10-20%	Li^+ [510]
NMR	∿± 30%	Li^+ [510]
chronopotentiometry	∿ ± 20%	I_2 [214]

Equation:

$$D = A \exp[-E/RT] \quad (30.1)$$

precision: in table 30.2 uncertainty: in table 30.1

Table 30.2. Parameters of diffusion equation (30.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
I_2	121.01	11234	770-970		214

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 30.3. Diffusion coefficients from equation in table 30.2

T (K)	D_{I_2} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{I_2} x 10^5 ($cm^2 s^{-1}$)
770	7.84	880	19.63
780	8.61	890	21.09
790	9.44	900	22.64
800	10.32	910	24.26
810	11.26	920	25.95
820	12.27	930	27.72
830	13.33	940	29.57
840	14.45	950	31.51
850	15.64	960	33.52
860	16.90	970	35.62
870	18.23		

For molten LI at 742 K, the value for D_{Li+},from conductivity and NMR techniques, are: 11.0 x 10^{-5} and 3.11 x 10^{-5} cm^2 s^{-1}, respectively.The former approximates closely the values gained from tracer diffusion techniques (∿ ± 10-20%); the NMR value suggests an anomalous effect, and may be understood if part of the lithium ions in LI behave as super-conductors [510].

System 31. NaI

List of diffusing species investigated in NaI as solvent

Na^+, I^-, I_2

Table 31.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	~ ± 10%	Na^+, I^-
chronopotentiometry	~ ± 20%	I_2

Equation:

$$D = A \exp[-E/RT] \quad (31.1)$$

precision: in table 31.2 uncertainty: in table 31.1

Table 31.2. Parameters of diffusion equation (31.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	0.604	3959	940-1070	± 1.3%	45,193
I^-	0.434	4439	950-1070	± 2.0%	45,193
I_2	225.36	15160	970-1120		214

No entry in precision column indicates estimates not possible, since results were reported as equations only.

Table 31.3. Self-diffusion coefficients from equations in table 31.2

T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	D_{I^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	D_{I^-} x 10^5 ($cm^2 s^{-1}$)
940	7.25		1010	8.40	4.75
970	7.75	4.34	1040	8.89	5.07
980	7.91	4.44	1050	9.06	5.17
1000	8.24	4.65	1070	9.38	5.38

Table 31.4. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 31.2

T (K)	I_2	T (K)	I_2
970	8.65	1050	15.76
1000	10.96	1080	19.28
1030	13.68	1110	23.33
1040	14.69	1120	24.81

System 32. KI

List of diffusing species investigated in KI as solvent

Tl^+, Ag^+, I_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients. For these species: see table 32.4.

Table 32.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	I_2
not cited	∿ ± 50%	Tl^+, Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (32.1)$$

precision: in table 32.2 uncertainty: in table 32.1

Table 32.2. Parameters of diffusion equation (32.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
I_2	178.18	14964	970-1120		214

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 32.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equation in table 32.2.

T (K)	I_2	T (K)	I_2
970	7.57	1050	13.68
990	8.86	1070	15.65
1010	10.30	1090	17.80
1030	11.90	1110	20.16
1040	12.77	1120	21.42

Table 32.4. Diffusion coefficients for species not included in table 32.3.

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Tl^+	720	3.1	209
	780	3.3	
Ag^+	720	4.6	209
	780	5.1	

System 33. CsI

List of diffusing species investigated in CsI as solvent

I_2

Table 33.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	I_2

Equation:

$$D = A \exp\left[-E/RT\right] \qquad (33.1)$$

precision: in table 33.2 uncertainty: in table 33.1

Table 33.2. Parameters of diffusion equation (33.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
I_2	93.29	13591	970-1120		214

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 33.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equation in table 33.2.

T (K)	I_2	T (K)	I_2
970	8.08	1050	13.83
990	9.32	1070	15.63
1010	10.69	1090	17.57
1030	12.19	1110	19.67
1040	12.99	1120	20.79

System 34. AgI

List of diffusing species investigated in AgI as solvent

Ag^+, I^-

Table 34.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
porous frit	∿ ± 10%	Ag^+, I^-

Equation:

$$D = A \exp\left[-E/RT\right] \qquad (34.1)$$

precision: in table 34.2 uncertainty: in table 34.1

System 34. AgI (cont'd)

Table 34.2. Parameters of diffusion equation (34.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Ag^+	1.206	5454	850-890	± 2.1%	509
I^-	78470	24913	860-890	± 0.2%	509

Table 34.3. Self-diffusion coefficients from equations in table 34.2.

T (K)	D_{Ag^+} x 10^5	D_{I^-} x 10^5	T (K)	D_{Ag^+} x 10^5	D_{I^-} x 10^5
850	4.78		880	5.33	5.10
860	4.96	3.66	890	5.52	5.98
870	5.14	4.33			

System 35. NaOH

List of diffusing species investigated in NaOH as solvent

Bi^{3+}

Table 35.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in value of D)	Species
chronopotentiometry	∿ ± 20%	Bi^{3+}

Table 35.2. Diffusion coefficient

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Bi^{3+}	613	0.7	215

System 36. KCNS

List of diffusing species investigated in KCNS as solvent

S_2^-, Se_4^{2-}, Se_5^{2-}, Se_6^{2-}

Table 36.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
cyclic voltammetry	∿ ± 20%	S_2^-, Se_4^{2-}, Se_5^{2-}, Se_6^{2-}
chronoamperometry	∿ ± 20%	S_2^-

System 36. KCNS (cont'd)

Table 36.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
[a] S_2^-	493	2.2[b]	216
Se_4^{2-}	493	0.147	217
Se_5^{2-}	493	0.085	217
Se_6^{2-}	493	0.072	217

[a]Diffusing species uncertain; S_2^- or S_3^- [b]By chronoamperometry, D = 1.3 x 10^{-5} $cm^2 s^{-1}$

System 37. Li_2CO_3

List of diffusing species investigated in Li_2CO_3 as solvent

Na^+, CO_3^{2-}

Table 37.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Na^+, CO_3^{2-}

Equation:

$$D = A \exp[-E/RT] \qquad (37.1)$$

precision: in table 37.2 uncertainty: in table 37.1

Table 37.2. Parameters of diffusion equation (37.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	1.32	9630	1080-1180	± 3.5%	57,218
CO_3^{2-}	1.35	9740	1120-1265	± 3.5%	57,218

Table 37.3. Diffusion coefficients from equations in table 37.2

T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	T (K)	$D_{CO_3^{2-}}$ x 10^5 ($cm^2 s^{-1}$)
1080	1.49	1120	1.70
1100	1.61	1160	1.97
1140	1.88	1200	2.27
1170	2.10	1240	2.59
		1260	2.76

System 38. Na_2CO_3

List of diffusing species investigated in Na_2CO_3 as solvent

Na^+, CO_3^{2-}

Table 38.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Na^+, CO_3^{2-}

Equation:

$$D = A \exp [-E/RT] \qquad (38.1)$$

precision: in table 38.2 uncertainty: in table 38.1

Table 38.2. Parameters of diffusion equation (38.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	10.0	12170	1180-1320	$\pm$ 1.5%	52,56,218
CO_3^{2-}	2.86	10620	1170-1335	$\pm$ 0.6%	52,56,218

Table 38.3. Self-diffusion coefficients from equations in table 38.2

T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	$D_{CO_3^{2-}}$ x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	$D_{CO_3^{2-}}$ x 10^5 ($cm^2 s^{-1}$)
1170		2.97	1260	7.75	4.11
1180	5.57	3.09	1280	8.36	4.40
1200	6.07	3.33	1300	9.00	4.69
1220	6.60	3.58	1320	9.66	4.99
1240	7.16	3.84	1340		5.30

System 39. Lithium Nitrate: $LiNO_3$

List of diffusing species investigated in $LiNO_3$ as solvent

Li^+, Na^+, K^+, Rb^+, Cs^+, Tl^+, Ag^+, Br^-, O^{2-}, NO_3^-

Th... ...ticized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 39.4 .

System 39. $LiNO_3$(cont'd)

Table 39.1 Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 5%	Li^+, NO_3^-
chronopotentiometry	∿ ± 10%	Ag^+, O^{2-}
electrophoresis	∿ ± 20%	Na^+, Cs^+
interferometry	∿ ± 20%	K^+, Rb^+, Tl^+, Br^-

Equation:

$$D = A \exp [-E/RT] \qquad (39.1)$$

precision: in table 39.2 uncertainty: in table 39.1

Table 39.2. Parameters of diffusion equation (39.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Li^+	2.47	5490	540-590	± 1.7%	50
NO_3^-	1.95	6340	540-590	± 3.3%	50
Na^+	0.43	3550	540-670		36,86
K^+	2.33	5776	540-615	± 11%	36,37
Rb^+	0.87	4898	545-665	± 3.6%	36,37
Cs^+	0.66	4540	540-675		36,37,86
Tl^+	3.95	6780	535-630	± 7.8%	37,38
Ag^+	16.1	7900	530-590	± 4.5%	106,109,219
Br^-	1.58	6290	530-625	± 10%	35

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 39.3. Self-diffusion coefficients from equations in table 39.2.

T (K)	D_{Li^+} x 10^5 ($cm^2 s^{-1}$)	$D_{NO_3^-}$ x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Li^+} x 10^5 ($cm^2 s^{-1}$)	$D_{NO_3^-}$ x 10^5 ($cm^2 s^{-1}$)
540	1.48	0.53	570	1.94	0.72
550	1.63	0.59	580	2.11	0.80
560	1.78	0.65	590	2.29	0.87

Table 39.4 . Diffusion coefficients for species not included in table 39.2

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
O^{2-}	593	1.9	220

System 39. $LiNO_3$(cont'd)

Table 39.5. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 39.2

T (K)	Na^+	K^+	Rb^+	Cs^+	Tl^+	Ag^+	Br^-
530					0.63	0.89	0.40
560	1.77	1.30	1.07	1.12	0.89	1.33	0.55
590	2.08	1.69	1.33	1.37	1.22	1.91	0.74
610	2.30	1.99	1.53	1.56	1.47		0.88
630	2.52		1.74	1.76	1.76		1.04
660	2.87		2.08	2.07			
680				2.29			

System 40. $NaNO_3$

List of diffusing species investigated in $NaNO_3$ as solvent

Na^+, NO_3^-, K^+, Rb^+, Cs^+, *Sr^{2+}*, *Ba^{2+}*,
Tl^+, Ag^+, F^-, Br^-, I^-, CO_3^{2-}, SO_4^{2-}, *CO_2*

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 40.5.

Table 40.1. Diffusion techniques, uncertainties, and species

Diffusion techniques of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Na^+, NO_3^-, K^+
	∿ ± 100%	Sr^{2+}, Ba^{2+}, Tl^+
chronopotentiometry	∿ ± 10%	Ag^+
interferometry	∿ ± 30%	Rb^+, Tl^+, F^-, Br^-, I^-, CO_3^{2-}, SO_4^{2-}
gravimetric porous frit	∿ ± 5%	K^+, Cs^+, Rb^+
electrophoresis	∿ ± 25%	Cs^+
rising bubble	∿ ± 40%	CO_2

Equation:

$$D = A \exp[-E/RT] \qquad (40.1)$$

precision: in table 40.2 uncertainty: in table 40.1

System 40. $NaNO_3$ (cont'd)

Table 40.2. Parameters of diffusion equation (40.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	1.29	4347	600-670	± 2.3%	see:table S-1
NO_3^-	0.90	5080	585-650	± 1.4%	50,94
K^+	0.732	4431	619 -722	± 1.0%	95,97,110,510
Rb^+	1.999	5780	597 - 623	± 1.0%	36,78,510
Cs^+	0.822	4761	598 -725	± 1.0%	36,81,86,99,103,510
Tl^+	0.631	4413	590-650	± 2.8%	91,209,221,227
Ag^+	1.07	4645	590-670	± 2.6%	see:Table S-1
F^-	0.782	5730	620-650	± 6.9%	35
Br^-	1.312	5671	590-670	± 7.4%	35
I^-	1.712	5994	590-660	± 6.6%	35
CO_3^{2-}	1.103	6432	590-650	± 6.2%	35
SO_4^{2-}	0.762	5888	590-650	± 4.2%	35

Table 40.3. Self-diffusion coefficients from equations in table 40.2

T (K)	D_{Na^+} x 10^5 (cm^2 s^{-1})	$D_{NO_3^-}$ x 10^5 (cm^2 s^{-1})	T (K)	D_{Na^+} x 10^5 (cm^2 s^{-1})	$D_{NO_3^-}$ x 10^5 (cm^2 s^{-1})
580		1.10	630	4.00	1.56
590		1.18	640	4.23	1.66
600	3.37	1.27	650	4.46	1.76
610	3.57	1.36	660	4.69	
620	3.79	1.46	670	4.93	

Table 40.4 Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 40.2

T (K)	K^+	Rb^+	Cs^+	Tl^+	Ag^+	F^-	Br^-	I^-	CO_3^{2-}	SO_4^{2-}
580										
610		1.698	1.743	1.66	2.32		1.22	1.22	0.547	0.592
620	2.007	1.834	1.855	1.76	2.47	0.747	1.31	1.32	0.596	0.640
640	2.246		2.088	1.96	2.77	0.864	1.52	1.54	0.702	0.744
670	2.625		2.462		3.27		1.85			
720	3.308		3.141							

Table 40.5. Diffusion coefficients for species not included in tables 40.3 and 40.4

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Sr^{2+}	618	4.2	209,221
	633	4.4	
Ba^{2+}	633	3.7	209,221
CO_2	623	2.5	229

System 41. KNO_3

List of diffusing species investigated in KNO_3 as solvent

K^+, NO_3^-, *Li^+*, Na^+, Rb^+, Cs^+, *Ca^{2+}*, Sr^{2+}, *Ba^{2+}*,

Tl^+, Ag^+, *Br^-*, I^-

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 41.5.

Table 41.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	K^+, NO_3^-, Li^+
capillary	∿ ± 10%	Tl^+, Br^-, I^-
gravimetric porous frit	∿ ± 5%	Na^+, Cs^+
chronopotentiometry	∿ ± 10%	Sr^{2+}, Ag^+, Ca^{2+}
polarography	∿ ± 50%	Ba^{2+}, Br^-, I^-
interferometry	∿ ± 30%	Na^+, Rb^+, Cs^+, Tl^+

Equation

$$D = A \exp[-E/RT] \quad (41.1)$$

precision: in table 41.2 uncertainty: in table 41.1

Table 41.2. Parameters of diffusion equation (41.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
K^+	1.48	5674	615-700	± 3%	see:table S-1
NO_3^-	1.42	5760	620-660	± 2.7%	50
Na^+	2.171	5913	617-726	± 1.0%	see:table S-1
Rb^+	1.026	5321	610-725	± 6.2%	36,37
Cs^+	1.014	5248	621-739	± 1.0%	36,37,510
Sr^{2+}	6.63	8150	620-690	± 4.5%	209,232,235
Tl^+	0.558	4516	610-680	± 5.0%	37,221,227,230
Ag^+	1.53	5280	620-720		see:table S-1

Table 41.3. Self-diffusion coefficients from equations in table 41.2

T (K)	D_{K^+} x 10^5 ($cm^2 s^{-1}$)	$D_{NO_3^-}$ x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{K^+} x 10^5 ($cm^2 s^{-1}$)	$D_{NO_3^-}$ x 10^5 ($cm^2 s^{-1}$)
610	1.37		660	1.96	1.76
620	1.48	1.32	670	2.09	
630	1.59	1.43	680	2.22	
640	1.71	1.53	690	2.36	
650	1.83	1.64	700	2.50	

System 41. KNO_3 (cont'd)

Table 41.4. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 41.2

T (K)	Na^+	Rb^+	Cs^+	Sr^{2+}	Ag^+	Tl^+
610		1.27				1.34
630		1.46	1.433	0.987	2.25	1.51
650	2.231	1.67	1.744	1.21	2.57	1.69
670	2.558	1.89	1.969	1.46	2.90	1.88
690	2.909	2.12	2.207	1.74	3.25	
720		2.49	2.589		3.82	
730		2.62	2.722			

Table 41.5. Diffusion coefficients for species not included in table 41.3 and 41.4

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Li^+	625	2.2	231
	645	2.6	
Ba^{2+}	643	2.1	221,230
Ca^{2+}	673	2.2	235
Br^-	633	3.0	221,230
I^-	633	3.0	221,230

System 42. $RbNO_3$

List of diffusing species investigated in $RbNO_3$ as solvent

Na^+, K^+, Rb^+, Cs^+, Tl^+, Ag^+, I^-, CO_3^{2-}

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 42.5.

Table 42.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	~ ± 10%	Rb^+
chronopotentiometry	~ ± 10%	Ag^+
interferometry	~ ± 10%	Tl^+, I^-, CO_3^{2-}
electrophoresis	~ ± 20%	Na^+, K^+, Cs^+

System 42. $RbNO_3$ (cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (42.1)$$

precision: in table 42.2 uncertainty: in table 42.1

Table 42.2. Parameters of diffusion equation (42.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	0.69	4560	590-720		78,85,86
Rb^+	1.137	5476	600-740	± 1.9%	see:table S-1
Cs^+	1.02	5470	590-720		86
Tl^+	1.995	6257	600-690	± 6.3%	227
Ag^{+a}	1.677	5623	610-690	± 2.3%	33,104,109,226
I^-	1.777	6621	600-670	± 2.2%	35
CO_3^{2-}	0.774	6401	600-670	± 6.3%	35

[a]Dependence of diffusion coefficients of Ag^+ on pressure has been reported in graphical form at 628, 679, and 708 K [226].

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 42.3. Self-diffusion coefficients from equation in table 42.2

T (K)	D_{Rb^+} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Rb^+} x 10^5 ($cm^2 s^{-1}$)
600	1.15	680	1.98
620	1.33	700	2.22
640	1.53	720	2.47
660	1.75	740	2.74
670	1.86		

Table 42.4. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 42.2

T (K)	Na^+	Cs^+	Tl^+	Ag^+	I^-	CO_3^{2-}
590	1.41	0.96				
610	1.60	1.12	1.14	1.62	0.75	0.39
630	1.81	1.29	1.35	1.88	0.90	0.47
650	2.02	1.48	1.57	2.16	1.06	0.55
670	2.25	1.68	1.82	2.46	1.23	0.63
690	2.48	1.89	2.08			
710	2.72	2.11				
720	2.85	2.23				

System 42. $RbNO_3$ (cont'd)

Table 42.5. Diffusion coefficient for species not included in tables 42.3 and 42.4

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
K^+	723	2.52	85

System 43. $CsNO_3$

List of diffusing species investigated in $CsNO_3$ as solvent

Na^+, K^+, Rb^+, Cs^+, Ag^+, NO_3^-

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 43.5.

Table 43.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Cs^+, NO_3^-
chronopotentiometry	∿ ± 10%	Ag^+
electrophoresis	∿ ± 20%	Na^+, K^+, Rb^+

Equation:

$$D = A \exp[-E/RT] \quad (43.1)$$

precision: in table 43.2 uncertainty: in table 43.1

Table 43.2. Parameters of diffusion equation (43.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Cs^+	2.228	6581	700-770	± 0.4%	47,50,99
Ag^{+a}	2.044	5955	700-750	± 1.0%	see:table S-1
NO_3^-	2.08	6514	700-750	± 3%	50
Pressure = 200 atm.					
Cs^+	1.828	6569	710-800	± 1.3%	99
Pressure = 400 atm.					
Cs^+	1.525	6347	710-770	± 3.1%	99
Pressure = 800 atm.					
Cs^+	1.283	6154	710-800	± 0.4%	99

For Ag^+, pressure dependence of D is reported graphically [226].

System 43. $CsNO_3$ (cont'd)

Table 43.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 43.2.

Pressure	1 atm.		200 atm.	400 atm.	800 atm.
T (K)	Cs^+	NO_3^-	Cs^+	Cs^+	Cs^+
700	1.96	1.92			
720	2.24	2.19	1.85	1.81	1.74
740	2.54	2.48	2.10	2.04	1.95
760	2.85		2.36	2.28	2.18
780			2.64		2.42
800			2.93		2.67

Table 43.4. Diffusion coefficients from equation in table 43.2.

T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})	T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})
700	2.83	730	3.37
710	3.00	740	3.56
720	3.18	750	3.76

Table 43.5. Diffusion coefficients for species not included in tables 43.3 and 43.4

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Na^+	723	2.41	85
K^+	723	2.44	85
Rb^+	723	2.32	85

System 44. $AgNO_3$

List of diffusing species investigated in $AgNO_3$ as solvent

Na^+, Ag^+, NO_3^-

Table 44.1 Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	~ ± 10%	Ag^+, NO_3^-
porous-frit	~ ± 20%	Na^+

System 44. $AgNO_3$ (cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (44.1)$$

precision: in table 44.2 uncertainty: in table 44.1

Table 44.2. Parameters of diffusion equation (44.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	1.504	4974	500-630	± 6.8%	78,238
Ag^+	0.47	3692	500-630	± 2.2%	47,50,83,238
NO_3^-	0.50	4333	490-560	± 4.9%	50

Table 44.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 44.2.

T (K)	Ag^+	NO_3^-	T (K)	Ag^+	NO_3^-
490		0.58	560	1.70	1.02
510	1.23	0.70	570	1.81	
530	1.41	0.82	590	2.02	
550	1.60	0.95	610	2.24	
		1.02	630	2.46	

Table 44.4. Diffusion-coefficients from equation in table 44.2

T (K)	D_{Na^+} x 10^5 (cm^2s^{-1})	T (K)	D_{Na^+} x 10^5 (cm^2s^{-1})
500	1.01	570	1.86
520	1.22	590	2.16
540	1.46	610	2.48
560	1.72	630	2.83

System 45. $TlNO_3$

List of diffusing species investigated in $TlNO_3$ as solvent

Na^+, Tl^+, Ag^+

Table 45.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Tl^+
gravimetric	∿ ± 10%	Ag^+
electrophoresis	∿ ± 20%	Na^+

System 45. $TlNO_3$ (cont'd)

Equation.

$$D = A \exp[-E/RT] \quad (45.1)$$

precision: in table 45.2 uncertainty: in table 45.1

Table 45.2. Parameters of diffusion equation (45.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	0.818	4431	490-590	± 1.0%	91
Tl^+	1.316	4963	500-610	± 6.5%	91,240
Ag^+	1.07	4130	520-610	± 6%	106,239

Table 45.3. Self-diffusion coefficients from equation in table 45.4

T (K)	D_{Tl^+} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Tl^+} x 10^5 ($cm^2 s^{-1}$)
500	0.89	560	1.52
520	1.08	580	1.77
540	1.29	600	2.05
550	1.41	610	2.19

Table 45.4. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 45.2

T (K)	Na^+	Ag^+	T (K)	Na^+	Ag^+
490	0.86		560	1.53	2.62
510	1.03		580	1.75	2.97
530	1.22	2.12	600		3.35
550	1.42	2.44			

System 46. $NaPO_3$

List of diffusing species investigated in $NaPO_3$ as solvent

U(VI)

Table 46.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry chronoamperometric	∿ ± 20%	U(VI)

System 46. $NaPO_3$ (cont'd)

Table 46.2. Diffusion coefficients

Species	Melt composition (R^a)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
U(VI)	1.0	967	0.013[b] 0.0116[c]	241
	1.1	967	0.0063[b] 0.0147[c]	
	1.2	967	0.0167[b] 0.0162[c]	
	1.3	967	0.0224[b] 0.0196[c]	
	1.4	967	0.0148[b] 0.0212[c]	
	1.5	967	0.0212[b] 0.0245[c]	

[a] R is the molar M_2O to P_2O_5 ratio and M is univalent.

[b] Chronopotentiometric values. [c] Chronoamperometric values.

System 47. Sulfur

List of diffusing species investigated in sulfur as solvent

P, S.

Table 47.1. Diffusion techniques, uncertainties, and species

Diffusion techniques of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	^{32}P
porous frit	∿ ± 20%	^{35}S

Equation:

$$D = A \exp[-E/RT] \quad (47.1)$$

precision: in table 47.2 uncertainty: in table 47.1

Table 47.2. Parameters of diffusion equation (47.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
^{35}S	281700	15167	395-420	± 5.5%	243,244
^{35}S	0.218	5348	540-590	± 2.5%	243,244
^{32}P	1.258x10^{12}	26839	395-410	± 6.3%	242

System 47. Sulfur (cont'd)

Table 47.3. Diffusion coefficients of sulfur[a]

T (K)	D x 10^6 (cm^2s^{-1})	T (K)	D x 10^6 (cm^2s^{-1})	T (K)	D x 10^6 (cm^2s^{-1})
395.6	1.05	431.6	1.45	488.1	0.95
396.1	1.20	436.1	1.31	504.1	0.80
398.1	1.45	436.5	1.24	509.1	0.83
399.1	1.52	440.6	1.17	513.1	0.91
412.1	2.50	443.1	1.53	541.1	1.55
414.6	2.80	453.1	1.03	546.1	1.52
421.1	3.90	456.1	0.90	547.1	1.23
422.1	3.85	458.1	0.86	551.1	2.05
422.1	2.42	465.1	0.71	565.1	1.90
426.1	2.45	472.1	0.71	580.1	2.34
427.6	2.90	474.1	0.84	580.1	2.10
428.1	3.22	479.1	0.87	589.1	2.26

[a]Experimental values of diffusion coefficients.

Table 47.4. Diffusion coefficients from equation in table 47.2

T (K)	D_p x 10^5 (cm^2s^{-1})	T (K)	D_p x 10^5 (cm^2s^{-1})
395	0.178	405	0.414
400	0.273	410	0.621

System 48. Na_2S_3

List of diffusing species investigated in Na_2S_3 solvent

polysulfide(?) ,i.e.,uncertain

Table 48.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
ac impedance	$\sim \pm$ 25%	uncertain

Table 48.2 Diffusion coefficients

Species	Melt composition	T (K)	D x 10^5 (cm^2s^{-1})	References
uncertain	$Na_2S_{3.08}$	623	0.98	31

System 49. Na_2S_4

List of diffusing species investigated in Na_2S_4 as solvent

S; polysufide(?),i.e., uncertain

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 49.4

Table 49.1 Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 50%	S
cathodic chronopotentiometry	$\sim \pm$ 25%	uncertain
anodic chronopotentiometry	$\sim \pm$ 30%	uncertain

Equation:

$$D = A \exp[-E/RT] \quad (49.1)$$

precision: in table 49.2 uncertainty: in table 49.1

Table 49.2. Parameters of diffusion equation (49.1), precisions and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range	Precision	References
uncertain[a]	220.13	11796	570-640	$\pm$ 3.6%	244
uncertain[b]	61.84	10373	590-640	$\pm$ 12.6%	244

[a]Species during the cathodic process. [b]Species during the anodic process.

Table 49.3. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 49.2

T (K)	Uncertain[a]	Uncertain[b]	T (K)	Uncertain[a]	Uncertain[b]
570	0.66		610	1.31	1.19
580	0.79		620	1.53	1.36
590	0.94	0.89	630	1.78	1.56
600	1.11	1.03	640	2.06	1.77

[a]Species during the cathodic process. [b]Species during the anodic process.

Table 49.4. Diffusion coefficients for species not included in table 49.3

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
S	573	2.3	244

System 50. Na_2S_5

List of diffusing species investigated in Na_2S_5 as solvent

S, uncertain

Table 50.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 30%	S
ac impedance	∿ ± 25%	uncertain

Table 50.2. Diffusion coefficients

Species	Melt composition	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
S	$Na_2S_{5.2}$	573	1.5	244
uncertain	$Na_2S_{4.86}$	6.23	1.4	31

System 51. $Na_2B_4O_7$

List of diffusing species investigated in $Na_2B_4O_7$ as solvent

Sn^{4+}, *Sb^{3+}*, *Bi^{3+}*, *Cu^{2+}*, *Ag^{+}*, *Cd^{2+}*, *Cr(VI)*, Ti^{3+}, Ti^{4+}, *Fe^{3+}*, *Co^{2+}*, *Ni^{2+}*, *U(VI)*.

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species see table 51.4.

Table 51.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	Ag^{+}, Cd^{2+}, Cr(VI), Ti^{3+}, Ti^{4+}, U(VI)
polarography	∿ ± 25%	Sn^{4+}, Sb^{3+}, Bi^{3+}, Cu^{2+}, Fe^{2+}, Co^{2+}, Ni^{2+}

Equation:

$$D = A \exp[-E/RT] \quad (51.1)$$

precision: in table 51.2 uncertainty: in table 51.1

System 51. $Na_2B_4O_7$ (cont'd)

Table 51.2. Parameters of diffusion equation (51.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
Ti^{3+}	4.408	10599	1020-1170	± 2.5%	248
Ti^{4+}	9.498	12859	1020-1170	± 8.8%	248

Table 51.3. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 51.2

T (K)	Ti^{3+}	Ti^{4+}	T (K)	Ti^{3+}	Ti^{4-}
1020	2.36	1.67	1100	3.45	2.65
1030	2.48	1.77	1110	3.61	2.79
1040	2.61	1.89	1120	3.77	2.94
1050	2.74	2.00	1130	3.93	3.09
1060	2.88	2.12	1140	4.10	3.25
1070	3.02	2.24	1150	4.27	3.42
1080	3.16	2.37	1160	4.44	3.59
1090	3.30	2.51	1170	4.62	3.76

Table 51.4. Diffusion coefficients for species not included in table 51.3

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Sn^{4+}	1093	0.00044	247
Sb^{3+}	1093	0.000098	247
Bi^{3+}	1093	0.00048	247
Cu^{2+}	1093	0.00017	247
Ag^{+}	1015.5	0.0065[a]	245
Cd^{2+}	1223	0.35[b]	247,249
Cr(VI)	1073	0.019	246
Fe^{3+}	1093	0.00014	247
Co^{2+}	1093	0.00011	247
Ni^{2+}	1093	0.00016	247
U(VI)	1073	0.04	246

[a] Temperature dependence of D in the range 973-1173 K reported in graphical form [245] at two different concentrations of Ag_2O; D values are reported to be dependent on Ag_2O conc.

[b] Temperature dependence of D in the range 1020-1250 K reported in graphical form [245].

System 52. $MgCl_2 \cdot 6H_2O$

List of diffusing species investigated in $MgCl_2 \cdot 6H_2O$ as solvent

Ni^{2+}

Table 52.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in value of D)	Species
dc polarography	$\sim \pm$ 20%	[a] Ni(II)

[a] Diffusing species is probably $[NiCl_4]^{2-}$

Table 52.2. Diffusion coefficient

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
[a] Ni(II)	393	0.11	250

[a] Diffusing species is probably $[NiCl_4]^{2-}$

System 53. $CaCl_2 \cdot 6H_2O$

List of diffusing species investigated in $CaCl_2 \cdot 6H_2O$ as solvent

Cd^{2+}, *Ga^{3+}*, *In^{3+}*, *Sn^{2+}*, *Co^{2+}*, *Ni^{2+}*

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 53.4.

Table 53.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 10%	Cd^{2+}, Ni^{2+}
linear sweep voltammetry	$\sim \pm$ 10%	Ga^{3+}, In^{3+}, Sn^{2+}, Co^{2+}

Equation:

$$D = AT^{\frac{1}{2}} \exp\left[\frac{-k}{T-T_o}\right] \qquad (53.1)$$

precision: in table 53.2 uncertainty: in table 53.1

Table 53.2. Parameters of diffusion equation (53.1), precision, and references

Species	A x 10^6 ($cm^2 s^{-1} k^{-\frac{1}{2}}$)	k (K)	T_o (K)	Temp. range (K)	Precision	References
Cd^{2+}	18.5	1099	138.6	280-340		250, 251

No entry in precision column indicates estimate not possible since results were reported as equation only.

System 53. $CaCl_2.6H_2O$ (cont'd)

Table 53.3. Diffusion coefficients from equation in table 53.2

T (K)	$D_{Cd^{2+}} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Cd^{2+}} \times 10^5$ ($cm^2 s^{-1}$)
280	0.0130	320	0.0774
290	0.0222	330	0.108
300	0.0354	340	0.146
310	0.0535		

Table 53.4. Diffusion coefficients for species not included in table 53.3

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Ga^{3+}	308	0.01	250
In^{3+}	308	0.035	250
Sn^{2+}	313	∿ 0.087	250
Co^{2+}	308	∿ 0.06	250
Ni^{2+}	308	0.0455	250
	388	0.39	250

System 54. $LiNO_3 \cdot 3H_2O$

List of diffusing species investigated in $LiNO_3 \cdot 3H_2O$ as solvent

Cd^{2+}, In^{3+}, Ni^{2+}

Table 54.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	∿ ± 20%	Cd^2, In^{3+}, Ni^{2+}

Table 54.2. Diffusion coefficients

Species	T (K)	D x 10^{-5} ($cm^2 s^{-1}$)	References
Cd^{2+}	319	0.029	250
In^{3+}	320	0.18	250
Ni^{2+}	320	0.195	250

System 55. $Ca(NO_3)_2 \cdot 4H_2O$

List of diffusing species investigated in $Ca(NO_3)_2 \cdot 4H_2O$ as solvent

Tl^+, Pb^{2+}, Cu^{2+}, Ag^+, Zn^{2+}, Cd^{2+}, In^{3+}, UO_2^{2+}

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 55.4.

Table 55.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	∿ ± 20%	Tl^+ Pb^{2+} Cu^2, Zn^{2+}, Cd^{2+}, In^{3+}
chronopotentiometry	∿ ± 20%	Tl^+, Ag^+, In^{3+}, UO_2^{2+}
cyclic voltammetry	∿ ± 20%	Tl^+, In^{3+}, UO_2^{2+}
chronoamperometry	∿ ± 20%	Tl^+

Equation:

$$D = AT^{\frac{1}{2}} \exp\left[\frac{-k}{T-T_o}\right] \qquad (55.1)$$

precision: in table 55.2 uncertainty: in table 55.1

Table 55.2. Parameters of diffusion equation (55.1), precision, and references

Species	A x 10^6 ($cm^2 s^{-1} k^{-\frac{1}{2}}$)	k (K)	T_o (K)	Temp. range (K)	Precision	References
Ag^+	5.84	598.2	202.5	288-332	∿ ± 3%	250,252,253,255
Cd^{2+}	0.359	199	266.8	320-367		see:table S-1

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 55.3. Diffusion coefficients from equations in table 55.2

T (K)	D_{Ag^+} x 10^5 ($cm^2 s^{-1}$)	$D_{Cd^{2+}}$ x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Ag^+} x 10^5 ($cm^2 s^{-1}$)	$D_{Cd^{2+}}$ x 10^5 ($cm^2 s^{-1}$)
290	0.0107		340		0.0437
300	0.0219		350		0.0614
310	0.0394		360		0.0805
320	0.0643	0.0152	370		0.1004
330	0.0973	0.0280			

System 55. $Ca(NO_3)_2.4H_2O$ (cont'd)

Table 55.4. Diffusion coefficients for species not included in table 55.3

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Tl^+	323	0.03	250,253,254,255
	333	0.054	258
Pb^{2+}	323	0.019	250
Cu^{2+}	323	0.0245	250
Zn^{2+}	323	0.0238	250
In^{3+}	323	0.0055	250
	333	0.016	258
UO_2^{2+}	328	0.013	257

System 56. $Ca(NO_3)_2 \cdot 4D_2O$

List of diffusing species investigated in $Ca(NO_3)_2 \cdot 4D_2O$ as solvent

Cd^{2+}, Ni^{2+}

Table 56.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 20%	Cd^{2+}, Ni^{2+}

Table 56.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Cd^{2+}	323	0.0184	250
Ni^{2+}	323	0.0145	250

System 57. $CH_3COONa \cdot 3H_2O$

List of diffusing species investigated in $CH_3COONa \cdot 3H_2O$ as solvent

Tl^+, Pb^{2+}, Zn^{2+}, Cd^{2+}, Co^{2+}, Ni^{2+}

Table 57.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 20%	Tl^+, Pb^{2+}, Zn^{2+}, Cd^{2+}, Co^{2+}, Ni^{2+}

System 57. $CH_3COONa.3H_2O$ (cont'd)

Table 57.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Tl^+	360	0.560	259
Pb^{2+}	360	0.137	259
Zn^{2+}	360	0.161	259
Cd^{2+}	360	0.366	259
Co^{2+}	360	0.155	259
Ni^{2+}	360	0.087	259

System 58. $HCOONH_4$

List of diffusing species investigated in $HCOONH_4$ as solvent

Pb^{2+}, Zn^{2+}, Cd^{2+}

Table 58.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 20%	Pb^{2+}, Cd^{2+}
calculated from equiv. conductance	$\sim \pm$ 50%	Zn^{2+}

Table 58.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Pb^{2+}	398	0.723	260,261
Zn^{2+}	398	1.16	261
Cd^{2+}	398	0.93	260,261

System 59. CH_3CONH_2

List of diffusing species investigated in CH_3CONH_2 as solvent

Tl^+, Pb^{2+}, Cd^{2+}, Ni^{2+}

Table 59.1 Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
cyclic voltammetry	$\sim \pm$ 10%	Tl^+, Pb^{2+}, Cd^{2+}, Ni^{2+}

Table 59.2 Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Tl^+	360	0.53	262
Pb^{2+}	360	0.36	262
Cd^{2+}	360	0.24	262
Ni^{2+}	360	0.24	262

Melt: acetamide 1 molar in CH_3COOK.

System 60. $NH_4SO_3NH_2$

List of diffusing species investigated in $NH_4SO_3NH_2$ as solvent

Tl^+, Sn^{2+}, Pb^{2+}, Zn^{2+}, Cd^{2+}, In^{3+}, Co^{2+}, Ni^{2+}

Table 60.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 20%	Tl^+, Sn^{2+}, Pb^{2+}, Zn^{2+}, Cd^{2+}, In^{3+}, Co^{2+}, Ni^{2+}

Table 60.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Tl^+	435	0.129	263
Sn^{2+}	435	0.055	263
Pb^{2+}	435	0.046	263
Zn^{2+}	435	0.05	263
Cd^{2+}	435	0.073	263
In^{3+}	435	0.044	263
Co^{2+}	435	0.052	263
Ni^{2+}	435	0.035	263

System 61. $C_2H_5NH_3Cl$

List of diffusing species investigated in $C_2H_5NH_3Cl$ as solvent

Be^{2+}, Pb^{2+}, Cu^+, Ag^+, *Au^+*, *Cd^{2+}*, *Hg^{2+}*, *Sn^{2+}*, Fe^{3+}, *Pt^{2+}*

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 61.4.

System 61. $C_2H_5NH_3Cl$ (cont'd)

Table 61.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	Be^{2+}, Pb^{2+}, Cu^{+}, Ag^{+}, Au^{+}, Cd^{2+}, Hg^{2+}, Sn^{2+}, Fe^{3+}, Pt^{2+}
rapid scan voltammetry	∿ ± 20%	Au^{+}

Equation:

$$D = A \exp[-E/RT] \quad (61.1)$$

precision: in table 61.2 uncertainty: in table 61.1

Table 61.2. Parameters of diffusion equation (61.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
Be^{2+}	0.1838	3297	400-440	± 0.1%	269
Pb^{2+}	6.1180	6728	400-440	± 8.2%	267
Cu^{+}	1.853	4124	400-440	± 0.02%	269
Ag^{+}	0.458	3979	400-440	± 1.9%	264
Fe^{3+}	0.1078	3373	400-440	± 0.1%	269

Table 61.3. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 61.2

T (K)	Be^{2+}	Pb^{2+}	Cu^{+}	Ag^{+}	Fe^{3+}
400	0.290	0.129	1.03	0.307	0.155
420	0.354	0.193	1.32	0.389	0.189
440	0.423	0.278	1.66	0.484	0.228

Table 61.4. Diffusion coefficients for species not included in table 61.3.

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Au^{+}	403	0.135	265,268
Cd^{2+}	396	0.069	272
Hg^{2+}	403	0.120	270
Sn^{2+}	390	0.25	271,272
Pt^{2+}	403	0.096	266

System 62. $[(CH_3)_2(NH_2)]_2SO_4$

List of diffusing species investigated in $[(CH_3)_2(NH_2)]_2SO_4$ as solvent

Cd^{2+}, Sn^{2+}

Table 62.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Cd^{2+}, Sn^{2+}

Table 62.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cd^{2+}	363	0.548	272
Sn^{2+}	363	0.05	271,272

System 63. B_2O_3

List of diffusing species investigated in B_2O_3 as solvent

O

Table 63.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
gas-liquid isotope exchange	$\sim \pm$ 25%	O

Equation:

$$D = A \exp[-E/RT] \quad (63.1)$$

precision: in table 63.2 uncertainty: in table 63.1

Table 63.2. Parameters of diffusion equation (63.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
O	24.9	32800	620-920		273

No entry in precision column indicates estimate not possible since results were reported as equations only.

System 63. B_2O_3 (cont'd)

Table 63.3. Diffusion coefficients from equation in table 63.2

T (K)	$D_0 \times 10^{10}$ ($cm^2 s^{-1}$)	T (K)	$D_0 \times 10^{10}$ ($cm^2 s^{-1}$)
620	0.000683	780	0.161
660	0.00343	820	0.451
700	0.0143	860	1.150
740	0.0512	900	2.699
760	0.0921	920	4.022

System 64. Al_2O_3

List of diffusing species investigated in Al_2O_3 as solvent

uncertain (most mobile species in the melt; oxide?)

Table 64.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
tracer	$\sim \pm$ 25%	most mobile species in the melt

Equation:

$$D = A \exp[-E/RT] \quad (64.1)$$

precision: in table 64.2 uncertainty: in table 64.1

Table 64.2. Parameters of diffusion equation (64.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
most mobile species in melt	2.451	22375	2340-2580	$\pm$ 1.8%	274

Table 64.3. Diffusion coefficients from equation in table 64.2

T (K)	D x 10^5 (a) ($cm^2 s^{-1}$)	T (K)	D x 10^5 (a) ($cm^2 s^{-1}$)
2340	1.99	2480	2.61
2380	2.16	2520	2.81
2420	2.34	2560	3.01
2460	2.52		

[a] Diffusion coefficients of most mobile species in the melt; species uncertain (oxide?)

System 65. $Na_2Si_2O_5$

List of diffusing species investigated in $Na_2Si_2O_5$ as solvent

Sn^{4+}, Pb^{2+}, Cu^{2+}, Zn^{2+}, Fe^{2+}, Fe^{3+}, SiO_4^{4-}

Table 65.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Sn^{4+}, Pb^{2+}, Cu^{2+}, Zn^{2+}, Fe^{2+}, Fe^{3+}, SiO_4^{4-}

Table 65.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
$\underline{Sn^{4+}}$	1173	0.071	276
$\underline{Pb^{2+}}$	1173	0.048	276
$\underline{Cu^{2+}}$	1173	0.041	276
$\underline{Zn^{2+}}$	1173	0.035	276
Fe^{2+}	1173	0.06	276
	1223	0.07	275
Fe^{3+}	1173	0.082	276
	1223	0.03	275
SiO_4^{4-}	1173	0.02	276

For the underlined species the temperature dependence of D reported in graphical form [276].

System 66. NaF-KF

List of diffusing species investigated in LiF-KF as solvent

Ge^{4+}, Ti^{3+}, Ti^{4+}

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 66.4.

Table 66.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Ti^{3+}, Ti^{4+}
rapid scan voltammetry	$\sim \pm$ 20%	Ge^{4+}

Equation:

$$D = A \exp[-E/RT] \quad (66.1)$$

precision: in table 66.2 uncertainty: in table 66.1

System 66. NaF-KF (cont'd)

Table 66.2. Parameters of diffusion equation (66.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Ti^{4+}	5.089	10187	1020-1170	± 1.5%	248
Ti^{4+}	5.584	10740	1020-1170	± 3.3%	248

Table 66.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 66.2.

T (K)	Ti^{3+}	Ti^{4+}	T (K)	Ti^{3+}	Ti^{4+}
1020	3.34	2.79	1100	4.82	4.10
1040	3.68	3.09	1120	5.23	4.48
1060	4.04	3.41	1140	5.67	4.87
1080	4.42	3.75	1160	6.13	5.29
1090	4.61	3.92	1170	6.36	5.51

Table 66.4. Diffusion coefficients for species not included in table 66.3

Species	T (T)	D x 10^5 ($cm^2 s^{-1}$)	References
Ge^{4+}	1023	4.2	277
	1073	9.0	

System 67. $LiF-BeF_2$

List of diffusing species investigated in $LiF-BeF_2$ as solvent

Li^+, *Be^{2+}*, *Fe^{2+}*, F^-

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 67.4.

Table 67.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 25%	F^-
rapid scan voltammetry	∿ ± 20%	Fe^{2+}
electromigration depletion chronopotentiometry	∿ ± 20%	Li^+, Be^{2+}

System 67. $LiF-BeF_2$(cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (67.1)$$

precision: in table 67.2 uncertainty: in table 67.1

Table 67.2. Parameters of diffusion equation (67.1), precisions, and references

Species	A x 10^{-3} ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $LiF-BeF_2$ (5.0 mol % LiF)					
Li^+	53.239	50904	840-980	± 6%	279,280
(b) $LiF-BeF_2$ (66.67 mol % LiF)					
F^-	6.974	30615	790-920	± 4.7%	137

Table 67.3. Self-diffusion coefficients from equations in table 67.2

T (K)	5.0 mol % LiF D_{Li^+} x 10^8	66.67 mol % LiF D_{F^-} x 10^5
790		2.37
820		4.83
850	0.434	9.37
880	1.214	17.38
910	3.169	30.96
940	7.781	
970	18.08	
980	23.68	

Table 67.4. Diffusion coefficients

Species	Melt composition (mol % LiF)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Fe^{2+}	66.0	773	0.5	278
Li^+	2	933	0.0035	280
	5		0.01	
	10		0.05	
	15.6		0.12	
	22.2		0.27	
Be^{2+}	2	933	0.00035	280
	5		0.001	
	10		0.005	
	15.6		0.012	
	22.2		0.027	

System 68. $LiF-BaF_2$

List of diffusing species investigated in $LiF-BaF_2$ as solvent

Zr^{4+}, Ce^{3+}, U^{4+}

Table 68.1 Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
linear sweep voltammetry	$\sim \pm$ 20%	Zr^{4+}, Ce^{3+}, U^{4+}

Table 68.2 Diffusion coefficients

Species	Melt composition (mol % LiF)	T (K)	D x 10^5 (cm^2s^{-1})	References
Zr^{4+}	38	1123	0.8	281
Ce^{3+}	38	1098	1.5	281
U^{4+}	38	1113	1.9	281

System 69. $NaF-BeF_2$

List of diffusing species investigated in $NaF-BeF_2$ as solven

Na^+

Table 69.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
electromigration depletion chronopotentiometry	$\sim \pm$ 20%	Na^+

Table 69.2. Self-diffusion coefficient

Species	Melt composition (mol % NaF)	T (K)	D x 10^5 (cm^2s^{-1})	References
Na^+	25	793	0.03	282

System 70. $NaF-AlF_3$

List of diffusing species investigated in $NaF-AlF_3$ as solvent

Na^+, Al(III), F^-

Table 70.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 20%	Na^+, Al(III), F^-

Equation:

$$D = A \exp[-E/RT] \quad (70.1)$$

precision: in table 70.2 uncertainty: in table 70.1

Table 70.2. Parameters of diffusion equation (70.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaF-AlF_3$ (2.06 mol % AlF_3)					
Al(III)	*insufficient data for temp.-dependence parameters*				144
(b) $NaF-AlF_3$ (13.5 mol % AlF_3)					
Na^+	3.798	9595	1211-1343	± 7.5%	133
Al(III)	*insufficient data for temp.-dependence parameters*				144
F^-	14.956	14030	1211-1324	± 9.8%	133
(c) $NaF-AlF_3$ (25 mol % AlF_3)[a]					
Na^+	*insufficient data for temp.-dependence parameters*				133
Al(III)	*insufficient data for temp.-dependence parameters*				144
F^-	*insufficient data for temp.- dependence parameters*				133
(d) $NaF-AlF_3$ (37.5 mol % AlF_3)					
Na^+	5.412	10040	1201-1273	± 3.8%	133
F^-	0.712	6165	1201-1273	± 2.6%	133

[a]The composition $NaF-AlF_3$ (25 mol % AlF_3) corresponds to that of cryolite, Na_3AlF_6. See system Na_3AlF_6, this work, for additional studies in molten cryolite.

System 70. $NaF-AlF_3$(cont'd)

Table 70.3 Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 70.2

T (K)	mol% AlF_3											
	2.06%			13.5%			25.0%			37.5%		
	Na^+	Al	F^-	Na^+	Al	F^-	Na^+	Al	F^-	Na^+	Al	F^-
1050		5.3[a]								8.03		5.37
1200												
1210				7.02		4.37				8.32		5.48
1220				7.26		4.59				8.61		5.60
1230				7.49		4.81				8.90		5.72
1240				7.73		5.04				9.20		5.83
1250				7.98		5.27				9.51		5.95
1260				8.23		5.51				9.82		6.07
1270				8.48		5.76				10.13		6.19
1280				8.74		6.02						
1290				8.99		6.28						
1300				9.26		6.55						
1310				9.52	7.44[b]	6.83						
1320				9.79		7.11	9.37[c]		5.7[d]			
1330				10.07				6.83[e]				
1340				10.34								

(a) based on 3 data points for 1049-1054K; (b) based on 2 data points at 1307 and 1314 K, respectively; (c) average of 2 values for 1321 and 1322 K, respectively; (d) based on 2 data points at 1321 and 1322 K, respectively; see also Na_3AlF_6 ; (e) this value is at 1325 K.

System 71. $NaF-Na_3AlF_6$

List of diffusing species investigated in $NaF-Na_3AlF_6$ as solvent

Zn^{2+}, Fe^{3+}, Ni^{2+}

Table 71.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Zn^{2+}, Fe^{3+}, Ni^{2+}

Table 71.2. Diffusion coefficients

Species	T (K)	D (cm^2s^{-1})	References
Zn^{2+}	1273	0.90	283
Fe^{3+}	1273	1.00	283
Ni^{2+}	1273	0.20	283

System 72. LiF-NaF-KF

List of diffusing species investigated in LiF-NaF-KF (46.5-11.5-42 mol %) as solvent

Li^+, *Ti(IV)*, *Nb(IV)*, *Nb(V)*, *Ta(V)*, *Th(IV)*, *Fe^{2+}*, Ni^{2+}, F^-.

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 72.5.

Table 72.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Li^+, F^-
chronopotentiometry	$\sim \pm$ 20%	Ti(IV), Nb(IV), Nb(V), Ta(V)
rapid scan voltammetry	$\sim \pm$ 20%	Ti(V), Th(IV), Fe^{2+}, Ni^{2+}

Equation:

$$D = A \exp[-E/RT] \quad (72.1)$$

precision: in table 72.2 uncertainty: in table 72.1

Table 72.2. Parameters of diffusion equation (72.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
Li^+	3.85	8880	730-930		513
Ni^{2+}	391.6	19810	770-870	$\pm$ 10.8%	284
F^-	1.63	7230	730-930		513

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 72.3. Self-diffusion coefficients from equations in table 72.2.

T (K)	D_{Li^+} x 10^5 ($cm^2 s^{-1}$)	D_{F^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Li^+} x 10^5 ($cm^2 s^{-1}$)	D_{F^-} x 10^5 ($cm^2 s^{-1}$)
730	0.85	1.12	840	1.88	2.14
750	1.00	1.27	860	2.13	2.37
770	1.16	1.45	880	2.40	2.61
790	1.35	1.63	900	2.69	2.86
810	1.55	1.83	920	2.99	3.12
830	1.77	2.03			

System 72. LiF-NaF-KF (cont'd)

Table 72.4. Diffusion coefficients from equation in table 72.2.

T (K)	$D_{Ni^{2+}} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Ni^{2+}} \times 10^5$ ($cm^2 s^{-1}$)
770	0.09	830	0.24
790	0.13	850	0.32
810	0.18	870	0.41
820	0.21		

Table 72.5. Diffusion coefficients for species not included in tables 72.3 and 72.4.

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	Reference
Fe^{2+}	773	∿ 0.1	278
Nb(IV)[a]	1023	∿ 5.02	288
Nb(V)[a]	1023	∿ 1.5	
Ta(V)[a]	1023	∿ 1.5	287,289
Ti(IV)[a]	773	∿ 0.22	285
Th(IV)[a]	773	∿ 0.18	286

[a]Diffusing species uncertain.

System 73. $LiF-BeF_2-ZrF_4$

List of diffusing species investigated in $LiF-BeF_2-ZrF_4$ as solvent

Bi^{3+}, Ti^{3+}, Cr^{2+}, Ni^{2+}, U^{4+}

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 73.4.

Table 73.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 25%	Bi^{3+}, Ti^{3+}, Ni^{2+}, U^{4+}
linear scan voltammetry	∿ ± 25%	Bi^{3+}, Ti^{3+}, Cr^{2+}, Ni^{2+}, U^{4+}
chronoamperometry	∿ ± 25%	U^{4+}
square-wave voltammetry	∿ ± 25%	U^{4+}

Equation:

$$D = A \exp[-E/RT] \quad (73.1)$$

precision: in table 73.2 uncertainty: in table 73.1

System 73. $LiF-BeF_2-ZrF_4$(cont'd)

Table 73.2. Parameters of diffusion equation (73.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $LiF-BeF_2-ZrF_4$ (65.6-29.4-5.0 mol %)					
Bi^{3+}	*insufficient data for temp.-dependence parameters*				293
Ti^{3+}	*insufficient data for temp.-dependence parameters*				285
Cr^{2+}	*insufficient data for temp.-dependence parameters*				291
Ni^{2+}	*insufficient data for temp.-dependence parameters*				292
U^{4+}	*insufficient data for temp.-dependence parameters*				294, 295
(b) $LiF-BeF_2-ZrF_4-UF_4$ (65.0-29.2-5.0-0.83 mol %)					
U^{4+}	7.319	12973	770-870	± 6.5%	290
(c) $LiF-BeF_2-ZrF_4-UF_4$ (64.0-34.0-1.8-0.2 mol %)					
U^{4+}	*insufficient data for temp.-dependence parameters*				290

Table 73.3. Diffusion coefficients from equation in table 73.2

T (K)	D_{U4+} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{U4+} x 10^5 ($cm^2 s^{-1}$)
770	0.15	830	0.28
790	0.19	850	0.34
820	0.26	870	0.40

Table 73.4. Diffusion coefficients for species not included in table 73.3

Species	Melt composition (mol %)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Bi^{3+}	65.6-29.4-5.0	773	0.105	293
Ti^{3+}		773	0.15	285
Cr^{2+}		773	∿ 0.10	291
Ni^{2+}		773	0.106	292
U^{4+}		773	0.165	294, 295
U^{4+}	[a]	773	0.20	290

[a] $LiF-BeF_2-ZrF_4-UF_4$ (64-34-1.8-0.2 mol %).

System 74. $LiF-BeF_2-ThF_4$

List of diffusing species investigated in $LiF-BeF_2-ThF_4$ as solvent

Fe^{2+}

Table 74.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Fe^{2+}

Equation:

$$D = A \exp[-E/RT] \quad (74.1)$$

precision: in table 74.2 uncertainty: in table 74.1

Table 74.2. Parameters of diffusion equation (74.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Fe^{2+}	3.798	10697	790-970	$\pm$ 0.5%	296

Melt composition : $LiF-BeF_2-ThF_4$ (72-16-12 mol %)

Table 74.3. Diffusions coefficients from equation in table 74.2.

T (K)	$D_{Fe^{2+}}$ x 10^5 ($cm^2 s^{-1}$)	T (K)	$D_{Fe^{2+}}$ x 10^5 ($cm^2 s^{-1}$)
790	0.42	890	0.90
800	0.45	900	0.96
810	0.49	910	1.02
820	0.54	920	1.09
830	0.58	930	1.16
840	0.63	940	1.24
850	0.67	950	1.31
860	0.73	960	1.39
870	0.78	970	1.48
880	0.84		

System 75. LiCl-KCl

List of diffusing species investigated in LiCl-KCl as solvent

Na^+, Rb^+, Be^{2+}, Tl^+, *Ge^{2+}*, Pb^{2+}, *Sb^{3+}*, Bi^{3+}, Cu^+, Ag^+, Au^+, *Zn^{2+}*, Cd^{2+}, *Hg^{2+}*, *Y^{3+}*, La^{3+}, Ti^{3+}, Ti^{4+}, *V^{5+}*, *VO^{2+}*, *Nb^{2+}*, Nb^{3+}, *Nb_3Cl_8*, *$[TaCl_6]^{2-}$*, Cr^{3+}, Mo^{3+}, *$[MoCl_6]^{3-}$*, *W^{3+}*, Mn^{2+}, Fe^{2+}, Co^{2+}, Ni^{2+}, *Pd^{2+}*, *Pt^{2+}*, Ce^{3+}, *Pr^{3+}*, *Nd^{3+}*, *Sm^{3+}*, *Eu^{3+}*, *Gd^{3+}*, *Tb^{3+}*, *Dy^{3+}*, *Ho^{3+}*, *Er^{3+}*, *Tm^{3+}*, *Yb^{3+}*, *Lu^{3+}*, U^{3+}, U^{4+}, UO_2^{2+}, Np^{3+}, Np^{4+}, *NpO_2^+*, *NpO_2^{2+}*, Pu^{3+}, Pu^{4+}, Am^{3+}, Cm^{3+}, *O^{2-}*, *S_2^{2-}*, *S_x^{2-}*, *Cl_2*, *HCl*, *CO_2*, *H_2O*, *VO_3^-*, *CrO_4^{2-}*, *MoO_4^{2-}*, *MoO_2Cl_2*, *PO_4^{3-}*

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients. For these species: see table 75.4.

Table 75.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Na^+, Rb^+, Cu^+, U^{4+}, UO_2^{2+}
chronopotentiometry	∿ ± 10%	Be^{2+}, Cu^+, Ag^+, Au^+, La^{3+}, Nb^{3+}, Mo^{3+}, Fe^{2+}, Ni^{2+}, Ce^{3+}, U^{3+}, U^{4+}, Np^{3+}, Np^{4+}, Pu^{3+}, Pu^{4+}, Am^{3+}, Cm^{3+}, Ge^{2+}, Zn^{2+}, Hg^{2+}, Ti^{3+}, Ti^{4+}, V^{5+}, VO^{2+}, Nb_3Cl_8, $TaCl_6^{2-}$, $MoCl_6^{3-}$, W^{3+}, Pd^{2+}, NpO_2^+, NpO_2^{2+}, O^{2-}, VO_3^-, CrO_4^{2-}, MoO_4^{2-}, MoO_2Cl_2, PO_4^{3-}, S_x^{2-}, Cl_2, HCl, H_2O
voltammetry	∿ ± 20%	Bi^{3+}, Tl^+, Cd^{2+}, Cr^{3+}, Mn^{2+}, Co^{2+}, S_2^{2-}
polarography	∿ ± 20%	Sb^{3+}, Pd^{2+}, Pt^{2+}
rotating disc electrode	∿ ± 20%	Y^{3+}, Pr^{3+}, Nd^{3+}, Sm^{3+}, Eu^{3+}, Gd^{3+}, Tb^{3+}, Dy^{3+}, Ho^{3+}, Er^{3+}, Tm^{3+}, Yb^{3+}, Lu^{3+}
rising bubble	∿ ± 40%	CO_2

Equation:

$$D = A \exp[-E/RT] \qquad (75.1)$$

precision: in table 75.2 uncertainty: in table 75.1

System 75. LiCl-KCl (cont'd)

Table 75.2. Parameters of diffusion equation (75.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Rb^+	1829	16490	700-790	± 7.1%	97
Be^{2+}	0.775	5079	800-1040		353,357
Tl^+	3.08	6498	650-810		see:table S-1
Pb^{2+}	2.84	7313	650-810		see:table S-1
Bi^{3+}	6.03	10067	630-800		see:table S-1
Cu^+	0.601	4550	670-750		see:table S-1
Ag^+	1.32	5800	670-870		see:table S-1
Au^+	1.14	6300	670-870		305
Cd^{2+}	5.94	8502	640-800		see:table S-1
La^{3+}	2.69	7688	710-940		301,337,360
Ti^{3+}	2.35	8095	770-1170	± 1.1%	351
Ti^{4+}	4.59	10378	770-1170	± 1.2%	351
Nb^{3+}	2.18	7000	670-870		308,315
Cr^{3+}	6.35	10424	690-810		see:table S-1
Mo^{3+}	3.89	9212	810-1190		153,158
Mn^{2+}	10.9	9706	640-810		121,314,321
Fe^{2+}	1.53	7200	670-870		297,305,352
Co^{2+}	2.45	8054	670-820		see:table S-1
Ni^{2+}	1.56	7100	670-870		see:table S-1
Ce^{3+}	1.78	7670	670-920		324,337
U^{3+}	1.739	8502	650-810	± 4.1%	112,300,328,354
U^{4+}	1.13	6300	640-880	± 3%	see:table S-1
U^{4+}[a]	*5.788*	*8759*	*690-820*	*± 3.6%*	112
UO_2^{2+}	1.76	7500	665-800	± 0.14%	312,328
Np^{3+}	3.05	8699	670-920	± 3%	307,313
Np^{4+}	3.447	8787	670-820	± 4.6%	306,325,328
Pu^{3+}	3.314	8792	670-920	± 2%	112,313,326,335
Pu^{4+}	5.918	9665	670-920	± 2.1%	306
Am^{3+}	5.657	9770	670-920	± 8.3%	313
Cm^{3+}	8.799	10397	670-820	± 14%	338

No entry in precision column indicates estimates not possible since results were reported as equations only.

[a]The italicized U^{4+} is for a study in presence of added F^- ions; diffusing species is uncertain.

System 75. LiCl-KCl (cont'd)

Table 75.3.1. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 75.2

T (K)	Rb^+	Be^{2+}	Tl^+	Pb^{2+}	Bi^{3+}	Cu^+	Ag^+	Au^+	Cd^{2+}	La^{3+}
630					0.194					
650			2.01	0.99	0.248				0.823	
690			2.69	1.37	0.391	2.18	1.92	1.15	1.20	
730	2.12		3.49	1.84	0.584	2.61	2.42	1.48	1.69	1.34
770	3.82		4.41	2.39	0.837		2.98	1.86	2.29	1.77
800		3.18	5.17	2.85	1.07		3.44	2.17	2.83	2.14
830		3.56					3.92	2.50		2.54
870		4.11					4.61	2.98		3.15
930		4.96								4.20
970		5.56								
1010		6.17								
1030		6.48								

Table 75.3.2. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 75.2

T (K)	Nb^{3+}	Cr^{3+}	Mo^{3+}	Mn^{2+}	Fe^{2+}	Co^{2+}	Ti^{3+}	Ti^{4+}
640				0.528				
670	1.14			0.744	0.686	0.578		
710	1.53	0.393		1.12	0.93	0.813		
750	1.99	0.582		1.62	1.22	1.10		
790	2.52	0.830		2.25	1.56	1.45	1.35	0.62
810	2.82	0.977	1.27	2.62	1.75	1.64	1.54	0.73
850	3.46		1.66		2.15		1.95	0.99
890			2.13				2.42	1.30
950			2.96				3.23	1.88
990			3.60				3.84	2.35
1030			4.32				4.50	2.88
1070			5.11				5.22	3.48
1110			5.97				5.99	4.15
1150			6.91				6.80	4.89
1190			7.91					

System 75. LiCl-KCl (cont'd)

Table 75.3.3. Diffusion coefficients. D x 10^5 (cm^2s^{-1}), from equations in table 75.2

T (K)	Ni^{2+}	Ce^{3+}	U^{3+}	U^{4+}	U^{4+}a	UO_2^{2+}	Np^{3+}	Np^{4+}	Pu^{3+}	Pu^{4+}	Am^{3+}	Cm^{3+}
630												
670	0.754	0.560	0.293	0.996		0.630	0.443	0.469	0.449	0.416	0.368	0.357
730	1.17	0.900	0.495	1.47	1.38	1.00	0.759	0.807	0.773	0.756	0.672	0.679
790	1.69	1.34	0.773	2.04	2.18	1.48	1.20	1.28	1.22	1.25	1.12	1.17
830	2.11	1.70		2.48			1.56		1.60	1.69	1.51	
890		2.33					2.23		2.30	2.51	2.26	
910		2.56					2.48		2.56	2.82	2.55	

[a] The U^{4+} in italics is for a diffusion study in the presence of added F^- ions.

Table 75.4. Diffusion coefficients for species not included in table 75.3

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Na^+	677	1.97	329
	755	2.65	
Ge^{2+}	723	2.2	341
Sb^{3+}	723	1.2	323
Zn^{2+}	723	1.15	115,118,121
Hg^{2+}	723	1.67	344
Y^{3+}	673	0.057	339
V^{5+}	723	0.8	327
VO^{2+}	723	2.68	310
Nb^{2+}	723	3.5	315
Nb_3Cl_8	773	3.2	347
	948	9.3	
$[TaCl_6]^{2-a}$	773	9.0	320
	873	25.0	
	948	46.0	
$[MoCl_6]^{3-}$	873	1.43	340
	973	2.89	
	1023	3.8	
W^{3+}	723	0.71	348
Pd^{2+}	723	1.39	323
	758	1.68	322
Pt^{2+}	723	1.49	323
Pr^{3+}	673	0.037	337
Nd^{3+}	673	0.064	337
Sm^{3+}	673	0.153	337
Eu^{3+}	673	0.111	337

[a] $[TaCl_6]^{2-}$; values of diffusion coefficients appear improbable: possibly a factor of 10 too high

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Gd^{3+}	673	0.054	337
Tb^{3+}	673	0.046	337
Dy^{3+}	673	0.043	337
Ho^{3+}	673	0.045	337
Er^{3+}	673	0.046	337
Tm^{3+}	673	0.056	337
Yb^{3+}	673	0.080	337
Lu^{3+}	673	0.060	337
NpO_2^+	673	0.48	336
NpO_2^{2+}	673	0.20	336
O^{2-}	673	1.6	299,356,358,359
	713	2.6	
	753	4.8	
	783	7.2	
S_2^{2-}	693	5.7	216
VO_3^-	723	0.76	343
CrO^{2-}	723	0.96	331,348
MoO_4^{2-}	723	1.64	342
MoO_2Cl_2	723	1.08	342
PO_4^{3-}	723	0.80	332
S_x^{2-}	693	0.312	334
Cl_2	673	6.0	201,194
	843	23	
HCl	677	18	328,346
	793	21	
CO_2	723	1.32	229
	803	1.70	
H_2O	723	1.77	330,358

System 76. LiCl-CsCl

List of diffusing species investigated in LiCl-CsCl as solvent

Cu^{+}, U^{3+}, U^{4+}

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 76.4.

Table 76.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 10%	U^{3+}, U^{4+}
cyclic voltammetry	∿ ± 10%	Cu^{+}

Equation:

$$D = A \exp[-E/RT] \quad (76.1)$$

precision: in table 76.2 uncertainty: in table 76.1

Table 76.2. Parameters of diffusion equation (76.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) LiCl-CsCl (55 mol % CsCl)					
Cu^{+}	*insufficient data for temp.-dependence parameters*				349
(b) LiCl-CsCl (eutectic composition)					
U^{3+}	2.818	8095	670-870	± 12.7%	361
U^{4+}	4.656	9112	670-870	± 2.9%	361

Table 76.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 76.2 in the eutectic melt

T (K)	U^{3+}	U^{4+}	T (K)	U^{3+}	U^{4+}
670	0.645	0.496	780	1.52	1.30
690	0.769	0.605	800	1.73	1.51
710	0.908	0.730	820	1.96	1.74
730	1.06	0.871	840	2.21	1.98
750	1.23	1.03	860	2.47	2.25
770	1.42	1.21			

Table 76.4. Diffusion coefficients for species not included in table 76.3

Species	Melt Composition (mol % LiCl)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cu^{+}	55	723	4.5	349

System 77. NaCl-KCl

List of diffusing species investigated in NaCl-KCl as solvent

Be^{2+}, Mg^{2+}, Al^{3+}, Tl^{+}, Pb^{2+}, *Cu^{+}*, Ag^{+}, Zn^{2+}, Cd^{2+}, Y^{3+}, Ti^{3+}, Ti^{4+}, Zr^{2+}, Zr^{4+}, ZrF_6^{2-}, Hf^{2+}, Hf^{4+}, HfF_6^{2-}, Nb^{2+}, Nb^{3+}, *Nb_3Cl_8*, *K_2NbF_7*, Cr^{3+} *Mo^{3+}*, W^{4+}, W^{5+}, Fe^{2+}, *Co^{2+}*, *Ni^{+}*, *Ni^{2+}*, Th^{4+}, U^{3+}, U^{4+}, UO_2^{2+}, *O^{2-}*, *PO_4^{3-}*, Cl_2, *HCl*, *SO_3*, *CO_2*.

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 77.5

Table 77.1. Diffusion techniques, uncertainties, and species

Diffusion techniques of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 10%	Be^{2+}, Mg^{2+}, Al^{3+}, Tl^{+}, Pb^{2+}, Ag^{+}, Cd^{2+}, Y^{3+}, Ti^{3+}, Ti^{4+}, Zr^{2+}, Zr^{4+}, ZrF_6^{2-}, Hf^{2+}, Hf^{4+}, HfF_6^{2-}, Nb^{2+}, Nb^{3+}, K_2NbF_7, W^{4+}, W^{5+}, Fe^{2+}, Th^{4+}, U^{3+}, U^{4+}, UO_2^{2+}, Cl_2, Zn^{2+}, Nb_3Cl_8, CO^{2+}, Ni^{+}, Ni^{2+}, PO_4^{3-}, SO_3, CO_2
galvanostatic	∿ ± 20%	Cr^{3+}
voltammetry	∿ ± 20%	Cu^{+}, O^{2-}
rotating disc electrode	∿ ± 20%	HCl

Equation:

$$D = A \exp[-E/RT] \qquad (77.1)$$

precision: in table 77.2 uncertainty: in table 77.1

System 77. NaCl-KCl (cont'd)

Table 77.2. Parameters of diffusion equation (77.1), precisions, and references

Species	A x 10^3 (cm^2 s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
Be^{2+}	5.27	10700	950-1070		370
Mg^{2+}	3.80	8328	1020-1120		195
[a] Mg^{2+}	3.977	8696	1020-1120		195
[b] Mg^{2+}	2.568	9152	1020-1120		195
[c] Mg^{2+}	2.815	9610	1020-1120		195
Al^{3+}	1.096	6543	950-1090		374
Tl^{+}	5.16	8526	945-1040	± 2.6%	174,392
Pb^{2+}	1.582	7678	970-1200	± 3.4%	see:table S-1
Ag^{+}	1.91	6411	980-1150	± 2.8%	see:table S-1
Zn^{2+}	1.424	6493	940-1070		375,377,398
Cd^{2+}	1.63	7030	950-1070		see:table S-1
Y^{3+}	1.49	8359	950-1090		364
Ti^{3+}	3.31	8645	970-1170	± 3.8%	248
Ti^{4+}	8.77	11833	970-1170	± 4.5%	248
Zr^{2+}	5.40	11100	970-1170	± 0.4%	362,372,381
Zr^{4+}	6.20	9800	970-1170		362,372
ZrF_6^{2-}	36.0	14963	970-1070		362
Hf^{2+}	2.73	7950	970-1170		371
Hf^{4+}	4.40	9200	970-1170		382,393
HfF_6^{2-}	9.55	12767	950-1130		382
Nb^{2+}	9.12	9152	970-1110		308
Nb^{3+}	4.36	10500	970-1110		308
Cr^{3+}	5.75	11472	1020-1120		369,391
W^{4+}	11.38	12643	970-1130		368
W^{5+}	15.21	13480	970-1130		368
Fe^{2+}	6.53	9839	960-1180		366
Th^{4+}	17.46	12776	950-1100		365
Th^{4+}	60.26	15897	950-1100		365
U^{3+}	2.83	8800	950-1170		386,387,396
U^{4+}	9.55	11797	950-1160		386,387,396
UO_2^{2+}	2.94	10726	950-1120		see:table S-1
[d] Cl_2	linear equation		1010-1110		166,177,178,179

No entry in precision column indicates estimate not possible since results were reported as equations only.

[a] Melt containing 0.318 x 10^{-2} mol % NaF

[b] Melt containing 0.701 x 10^{-2} mol % NaF

[c] Melt containing 2.87 x 10^{-2} mol % NaF

[d] Cl_2: $D_{Cl_2} = 0.95 \times 10^{-3} - 0.9 \times 10^{-6}(T-931)$

The italicized species indicate the presence of added F^- ions during these investigations; diffusing species uncertain.

System 77. NaCl-KCl (cont'd)

Table 77.3.1. Diffusion coefficients, D x 10^5($cm^2 s^{-1}$),from equations in table 77.2

T (K)	Be^{2+}	Al^{3+}	Tl^{+}	Pb^{2+}	Ag^{+}	$^{a}Zr^{2+}$	Cd^{2+}	Y^{3+}	Ti^{3+}	Ti^{4+}	Zr^{2+}	Zr^{4+}	ZrF_6^{2-}	Hf^{2+}	Hf^{4+}	HfF_6^{2-}
950	1.82	3.42	5.64			4.57	3.93	1.78								1.10
980	2.17	3.81	6.48	3.07	7.10	5.08	4.41	2.04	3.91	2.01	1.81	4.04	1.66	4.60	3.91	1.36
1020	2.69	4.34	7.69	3.58	8.08	5.78	5.08	2.41	4.65	2.56	2.26	4.93	2.24	5.40	4.70	1.76
1060	3.28	4.91		4.13	9.10	6.53	5.79	2.82	5.46	3.19	2.78	5.91	2.96	6.27	5.58	2.23
1090		5.34		4.57	9.90			3.14	6.12	3.72	3.21	6.72		6.95	6.29	2.63
1120				5.02	10.72				6.81	4.31	3.68	7.59		7.67	7.05	3.08
1150				5.50	11.55				7.53	4.95	4.20	8.51		8.42	7.85	
1190				6.15												
1200				6.32												

[Al^{3+}; for Al^{3+} conc'ns <0.18 wt%]

[a]For diffusion coefficients of Zn^{2+} in the presence of added F^- ions, see ref. 398.

Table 77.3.2. Diffusion coefficients, D x 10^5($cm^2 s^{-1}$),from equations in table 77.2

T (K)	Nb^{2+}	Nb^{3+}	Cr^{3+}	W^{4+}	W^{5+}	Fe^{2+}	Th^{4+}	*Th^{4+}*	U^{3+}	U^{4+}	UO_2^{2+}	Cl_2
950							2.01	1.33	2.67	1.85	1.00	
970	7.91	1.88		1.61	1.40	3.96	2.31	1.58	2.94	2.10	1.13	
990	8.70	2.10		1.84	1.61	4.39	2.64	1.86	3.23	2.38	1.26	
1010	9.54	2.33		2.09	1.84	4.85	3.00	2.19	3.53	2.67	1.40	87.9
1040	10.88	2.71	2.23	2.51	2.24	5.59	3.61	2.75	4.00	3.17	1.64	85.2
1070	12.32	3.12	2.61	2.98	2.68	6.39	4.29	3.41	4.51	3.72	1.89	82.5
1100	13.86	3.58	3.02	3.50	3.19	7.25	5.05	4.18	5.05	4.33	2.17	79.8
1120			3.32	3.88	3.56	7.85			5.43	4.76	2.37	
1150						8.81			6.02	5.47		
1180						9.83						

[*Th^{4+}*: italicized indicates study with added F^- ions; diffusing species uncertain]

Table 77.4 Diffusion coefficients, D x 10^5($cm^2 s^{-1}$) of magnesium(II) from equations in table 77.2

	Concentration of NaF in the melt (mol %)			
	0.0	0.318 x 10^{-2}	0.701 x 10^{-2}	2.87 x 10^{-2}
1020	6.24	5.45	2.81	2.46
1050	7.02	6.16	3.20	2.81
1080	7.84	6.92	3.61	3.20
1120	9.01	7.99	4.21	3.75

In studies with added F^- ions, the diffusing species is uncertain.

System 77. NaCl-KCl (cont'd)

Table 77.5 Diffusion coefficients for species not included in tables 77.3 to 77.4

Species	T (K)	D x 10^5 ($cm^2 sec^{-1}$)	References
Cu^+	773	6.7	316,388,389
	1123	23.0	388,389
Nb_3Cl_8	948	8.6	347
K_2NbF_7	1023	4.9	394
Mo^{3+}	1000	2.9	315
Co^{2+}	973	2.04	180
	1079	2.59	
Ni^+	1003	70	384
Ni^{2+}	978	2.36	181,375,383,384
	1080	2.87	
O^{2-}	973	4.4	400,402
	1023	5.0	
	1073	5.65	
PO_4^{3-}	1053	0.82	395
HCl	988	10	164,194
	1068	25	
	1093	27	
	1180	30	
SO_3	1023	20	390
CO_2	973	17	397

System 78. NaCl-CsCl

List of diffusing species investigated in NaCl-CsCl as solvent

UO_2^{2+}

Table 78.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	UO_2^{2+}

Equation:

$$D = A \exp[-E/RT] \quad (78.1)$$

precision: in table 78.2 uncertainty: in table 78.1

Table 78.2. Parameters of diffusion equation (78.1), precisions, and references

Species	A x 10^3	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
UO_2^{2+}	1.512	8328	930-1120		199
$^aUO_2^{2+}$	1.046	8603	930-1050		199

No entry in precision column indicates estimates not possible since results were reported as equations only. a In the presence of F^- ions added as NaF.

System 78. NaCl-CsCl (cont'd)

Table 78.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 78.2

T (K)	UO_2^{2+}	UO_2^{2+} (a)	T (K)	UO_2^{2+}	UO_2^{2+} (a)
930	1.67	0.995	1030	2.59	1.56
940	1.75	1.05	1040	2.69	1.63
950	1.84	1.10	1050	2.79	1.69
960	1.92	1.15	1060	2.90	
970	2.01	1.21	1070	3.01	
980	2.10	1.26	1080	3.12	
990	2.19	1.32	1090	3.23	
1000	2.29	1.38	1100	3.35	
1010	2.39	1.44	1110	3.47	
1020	2.48	1.50	1120	3.59	

[a] In the presence of fluoride ions added as NaF

System 79. KCl-AgCl

List of diffusing species investigated in KCl-AgCl as solvent

Cl_2

Table 79.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	Cl_2

Table 79.2 Diffusion coefficient

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cl_2	673	3.5	403

System 80. RbCl-CsCl

List of diffusing species investigated in RbCl-CsCl as solvent

U^{3+}, U^{4+}

Table 80.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	U^{3+}, U^{4+}

Equation:

$$D = A \exp[-E/RT], \quad (80.1)$$

precision: in table 80.2 uncertainty: in table 80.1

Table 80.2. Parameters of diffusion equation (80.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
eutectic composition					
U^{3+}	74.59	9751	940-1180	± 6.9%	404
U^{4+}	569.87	14761	940-1110	± 2.2%	404

Table 80.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 80.2 in eutectic melt

T (K)	U^{3+}	U^{4+}	T (K)	U^{3+}	U^{4+}
940	40.32	21.08	1070	76.03	55.06
950	42.60	22.91	1080	79.33	58.71
960	44.96	24.85	1090	82.71	62.53
970	47.39	26.91	1100	86.17	66.53
980	49.90	29.10	1110	89.70	70.71
990	52.49	31.42	1120	93.31	
1000	55.16	33.87	1130	97.00	
1010	57.90	36.45	1140	100.8	
1020	60.73	39.18	1150	104.6	
1030	63.63	42.05	1160	108.5	
1040	66.61	45.06	1170	112.5	
1050	69.67	48.24	1180	116.6	
1060	72.82	51.57			

The values seem improbably high compared to diffusion data for these species in LiCl-CsCl.

System 81. $LiCl-CdCl_2$

List of diffusing species investigated in $LiCl-CdCl_2$ as solvent

Pb^{2+}, Zn^{2+}

Table 81.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm 25\%$	Pb^{2+}, Zn^{2+}

Table 81.2 Diffusion coefficients in the eutectic melt

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Pb^{2+}	723	1.3	405
Zn^{2+}	723	1.9	405

System 82. $NaCl-MgCl_2$

List of diffusing species investigated in $NaCl-MgCl_2$ as solvent

Fe^{3+}, Cl_2

Table 82.1. Diffusion techniques, uncertainties and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
impedance	$\sim \pm 25\%$	Cl_2
rotating disc electrode	$\sim \pm 10\%$	Fe^{3+}

Equation:

$$D = A \exp[-E/RT] \quad (82.1)$$

precision: in table 82.2 uncertainty: in table 82.1

Table 82.2. Parameters of diffusion equation (82.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaCl-MgCl_2$ (50 mol % NaCl)					
Fe^{3+}	0.404	5130	970-1120	$\pm$ 0.1%	406
Cl_2	47.930	13510	860-1125	$\pm$20.1%	407
(b) $NaCl-MgCl_2$ (75 mol % NaCl)					
Cl_2	0.000165	-13600	950-1050	$\pm$ 1.1%	407

System 82 $NaCl-MgCl_2$ (cont'd)

Table 82.3. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 82.2

T (K)	50 mol % NaCl		75 mol & NaCl
	Fe^{3+}	Cl_2	Cl_2
863		1.82	
900		2.51	
950		3.74	22.2
1000	3.06	5.35	15.5
1050	3.46	7.39	11.2
1100	3.86	9.92	
1125	4.07	11.4	

Table 82.4. Diffusion coefficients not included in table 82.3

Species	Melt composition (mol % NaCl)	T (K)	D x 10^5 (cm^2s^{-1})	References
Cl_2	25	952	0.50	407
		973	1.0	

System 83. $NaCl-CaCl_2$

List of diffusing species investigated in $NaCl-CaCl_2$ as solvent

Fe^{2+}

The italicized species indicates study with insufficient data-sets for characterization of temperature dependence of diffusion coefficients.

Table 83.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Fe^{2+}

Table 83.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Fe^{2+}	873	2.36	408

System 84. $NaCl-CdCl_2$

List of diffusing species investigated in $NaCl-CdCl_2$ as solvent

Na^+, Cd^{2+}, Cl^-

Table 84.1. Dffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Na^+, Cd^{2+}, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (84.1)$$

precision: in table 84.2 uncertainty: in table 84.1

Table 84.2. Parameters of diffusion equation (84.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $CdCl_2$-NaCl (15.7 mol % NaCl)					
Na^+	2.178	6310	900-1040	± 5.7%	43
(b) $CdCl_2$-NaCl (25.0 mol % NaCl)					
Cl^-	0.858	6049	880-1090	± 3.3%	43
(c) $CdCl_2$-NaCl (35.6 mol % NaCl)					
Cd^{2+}	1.490	7370	870-1180	± 4.8%	43,44
(d) $CdCl_2$-NaCl (50 mol % NaCl)					
Cd^{2+}	1.70	6894	790-1010	± 4.7%	43,44
Cl^-	1.916	7069	770-920	± 5.0%	43
(e) $CdCl_2$-NaCl (54.0 mol % NaCl)					
Na^+	0.745	4166	700-970	± 5.8%	43
(f) $CdCl_2$-NaCl (55.7 mol % NaCl)					
Cd^{2+}	1.873	7116	790-940	± 3.7%	43,44
(g) $CdCl_2$-NaCl (65.8 mol % NaCl)					
Cd^{2+}	3.550	8139	730-960	± 5.9%	43,44
(h) $CdCl_2$-NaCl (72.6 mol % NaCl)					
Na^+	0.507	3657	910-1230	± 1.2%	43
(i) $CdCl_2$-NaCl (75 mol % NaCl)					
Cl^-	1.160	5812	960-1240	± 9.3%	43
(j) $CdCl_2$-NaCl (80.1 mol % NaCl)					
Cd^{2+}	2.440	8017	1020-1250	± 4.2%	43,44

System 84. $NaCl-CdCl_2$(cont'd)

Table 84.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 84.2

	Mol % NaCl									
	15.7	25.0	35.6	50.0		54.0	55.7	65.8	72.6	75.6	80.1
T (K)	Na^+	Cl^-	Cd^{2+}	Cd^{2+}	Cl^-	Na^+	Cd^{2+}	Cd^{2+}	Na^+	Cl^-	Cd^{2+}
700						3.73					
760						4.72		1.62			
820				2.47	2.50	5.78	2.38	2.40			
880		2.70	2.20	3.30	3.36	6.88	3.20	3.38			
940	7.43	3.37	2.88	4.24		8.01	4.15	4.55	7.16		
1000	9.10	4.09	3.65	5.29					8.05	6.23	
1060		4.86	4.51						8.93	7.35	5.43
1120			5.43						9.80	8.52	6.65
1180			6.43						10.66	9.73	7.99
1200									10.94	10.14	8.46
1240										10.97	9.43

System 85. $KCl-MgCl_2$

List of diffusing species investigated in $KCl-MgCl_2$ as solvent

Fe^{3+}, Cl_2

Table 85.1 Diffusion techniques, uncertainties and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm 15\%$	Cl_2
double layer impedance	$\sim \pm 15\%$	Cl_2
rotating disc electrode	$\sim \pm 15\%$	Fe^{3+}

Equation

$$D = A \exp[-E/RT] \quad (85.1)$$

precision: in table 85.2 uncertainty: in table 85.1

System 85. $KCl-MgCl_2$ (cont'd)

Table 85.2. Parameters of diffusion equation (85.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $KCl-MgCl_2$ (50 mol % KCl					
Fe^{3+}	0.779	6180	873-1123	± 0.1%	406
Cl_2	2.467	7865	913-1140	±18.5%	178,407
(b) $KCl-MgCl_2$ (75 mol % KCl)					
Cl_2	3.980	6171	913-1061	± 4.4%	178,407

Table 85.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 85.2

T (K)	50 mol % KCl		75 mol % KCl
	Fe^{3+}	Cl_2	Cl_2
870	2.18		
880	2.27		
900	2.46		
920	2.65	3.34	13.61
940	2.85	3.66	14.63
960	3.05	4.00	15.67
980	3.26	4.35	16.74
1000	3.47	4.71	17.83
1020	3.69	5.09	18.95
1040	3.92	5.49	20.09
1060	4.14	5.90	21.26
1080	4.37	6.32	
1120	4.85	7.20	

The diffusion of Cl_2 has also been investigated chronopotentiometrically in the 50 mol % KCl mixture[178]; the values of the diffusion coefficients appear high (∿ x 10) relative to the values in the table above. There are insufficient details in the publication to resolve this.

Table 85.4. Diffusion coefficients not included in table 85.3

Species	Melt composition (mol % KCl)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cl_2	25	926	1.0	407

System 86. $KCl-CaCl_2$

List of diffusing species investigated in $KCl-CaCl_2$ as solvent

Ca^{2+}

Table 86.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Ca^{2+}

Equation:

$$D = A \exp[-E/RT] \quad (86.1)$$

precision: in table 86.2 uncertainty: in table 86.1

Table 86.2. Parameters of diffusion equation (86.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
Ca^{2+}	1.290	7920	1055-1175	$\pm$ 0.2%	173

Melt composition : 0.2 mol % $CaCl_2$

Table 86.3. Self-diffusion coefficients from equation in table 86.2.

T (K)	$D_{Ca^{2+}}$ x 10^5 ($cm^2 s^{-1}$)	T (K)	$D_{Ca^{2+}}$ x 10^5 ($cm^2 s^{-1}$)
1055	2.95	1120	3.67
1060	3.00	1130	3.79
1070	3.11	1140	3.91
1080	3.22	1150	4.03
1090	3.33	1160	4.15
1100	3.44	1170	4.28
1110	3.56	1175	4.34

System 87. $KCl-ZnCl_2$

List of diffusing species investigated in $KCl-ZnCl_2$ as solvent

CrO_4^{2-}

Table 87.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in value of D)	Species
chronopotentiometry	$\sim \pm$ 25%	CrO_4^{2-}

System 87. $KCl-ZnCl_2$ (cont'd)

Table 87.2. Diffusion coefficients

Species	Melt composition (mol % KCl)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
CrO_4^{2-}	50	573	0.133	409

System 88. $KCl-CdCl_2$

List of diffusing species investigated in $KCl-CdCl_2$ as solvent

Cd^{2+}

Table 88.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
diffusion couple	$\sim \pm$ 20%	Cd^{2+}

Table 88.2. Self-diffusion coefficients

Species	Melt composition (mol % KCl)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cd^{2+}	50	743	1.4	63
	30-65	743	a	64

[a]Reported in graphical form.

System 89. $KCl-PbCl_2$

List of diffusing species investigated in $KCl-PbCl_2$ as solvent

Pb^{2+}, *In^{3+}*, *Ni^{2+}*, *Cl^-*, *S^{2-}*

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species : see table 89.5.

Table 89.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Pb^{2+}, Cl^-
chronoamperometry	$\sim \pm$ 10%	In^{3+}, Ni^{2+}
	$\sim \pm$ 25%	S^{2-}

System 89. $KCl-PbCl_2$ (cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (89.1)$$

precision: in table 89.2 uncertainty: in table 89.1

Table 89.2. Parameters of diffusion equation (89.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $KCl-PbCl_2$ (23.0 mol % KCl)					
In^{3+}	*insufficient data for temp.-dependence parameters*				411,413,414
Ni^{2+}	*insufficient data for temp.-dependence parameters*				411
S^{2-}	0.464	6991	720-760	± 1.4%	412,414
(b) $KCl-PbCl_2$ (25.2 mol % KCl)					
Pb^{2+}	4.289	9607	720-840	± 4.8%	410
Cl^-	2.132	7262	720-840	± 7.4%	410
(c) $KCl-PbCl_2$ (33.3 mol % KCl)					
Pb^{2+}	29.125	12792	720-850	±11.3%	410
Cl^-	1.440	6607	720-850	± 7.8%	410
(d) $KCl-PbCl_2$ (37.0 mol % KCl)					
Pb^{2+}	1.943	8393	720-850	± 8.5%	410
Cl^-	1.425	6502	720-850	± 7.2%	410

Table 89.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 89.2

T (K)	25.2 mol % KCl		33.3 mol % KCl		37.0 mol % KCl	
	Pb^{2+}	Cl^-	Pb^{2+}	Cl^-	Pb^{2+}	Cl^-
720	0.520	1.33	0.381	1.42	0.551	1.51
740	0.624	1.53	0.486	1.61	0.645	1.71
760	0.741	1.74	0.611	1.81	0.750	1.92
780	0.872	1.97	0.759	2.03	0.865	2.15
800	1.02	2.21	0.932	2.26	0.990	2.39
820	1.18	2.47	1.13	2.50	1.13	2.64
840	1.36	2.75	1.37	2.75	1.27	2.90
850			1.50	2.88	1.35	3.03

System 89. $KCl-PbCl_2$ (cont'd)

Table 89.4. Diffusion coefficients from equation in table 89.2.

T (K)	$D_{S^{2-}} \times 10^5$ (cm^2s^{-1})	T (K)	$D_{S^{2-}} \times 10^5$ (cm^2s^{-1})
720	0.350	750	0.426
730	0.374	760	0.453

Table 89.5. Diffusion coefficients for species not included in tables 89.3 and 89.4

Species	Melt composition (mol % KCl)	T (K)	D x 10^5 (cm^2s^{-1})	References
In^{3+}	23.0	713	0.52	411,413,414
Ni^{2+}	23.0	713	1.03	411

System 90. $CsCl-BaCl_2$

List of diffusing species investigated in $CsCl-BaCl_2$ as solvent

U^{3+}

Table 90.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	U^{3+}

Equation:

$$D = A \exp[-E/RT] \quad (90.1)$$

precision: in table 90.2 uncertainty: in table 90.1

Table 90.2. Parameters of diffusion equation (90.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $CsCl-BaCl_2$ (24.72 mol % CsCl)					
U^{3+}	0.976	10113	1070-1240		205
(b) $CsCl-BaCl_2$ (46.63 mol % CsCl)					
U^{3+}	0.758	9518	950-1190		205
(c) $CsCl-BaCl_2$ (88.58 mol % CsCl)					
U^{3+}	1.095	8603	920-1150		205

No entry in precision column indicates estimates not possible since results were reported as equations only.

System 90. $CsCl-BaCl_2$(cont'd)

Table 90.3. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 90.2

T (K)	U^{3+}		
	24.72 mol % CsCl	46.63 mol % CsCl	88.58 mol % CsCl
920			0.990
970		0.543	1.26
1030		0.725	1.64
1090	0.916	0.936	2.06
1150	1.17	1.18	2.54
1210	1.45		
1240	1.61		

System 91. $CsCl-CdCl_2$

List of diffusing species investigated in $CsCl-CdCl_2$ as solvent

Cs^+, Cd^{2+}, Cl^-

Table 91.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Cs^+, Cd^{2+}, Cl^-

Equation:

$$D = A \exp[-E/RT] \quad (91.1)$$

precision: in table 91.2 uncertainty: in table 91.1

Table 91.2.1. Parameters of diffusion equation (91.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $CdCl_2$-CsCl (12.5 mol % CsCl)					
Cl^-	2.157	7559	820-1050	± 2.3%	43
(b) $CdCl_2$-CsCl (24.3 mol % CsCl)					
Cs^+	7.225	9348	850-930	± 5.0%	43
Cd^{2+}	2.162	7475	820-950	± 4.4%	43
(c) $CdCl_2$-CsCl (25.0 mol % CsCl)					
Cd^{2+}	1.792	7274	790-1020	± 3.3%	43
Cl^-	1.151	6307	770-1020	+ 6.9%	43
(d) $CdCl_2$-CsCl (34.7 mol % CsCl)					
Cs^+	1.405	6274	860-1020	± 5.7%	43
(e) $CdCl_2$-CsCl (44.4 mol % CsCl)					
Cd^{2+}	1.797	7300	930-1110	± 5.3%	43

System 91. $CsCl-CdCl_2$ (cont'd)

Table 91.2.2 Parameters of diffusion equation (91.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
(f) $CdCl_2$-CsCl (50.0 mol % CsCl)					
Cd^{2+}	0.906	6285	850-990	± 4.4%	43
Cl^-	0.458	4445	820-1060	± 7.5%	
(g) $CdCl_2$-CsCl (50.7 mol % CsCl)					
Cs^+	6.104	9108	870-1040	± 7.4%	43
(h) $CdCl_2$-CsCl (75.0 mol % CsCl)					
Cl^-	1.70	7125	770-1080	± 3.9%	43
(i) $CdCl_2$-CsCl (76.0 mol % CsCl)					
Cs^+	1.206	6045	860-1060	± 1.3%	43
(j) $CdCl_2$-CsCl (80.2 mol % CsCl)					
Cs^+	1.615	6621	840-1040	± 3.4%	43
Cd^{2+}	1.195	6918	890-1120	± 4.1%	43

Table 91.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 91.2

T (K)	CsCl (mol%)													
	12.5%	24.3%		25.0%		34.7%	44.4%	50.0%		50.7%	75.0%	76.0%	80.2	
	Cl^-	Cs^+	Cd^{2+}	Cd^{2+}	Cl^-	Cs^+	Cd^{2+}	Cd^{2+}	Cl^-	Cs^+	Cl^-	Cs^+	Cs^+	Cd^{2+}
770					1.87						1.61			
810				1.95	2.29						2.03			
850	2.46	2.85	2.59	2.42	2.75			2.19	3.30		2.50		3.20	
890	3.00	3.66	3.16	2.93	3.25	4.05		2.59	3.71	3.54	3.03	3.95	3.82	2.39
930	3.61	4.59	3.79	3.50	3.79	4.71	3.46	3.02	4.13	4.42	3.60	4.58	4.49	2.83
970	4.27			4.12	4.37	5.42	4.07	3.48	4.56	5.41	4.22	5.24	5.20	3.30
1010	4.99			4.78	4.97	6.17	4.73		5.00	6.53	4.88	5.93	5.96	3.81
1050	5.76					6.95	5.43				5.59	6.65		4.34
1090							6.18							4.90
1110							6.57							5.19

System 92. $NaCl-AlCl_3$

List of diffusing species investigated in $NaCl-AlCl_3$ as solvent

Na^+, Sn^{2+}, Pb^{2+}, Bi^{3+}, Cu^+, Ag^+, Cd^{2+}, Ti^{2+}, Zr^{2+}, Zr^{4+}, Nb^{5+}, Cr^{3+}, Mo^{5+}, Te^{4+}, Te_4^{2+}, Se(IV), Fe^{3+}, Ni^{2+}, Sm^{2+}, Sm^{3+}, Eu^{3+}, Yb^{2+}, Yb^{3+}, U(III), U^{4+}, I^-, *$[AlSeCl_2]^-$, Na_2Se.*

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients. For these species: see table 92.4.

Table 92.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	Na^+, Sn^{2+}, Pb^{2+}, Bi^{3+}, Ag^+, Cd^{2+} Ti^{2+}, Zr^{2+}, U^{4+}, I^-
cyclic voltammetry	∿ ± 20%	Zr^{4+}, Cr^{3+}, Mo^{5+}, Te^{4+}, Ni^{2+}, Yb^{2+}, Yb^{3+}, U(IV), I^-
linear sweep voltammetry	∿ ± 20%	Sn^{2+}, Pb^{2+}, Cu^+, Cd^{2+}, Ti^{2+}, Nb^{5+}, Sm^{2+}, Sm^{3+}, Eu^{3+}
pulse polarography	∿ ± 20%	Ag^+, Mo^{5+}, Se(IV), Fe^{3+}, U(III), U(IV), I^-, $[AlSeCl_2]^-$
chronoamperometry	∿ ± 20%	Ti^{2+}, Cr^{3+}, Fe^{3+}, Yb^{3+}
rotating disc electrode	∿ ± 20%	Cr^{3+}, Mo^{5+}, Te^{4+}, Te_4^{2+}, Se(IV), Fe^{3+}, Na_2Se

Equation:

$$D = A \exp[-E/RT] \quad (92.1)$$

precision: in table 92.2 uncertainty: in table 92.1

Table 92.2. Diffusion equation parameters, precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaCl-AlCl_3$ (eutectic)					
U^{4+}	3.82	4150	520-670	8.5%	416
(b) $NaCl-AlCl_3$ (50 mol % NaCl)					
Nb^{5+}	1.99	5033	430-570	9.2%	417
U^{4+}	8.36	5324	520-670	2.8%	416
(c) $NaCl-AlCl_3$ (48 mol % NaCl)					
Zr^{4+}	15.17	6859	450-490	12%	420
(d) $NaCl-AlCl_3$ (37 mol % NaCl)					
Yb^{2+}	0.514	4016	450-520	1.0%	425

System 92. $NaCl-AlCl_3$ (cont'd)

Table 92.3. Diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 92.2

T	Eutectic melt	50 mol % NaCl		48 mol % NaCl	37 mol % NaCl
(K)	U^{4+}	Nb^{5+}	U^{4+}	Zr^{4+}	Yb^{2+}
430		0.551			
470		0.909		0.981	0.70
500		1.26			0.90
560	9.17	2.16	6.99		
610	12.45		10.34		
670	16.92		15.33		

Table 92.4.1. Diffusion coefficients for species not included in table 92.3

Species	Melt composition (mol % NaCl)	T (K)	D x 10^5 (cm^2s^{-1})	References
Yb^{3+}	32.5	449	0.70	425
Sn^{2+}	33.33	433	0.12	423,424
Pb^{2+}		433	0.27	423,424
Bi^{3+}		448	1.0	431
Ag^{+}		448	4.6	421,431
Cd^{2+}		448	0.96	423,431
Zr^{2+}		448	0.87	431
Eu^{3+}		448	0.55	425,431
Ti^{2+}	35.0	458	0.295	418
			0.275	
		533	0.60	418
Na^{+}	37.0	413	0.10	422
Sm^{2+}		448	0.40	425
Sm^{3+}		448	0.35	425
Eu^{3+}		448	0.55	425,431
I^{-}		448	0.202	419
			0.107	
			0.241	
Yb^{3+}	37.0	448	0.53	425
Yb^{3+}	39.1	448	0.54	425
	40.8	448	0.635	425
Yb^{3+}	43.9	448	0.65	425
	45.9	448	0.56	425
U(III)		448	0.30	432
U(IV)		448	0.30	432

System 92. $NaCl-AlCl_3$ (cont'd)

Table 92.4.2. Diffusion coefficients for species not included in table 92.3

Species	Melt composition (p Cl)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Te^{4+}	1.9	448	0.47	430
	3.8	448	0.40	430
	4.5	448	0.47	430
Se(IV)	5.25	448	0.30	429
	5.8	448	0.69	429
Na_2Se	1.9-6.2	448	0.20	429
Sn^{2+}	48.0[b]	433	0.19	423[a],424
Pb^{2+}		433	0.24	423[a],424
Cu^{+}		433	0.53	423[a]
Cd^{2+}		433	0.18	423[a],431
Ag^{+}	50.0[b]	448	0.30	421,431
Fe^{3+}		448	0.91	421
		523	2.20	415
I^{-}		448	0.268	419
			0.211	
			0.243	
Cr^{3+}	satd. with NaCl	448	0.23	426
Mo^{5+}		448	0.30	427
Te^{4+}		448	0.45	430
Te_4^{2+}		448	0.77	430
Se(IV)	Basic	448	0.194	429
$[AlSeCl_2]^{-}$	(c)	448	0.23	429
Ni^{2+}	Acidic	448	0.36	428

(a) Ref. [423] reported data in graphical form in the temperature range 430-500 K.
(b) compositions in mol% NaCl (c) sat'd with NaCl

System 93. $LiCl-KCl-ZnCl_2$

List of diffusing species investigated in $LiCl-KCl-ZnCl_2$ as solvent

HCl

Table 93.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry and linear sweep voltammetry	$\sim \pm$ 20%	HCl

System 93. LiCl-KCl-$ZnCl_2$ (cont'd)

Table 93.2. Diffusion coefficients

Species	Melt composition (mol % $ZnCl_2$ in LiCl-KCl eutectic)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
HCl	3.4	723	23.5[a]	433
	4.7		25.0	
	8.2		10.0	
	11.9		9.5	
	13.9		9.0	
	17.4		7.5	

[a]Average values obtained by two techniques.

System 94. LiBr-KBr

List of diffusing species investigated in LiBr-KBr as solvent

Li^+, Na^+, K^+, Br^-, Br_2

Table 94.1. Diffusion techniques, uncertainties, and species

Diffusion technique	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Li^+, Na^+, K^+, Br^-
chronopotentiometry	∿ ± 25%	Br_2

Equation:

$$D = A \exp[-E/RT] \quad (94.1)$$

precision: in table 94.2 uncertainty: in table 94.1

Table 94.2.1. Parameters of diffusion equation (94.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) LiBr-LBr (4 mol % LiBr)					
Li^+	*insufficient data for temp.-dependence parameters*				434
Na^+	*insufficient data for temp.-dependence parameters*				434
K^+	*insufficient data for temp.-dependence parameters*				434
Br^-	*insufficient data for temp.-dependence parameters*				434
(b) LiBr-KBr (24.5 mol % LiBr)					
Li^+	1.218	5672	930-1030	± 4.8%	434
K^+	*insufficient data for temp.-dependence parameters*				434
Br^-	0.518	4576	930-1030	± 9.4%	434

System 94. LiBr-KBr (cont'd)

Table 94.2.2. Parameters of diffusion equation (94.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(c) LiBr-KBr (36 mol % LiBr)					
Li^+	*insufficient data for temp.-dependence parameters*				434
K^+	*insufficient data for temp.-dependence parameters*				434
Br^-	*insufficient data for temp.-dependence parameters*				434
(d) LiBr-LiBr (50 mol % LiBr)					
Br_2	0.666	1785	710-1010	± 5.3%	196
(e) LiBr-KBr (51.5 mol % LiBr)					
Li^+	1.238	5264	630-1030	± 4.9%	434
Na^+	1.006	5102	630-1030	± 6.3%	434
K^+	1.023	5547	630-1030	± 6.5%	434
Br^-	1.238	6096	630-1030	± 2.7%	434
(f) LiBr-KBr (76 mol % LiBr)					
Li^+	0.865	4283	770-1020	± 5.9%	434
Na^+	*insufficient data for temp.-dependence parameters*				434
K^+	*data do not fit a simple equation*				434
Br^-	1.112	6158	810-1020	± 7.3%	434
(g) LiBr- KBr (99 mol % LiBr)					
Li^+	0.559	3114	840-1020	± 1.3%	434
Na^+	*insufficient data for temp.-dependence parameters*				434
K^+	0.977	4974	840-1020	± 0.9%	434
Br^-	0.30	3773	840-1040	± 6.3%	434

Table 94.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 94.2

T (K)	24.5 mol % LiBr		51.5 mol % LiBr			76 mol % LiBr		99 mol % LiBr		
	Li^+	Br^-	Li^+	K^+	Br^-	Li^+	Br^-	Li^+	K^+	Br^-
630			1.85	1.22	0.95					
690			2.66	1.79	1.45					
770			3.97	2.73	2.30	5.26				
840			5.29	3.69	3.21	6.65	2.78	8.65	4.96	3.13
920			6.95	4.92	4.41	8.31	3.83	10.18	6.43	3.81
940	5.85	4.47	7.39	5.25	4.74	8.73	4.11	10.55	6.81	3.98
1030	7.62	5.54	9.46	6.81	6.30					4.75
1040										4.83

System 94. LiBr-KBr (cont'd)

Table 94.4. Diffusion coefficients D x 10^5 ($cm^2 s^{-1}$) from equations in table 94.2

T (K)	50 mol % LiBr	51.5 mol % LiBr
	Br_2	Na^+
630		1.71
690		2.44
750	20.11	3.28
810	21.97	4.23
870	23.72	5.26
930	25.35	6.36
1030		8.32

Table 94.5. Diffusion coefficients for species not included in tables 94.3 to 94.4

Species	Melt composition (mol % LiBr)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Li^+	4.0	1023	6.86	434
	36.0	828	4.22	434
		830	4.31	
Na^+	4.0	1023	6.55	434
	76.0	769	4.40	434
	99.0	839	6.81	434
K^+	4.0	1023	6.31	434
	24.5	932	4.90	434
		1032	6.30	
	36.0	830	3.91	434
	76.0	769	3.38[a]	434
		808	2.92[a]	
		916	4.33[a]	
		1020	8.44[a]	
Br^-	4.0	1023	5.62	434
	36.0	828	2.74	434
		830	2.75	

[a]These data do not fit a simple equation.

System 95. NaBr-KBr

List of diffusing species investigated in NaBr-KBr as solvent

Zr^{4+}, Br_2

System 95. NaBr-KBr (cont'd)

Table 95.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 25%	Zr^{4+}, Br_2

Equation:

$$D = A \exp[-E/RT] \quad (95.1)$$

precision: in table 95.2 uncertainty: in table 95.1

Table 95.2. Parameters of diffusion equation (95.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
[a] Zr^{4+}	0.575	6315	920-1070		210
Br_2	1.245	3768	1010-1140	± 4%	196

No entry in precision column indicates estimates not possible since results were reported as equations only. [a] Diffusing species probably $[ZrBr_6]^{2-}$.

Table 95.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 95.2

T (K)	Zr^{4+}	Br_2
920	1.82	
980	2.25	
1040	2.71	20.11
1140		23.59

System 96. KCl-NaI

List of diffusing species investigated in KCl-NaI as solvent

Na^+

Table 96.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Na^+

System 96. KCl-NaI (cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (96.1)$$

precision: in table 96.2 Uncertainty: in table 96.1

Table 96.2. Parameters of diffusion equation(96.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	2.018	6527	930-1110	± 6.1%	193

melt composition : 50 mol% KCl

Table 96.3. Self-diffusion coefficients from equation in table 96.2

50 mol % KCl

T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{Na^+} x 10^5 ($cm^2 s^{-1}$)
930	5.90	1030	8.32
960	6.59	1060	9.10
1010	7.81	1110	10.47
1020	8.06		

System 97. $NaCl-K_2TiF_6$

List of diffusing species investigated in $NaCl-K_2TiF_6$ as solvent

Ti^{4+}

Table 97.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	[a] Ti(IV)

Table 97.2. Diffusion coefficient

Species	Melt composition (mol % NaCl)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
[a] Ti(IV)	80	1123	0.34	435

[a] Exact diffusing species uncertain.

System 98. LiF-LiCl-KCl

List of diffusing species investigated in LiF-LiCl-KCl as solvent

Ce^{3+}

Table 98.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	[a]Ce(III)

Equation:

$$D = A \exp[-E/RT] \quad (98.1)$$

precision: in table 98.2 uncertainty: in table 98.1

Table 98.2. Parameters of diffusion equation (98.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
[a]Ce(III)	1.993	8237	870-1040		436

No entry in precision column indicates estimate not possible since results were reported as equations only. [a]Exact diffusing species uncertain.

Table 98.3. Diffusion coefficients from equation in table 98.2

T (K)	$D_{Ce(III)}$ x 10^5	T (K)	$D_{Ce(III)}$ x 10^5
870	1.70	960	2.66
900	1.99	990	3.03
950	2.54	1040	3.70

Melt contained 5 mol % LiF; diffusing species uncertain.

System 99. $NaF-AlF_3-BaCl_2$

List of diffusing species investigated in $NaF-AlF_3-BaCl_2$ as solvent

Cu^+

Table 99.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 25%	Cu^+

Melt composition : $NaF-AlF_3-BaCl_2$ (17-23-60 wt %).

System 99. $NaF-AlF_3-BaCl_2$ (cont'd)

Table 99.2. Diffusion coefficient

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Cu^+	1023	2.8	437

System 100. NaCN-KCN

List of diffusing species investigated in NaCN-KCN as solvent

$[Pt(CN_4)]^{2-}$

Table 100.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry & linear sweep voltammetry	~ ± 25%	$[Pt(CN)_4]^{2-}$ [438]

Melt composition : 53 wt. % NaCN.

Table 100.2. Diffusion coefficients of $[Pt(CN)_4]^{2-}$

T (K)	D x 10^5 (cm^2s^{-1})	
	Chronopotentiometric	Linear sweep voltammetric
783	2.45	1.38 1.59
789	2.23	
800	2.01	1.55
811	2.16	1.72
813	2.27	1.76
817	2.57	2.15
828	3.30	1.90 2.40
833	3.02 3.52	1.88 1.90
835	2.32	
853	2.96	

Experimental values of D; these data do not fit a simple equation.

System 101. NaOH-KOH

List of diffusing species investigated in NaOH-KOH as solvent

Am(VI), H_2O

The italicized species indicate studies with insufficient data-sets for characterization of temperature-dependence of diffusion coefficients.

System 101. NaOH-KOH (cont'd)

Table 101.1. Diffusion techniques, uncertainties and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 10%	Am(VI)
	∿ ± 20%	H_2O

Equation:

$$D = A \exp[-E/RT] \qquad (101.1)$$

precision: in table 101.2 uncertainty: in table 101.1

Table 101.2. Parameters of diffusion equation (101.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
H_2O	71.95	6240	460-530		439

No entry in precision column indicates estimate not possible since results were reported as equations only.

Table 101.3. Diffusion coefficients for H_2O in NaOH-KOH from equation in table 101.2.

T (K)	D x 10^5 ($cm^2 s^{-1}$)	T (K)	D x 10^5 ($cm^2 s^{-1}$)
460	7.8	500	13.5
480	10.4	520	17.2
490	11.9	530	19.2

Melt composition : 50 mol % KOH D_{H_2O} values are about 10 x larger than for various ions in molten salts at comparable temperatures.

Table 101.4. Diffusion coefficients for species not included in table 101.3

Species	Melt composition (mol % KOH)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
[a]Am(VI)	50	523	∿ 0.65 ± 0.20	440

[a]The diffusing entities of Am(VI) are uncertain; most probably diffusing as AmO_2^{2+} or AmO_4^{2-}.

System 102. Li_2CO_3-Na_2CO_3

List of diffusing species investigated in Li_2CO_3-Na_2CO_3 as solvent

Na^+, CO_3^{2-}, H_2

System 102. Li_2CO_3-Na_2CO_3 (cont'd)

Table 102.1. Diffusion techniques, uncertainties, and species

Diffusion techniques of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	Na^+, CO_3^{2-}
chronopotentiometry	∿ ± 10%	H_2
voltammetry (linear sweep)	∿ ± 20%	H_2

Equation:

$$D = A \exp[-E/RT] \quad (102.1)$$

precision: in table 102.2 uncertainty: in table 102.1

Table 102.2. Parameters of diffusion equation (102.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E ($cal\ mol^{-1}$)	Temp. range (K)	Precision	References
(a) Li_2CO_3-Na_2CO_3 eutectic					
Na^+	9.81	10,990	850-1130	± 1.3%	441
CO_3^{2-}	7.36	11,560	840-1115	± 4.8%	441
H_2	6.45	4,346	780-970	± 3%	442
(b) Li_2CO_3-Na_2CO_3 (25 mol % Na_2CO_3)					
Na^+	4.42	10,060	1030-1210		218
CO_3^{2-}	3.57	10,920	1030-1210		218
(c) Li_2CO_3-Na_2CO_3 (75 mol % Na_2CO_3)					
Na^+	9.40	11,910	1050-1205		218
CO_3^{2-}	4.26	11,130	1050-1205		218

No entry in precision column indicates estimates not possible since results were reported as equations only.

Table 102.3. Diffusion coefficients from equation in table 102.2 in the eutectic melt

T (K)	D_{H_2} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{H_2} x 10^5 ($cm^2 s^{-1}$)
780	39.1	880	53.7
800	41.9	900	56.8
820	44.8	920	59.8
840	47.7	940	63.0
860	50.7	960	66.1
870	52.2	970	67.6

System 102. Li_2CO_3-Na_2CO_3 (cont'd)

Table 102.4. Self-diffusion coefficients[a] from equations in table 102.2

T (K)	Eutectic melt		25 mol % Na_2CO_3		75 mol % Na_2CO_3	
	Na^+	CO_3^{2-}	Na^+	CO_3^{2-}	Na^+	CO_3^{2-}
840		0.723				
890	1.96	1.066				
950	2.91	1.612				
1010	4.11	2.319				
1070	5.58	3.203	3.90	2.10	3.47	2.27
1130	7.34		5.01	2.76	4.67	3.00
1190			6.28	3.52	6.10	3.85
1210			6.73	3.80	6.63	4.16

(a) $D \times 10^5$ ($cm^2 s^{-1}$)

System 103. Li_2CO_3-K_2CO_3

List of diffusing species investigated in Li_2CO_3-K_2CO_3 as solvent

K^+, CO_3^{2-}, *Pb^{2+}*, *Cu^+*, *Cd^{2+}*, *Ni^{2+}*, *$Cr_2O_7^{2-}$*, *Cl^-*, *Br^-*, *I^-*.

The italicized species indicate studies with insufficient data-sets for temperature-dependence characterization of diffusion coefficients. For these species: see table 103.4.

Table 103.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	K^+, CO_3^{2-}
chronopotentiometry	∿ ± 10%	Pb^{2+}, Cu^+, Cd^{2+}, Ni^{2+}, $Cr_2O_7^{2-}$, Cl^-, Br^-, I^-

Equation:

$$D = A \exp[-E/RT] \quad (103.1)$$

precision: in table 103.2 uncertainty: in table 103.1

Table 103.2. Parameters of diffusion equation (103.1), precision, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
K^+	7.26	11,490	890-1130	± 3.5%	441
CO_3^{2-}	7.94	11,860	850-1135	± 3.5%	441

System 103. Li_2CO_3- K_2CO_3 (cont'd)

Table 103.3. Self-diffusion coefficients from equations in table 103.2

T	$D_{K^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{CO_3^{2-}} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{K^+} \times 10^5$ ($cm^2 s^{-1}$)	$D_{CO_3^{2-}} \times 10^5$ ($cm^2 s^{-1}$)
850		0.71	1010	2.37	2.15
890	1.09	0.97	1070	3.27	3.00
950	1.65	1.48	1130	4.35	4.03
980	1.99	1.80			

Table 103.4. Diffusion coefficients for species not included in table 103.3

Species	T (K)	$D \times 10^5$ ($cm^2 s^{-1}$)	References
Pb^{2+}	913	2.74	443
Cu^{+}	913	4.89	443
Cd^{2+}	913	2.71	443
Ni^{2+}	913	3.78	443
$Cr_2O_7^{2-}$	913	4.12	443
Cl^{-}	913	0.089	443
Br^{-}	913	0.081	443
I^{-}	913	0.071	443

System 104. Na_2CO_3-K_2CO_3

List of diffusing species investigated in Na_2CO_3-K_2CO_3 as solvent

Na^+, K^+, CO_3^{2-}

Table 104.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	Na^+, K^+, CO_3^{2-}

Equation:

$$D = A \exp[-E/RT] \quad (104.1)$$

precision: in table 104.2 uncertainty: in table 104.1

System 104. Na_2CO_3-K_2CO_3 (cont'd)

Table 104.2. Parameters of diffusion equation (104.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
K^+	7.61	11,840	1065-1240	± 1.5%	441
Na^+	8.18	11,820	1080-1240	± 3.1%	441
CO_3^{2-}	2.71	11,030	1030-1190	± 2.4%	441

Table 104.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 104.2

T (K)	Na^+	K^+	CO_3^{2-}
1020			1.24
1080	3.32	3.06	1.59
1140	4.43	4.09	2.08
1190	5.52	5.09	2.55
1240	6.75	6.23	

System 105. Li_2CO_3-Na_2CO_3-K_2CO_3

List of diffusing species investigated in Li_2CO_3-Na_2CO_3-K_2CO_3 as solvent

Na^+, K^+, CO_3^{2-}

Table 105.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	~ ± 20%	Na^+, K^+, CO_3^{2-}

Equation:

$$D = A \exp[-E/RT] \quad (105.1)$$

precision: in table 105.2 uncertainty: in table 105.1

Table 105.2. Parameters of diffusion equation (105.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
Na^+	8.06	11,035	830-1040	± 3.6%	52
K^+	9.73	11,880	885-1115	± 1%	52
CO_3^{2-}	1.58	10,070	690-1130	± 6%	52

System 105. Li_2CO_3-Na_2CO_3-K_2CO_3(cont'd)

Table 105.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 105.2

T (K)	Na^+	K^+	CO_3^{2-}
690			0.102
770			0.219
850	1.17		0.407
930	2.06	1.57	0.679
1010	3.30	2.61	1.046
1080		3.84	1.448
1120		4.67	1.712
1130			1.782

System 106. $LiNO_3$-$NaNO_3$

List of diffusing species investigated in $LiNO_3$-$NaNO_3$ as solvent

Li^+, Na^+, NO_3^-

Table 106.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Li^+, Na^+, NO_3^-

Table 106.2. Self-diffusion coefficients

Species	Melt composition (mol % $NaNO_3$)	T (K)	D x 10^5 (cm^2s^{-1})	References
Li^+	20	623.5	2.64	444
	53	626.0	2.61	444
Na^+	20	623.5	2.45	444
	53	626.0	2.41	444
NO_3^-	20	623.5	1.21	444
	53	623.0	1.29	444
		626.0	1.31	444

System 107. $LiNO_3$-KNO_3

List of diffusing species investigated in $LiNO_3$-KNO_3 as solvent

Li^+, Na^+, K^+, Rb^+, Cs^+, Ag^+, Cd^{2+}, Cd^{2+}(EDTA), Tl^+, Pb^{2+}, Pb^{2+}(EDTA), NO_3^-, Cl^-, Br^-, I^-, O_2

System 107. $LiNO_3$-KNO_3(cont'd)

Table 107.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	K^+, Li^+, Na^+, NO_3^-
chronopotentiometry	∿ ± 10%	Ag^+, Br^-, Cl^-, I^-
dc polarography	∿ ± 20%	Cd^{2+}, Pb^{2+}
wave-front shearing interferometry	∿ ± 10%	K^+, Rb^+, Cs^+, Tl^+
oscillographic polarography	∿ ± 20%	O_2

Equation:

$$D = A \exp[-E/RT] \quad (107.1)$$

precision: in table 107.2 uncertainty: in table 107.1

Table 107.2.1. Parameters of diffusion equation (107.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $LiNO_3KNO_3$ (4 mol % $LiNO_3$)					
Li^+	1.072	4884	600-660	± 3%	445
Na^+	1.107	5054	600-660	± 2%	445
K^+	1.007	5159	600-660	± 1%	445
NO_3^-	*insufficient data for temp.-dependence parameters*				444
(b) $LiNO_3$-KNO_3 (20 mol % $LiNO_3$)					
Ag^+	0.591	4107	560-630	± 2%	447
(c) $LiNO_3$-KNO_3 (25 mol % $LiNO_3$)					
Li^+	1.020	4754	550-620	± 1%	445
Na^+	1.424	5239	550-620	± 1%	445
K^+	1.516	5552	550-620	± 1%	444
Rb^+	0.78	4804	530-660	± 3%	37
Cs^+	0.54	4780	540-670	± 4%	37
Tl^+	0.70	4780	540-650	± 3%	37
NO_3^-	*insufficient data for temp.-dependence parameters*				
(d) $LiNO_3KNO_3$ (34 mol % $LiNO_3$)					
Li^+	1.415	5135	470-625	± 1%	445
Na^+	1.340	5151	470-625	± 3%	445
K^+	1.395	5415	470-625	± 2%	444,445
NO_3^-	1.077	5349	550-620	± 1%	444
(e) $LiNO_3$-KNO_3 (38.6 mol % $LiNO_3$)					
Cd^{2+}	35.056	8820	430-480	± 4%	446
Cd^{2+}(EDTA	6.604	8773	430-480	± 2%	446

System 107. $LiNO_3$-KNO_3(cont'd)

Table 107.2.2. Parameters of diffusion equation (107.1), precisions, precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(f) $LiNO_3KNO_3$ (40 mol % $LiNO_3$)					
Ag^+	0.508	3837	530-630	± 3%	447
(g) $LiNO_3$-KNO_3 (41.2 mol % $LiNO_3$)					
O_2	0.834	4992	430-580	± 2%	448
(h) $LiNO_3$-KNO_3 (43 mol % $LiNO_3$)					
Ag^+	1.891	5226	420-500	± 3%	514
Cl^-	2.726	6235	420-520	± 3%	514
Br^-	8.770	7589	420-520	± 6%	514
I^-	12.294	7821	420-520	± 4%	514
(i) $LiNO_3$-KNO_3 (50 mol % $LiNO_3$)					
Li^+	1.168	4792	550-620	± 1%	445
Na^+	1.387	5076	550-620	± 1%	445
K^+	1.722	5576	550-620	± 1%	444
NO_3^-	*insufficient data for temp.-dependence parameters*				444
(j) $LiNO_3$-KNO_3 (51 mol % $LiNO_3$)					
K^+	2.11	5641	530-660	± 2%	37
Rb^+	0.31	3489	540-660	± 3%	37
Cs^+	0.40	4230	530-640	± 4%	37
Tl^+	0.72	4708	540-650	± 3%	37
(k) $LiNO_3$-KNO_3 (60 mol % $LiNO_3$)					
Ag^+	0.821	4410	530-630	± 2%	447
(l) $LiNO_3$-KNO_3 (75 mol % $LiNO_3$)					
Li^+	1.367	4903	550-620	± 1%	445
Na^+	1.654	5222	550-620	± 1%	445
K^+	1.269	5182	550-620	± 1%	445
Rb^+	0.69	4469	550-650	± 3%	37
Cs^+	1.12	5473	570-650	± 4%	37
Tl^+	1.66	5593	550-670	± 3%	37
(m) $LiNO_3$-KNO_3 (80 mol % $LiNO_3$)					
Ag^+	2.098	5636	530-630	± 6%	447
(n) $LiNO_3$-KNO_3 (99 mol % $LiNO_3$)					
Li^+	1.332	4826	535-625	± 2%	445
Na^+	1.236	4835	535-625	± 2%	445
K^+	1.176	5082	535-625	± 2%	445
NO_3^-	1.523	6044	550-625	± 1%	444

System 107. $LiNO_3$-KNO_3(cont'd)

Table 107.3.1. Diffusion coefficients in $LiNO_3$-KNO_3 (4 mol % $LiNO_3$) from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})			
	Li^+ (a)	Na^+	K^+(a)	NO_3^- (a)
600	1.78	1.60	1.33	
620	2.03	1.83	1.53	1.35 (b)
640	2.30	2.08	1.74	
660	2.59	2.35	1.97	

[a] Self-diffusion coefficients [b] Based on sole data point at 623 K

Table 107.3.2. Diffusion coefficients in $LiNO_3$-KNO_3 (20 mol % $LiNO_3$) from equations in table 107.2

T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})	T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})
560	1.47	600	1.89
570	1.57	610	2.00
580	1.67	620	2.11
590	1.78	630	2.22

Table 107.3.3. Diffusion coefficients in $LiNO_3$-KNO_3 (25 mol % $LiNO_3$), from equations in table 107.2.

T (K)	D x 10^5 (cm^2s^{-1})						
	Li^+ (a)	Na^+	K^+ (a)	Rb^+	Cs^+	Tl^+	NO_3^- (a)
530				0.825			
570	1.53	1.40	1.13	1.12	0.79	1.03	
600	1.89	1.76	1.44	1.39	0.98	1.27	
620	2.15	2.03	1.67	1.58	1.12	1.45	1.41 (b)
640				1.79	1.26	1.63	
660				2.00	1.41		
670					1.49		

[a] Self-diffusion coefficients [b] Based on sole data point at 624 K

Table 107.3.4. Diffusion coefficients in $LiNO_3$-KNO_3 (34 mol % $LiNO_3$), from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})			
	Li^+ (a)	Na^+	K^+ (a)	NO_3^- (a)
480	0.65	0.60	0.48	
560	1.40	1.31	1.07	0.88
600	1.91	1.78	1.49	1.21
625	2.26	2.12	1.78	

[a] Self-diffusion coefficients

System 107. $LiNO_3$-KNO_3(cont'd)

Table 107.3.5. Diffusion coefficients in $LiNO_3$-KNO_3 (38.6 mol % $LiNO_3$), from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})			
	Cd^{2+}	Cd^{2+}(EDTA)	Pb^{2+}	Pb^{2+}(EDTA)
430	0.12	0.02	0.25[a]	0.04[a]
440	0.15	0.03		
470	0.28	0.05		
480	0.34	0.07		

[a]Based on sole data point at 443 K [446]

Table 107.3.6. Diffusion coefficients in $LiNO_3$-KNO_3 (40 mol % $LiNO_3$) from equations in table 107.2

T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})	T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})
530	1.33	590	1.93
550	1.52	610	2.14
570	1.72	630	2.37
580	1.82		

Table 107.3.7. Diffusion coefficients in $LiNO_3$-KNO_3 (41.2 mol % $LiNO_3$) from equation in table 107.2

T (K)	D_{O_2} x 10^5 (cm^2s^{-1})	T (K)	D_{O_2} x 10^5 (cm^2s^{-1})
430	0.242	510	0.605
450	0.314	530	0.729
470	0.398	550	0.866
490	0.495	570	1.02
500	0.549	580	1.10

Table 107.3.8. Diffusion coefficients in $LiNO_3$-KNO_3 (43 mol % $LiNO_3$) from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})			
	Ag^+	Cl^-	Br^-	I^-
420	0.36	0.16	0.10	0.10
450	0.55	0.26	0.18	0.20
480	0.79	0.40	0.31	0.34
510	1.09	0.58	0.49	
520	1.20	0.65	0.57	

System 107. $LiNO_3$-KNO_3(cont'd)

Table 107.3.9. Diffusion coefficients in $LiNO_3$-KNO_3 (50 mol % $LiNO_3$) from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})			
	Li^+ (a)	Na^+	K^+ (a)	NO_3^- (a)
550	1.46	1.33	1.05	
570	1.70	1.57	1.25	
600	2.10	1.96	1.60	
620	2.39	2.25	1.86	1.33 (b)

[a]Self-diffusion coefficients [b]Based on 2 data points at 617 and 623 K, respectively.

Table 107.3.10. Diffusion coefficients in $LiNO_3$-KNO_3 (51 mol % $LiNO_3$) from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})			
	K^+	Rb^+	Cs^+	Tl^+
530	1.00		0.72	
560	1.33	1.35	0.89	1.05
590	1.72	1.58	1.08	1.30
620	2.17	1.83	1.29	1.58
660	2.86	2.17		

Table 107.3.11. Diffusion coefficients in $LiNO_3$-KNO_3 (60 mol % $LiNO_3$) from equations in table 107.2

T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})	T (K)	D_{Ag^+} x 10^5 (cm^2s^{-1})
530	1.25	590	1.91
550	1.45	610	2.16
570	1.67	630	2.42
580	1.79		

Table 107.3.12. Diffusion coefficients in $LiNO_3$-KNO_3 (75 mol % $LiNO_3$) from equations in table 107.2

T (K)	D x 10^5 (cm^2s^{-1})					
	Li^+ (a)	Na^+	K^+ (a)	Rb^+	Cs^+	Tl^+
550	1.54	1.39	1.11	1.16		0.99
580	1.94	1.78	1.41	1.43	0.97	1.30
610	2.39	2.23	1.76	1.73	1.23	1.65
640				2.06	1.52	2.04
670						2.49

[a]Self-diffusion coefficients.

System 107. $LiNO_3$-KNO_3 (cont'd)

Table 107.3.13. Diffusion coefficients in $LiNO_3$-KNO_3 (80 mol % $LiNO_3$) from equations in table 107.2

T (K)	$D_{Ag^+} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Ag^+} \times 10^5$ ($cm^2 s^{-1}$)
530	0.99	590	1.71
550	1.21	610	2.01
570	1.45	630	2.3
580	1.58		

Table 107.3.14. Diffusion coefficients in $LiNO_3$-KNO_3 (99 mol % $LiNO_3$) from equations in table 107.2

(K)	D x 10^5 ($cm^2 s^{-1}$)			
	Li^+ (a)	Na^+	K^+ (a)	NO_3^- (a)
535	1.42	1.31	0.99	
560	1.74	1.60	1.22	0.67
590	2.17	2.00	1.54	0.88
625	2.73	2.52	1.96	1.17

[a]Self-diffusion coefficient

System 108. $LiNO_3$-$CsNO_3$

List of diffusing species investigated in $LiNO_3$-$CsNO_3$ as solvent

Ag^+

Table 108.1 Diffusion technique, uncertainty, and species

Diffusion techniique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (108.1)$$

precision: in table 108.2 uncertainty: in table 108.1

System 108. $LiNO_3$-$CsNO_3$(cont'd)

Table 108.2. Parameters of diffusion equation (108.1), precisions and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $LiNO_3$-$CsNO_3$ (20 mol % $CsNO_3$)					
Ag^+	0.824	4301	530-630	± 2.4%	449
(b) $LiNO_3$-$CsNO_3$ (40 mol % $CsNO_3$)					
Ag^+	0.832	4755	530-630	± 3.8%	449
(c) $LiNO_3$-$CsNO_3$ (60 mol % $CsNO_3$)					
Ag^+	2.303	6211	530-630	± 5%	449
(d) $LiNO_3$-$CsNO_3$ (80 mol % $CsNO_3$)					
Ag^+	5.044	7312	610-650	± 1.7%	449

Table 108.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 108.2

T (K)	20 mol % $CsNO_3$	40 mol % $CsNO_3$	60 mol % $CsNO_3$	80 mol % $CsNO_3$
	Ag^+	Ag^+	Ag^+	Ag^+
530	1.39	0.94	0.63	
560	1.73	1.16	0.87	
590	2.10	1.44	1.15	
620	2.51	1.75	1.49	1.33
650				1.75

System 109. $LiNO_3$-$AgNO_3$

List of diffusing species investigated in $LiNO_3$-$AgNO_3$ as solvent

Ag^+

Equation: $D = A \exp[-E/RT]$ (109.1)

precision: in table 109.2 uncertainty: in table 109.1

Table 109.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Ag^+

System 109. $LiNO_3$-$AgNO_3$(cont'd)

Table 109.2. Parameters of diffusion equation (109.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $AgNO_3$-$LiNO_3$ (25 mol % $LiNO_3$)					
Ag^+	0.267	3177	500-620	± 0.6%	48
(b) $AgNO_3$-$LiNO_3$ (50 mol % $LiNO_3$)					
Ag^+	0.702	4547	560-600	± 1.2%	48
(c) $AgNO_3$-$LiNO_3$ (75 mol % $LiNO_3$)					
Ag^+	1.313	5047	560-620	± 0.9%	48

Table 109.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 109.2

T (K)	25 mol % $LiNO_3$	50 mol % $LiNO_3$	75 mol % $LiNO_3$
	Ag^+	Ag^+	Ag^+
500	1.09		
530	1.31		
560	1.54	1.10	1.30
590	1.78	1.45	1.77
620	2.03		2.18

System 110. $NaNO_3$-KNO_3

List of diffusing species investigated in $NaNO_3$-KNO_3 as solvent

Na^+, K^+, *Li^+*, *Tl^+*, *Pb^{2+}*, *Ag^+*, *Cd^{2+}*, *Hg_2^{2+}*, *Hg^{2+}*, *Ce^{3+}*, *Pr^{3+}*, *Nd^{3+}*, *O_2^-*, *O_2^{2-}*, *O^{2-}*, *OH^-*, *CO_3^{2-}*, *$C_2O_4^{2-}$*, *NO_2^-*, *Cl^-*, *Br^-*, *I^-*, *H_2*, *O_2*, *CO_2*, *H_2O*

The italicized species indicate studies with insufficient data-sets for temperature dependence characterization of diffusion coefficients. For these species: see table 110.5.

System 110. $NaNO_3$-KNO_3 (cont'd)

Table 110.1. Diffusion techniques, uncertainties, and species

Diffusion techniques of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 15%	Li^+, Na^+, K^+
chronopotentiometry	∿ ± 10%	Ag^+, Cd^{2+}, O^{2-}, $C_2O_4^{2-}$
linear sweep voltammetry	∿ ± 20%	Tl^+, Pb^{2+}, Ag^+, Cd^{2+}, Cl^-, Br^-, OH^-
voltammetry (cyclic)	∿ ± 20%	Hg^{2+}
pulse polarography	∿ ± 20%	Cl^-, Br^-, I^-
rotating disc electrode	∿ ± 20%	I^-, CO_3^{2-}, CO_2, O_2^-, O_2^{2-}, H_2, O_2, H_2O, Hg_2^{2+}
paper electrophoresis	∿ ± 15%	Na^+, K^+

Equation:

$$D = A \exp[-E/RT] \quad (110.1)$$

precision: in table 110.2 uncertainty: in table 110.1

Table 110.2. Parameters of diffusion equation (110.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaNO_3$-KNO_3 eutectic					
Na^+	0.533	4013	550-720	± 3.7%	82
K^+	1.352	5380	550-720	± 4.8%	82
OH^-	12.935	8581	510-620	± 0.8%	458,460
(b) $NaNO_3$-KNO_3 (30.3 mol % $NaNO_3$)					
Na^+	1.323	5220	590-670	± 0.2%	95
K^+	1.357	5468	590-670	± 0.1%	95
(c) $NaNO_3$-KNO_3 (51.7 mol % $NaNO_3$)					
Na^+	1.404	5228	590-670	± 0.13%	95
K^+	1.438	5462	590-670	± 0.35%	95
(d) $NaNO_3$-KNO_3 (79.7 mol % $NaNO_3$)					
Na^+	1.180	4958	590-670	± 0.65%	95
K^+	1.425	5401	590-670	± 0.25%	95

System 110. $NaNO_3$-KNO_3 (cont'd)

Table 110.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 110.2

T (K)	Eutectic Melt		30.3 mol % $NaNO_3$		56.7 mol % $NaNO_3$		79.7 mol % $NaNO_3$	
	Na^+	K^+	Na^+	K^+	Na^+	K^+	Na^+	K^+
550	1.36	0.984						
590	1.74	1.37	1.54	1.28	1.62	1.36	1.72	1.42
670	2.62	2.38	2.62	2.23	2.77	2.38	2.85	2.47
710	3.10	2.98						
720	3.23	3.15						

Table 110.4. Diffusion coefficients in the eutectic melt from equation in table (110.2)

T (K)	D_{OH^-} x 10^5 ($cm^2 s^{-1}$)	T (K)	D_{OH^-} x 10^5 ($cm^2 s^{-1}$)
510	0.272	570	0.663
530	0.374	590	0.857
550	0.503	610	1.09
560	0.579	620	1.22

Table 110.5.1. Diffusion coefficients for species not included in table 110.2 to 110.4

Species	Melt composition (mol % $NaNO_3$)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Li^+	51.7	522 619 675	1.1 2.2 3.2	231
$\underline{Tl^+}$	eutectic	525	1.07	471
$\underline{Pb^{2+}}$	eutectic	518	0.40	452,464,471
Ag^+	eutectic	523 536 553 570 590	0.40 0.73 1.10 1.30 1.59	see:table S-1
Ag^+	20	588 613 633	1.65 1.94 2.14	108
Ag^+	40	588 613 633	1.76 2.11 2.26	108
Ag^+	45	573	1.68	461
Ag^+	60	588 613 633	1.83 2.14 2.32	108
Ag^+	80	588 613 633	1.94 2.25 2.47	108

System 110. $NaNO_3$-KNO_3 (cont'd)

Table 110.5.2. Diffusion coefficients for species not included in table 110.2 to 110.4

Species	Melt composition (mol % $NaNO_3$)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Hg^{2+}	eutectic	523	0.13	454
Ce^{3+}	40	523	19.5[a]	457,462
Pr^{3+}	40	523	0.5	457,464
Nd^{3+}	40	523	14.0[a]	462
Cl^-	eutectic	518	0.69	423,465,471,515
Br^-	eutectic	518	0.70	423,465,471,515
I^-	eutectic	518	0.68	423,459,465,471,515
O_2^-	eutectic	502	0.48	467
O_2^{2-}	eutectic	502	0.31	467
O^{2-}	eutectic	523	2.24	469
CO_3^{2-}	eutectic	510	0.31	468
$C_2O_4^{2-}$	eutectic	523	1.03	469
NO_2^-	eutectic	523	2.75	469
H_2	eutectic	571 513	5.20 7.80	470 472
O_2	eutectic	550	31.0	453
CO_2	eutectic	510	1.9	468,474
H_2O	eutectic	503	1.9	466
Cd^{2+}	eutectic	523	0.47	452,456,464,471
Cd^{2+}	40	523	2.34[a]	457
Cd^{2+}	45	529 598	0.30 0.80	461
Hg_2^{2+}	eutectic	523	0.14	454

[a] Values are improbable, possibly by a factor of 20.
For the underlined species the temperature dependence of D was reported in graphical form; see [459,468,471,515].

System 111. $NaNO_3$-$RbNO_3$

List of diffusing species investigated in $NaNO_3$-$RbNO_3$ as solvent

Na^+, Rb^+

System 111. $NaNO_3$-$RbNO_3$(cont'd)

Table 111.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
gravimetric porous frit	~ ± 5%	Rb^+
capillary	~ ± 10%	Na^+, Rb^+
paper strip[a]	~ ± 20%	Na^+

[a]Melt-containing 2 mol % $NaNO_3$.

Equation:

$$D = A \exp[-E/RT] \qquad (111.1)$$

precision: in table 111.2 uncertainty: in table 111.1

Table 111.2. Parameters of diffusion equation (111.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	A x 10^3 (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaNO_3$-$RbNO_3$ (2 mol % $NaNO_3$)					
Na^+	0.586	4343	590-720	± 1.8%	87
(b) $NaNO_3$-$RbNO_3$ (25 mol % $NaNO_3$)					
Na^+	0.707	4454	600-700	± 1%	100,101
Rb^+	0.868	4701	610-720	± 1%	100
(c) $NaNO_3$-$RbNO_3$ (41 mol % $NaNO_3$)					
Rb^+	1.686	5532	590-750	± 6.9%	100
(d) $NaNO_3$-$RbNO_3$ (50 mol % $NaNO_3$)					
Na^+	0.88	4615	550-710	± 3.8%	100,101
(e) $NaNO_3$-$RbNO_3$ (75 mol % $NaNO_3$)					
Na^+	1.048	4768	590-700	± 2%	100,101
Rb^+	4.470	6801	640-700	± 0.9%	100
(f) $NaNO_3$-$RbNO_3$ (90 mol % $NaNO_3$)					
Rb^+	1.346	5355	597-640	± 1%	510

Table 111.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 111.2

$NaNO_3$(mol %)	2 %	25%		41%	50%	75%		90%
T (K)	Na^+	Na^+	Rb^+	Rb^+	Na^+	Na^+	Rb^+	Rb^+
550					1.29			
590	1.44	1.58		1.51	1.72	1.79		
630	1.82	2.01	2.03	2.03	2.20	2.32		1.868
670	2.24	2.49	2.54	2.64	2.75	2.92	2.70	
710	2.70		3.10	3.34	3.34			
750				4.11				

System 112. $NaNO_3$-$CsNO_3$

List of diffusing species investigated in $NaNO_3$-$CsNO_3$ as solvent

Na^+, Cs^+

Table 112.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
gravimetric porous frit	∿ ± 5%	Na^+, Cs^+ [510]
electrophoresis	∿ ± 20%	Na^+, Cs^+ [103]

Table 112.2. Diffusion coefficients

Species	Melt composition (mol % $CsNO_3$)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Na^+	10	723	3.84	103
	25	723	3.50	103
	50	723	3.18	103
	75	723	2.95	103
	90	723	2.72	103
Cs^+	10	723	3.20	510
	25	723	2.80	103
	50	723	2.57	103
	75	723	2.35	103
	90	723	2.34	103

For 10 mol % $CsNO_3$, diffusion was investigated from 598 -725 K. The data are expressed by the equation: $D = 0.794 \times 10^{-3} \exp[-4626/RT]$ $cm^2 s^{-1}$; precision, ∿ ± 1%; accuracy, ∿ ± 5%. Within the limits of error, no difference in the calues of D_{Cs^+} for this composition and that in pure $NaNO_3$ is observed.

System 113. $NaNO_3$-$AgNO_3$

List of diffusing species investigated in $NaNO_3$-$AgNO_3$ as solvent

Na^+, Ag^+

Table 113.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Na^+, Ag^+

Equation: $D = A \exp[-E/RT]$ (113.1)

precision: in table 113.2 uncertainty: in table 113.1

System 113. $NaNO_3$-$AgNO_3$(cont'd)

Table 113.2. Parameters of diffusion equation (113.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $AgNO_3$-$NaNO_3$ (20 mol % $NaNO_3$)					
Ag^+	*insufficient data for temp.-dependence parameters*				238
(b) $AgNO_3$-$NaNO_3$ (25 mol % $NaNO_3$)					
Na^+	0.358	3338	590-640	± 2.1%	222
Ag^+	0.825	4351	580-630	± 1.6%	222
(c) $AgNO_3$-$NaNO_3$ (40 mol % $NaNO_3$)					
Na^+	*insufficient data for temp.-dependence parameters*				238
Ag^+	*insufficient data for temp.-dependence parameters*				238
(d) $AgNO_3$-$NaNO_3$ (50 mol % $NaNO_3$)					
Na^+	0.810	4324	570-640	± 2.8%	222
Ag^+	0.528	3834	580-650	± 2.1%	222
(e) $AgNO_3$-$NaNO_3$ (60 mol % $NaNO_3$)					
Na^+	*insufficient data for temp.-dependence parameters*				238
Ag^+	*insufficient data for temp.-dependence parameters*				238
(f) $AgNO_3$-$NaNO_3$ (75 mol % $NaNO_3$)					
Na^+	0.609	4023	600-640	± 1.7%	222
Ag^+	0.442	3627	580-650	± 4.1%	222
(g) $AgNO_3$-$NaNO_3$ (80 mol % $NaNO_3$)					
Na^+	*insufficient data for temp.-dependence parameters*				238
Ag^+	2.877	5818	590-630	± 0.2%	238

Table 113.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 113.2

T (K)	25 mol % $NaNO_3$		50 mol % $NaNO_3$		75 mol % $NaNO_3$		80 mol % $NaNO_3$
	Na^+	Ag^+	Na^+	Ag^+	Na^+	Ag^+	Ag^+
570			1.78				
580		1.89	1.90	1.90		1.90	1.85
590	2.08	2.02	2.03	2.01		2.00	2.01
600	2.18	2.15	2.16	2.12	2.09	2.11	2.19
610	2.28	2.28	2.29	2.24	2.20	2.22	2.37
620	2.38	2.41	2.42	2.35	2.33	2.33	2.56
630	2.49	2.55	2.56	2.47	2.46	2.44	2.76
640	2.59		2.70	2.59	2.58	2.55	
650				2.72		2.66	

System 113. $NaNO_3$-$AgNO_3$(cont'd)

Table 113.4. Diffusion coefficients for melt compositions not included in table 113.3

Species	Melt composition (mol % $NaNO_3$)	T (K)	D x 10^5 (cm^2s^{-1})	References
Na^+	40	588	1.80	238
	60	588	1.83	238
	80	588	1.82	238
Ag^+	20	588	2.11	238
	40	588	2.06	238
	40	613	2.57	238
	60	588	2.10	238

System 114. $NaNO_3$-$TlNO_3$

List of diffusing species investigated in $NaNO_3$-$TlNO_3$ as solvent

Na^+, Tl^+

Table 114.1. Diffusion techniques, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Na^+, Tl^+
interferometry	$\sim \pm$ 10%	Tl^+
electrophoresis	$\sim \pm$ 20%	Na^+, Tl^+

Equation:

$$D = A \exp[-E/RT] \qquad (114.1)$$

precision: in table 114.2 uncertainty: in table 114.1

Table 114.2.1. Parameters of diffusion equation (114.1), precisions, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $TlNO_3$-$NaNO_3$ (5 mol % $NaNO_3$)					
Na^+	1.342	5058	530-580	$\pm$ 1.5%	475[a]
(b) $TlNO_3$-$NaNO_3$ (20 mol % $NaNO_3$)					
Na^+	1.061	4577	490-590	$\pm$ 1.8%	91[a]
Tl^+	0.678	4296	500-590	$\pm$ 1.5%	91
(c) $TlNO_3$-$NaNO_3$ (25 mol % $NaNO_3$)					
Na^+	0.914	4734	540-600	$\pm$ 0.4%	475
(d) $TlNO_3$-$NaNO_3$ (30 mol % $NaNO_3$)					
Tl^+	0.919	4717	540-570	$\pm$ 1.2%	475

(a) 1,electrophoresis; 2,capillary; 3,interferometry.

System 114. $NaNO_3$-$TlNO_3$(cont'd)

Table 114.2.2. Parameters of diffusion equation (114.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(e) $TlNO_3$-$NaNO_3$ (31.6 mol % $NaNO_3$)					
Tl^+	3.793	6383	520-590	± 3.5%	227[a]
(f) $TlNO_3$-$NaNO_3$ (40 mol % $NaNO_3$)					
Na^+	*insufficient data for temp.-dependence parameters*				91
Tl^+	*insufficient data for temp.-dependence parameters*				91
(g) $TlNO_3$-$NaNO_3$ (44 mol % $NaNO_3$)					
Na^+	*insufficient information for temp.-dependence parameters*				91
(h) $TlNO_3$-$NaNO_3$ (50 mol % $NaNO_3$)					
Na^+	0.808	4717	540-600	± 1.3%	475
Tl^+	2.277	5750	540-600	± 7.4%	475
(i) $TlNO_3$-$NaNO_3$ (51.5 mol % $NaNO_3$)					
Tl^+	0.829	4775	550-640	± 2.8%	227
(j) $TlNO_3$-$NaNO_3$ (70 mol % $NaNO_3$)					
Tl^+	3.336	6356	560-600	± 2.5%	475
(k) $TlNO_3$-$NaNO_3$ (73 mol % $NaNO_3$)					
Na^+	*insufficient data for temp.-dependence parameters*				91
Tl^+	*insufficient data for temp.-dependence parameters*				91
(l) $TlNO_3$-$NaNO_3$ (73.8 mol % $NaNO_3$)					
Tl^+	1.188	5206	550-590	± 1.8%	227
(m) $TlNO_3$-$NaNO_3$ (75 mol % $NaNO_3$)					
Na^+	1.325	5146	590-660	± 5.1%	475
(n) $TlNO_3$-$NaNO_3$ (88.8 mol % $NaNO_3$)					
Tl^+	3.597	6575	570-630	± 4.7%	227
(o) $TlNO_3$-$NaNO_3$ (90 mol % $NaNO_3$)					
Tl^+	0.801	4752	590-640	± 2.6%	475

[a] [1], electrophoresis; [2], capillary; [3], interferometry.

System 114. $NaNO_3$-$TlNO_3$(cont'd)

Table 114.3.1. Self-diffusion coefficients, D x 10^5(cm^2s^{-1}), from equations in table 114.2

T (K)	5 mol % $NaNO_3$	20 mol % $NaNO_3$		25 mol % $NaNO_3$	30 mol % $NaNO_3$	31.6 mol % $NaNO_3$	50 mol % $NaNO_3$	
	Na^+	Na^+	Tl^+	Na^+	Tl^+	Tl^+	Na^+	Tl^+
490		0.97						
520		1.27	1.06			0.79		
550	1.31	1.61	1.33	1.20	1.23	1.10	1.08	1.18
600				1.73			1.55	1.83

Table 114.3.2. Self-diffusion coefficients, D x 10^5(cm^2s^{-1}), from equations in table 114.2

T (K)	51.5 mol % $NaNO_3$	70 mol % $NaNO_3$	73.8 mol % $NaNO_3$	75 mol % $NaNO_3$	88.8 mol % $NaNO_3$	90 mol % $NaNO_3$
	Tl^+	Tl^+	Tl^+	Na^+	Tl^+	Tl^+
550	1.05		1.02			
580	1.32	1.34	1.30		1.20	
610	1.61			1.90	1.59	1.59
660				2.62		

Table 114.4. Diffusion coefficients for melt compositions not included in table 114.3

Species	Melt composition (mol % $NaNO_3$)	T (K)	D x 10^5 (cm^2s^{-1})	References
Na^+	40	589	2.07	91
	44	589	2.03	91
	73	589	2.02	91
Tl^+	40	589	1.81	91
	73	589	1.85	91

System 115. KNO_3-$CsNO_3$

List of diffusing species investigated in KNO_3-$CsNO_3$ as solvent

Ag^+, Cs^+

Table 115.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
gravimetric porous frit	∿ ± 5%	Cs^+
chronopotentiometry	∿ ± 10%	Ag^+

System 115. KNO_3-$CsNO_3$(cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (115.1)$$

precision: in table 115.2 uncertainty: in table 115.1

Table 115.2. Parameters of diffusion equation (115.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) KNO_3-$CsNO_3$ (20 mol % KNO_3)					
Ag^+	*insufficient data for temp.-dependence parameters*				449
(b) KNO_3-$CsNO_3$ (40 mol % KNO_3)					
Ag^+	1.26	5373	590-630	± 2.5%	449
(c) KNO_3-$CsNO_3$ (60 mol % KNO_3)					
Ag^+	0.535	4267	590-630	± 2.5%	449
(d) KNO_3-$CsNO_3$ (80 mol % KNO_3)					
Ag^+	1.016	4921	590-630	± 1.4%	449
(e) KNO_3-$CsNO_3$ (90 mol % KNO_3)					
Cs^+	0.942	5166	621 - 739	~ ± 15%	510

Table 115.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 115.2

T (K)	40 mol % KNO_3	60 mol % KNO_3	80 mol % KNO_3	90 mol % KNO_3
	Ag^+	Ag^+	Ag^+	Cs^+
590	1.29	1.40	1.53	
610	1.50	1.58	1.75	
630	1.72	1.77	1.99	
650				1.724
730				2.673

Table 115.4. Diffusion coefficients for composition not included in table 115.3

Species	Melt composition (mol % KNO_3)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Ag^+	20	633	1.64	449
	20	653	1.94	449

System 116. KNO_3-$AgNO_3$

List of diffusing species investigated in KNO_3-$AgNO_3$ as solvent

K^+, Ag^+

Table 116.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	K^+, Ag^+
porous frit[a]	∿ ± 20%	Ag^+

[a]For melts containing 35, and 39 mol % KNO_3.

Equation:

$$D = A \exp[-E/RT] \quad (116.1)$$

precision: in table 116.2 uncertainty: in table 116.1

Table 116.2. Parameters of diffusion equation (116.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $AgNO_3$-KNO_3 (25 mol % KNO_3)					
K^+	1.391	5151	590-640	± 1.9%	222
Ag^+	1.075	4721	560-630	± 3.4%	222
(b) $AgNO_3$-KNO_3 (35 mol % KNO_3)					
Ag^+	*insufficient data for temp.-dependence parameters*				75
(c) $AgNO_3$-KNO_3 ((39 mol % KNO_3)					
Ag^+	0.169	2885	460-510	± 5.9%	75
(d) $AgNO_3$-KNO_3 (50 mol % KNO_3)					
K^+	1.566	5480	560-640	± 3.4%	222
Ag^+	2.139	5761	560-650	± 6.6%	222
(e) $AgNO_3$-KNO_3 (75 mol % KNO_3)					
K^+	1.927	5851	590-640	± 1.5%	222
Ag^+	2.691	6309	600-640	± 1.0%	222

Table 116.3. Self-diffusion coefficients. D x 10^5 ($cm^2 s^{-1}$). from equations in table 116.2.

T	25 mol % KNO_3		39 mol % KNO_3	50 mol % KNO_3		75 mol % KNO_3	
(K)	K^+	Ag^+	Ag^+	K^+	Ag^+	K^+	Ag^+
460			0.72				
500			0.93				
570		1.66		1.23	1.32		
610	1.98	2.19		1.70	1.85	1.54	1.48
650	2.58				2.47		

System 116. KNO_3-$AgNO_3$(cont'd)

Table 116.4. Diffusion coefficients for melt composition not included in table 116.3

Species	Melt composition (mol % KNO_3)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Ag^+	35	451	0.63	75
		598	0.88	

System 117. KNO_3-$TlNO_3$

List of diffusing species investigated in KNO_3-$TlNO_3$ as solvent

K^+, Tl^+

Table 117.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	K^+, Tl^+

Equation:

$$D = A \exp[-E/RT]$$

precision: in table 117.2 uncertainty: in table 117.1

Table 117.2. Parameters of diffusion equation (117.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $TlNO_3$-KNO_3 (25 mol % KNO_3)					
K^+	2.247	5726	530-630	± 2.9%	476
Tl^+	4.067	6336	530-600	± 3.0%	476
(b) $TlNO_3$-KNO_3 (50 mol % KNO_3)					
K^+	1.142	5053	550-630	± 1.1%	476
Tl^+	1.628	5425	550-630	± 1.8%	476
(c) $TlNO_3$-KNO_3 (75 mol % KNO_3)					
K^+	1.410	5488	590-650	± 1.7%	476
Tl^+	1.844	5748	590-650	± 1.8%	476
(d) $TlNO_3$-KNO_3 (90 mol % KNO_3)					
Tl^+	1.214	5402	610-690	± 1.7%	476

System 117. KNO_3-$TlNO_3$ (cont'd)

Table 117.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 117.2

T (K)	25 mol % KNO_3		50 mol % KNO_3		75 mol % KNO_3		90 mol % KNO_3
	K^+	Tl^+	K^+	Tl^+	K^+	Tl^+	Tl^+
530		0.99					
560	1.31	1.37	1.22	1.25			
590	1.70	1.83	1.54	1.59	1.31	1.37	
620	2.16		1.89	1.99	1.64	1.74	1.51
650					2.01	2.15	1.85
680							2.23
690							2.36

System 118. $RbNO_3$-$AgNO_3$

List of diffusing species investigated in $RbNO_3$-$AgNO_3$ as solvent

Rb^+, Ag^+

Table 118.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Rb^+, Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (118.1)$$

precision: in table 118.2 uncertainty: in table 118.1

Table 118.2. Parameters of diffusion equation (118.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $AgNO_3$-$RbNO_3$ (25 mol % $RbNO_3$)					
Rb^+	1.186	4978	560-660	± 2.4%	48
Ag^+	0.523	3928	540-600	± 4.3%	48
(b) $AgNO_3$-$RbNO_3$ (50 mol % $RbNO_3$)					
Rb^+	1.04	5011	550-620	± 4.4%	48
Ag^+	0.969	4957	590-630	± 0.6%	48
(c) $AgNO_3$-$RbNO_3$ (75 mol % $RbNO_3$)					
Rb^+	1.389	5634	580-640	± 3.1%	48
Ag^+	0.923	5007	580-620	± 2.2%	48

System 118. $RbNO_3$-$AgNO_3$ (cont'd)

Table 118.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 118.2

T (K)	25 mol % $RbNO_3$		50 mol % $RbNO_3$		75 mol % $RbNO_3$	
	Rb^+	Ag^+	Rb^+	Ag^+	Rb^+	Ag^+
540		1.34				
570	1.46	1.63	1.25			
600	1.82	1.94	1.55	1.51	1.23	1.38
630	2.22			1.85	1.54	
660	2.66					

System 119. $RbNO_3$-$TlNO_3$

List of diffusing species investigated in $RbNO_3$-$TlNO_3$ as solvent

Rb^+, Tl^+

Table 119.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Rb^+, Tl^+

Equation:

$$D = A \exp[-E/RT] \quad (119.1)$$

precision: in table 119.2 uncertainty: in table 119.1

Table 119.2.1. Parameters of diffusion equation (119.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $TlNO_3$-$RbNO_3$ (5 mol % $RbNO_3$)					
Rb^+	0.574	4046	540-620	± 2.0%	475
(b) $TlNO_3$-$RbNO_3$ (25 mol % $RbNO_3$)					
Rb^+	0.640	4281	540-650	± 0.3%	475
Tl^+	2.171	5764	520-620	± 2.6%	475
(c) $TlNO_3$-$RbNO_3$ (50 mol % $RbNO_3$)					
Rb^+	1.749	5575	560-620	± 1.0%	475
Tl^+	1.904	5703	540-630	± 2.5%	475

System 119. $RbNO_3$-$TlNO_3$ (cont'd)

Table 119.2.2. Parameters of diffusion equation (119.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(d) $TlNO_3$-$RbNO_3$ (75 mol % $RbNO_3$)					
Rb^+	2.307	6011	600-630	± 1.7%	475
Tl^+	2.321	6051	550-630	± 3.0%	475
(e) $TlNO_3$-$RbNO_3$ (95 mol % $RbNO_3$)					
Tl^+	2.421	6220	590-650	± 1.0%	475

Table 119.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 119.2

T (K)	5 mol % $RbNO_3$	25 mol % $RbNO_3$		50 mol % $RbNO_3$		75 mol % $RbNO_3$		95 mol % $RbNO_3$
	Rb^+	Rb^+	Tl^+	Rb^+	Tl^+	Rb^+	Tl^+	Tl^+
520			0.82					
550	1.42	1.27	1.11	1.07	1.03		0.91	
580	1.72	1.56	1.46	1.39	1.35		1.22	
610	2.04	1.87	1.87	1.76	1.72	1.62	1.58	1.43
640				2.18				1.82
650				2.33				1.96

System 120. $CsNO_3$-$AgNO_3$

List of diffusing species investigated in $CsNO_3$-$AgNO_3$ as solvent

Cs^+, Ag^+

Table 120.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Cs^+, Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (120.1)$$

precision: in table 120.2 uncertainty: in table 120.1

System 120. $CsNO_3$-$AgNO_3$ (cont'd)

Table 120.2. Parameters of diffusion equation (120.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $AgNO_3$-$CsNO_3$ (25 mol % $CsNO_3$)					
Cs^+	4.422	6607	530-630	± 2.5%	48
Ag^+	0.739	4464	500-600	± 6.9%	48
(b) $AgNO_3$-$CsNO_3$ (50 mol % $CsNO_3$)					
Cs^+	3.199	6625	510-610	± 5.7%	48
Ag^+	1.148	5200	550-620	± 1.4%	48
(c) $AgNO_3$-$CsNO_3$ (75 mol % $CsNO_3$)					
Cs^+	1.848	5978	610-670	± 1.4%	48
Ag^+	3.088	6707	620-680	± 1.2%	48

Table 120.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 120.2

T (K)	25 mol % $CsNO_3$		50 mol % $CsNO_3$		75 mol % $CsNO_3$	
	Cs^+	Ag^+	Cs^+	Ag^+	Cs^+	Ag^+
500		0.83				
540	0.94	1.15	0.67			
580	1.43	1.54	1.02	1.26		
620	2.07			1.69	1.44	1.34
680						2.16

System 121. $CsNO_3$-$TlNO_3$

List of diffusing species investigated in $CsNO_3$-$TlNO_3$ as solvent

Cs^+, Tl^+

Table 121.1. Diffusion technique, uncertainty, and species

Diffusion technique	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Cs^+, Tl^+

System 121. $CsNO_3$-$TlNO_3$ (cont'd)

Equation:

$$D = A \exp[-E/RT] \quad (121.1)$$

precision: in table 121.2 uncertainty: in table 121.1

Table 121.2. Parameters of diffusion equation (121.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $TlNO_3$-$CsNO_3$ (10 mol % $CsNO_3$)					
Cs^+	1.973	5593	520-590	± 5.4%	476
(b) $TlNO_3$-$CsNO_3$ (25 mol % $CsNO_3$)					
Cs^+	3.779	6398	540-620	± 4.8%	476
Tl^+	2.912	6177	540-640	± 6.3%	476
(c) $TlNO_3$-$CsNO_3$ (50 mol % $CsNO_3$)					
Cs^+	6.604	7642	600-640	± 2.5%	476
Tl^+	2.849	6584	590-630	± 4.0%	476
(d) $TlNO_3$-$CsNO_3$ (75 mol % $CsNO_3$)					
Cs^+	5.337	7634	630-690	± 3.5%	476
Tl^+	1.603	5959	630-700	± 2.6%	476
(e) $TlNO_3$-$CsNO_3$ (90 mol % $CsNO_3$)					
Tl^+	1.075	5416	680-780	±2.2%	476

Table 121.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$) from equations in table 121.2

T (K)	10 mol % $CsNO_3$	25 mol % $CsNO_3$		50 mol % $CsNO_3$		75 mol % $CsNO_3$		90 mol % $CsNO_3$
	Cs^+	Cs^+	Tl^+	Cs^+	Tl^+	Cs^+	Tl^+	Tl^+
520	0.88							
550	1.18	1.09	1.02					
580	1.54	1.47	1.37					
610		1.93	1.78	1.21	1.25			
640			2.27	1.63		1.32	1.48	
670						1.73	1.83	
700							2.21	2.19
730								2.57
780								3.27

System 122. $NaNO_3$-$Ba(NO_3)_2$

List of diffusing species investigated in $NaNO_3$-$Ba(NO_3)_2$ as solvent

Na^+, Ag^+

Table 122.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 10%	Na^+
chronopotentiometry	∿ ± 10%	Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (122.1)$$

precision: in table 122.2 uncertainty: in table 122.1

Table 122.2. Parameters of diffusion equation (122.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaNO_3$-$Ba(NO_3)_2$ (80 mol % $NaNO_3$)					
Na^+	0.758	5298	700-780	± 6.3%	100
(b) $NaNO_3$-$Ba(NO_3)_2$ (90 mol % $NaNO_3$)					
Na^+	0.868	4791	620-720	± 4.5%	100
(c) $NaNO_3$-$Ba(NO_3)_2$ (94 mol % $NaNO_3$)					
Na^+	0.668	4110	600-720	± 2.2%	100
Ag^+	0.663	4150	590-690	± 1.2%	477,478

Table 122.3. Self-diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 122.2

T (K)	80 mol % $NaNO_3$	90 mol % $NaNO_3$	90 mol % $NaNO_3$
	Na^+	Na^+	Na^+
600			2.13
630		1.89	2.51
660		2.25	2.91
690		2.64	3.33
720	1.87	3.05	3.78
750	2.17		
780	2.49		

System 122. $NaNO_3$-$Ba(NO_3)_2$ (cont'd)

Table 122.4. Diffusion coefficients from equation in table 122.2

T (K)	$D_{Ag^+} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Ag^+} \times 10^5$ ($cm^2 s^{-1}$)
590	1.93	650	2.67
610	2.16	670	2.94
630	2.41	690	3.22
640	2.54		

System 123. $NaNO_3$-$Sr(NO_3)_2$

List of diffusing species investigated in $NaNO_3$-$Sr(NO_3)_2$ as solvent

Na^+, Ag^+

Table 123.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Na^+
chronopotentiometry	$\sim \pm$ 10%	Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (123.1)$$

precision: in table 123.2 uncertainty: in table 123.1

Table 123.2. Parameters of diffusion equation (123.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) $NaNO_3$-$Sr(NO_3)_2$ (78 mol % $NaNO_3$)					
Na^+	0.380	4200	700-740	$\pm$ 1.4%	100
(b) $NaNO_3$-$Sr(NO_3)_2$ (85 mol % $NaNO_3$)					
Na^+	0.262	3229	630-720	$\pm$ 3.9%	100
(c) $NaNO_3$-$Sr(NO_3)_2$ (93 mol % $NaNO_3$)					
Na^+	0.780	4307	620-710	$\pm$ 2.3%	100
(d) $NaNO_3$-$Sr(NO_3)_2$ (94 mol % $NaNO_3$)					
Ag^+	1.239	4818	590-680	$\pm$ 2.3%	477

System 123. $NaNO_3$-$Sr(NO_3)_2$

Table 123.3. Self-diffusion coefficients, D x 10^5 (cm^2s^{-1}), from equations in table 123.2

T (K)	78 mol % $NaNO_3$	85 mol % $NaNO_3$	93 mol % $NaNO_3$
	Na^+	Na^+	Na^+
620			2.37
650		2.17	2.78
680		2.42	3.22
710	1.94	2.66	3.68
740	2.18		

Table 123.4. Diffusion coefficients, D x 10^5 (cm^2s^{-1}) from equation in table 123.2

T (K)	94 mol % $NaNO_3$	T (K)	94 mol % $NaNO_3$
	Ag^+		Ag^+
590	2.04	640	2.81
610	2.33	660	3.15
630	2.64	680	3.51

System 124. $NaNO_3$-$Ca(NO_3)_2$

List of diffusing species investigated in $NaNO_3$-$Ca(NO_3)_2$ as solvent

Ag^+

Table 124.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (124.1)$$

precision: in table 124.2 uncertainty: in table 124.1

Table 124.2. Parameters of diffusion equation (124.1), precision, and references

Species	A x 10^3 (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
Ag^+	0.676	4248	570-670	$\pm$ 3.4%	477

System 124. $NaNO_3$-$Ca(NO_3)_2$ (cont'd)

Table 124.3. Diffusion coefficients from equation in table 124.2

T (K)	$D_{Ag^+} \times 10^5$ ($cm^2 s^{-1}$)	T (K)	$D_{Ag^+} \times 10^5$ ($cm^2 s^{-1}$)
570	1.59	630	2.27
590	1.80	650	2.52
610	2.03	670	2.78
620	2.15		

Melt composition: 94 mol % $NaNO_3$

System 125. KNO_3-$Ba(NO_3)_2$

List of diffusing species investigated in KNO_3-$Ba(NO_3)_2$ as solvent

Ag^+

Table 125.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (125.1)$$

precision: in table 125.2 uncertainty: in table 125.1

Table 125.2. Parameters of diffusion equation (125.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) KNO_3-$Ba(NO_3)_2$ (80 mol % KNO_3)					
Ag^+	1.43	5856	630-690		479
(b) KNO_3-$Ba(NO_3)_2$ (87.6 mol % KNO_3)					
Ag^+	0.913	4734	580-700		516
(c) KNO_3-$Ba(NO_3)_2$ (90 mol % KNO_3)					
Ag^+	1.9	5998	580-680		479

No entry in precision column indicates estimates not possible, since results were reported as equations only.

System 125. KNO_3-$Ba(NO_3)_2$ (cont'd)

Table 125.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 125.2

T (K)	80 mol % KNO_3	87.6 mol % KNO_3	90 mol % KNO_3
	Ag^+	Ag^+	Ag^+
580		1.50	1.04
610		1.84	1.35
640	1.43	2.21	1.70
670	1.76	2.61	2.10
700		3.04	

System 126. KNO_3-$Sr(NO_3)_2$

List of diffusing species investigated in KNO_3-$Sr(NO_3)_2$ as solvent

Ag^+

Table 126.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Ag^+

Equation:

$$D = A \exp[-E/RT] \quad (126.1)$$

precision: in table 126.2 uncertainty: in table 126.1

Table 126.2. Parameters of diffusion equation (126.1), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) KNO_3-$Sr(NO_3)_2$ (80 mol % KNO_3)					
Ag^+	0.41	4348	600-680		479
(b) KNO_3-$Sr(NO_3)_2$ (90 mol % KNO_3)					
Ag^+	0.90	5015	580-690		479

No entry in precision column indicates estimates not possible, since results were reported as equations only.

System 126. KNO_3-$Sr(NO_3)_2$ (cont'd)

Table 126.3. Diffusion coefficients, D x 10^5 ($cm^2 s^{-1}$), from equations in table 126.2

T (K)	80 mol % KNO_3	90 mol % KNO_3
	Ag^+	Ag^+
580		1.16
610	1.13	1.44
640	1.34	1.74
690		2.32

System 127. KNO_3-$Ca(NO_3)_2$

List of diffusing species investigated in KNO_3-$Ca(NO_3)_2$ as solvent

Na^+, Ag^+, Cl^-, Br^-, I^-

Table 127.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	∿ ± 20%	Na^+ [480]
chronopotentiometry	∿ ± 10%	Ag^+, Cl^-, Br^- [106,481]
chronopotentiometry	∿ ± 20%	Ag^+ [482]
chronopotentiometry	∿ ± 10%	I^- [514]

Equations:

$$D = A \exp[-E/RT] \quad (127.1)$$

$$D = B \exp[-k/T-T_o] \quad (127.2)$$

$$D = CT^{\frac{1}{2}} \exp[-k/T-T_o] \quad (127.3)$$

precision: in table 127.2 uncertainty: in table 127.1

Table 127.2.1. Parameters of diffusion equations (127.1) to (127.3), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	B x 10^6 ($cm^2 s^{-1}$)	C x 10^6 ($cm^2 s^{-1} K^{-\frac{1}{2}}$)	E (cal mol^{-1})	k (K)	T_o (K)	Temp. range (K)	References
(a) KNO_3-$Ca(NO_3)_2$ (60 mol % KNO_3)								482
Ag^+	equation in [482] for temperature dependence of D_{Ag^+} is incorrect							
(b) KNO_3-$Ca(NO_3)_2$ (61.9 mol % KNO_3)								
Na^+	*data reported in graphical form*						430-570	480
I			2.780		779.6	300	470-490	514

Precision not reported; results were reported as equations or graphs only.

System 127. KNO_3-$Ca(NO_3)_2$ (cont'd)

Table 127.2.2. Parameters of diffusion equations (127.1) to (127.3), precisions, and references

Species	A x 10^3 ($cm^2 s^{-1}$)	B x 10^6 ($cm^2 s^{-1}$)	C x 10^6 ($cm^2 s^{-1} K^{-½}$)	E (cal mol^{-1})	k (K)	T_o (K)	Temp. range (K)	References
(c) KNO_3-$Ca(NO_3)_2$ (62 mol % KNO_3)								
Ag^+			3.50		670.0	316	400-560	481
Cl^-			3.20		715.0	316	400-530	481
Br^-			3.20		735.0	316	390-560	481
(d) KNO_3-$Ca(NO_3)_2$ (70 mol % KNO_3)								
Ag^+	equation in [482] for temperature dependence of D_{Ag^+} is incorrect							
(e) KNO_3-$Ca(NO_3)_2$ (80 mol % KNO_3)								
Ag^+	1.03			5454			490-620	482
(f) KNO_3-$Ca(NO_3)_2$ (90 mol % KNO_3)								
Ag^+	0.53			4529			580-660	482

Precision not reported; results were reported as equations or graphs only.

Table 127.3.1. Diffusion coefficients, D x 10^5($cm^2 s^{-1}$), from equations in table 127.2

T (K)	KNO_3 (mol %)		T (K)	KNO_3 (mol %)	
	61.9	80		80	90
	I^-	Ag^+		Ag^+	Ag^+
470	0.0616		580	0.91	1.04
490	0.1020	0.38	610	1.14	1.26
530		0.58	640		1.51
570		0.83	660		1.68

D_{Ag^+} at 573 K: (60 mol% KNO_3), 0.54 x 10^{-5}; (70 mol% KNO_3), 0.73 x 10^{-5} $cm^2 s^{-1}$.

Table 127.3.2. Diffusion coefficients, D x 10^5($cm^2 s^{-1}$), from equations in table 127.2

T (K)	62 mol% KNO_3			T (K)	62 mol% KNO_3		
	Ag^+	Cl^-	Br^-		Ag^+	Cl^-	Br^-
390			0.00031	480	0.129	0.0896	0.0793
410	0.00568	0.00322	0.00260	500	0.205	0.147	0.132
430	0.0203	0.0125	0.0105	520	0.299	0.219	0.199
450	0.0500	0.0327	0.0282	540	0.408		0.279
460	0.0715	0.0479	0.0417	550	0.468		0.324
470	0.0978	0.0668	0.0587	560	0.532		0.372

System 128. $LiNO_3$-$NaNO_3$-KNO_3

List of diffusing species investigated in $LiNO_3$-$NaNO_3$-KNO_3 as solvent

In^{2+}, Tl^{+}, Pb^{2+}, Zn^{2+}, Cd^{2+}, Co^{2+}, Ni^{2+}, Eu^{3+}, Cl_2, Br_2, I_2, NO_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients.

Table 128.1. Diffusion techniques, uncertainties and species

Diffusion techniques of recommended study	Uncertainty (in values of D)	Species
polarography	$\sim \pm$ 20%	Pb^{2+}, Zn^{2+}, Cd^{2+}, Co^{2+}, Ni^{2+}
oscillographic polarography	$\sim \pm$ 20%	Tl^{+}, Pb^{2+}, Zn^{2+}, Cd^{2+}, Ni^{2+}, Eu^{3+}
rotating disc electrode	$\sim \pm$ 20%	Tl^{+}, Cl_2, Br_2, I_2, NO_2
square wave polarography	$\sim \pm$ 20%	In^{2+}

Table 128.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
In^{2+}	429	0.05	487
$\underline{Tl^{+}}$	423	8.4 (a)	457,471,487,517
$\underline{Pb^{2+}}$	423	0.087	see:table S-1
$\underline{Zn^{2+}}$	433	0.15	471,483,484,517
$\underline{Cd^{2+}}$	422	0.10	471,483,484,517
Co^{2+}	421	0.08	484
$\underline{Ni^{2+}}$	416	0.035	471,483,484,517
$\underline{Eu^{3+}}$	433	0.044	471,486
Cl_2	423	5.8	485
Br_2	423	5.1	485
I_2	423	4.2	457,485
NO_2	423	7.0	457

[a] Value appears improbably high.

For the underlined species, the temperature dependence of D reported in graphical form; see [486,517].

System 129. $NaPO_3$-KPO_3

List of diffusing species investigated in $NaPO_3$-KPO_3 as solvent

Cu^{+}, Cu^{2+}, Ag^{+}, V^{5+}, U^{4+}, U^{6+}

System 129. $NaPO_3$-KPO_3 (cont'd)

Table 129.1. Diffusion techniques, uncertainties, and species

Diffusion technique	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 20%	Cu^+, Cu^{2+}, Ag^+, V^{5+}, U^{4+}, U^{6+}

Table 129.2. Diffusion coefficients

Species	Melt composition (mole % $NaPO_3$)	T (K)	D x 10^5 (cm^2s^{-1})	References
Cu^+	50	973	0.70	488
Cu^{2+}	50	973	0.046	488
Ag^+	50	973	1.09	488
V^{5+}	50	973	0.169	488
U^{4+}	50	973	0.0032	488
U^{6+}	50	973	0.0126	488

System 130. Li_2SO_4-K_2SO_4

List of diffusing species investigated in Li_2SO_4-K_2SO_4 as solvent

In^{3+}, Pb^{2+}, Bi^{3+}, Cu^+, Cu^{2+}, Ag^+, Zn^{2+}, Cd^{2+}, Fe^{2+}, Fe^{3+}, Co^{2+}, Ni^{2+}

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients.

Table 130.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	∿ ± 10%	In^{3+}, Pb^{2+}, Bi^{3+}, Cu^+, Cu^{2+}, Ag^+, Zn^{2+}, Cd^{2+}, Fe^{2+}, Co^{2+}, Ni^{2+}

Table 130.2.1. Diffusion coefficients

Species	Melt composition (mol % Li_2SO_4)	T (K)	D x 10^5 (cm^2s^{-1})	References
In^{3+}	86.38	873	0.05	490
Pb^{2+}	86.38	873	0.79	490
Bi^{3+}	86.38	873	0.16	490
Cu^+	86.38	873	1.58	490
	80	898	2.00	491
Cu^{2+}	86.38	873	0.28	490

System 130. Li_2SO_4-K_2SO_4 (cont'd)

Table 130.2.2. Diffusion coefficients

Species	Melt composition (mol % Li_2SO_4)	T (K)	D x 10^5 (cm^2s^{-1})	References
Ag^+	86.38	873	2.07	489,<u>490</u>
Zn^{2+}	86.38	873	0.42	490
Cd^{2+}	86.38	873	0.46	490
Fe^{2+}	86.38	873	0.39	492
Fe^{3+}	86.38	873	0.145	492
<u>Co^{2+}</u>	86.38	873	0.25	<u>490</u>,493
Ni^{2+}	86.38	873	0.33	490

For the underlined species the temperature dependence of D reported in graphical form in the range 873-990 K; see [493].

System 131. Li_2SO_4-Na_2SO_4-K_2SO_4

List of diffusing species investigated in Li_2SO_4-Na_2SO_4-K_2SO_4 as solvent

Co^{2+}, SO_3

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients.

Table 131.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 10%	Co^{2+}
	$\sim \pm$ 20%	SO_3

Table 131.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
<u>Co^{2+}</u>	893	0.38 (a)	493
SO_3	873	0.6	494

For the underlined species the temperature dependence of D reported in graphical form in the range 893-983 K; see [493].

[a]Melt composition: Li_2SO_4-Na_2SO_4-K_2SO_4 (78-8.5-13.5 mol %).

System 132. NH_4NO_3-H_2O

List of diffusing species investigated in NH_4NO_3-H_2O as solvent

Cd^{2+}

Table 132.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 10%	Cd^{2+}

Table 132.2. Diffusion coefficients

Species	Melt composition	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cd^{2+}	$NH_4NO_3 \cdot 2H_2O$	323	0.615	256
Cd^{2+}	$NH_4NO_3 \cdot 4H_2O$	323	1.506	256

System 133. KNO_3-$Ca(NO_3)_2 \cdot 4H_2O$

List of diffusing species investigated in $Ca(NO_3)_2 \cdot 4H_2O$-KNO_3 as solvent

Cd^{2+}, *Ni^{2+}*

The italicized species indicate study with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 133.4.

Table 133.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography	$\sim \pm$ 20%	Cd^{2+}, Ni^{2+}

Equation:

$$D = AT^{\frac{1}{2}} \exp[-k/(T-T_o)] \quad (133.1)$$

precision: in table 133.2 uncertainty: in table 133.1

Table 133.2. Parameters of diffusion equation (133.1), precision, and references

Species	A x 10^6 ($cm^2 s^{-1} K^{-\frac{1}{2}}$)	k (K)	T_o (K)	Temp. range (K)	Precision	References
Cd^{2+}	1.49	496	218.1	273.5-401		251

Melt composition: 39 mol % KNO_3

System 133. KNO_3-$Ca(NO_3)_2.2H_2O$(cont'd)

Table 133.3. Diffusion coefficients from equation in table 133.2

T (K)	$D_{Cd^{2+}} \times 10^5$ (cm^2s^{-1})	T (K)	$D_{Cd^{2+}} \times 10^5$ (cm^2s^{-1})
280	0.000826	350	0.0649
300	0.00605	370	0.109
320	0.0205	390	0.164
340	0.0470		

Melt composition: 39 mol % KNO_3

Table 133.4. Diffusion coefficients for compositions not included in table 133.2

Species	Melt composition (mol % KNO_3)	T (K)	$D \times 10^5$ (cm^2s^{-1})	References
Cd^{2+}	15.0	373	0.137	251,256
	25.0	373	0.134	
	40.0	373	0.140	
	50.0	373	0.134	
	55.0	373	0.136	
Ni^{2+}	46.0	324	0.0175	250

System 134. $Ca(NO_3)_2$-H_2O

List of diffusing species investigated in $Ca(NO_3)_2$-H_2O system

Ag^+, Cd^{2+}

Table 134.1. Diffusion technique, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	Ag^+, Cd^{2+}

System 134. $Ca(NO_3)_2$-H_2O (cont'd)

Table 134.2. Diffusion coefficients

Species	Melt composition (mol % $Ca(NO_3)_2$)	Temp. range (K)	D x 10^5 (cm^2s^{-1})	References
Ag^+	6.47 8.39 10.02 14.05 15.87 18.00 19.53 21.16	283-333	a	255
Cd^{2+}	2.0 6.15 12.14 13.40 17.64 19.05 20.75	283-333	a	255

[a]Temperature dependence of D reported in graphical form for different melt compositions.

System 135. CH_3COONa-CH_3COOK

List of diffusing species investigated in CH_3OONa -CH_3COOK as solvent

H_2O

Table 135.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in value of D)	Species
chronopotentiometry	$\sim \pm$ 20%	H_2O

Melt composition: 46.3 mol % CH_3COONa

Table 135.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
H_2O	523	1.34	495

Temperature dependence of D in the range 520-560 K reported in graphical form.

System 136. CH_3COOLi-CH_3COONa-CH_3COOK

List of diffusing species investigated in CH_3COOLi-CH_3COONa-CH_3COOK as solvent

Tl^+, Pb^2, Zn^{2+}, Cd^{2+}

System 136. CH_3COOLi-CH_3COONa-CH_3COOK (cont'd)

Table 136.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
dc polarography & linear sweep voltammetry	$\sim \pm$ 20%	Tl^+, Pb^{2+}, Zn^{2+}, Cd^{2+}

Melt composition: CH_3COOLi-CH_3COONa-CH_3COOK (20-35-45 mol %)

Table 136.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Tl^+	500	0.11	496
Pb^{2+}	500	0.04	496
Zn^{2+}	500	0.028	496
Cd^{2+}	500	0.026	496

System 137. Cd-$CdCl_2$

List of diffusing species investigated in Cd-$CdCl_2$ as solvent

Cd^{2+}, Cl^-

Table 137.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
capillary	$\sim \pm$ 10%	Cd^{2+}, Cl^-

Table 137.2.1. Self-diffusion coefficients

Species	Melt composition (mol % Cd)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cd^{2+}	2.9	858	2.47	96
	3.7	858	2.50	
	8.2	858	2.40	
	10.6	858	2.35	
	11.1	858	2.41	
	11.8	868	2.45	
	11.9	813	1.90	
	12.4	858	2.32	
	13.0	858	2.32	

System 137. Cd-$CdCl_2$ (cont'd)

Table 137.2.2. Self-diffusion coefficients

Species	Melt composition (mol % Cd)	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cl	3.0	858	2.28	96
	3.7	858	2.25	
	7.0	858	2.31	
	7.3	858	2.32	
	9.9	858	2.22	
	10.3	858	2.25	
	11.0	833	2.02	
	11.8	813	1.92	
	12.2	858	2.23	
	13.2	858	2.23	

System 138. $AlCl_3$-$C_5H_5N \cdot nC_4H_9Cl$

List of diffusing species investigated in $AlCl_3$-$C_5H_5N \cdot nC_4H_9Cl$ as solvent

$[Al_2Cl_7]^-$

Table 138.1 Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronoamperometry & cyclic voltammetry	$\sim \pm$ 50%	$[Al_2Cl_7]^-$

Melt composition: 66.67 mol % $AlCl_3$

Table 138.2 Diffusion coefficient

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
$[Al_2Cl_7]^-$	333	$\sim$ 0.04-0.08	497

System 139. CaF_2-Al_2O_3

List of diffusing species investigated in CaF_2-Al_2O_3 as solvent

Al_2O_3

Table 139.1. Diffusion technique, uncertainty, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
rotating disk	$\sim \pm$ 25%	Al_2O_3

System 139. CaF_2-Al_2O_3 (cont'd)

Table 139.2. Diffusion coefficients

Species	Melt composition (wt. % Al_2O_3)	T (K)	D x 10^5 (cm^2s^{-1})	References
Al_2O_3	20	1773	4.0	498
Al_2O_3	30	1782	8.1	498
		1791	8.5	

System 140. Na_3AlF_6-Al_2O_3

List of diffusing species investigated in Na_3AlF_6-Al_2O_3 as solvent

Na^+, F^-, Al_2O_3, dissolved Al metal, CO_2

The italicized species indicate studies with insufficient data-sets for characterization of temperature dependence of diffusion coefficients. For these species: see table 140.4.

Table 140.1. Diffusion techniques; uncertainties, and species

Diffusion technqiue of recommended study	Uncertainty (in value of D)	Species
capillary	$\sim \pm$ 10%	$^{22}Na^+$ and $^{78}F^-$ containing species
chronopotentiometry	$\sim \pm$ 25%	Al_2O_3 (diffusing coefficient of oxygen containing ions); Al metal (diffusing coefficient of fluoride containing ions).
voltammetry	$\sim \pm$ 20%	CO_2

Equation:

$$D = A \exp[-E/RT] \quad (140.1)$$

precision: in table 140.2 uncertainty: in table 140.1

Table 140.2.1. Parameters of diffusion equation (140.1), precisions, and references

Species	A (cm^2s^{-1})	E (cal mol^{-1})	Temp. range (K)	Precision	References
(a) Na_3AlF_6-Al_2O_3 (2.5 wt % Al_2O_3)					
Al_2O_3	3.111×10^{-3}	12,940	1273-1323	(*)	141,142,149,518
(b) Na_3AlF_6-Al_2O_3 (5 wt % Al_2O_3)					
Al_2O_3	2.665	30,850	1273-1323	(*)	141,142,149,518

(*) Equations derived from digitized graphical results; insufficient data for estimates of precision of measurements.

System 140. Na_3AlF_6-Al_2O_3 (cont'd)

Table 140.2.2. Parameters of diffusion equation (140.1), precisions, and references

Species	D x 10^5 ($cm^2 s^{-1}$)	E (cal mol^{-1})	Temp. range (K)	Precision	References
(c) Na_3AlF_6-Al_2O_3 (7.5 wt % Al_2O_3)					
Al_2O_3	922.9	46,400	1253-1323	(*)	141,142,149,518
(d) Na_3AlF_6-Al_2O_3 (10 wt % Al_2O_3)					
Al_2O_3	3.541×10^8	80,160	1253-1323	(*)	141,142,149,518
(e) Na_3AlF_6-Al_2O_3 (12.5 wt % Al_2O_3)					
Al_2O_3	9.893×10^5	65,220	1273-1323	(*)	141,142,149,518

(*) Equations derived from digitized graphical results; insufficient data for estimates of precision of measurements.

Table 140.3. Diffusion coefficients of Al_2O_3, D x 10^5 ($cm^2 s^{-1}$), from equations in table 140.2

T (K)	D x 10^5 ($cm^2 s^{-1}$)				
	2.5 wt % Al_2O_3	5 wt % Al_2O_3	7.5 wt % Al_2O_3	10 wt % Al_2O_3	12.5 wt % Al_2O_3
1250			0.71	0.34	
1270	1.85	1.31	0.96	0.57	0.59
1290	2.00	1.58	1.27	0.93	0.88
1310	2.16	1.90	1.68	1.50	1.30
1320	2.24	2.08	1.92	1.89	1.57

Thonstad[518]reported a value of 1.5 x 10^{-5} $cm^2 s^{-1}$ for $D_{Al_2O_3}$ at 1293 K, and the diffusion coefficient was constant (within limits of experimental error, (± 15%)) over the investigated concentration range (0.25-12 wt % Al_2O_3). At 1353 K, Shurygin,et al. reported a value of 1.33 x 10^{-5} $cm^2 s^{-1}$ for $D_{Al_2O_3}$ [143,149].

Table 140.4. Diffusion coefficients for species not included in table 140.3

Species	Melt composition (wt % Al_2O_3)	1270-1345 (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Na^+	14	1318	7.50	140
Na^+	12.9	1326	7.73	140
F^-	12.9	1326	3.81	140
Na^+	12.0	1327	3.09	140
Al	3.2	1270-1345	(a)	499
CO_2	sat'd. (∿12-13.5%)	1273	0.005(*)	145,147

[a]For dissolved Al, the diffusing species probably are sub-fluorides con-

System 140. Na_3ALF_6-Al_2O_3 (cont'd)

taining ions; the values of D in this study appear unusually high, i.e. $\sim 10^{-4} cm^2 s^{-1}$ (by a factor of 10); a Grotthuss type mechanism is suggested to account for the increased translational mobility of the diffusing species.

(*) This value is based on a CO_2 solubility of 3.32×10^{-6} mol cm^{-3} [503]; with the earlier (less reliable) CO_2 solubility (0.8×10^{-7} mol cm^{-3} [504]), D_{CO_2} is $\sim 12 \times 10^{-5} cm^2 s^{-1}$.

System 141. KCl-$NaPO_3$

List of diffusing species investigated in KCl-$NaPO_3$ as solvent

Cu^{2+}, Cd^{2+}, Fe^{3+}

Table 141.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
rotating disk electrode	$\sim \pm$ 20%	Cu^{2+}, Cd^{2+}, Fe^{3+}

Table 141.2. Diffusion coefficients

Species	T (K)	D x 10^5 ($cm^2 s^{-1}$)	References
Cu^{2+}	893	0.205	505
Cd^{2+}	893	0.665	505
Fe^{3+}	893	0.198	505

System 142. K_2SO_4-$K_2S_2O_7$

List of diffusing species investigated in K_2SO_4-$K_2S_2O_7$ as solvent

V^{5+}, O_2

Table 142.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
chronopotentiometry	$\sim \pm$ 20%	V^{5+}
chronoamperometry	$\sim \pm$ 20%	V^{5+}, O_2

System 142. K_2SO_4-$K_2S_2O_7$ (cont'd)

Table 142.2. Diffusion coefficients

Species	Melt composition (mol % K_2SO_4)	T (K)	D x 10^5 (cm^2s^{-1})	References
V^{5+}	5.0	698	0.13	506
O_2	satd. with K_2SO_4	698	0.36	507

System 143. Na_2O-SiO_2-B_2O_3

List of diffusing species investigated in Na_2O-SiO_2-B_2O_3 as solvent

Cu^{2+}, Cd^{2+}, Fe^{3+}, Co^{2+}, Ni^{2+}

Table 143.1. Diffusion techniques, uncertainties, and species

Diffusion technique of recommended study	Uncertainty (in values of D)	Species
polarography	$\sim \pm$ 25%	Cu^{2+}, Cd^{2+}, Fe^{3+}, Co^{2+}, Ni^{2+}

Table 143.2. Diffusion coefficients

Species	T (K)	D x 10^5 (cm^2s^{-1})	References
Cu^{2+}	1273	0.0032	247,508
Cd^{2+}	1273	0.0044	247,508
Fe^{3+}	1273	0.0091	247,508
Co^{2+}	1273	0.0068	247,508
Ni^{2+}	1273	0.0012	247,508

9. List of Most Widely Investigated Systems

Table S-1. List of most widely investigated systems and references.

[The underscored reference is the data-base used for the recommended values]

System #	Solvent	Diffusing Species	References
9	NaCl	Na^+	43, 45, 93, 123, 161, 162, 165, 172, 175, 186
9	NaCl	Cl^-	43, 45, 93, 123, 161, 162, 165, 172, 175, 186
40	$NaNO_3$	Na^+	47, 50, 56, 81, 82, 84, 86, 91, 92, 94, 95, 96, 97, 99, 100, 101, 103, 105, 228
40	$NaNO_3$	Ag^+	33, 70, 71, 104, 105, 106, 107, 109, 110, 222, 223, 224, 225, 226
41	KNO_3	K^+	37,47,50,82,84,95,97,222
41	KNO_3	Na^+	36, 82, 85, 95, 209, 231, 510
41	KNO_3	Ag^+	33,106,107,109,209,223,233,234,237
42	$RbNO_3$	Rb^+	47, 85, 97, 100, 101, 236
43	$CsNO_3$	Ag^+	104, 105, 106, 109, 226
55	$Ca(NO_3)_2 \cdot 4H_2O$	Cd^{2+}	250,251,253,255,256,258
75	LiCl-KCl	Tl^+	117, 118, 122, 209, 221, 314
75	LiCl-KCl	Pb^{2+}	105, 115, 117, 118, 119, 120, 122, 209, 221, 314
75	LiCl-KCl	Bi^{3+}	105, 114, 115, 117, 118, 314, 323
75	LiCl-KCl	Cu^+	114, 117, 118, 305, 314, 316, 329, 349, 355
75	LiCl-KCl	Ag^+	105, 114, 117, 118, 209, 221, 230, 305, 314, 317, 333, 350
75	LiCl-KCl	Cd^{2+}	105, 112, 113, 114, 115, 117, 118, 119, 120, 121, 314, 316
75	LiCl-KCl	Cr^{3+}	117, 303, 311, 314, 318, 319
75	LiCl-KCl	Co^{2+}	117, 119, 122, 304, 314, 355
75	LiCl-KCl	Ni^{2+}	117, 118, 119, 298, 302, 305, 316, 321, 350
75	LiCl-KCl	U^{4+}	105, 112, 300, 306, 307, 312, 325, 328, 354
77	NaCl-KCl	Pb^{2+}	32, 171, 363, 373, 375, 377, 378, 385, 401
77	NaCl-KCl	Ag^+	151, 362, 373, 375, 378
77	NaCl-KCl	Cd^{2+}	178, 367, 373, 375, 377, 378, 379, 380, 399,519
77	NaCl-KCl	UO_2^{2+}	199, 376, 386, 387, 396
110	$NaNO_3$-KNO_3	Ag^+	88,450,452,455,463,464,473
128	$LiNO_3$-$NaNO_3$-KNO_3	Pb^{2+}	460, 463, 471, 483, 484,517

10. Solvent Systems: Cross Index

Table S-2. Cross index of molten salt solvent systems.

The systems are listed alphabetically by chemical element with the system number as locator.

Table S-2. Cross index of molten salt solvent systems-continued.

Table S-2. Cross index of molten salt solvent systems-continued.

	System No.
KCNS	36
K_2CO_3	
$-Li_2CO_3$	103
$-Li_2CO_3-Na_2CO_3$	105
$-Na_2CO_3$	104
KI	32
KNO_3	41
$-AgNO_3$	116
$-Ba(NO_3)_2$	125
$-Ca(NO_3)_2$	127
$-Ca(NO_3)_2 \cdot 4H_2O$	133
$-CsNO_3$	115
$-LiNO_3$	107
$-LiNO_3-NaNO_3$	128
$-NaNO_3$	110
$-Sr(NO_3)_2$	126
$-TlNO_3$	117
OH	
-NaOH	101
O_3	
$-NaPO_3$	129
K_2SO_4	
$-K_2S_2O_7$	142
$-Li_2SO_4$	130
$-Li_2SO_4-Na_2SO_4$	132
$K_2S_2O_7$	
$-K_2SO_4$	142
K_2TiF_6	
-NaCl	97

L	System No.
$LiBeF_3$	4
Li_2BeF_4	5
LiBr	23
-KBr	94
LiCl	8
$-CdCl_2$	81
-CsCl	76
-LiF-KCl	98
-KCl	75
$-KCl-ZnCl_2$	93
$LiCH_3OO$	
$-CH_3COONa-CH_3COOK$	136
Li_2CO_3	37
$-K_2CO_3$	103
$-Na_2CO_3$	102
$-Na_2CO_3-K_2CO_3$	105
LiF	1
$-BaF_2$	68
$-BeF_2$	67
$-BeF_2-ThF_4$	74
$-BeF_4-ZrF_4$	73
-LiCl-KCl	98
-NaF-KF	72
LiI	30
Li_2SO_4	
$-K_2SO_4$	130
$-Na_2SO_4-K_2SO_4$	131

Table S-2. Cross index of molten salt solvent systems-continued.

	System No.
$LiNO_3 \cdot 3H_2O$	54
$LiNO_3$	39
$-AgNO_3$	109
$-CsNO_3$	108
$-KNO_3$	107
$-NaNO_3$	106
$-NaNO_3-KNO_3$	128
M	
$MgCl_2$	
$-KCl$	85
$-NaCl$	82
$MgCl_2 \cdot 6H_2O$	52
N	
NH_2CH_3CO	59
$[(CH_3)_2NH_2]_2SO_4$	62
$C_2H_5NH_3Cl$	61
NH_4HCOO	58
NH_4NO_3	
$-H_2O$	132
$NH_4SO_3NH_2$	60
Na_3AlF_6	7
$-Al_2O_3$	140
$-NaF$	71
$NaBF_4$	6
$Na_2B_4O_7$	51
$NaBr$	24
$-KBr$	95
$NaCl$	9
$-AlCl_3$	92
$-CaCl_2$	83
$-CdCl_2$	84
$-CsCl$	78
$-MgCl_2$	82
$-KCl$	77
$-K_2TiF_6$	97
$NaCH_3COO$	
$-CH_3COOK$	135
$-CH_3COOK-CH_3COOLi$	136
$NaCH_3COO \cdot 3H_2O$	57
Na_2CO_3	38
$-K_2CO_3$	104
$-Li_2CO_3$	102
$-Li_2CO_3-K_2CO_3$	105
$NaCN$	
$-KCN$	100
NaF	2
$-AlF_3$	70
$-AlF_3-BaCl_2$	99
$-BeF_2$	69
$-KF$	66
$-KF-LiF$	72
$-Na_3AlF_6$	71
NaI	31
$-KCl$	96

Table S-2. Cross index of molten salt solvent systems-continued.

	System No.
$NaNO_3$	40
-$AgNO_3$	113
-$Ba(NO_3)_2$	122
-$Ca(NO_3)_2$	124
-$CsNO_3$	112
-KNO_3	110
-$LiNO_3$	106
-$LiNO_3$-KNO_3	128
-$RbNO_3$	111
-$Sr(NO_3)_2$	123
-$TlNO_3$	114
Na_2O	
-SiO_2-B_2O_3	143
NaOH	35
-KOH	101
$NaPO_3$	46
-KCl	141
-KPO_3	129
Na_2S_3	48
Na_2S_4	49
Na_2S_5	50
Na_2SO_4	
-Li_2SO_4-K_2SO_4	132
$Na_2Si_2O_5$	65
P	
$PbBr_2$	28
$PbCl_2$	21
-KCl	89
R	
RbCl	11
-CsCl	80
$RbNO_3$	42
-$AgNO_3$	118
-$NaNO_3$	111
-$TlNO_3$	119
S	
Sulfur	47
SiO_2	
-Na_2O-B_2O_3	143
$SrCl_2$	17
$Sr(NO_3)_2$	
-KNO_3	126
-$NaNO_3$	123
T	
$ThCl_4$	22
ThF_4	
-LiF-BeF_2	74
TlCl	15
$TlNO_3$	45
-$CsNO_3$	121
-KNO_3	117
-$NaNO_3$	114
-$RbNO_3$	119
Z	
$ZnBr_2$	27
$ZnCl_2$	19
-KCl	87
-KCl-LiCl	93
ZrF_4	
-LiF-BeF_2	73

11. Diffusing Species: Cross Index

Table S-3. Cross index of diffusing species and solvent systems.

The diffusing species are arranged in alphabetical order according to their symbols or chemical formula. The numbers indicate the melt system numbers in which the species have been studied.

A	
Ag^+	8,9,10,11,12,25,32,34,39,40,41,42,43,44,45,51,55,61,75,77,92,107,108,109,110,113,115,116,118,120,122,123,124,125,126,127,129,130,134
Al	7,140
Al(III)	70,77
$[Al_2Cl_7]^-$	138
Al_2O_3	7,139,140
$[AlSeCl_2]^-$	92
Am^{3+}	75
Am(VI)	101
Au^+	10,61,75

B	
Ba^{2+}	16,25,40,41
Be^{2+}	61,67,75,77
Bi^+	29
Bi^{3+}	35,51,73,75,92,130
Br_2	23,24,26,93,95,94,128
Br^-	14,27,28,39,40,41,94,103,107,110,127

C	
Ca^{2+}	9,10,18,41,86
Cd^{2+}	9,10,12,20,51,53,54,55,56,57,58,59,60,61,62,75,77,84,88,91,92,103,107,110,128,130,132,133,134,136,137,141,143
Cd^{2+}(EDTA)	107
Ce^{3+}	68,75,98,110
Cl_2	8,9,10,11,12,14,21,75,77,79,82,85,128
Cl^-	8,9,10,11,12,13,15,16,17,18,19,20,21,84,89,91,103,107,110,127,137
Cm^{3+}	75
Co^{2+}	9,10,12,51,53,57,60,75,77,128,130,131,143
CO_2	7,40,75,77,110,140
CO_3^{2-}	37,38,40,42,102,103,104,105,110
$C_2O_4^{2-}$	110
Cr^{2+}	73
Cr^{3+}	75,77,92
Cr(VI)	51
CrO_4^{2-}	75,87
$Cr_2O_7^{2-}$	103

Table S-3. Cross index of diffusing species and solvent systems-continued.

Cs^+	8,9,10,12,20,39,40,41,42,43,91,107,112,120,121,115
Cu^+	10,13,61,75,76,77,92,99,103,129,130
Cu^{2+}	51,55,65,129,130,141,143
	D
Dy^{3+}	75
	E
Er^{3+}	75
Eu^{3+}	75,92,128
	F
F^-	1,2,4,5,7,40,67,70,72,140
Fe^{2+}	65,72,74,75,77,83,130,143
Fe^{3+}	9,10,51,61,65,67,71,82,85,92,130,141
	G
Ga^{3+}	53
Gd^{3+}	75
Ge^{4+}	66,75
	H
H_2	102,110
HCl	9,10,75,77,92
Hf^{2+}	77
Hf^{4+}	77
HfF_6^{2-}	77
Hg^{2+}	61,75,110
Hg_2^{2+}	110
Ho^{3+}	75
H_2O	75,101,110,13[illegible]
	I
I_2	30,31,32,33,128
I^-	31,34,40,41,42,92,103,107,110,127
In^{3+}	53,54,55,60,89,128,130
	K
K^+	3,9,10,39,40,41,42,43,94,103,104,105,107,110,116,117
K_2NbF_7	77
	L
La^{3+}	75
Li^+	1,4,5,8,9,10,11,12,39,41,67,72,93,94,106,107,110
Lu^{3+}	75
	M
Mg^{2+}	10,77
Mn^{2+}	75
Mo^{3+}	8,10,12,75,77
Mo^{5+}	92
$[MoCl_6]^{2-}$	75
MoO_4^{2-}	75
MoO_2Cl_2	75

Table S-3. Cross index of diffusing species and solvent systems-continued.

	N
Na^+	2,7,8,9,10,11,12,20,31,37,38,39, 40,41,42,43,44,45,69,70,75,84,92, 94,96,102,104,105,106,107,110, 111,112,113,114,122,123,127,140
Na_2Se	92
Nb^{2+}	75,77
Nb^{3+}	75,77
Nb(IV)	72
Nb(V)	72,92
Nb_3Cl_8	75,77
Nd^{3+}	75,110
Ni^+	77
Ni^{2+}	9,10,12,51,52,53,54,56,57,59,60, 71,72,73,75,77,89,92,103,128,130, 133,143
NO_2^-	128
NO_3^-	39,40,41,43,44,106,107,110
Np^{3+}	75
Np^{4+}	75
NpO_2^+	75
NpO_2^{2+}	75
	O
O_2	63,107,110,142
O^{2-}	39,75,77,110
O_2^-	110
O_2^{2-}	110
	P
P	47
Pb^{2+}	8,9,10,11,12,21,28,55,57,58,59, 60,61,65,75,77,81,89,92,103,107, 110,128,130,136
Pb^{2+}(EDTA)	107
Pd^{2+}	75
PO_4^{3-}	75,77
Pr^{3+}	75,110
Pt^{2+}	61,75
$[Pt(CN)_4]^{2-}$	100
Pu^{3+}	75
Pu^{4+}	75
	R
Rb^+	8,9,10,11,12,39,40,41,42,43,75, 107,111,118,119
	S
S	47,49,50
S_2^-	36,75,89
S_x^{2-}	75
Sb^{3+}	51,75
Se_4^{2-}	36,92
Se_5^{2-}	36
Se_6^{2-}	36

Table S-3. Cross index of diffusing species and solvent systems-continued.

SiO_4^{4-}	65
Sm^{2+}	92
Sm^{3+}	75
Sn^{2+}	53,60,61,62,92
Sn^{4+}	51,65
SO_3	77,130,131
SO_4^{2-}	40
Sr^{2+}	17,40
T	
Ta(V)	72
$(TaCl_6)^{2-}$	75
Tb^{3+}	75
Te^{4+}	92
Te(V)	7
Th^{4+}	9,10,11,12,22,72,77
Ti^{2+}	92
Ti^{3+}	51,66,73,75,77
Ti^{4+}	6,10,11,45,51,66,72,75,77,97
TiO_2	9
Tl^{+}	11,15,25,32,39,40,41,42,55,57,59,60,75,77,107,110,114,117,119,121,128,136
Tm^{3+}	75
U	
U^{3+}	9,10,11,12,16,75,76,77,80,90,92
U^{4+}	9,10,11,12,68,73,75,76,77,80,92,129
U(VI)	46,51,129
UO_2^{2+}	12,55,75,77,78
V	
V^{5+}	75,129,142
VO^{2+}	75
VO_3^{-}	75
W	
W^{3+}	75
W^{4+}	77
W^{5+}	77
Y	
Y^{3+}	75,77
Yb^{2+}	92
Yb^{3+}	75,92
Z	
Zn^{2+}	19,27,55,57,58,60,65,71,75,77,81,128,130,136
Zr^{2+}	8,9,10,11,12,77,92
Zr^{4+}	9,10,11,12,25,26,68,77,92,95
ZrF_6^{-2}	77

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