Molten Salts: Volume 4, Part 3

Bromides and Mixtures; Iodides and Mixtures

Electrical Conductance, Density, Viscosity, and Surface Tension Data

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Data on the electrical conductance, density, viscosity, and surface tension of bromide mixtures and iodide mixtures have been systematically collected and evaluated. Results are given for eighty-five binary mixtures over a range of compositions and temperatures. Values of the above properties for twenty-three single bromide and iodide salts are also given

Key words: Bromides; data compilation; density; electrical conductance; iodides; molten salt mixtures; standard reference data; surface tension; viscosity.

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1. Introduction

The published data for the four physical properties: electrical conductance, density, viscosity, and surface tension for molten mixtures of bromides-bromides and iodides-iodides have been reviewed and critically assessed, and the results of this work, together with value judgements are reported herewith. This publication is Part 3 of Volume 4: Binary Mixtures of Halides. For earlier publications in this series see [1, 2, 3, 4, 5].[1] In addition to the assessment of the binary systems, a review of the data for single-salt bromide and iodide melts was undertaken as an update to the recommendations advanced in 1968 and 1969, and the results of this work are also reported.

Mixtures are arranged in alphabetical order by cations according to chemical symbol. The presentation of the material is organized as follows: some observations concerning melt preparation and purification are given together with a temperature-liquidus phase diagram, if the latter is known. This is followed by a tabular presentation of the investigations critically examined, including temperature and composition ranges, and comments on cell materials and calibrations. Table(s) of recommended numerical values over the experimental temperature and composition ranges complete the presentation. Each of the four properties is treated separately. Summary tables giving a total overview of the number of investigations and application of techniques are provided at the end of the manuscript.

2. Symbols and Units

The symbols and units[2] for the four physical properties of this compilation are:

κ = specific conductance ($\mathrm{ohm^{-1}\ cm^{-1}}$)
ρ = density ($\mathrm{g\ cm^{-3}}$)
η = viscosity (cp)
γ = surface tension ($\mathrm{dyn\ cm^{-1}}$).[2]

In addition:

E = activation energy ($\mathrm{cal\ mol^{-1}}$)
Λ = equivalent conductance ($\mathrm{ohm^{-1}\ cm^2 equiv^{-1}}$)
C = concentration (mol %)

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[1] Numbers in brackets refer to literature references in section 7.

[2] For conversion to the SI system:

$1\ \mathrm{ohm^{-1}\,cm^{-1}} = 1\times10^2\ \Omega^{-1}\mathrm{m^{-1}}$
$1\ \mathrm{g\,cm^{-3}} = 1\times10^3\ \mathrm{kg\,cm^{-3}}$
$1\ \mathrm{cp} = 1\times10^{-3}\ \mathrm{N\,s\,m^{-2}}$
$1\ \mathrm{dyn\,cm^{-1}} = 1\times10^{-3}\ \mathrm{N\,m^{-1}}$
$1\ \mathrm{cal\,mol^{-1}} = 4.184\ \mathrm{J\,mol^{-1}}$
$1\ \mathrm{Torr} = 1.333\times10^2\ \mathrm{Pa}$.

When γ is treated as a free energy per unit area, it is given the unit, erg $\mathrm{cm^{-2}}$; this is dimensionally identical to dyn $\mathrm{cm^{-1}}$.

R = gas constant = 1.98717 cal mol^{-1} deg^{-1}

T = temperature in kelvins, defined on the thermodynamic scale by assigning 273.16 K to the triple point of water (freezing point, 273.15 K = 0° C)

3. Experimental Methods

Experimental aspects relative to cell design for the four properties, electrical conductance, density, viscosity and surface tension, have been reviewed in the preceding volumes in this series (table 1). The results of a recent survey on current practices for conductance cell calibration procedures are considered below.

3.1. Calibration Techniques in Molten Salt Conductivity Measurements

The most common practice for determining the conductance cell constant is to use as a reference standard an electrolyte for which the electrical conductivity data have been established as calibration-quality data. Some observations on current practices, based on the results of a critical questionnaire survey [3] follow herewith.

TABLE 1. Experimental techniques

Technique	Aspects reviewed and reference
γ	Various possible methods and % application: This series, Vol. 2, Part 2 [2].
κ, ρ, η, γ	Descriptions of high temperature assemblies: This series, Vol. 3 [3].
κ, ρ, η, γ	As used with molten fluorides: This series, Vol. 4, Part 1 [4].
κ, ρ, η, γ	Conductance: possible errors in measurements. Viscosity: comparison of data for oscillational and capillary techniques: This series, Vol. 4, Part 2 [5].

For situations in which the conductance cells are used at ambient temperatures, the specific conductivity data for KCl in aqueous solutions are the generally accepted calibration standards. The use of aqueous KCl for this purpose dates back to the work of Kohlrausch [4] (1898). Since that time, the work of Jones and Bradshaw [5] (1933) and Jones and Prendergast [6] (1937) are most widely accepted as updates of the Kohlrausch values. The results of the three data sets are in table 2. Use of the demal concentrations (concentration by weight scale) avoids the possible source of error inherent in the volume concentration scale, since the latter is temperature-dependent. The three demal concentrations make possible the calibration of cells for the relatively wide range of cell constants normally encountered in the study of electrolytes from high dilution to moderately high concentration. For the highest precision, the bridge measurements are optimized if the impedance values fall in the range of 1000 ohms.

The highly precise conductance data reported by Fuoss, et al.[7, 8] have been advanced as calibration quality data. The results of the critical survey indicate that these values are finding general acceptance with the added convenience that the concentrations of the calibrating solutions are not restricted to the three demal values but may have any value encompassed in the concentration range 0.0–0.01 N or 0.0–0.1 N depending on the equation used, viz:

for cell constant range 1–2 cm^{-1}:

$$\Lambda = 149.93 - 94.65\, c^{1/2} + 58.74\, c \cdot \log c + 198.4\, c,$$

for cell constant range 10–20 cm^{-1}:

$$\Lambda = 149.936 - 94.88\, c^{1/2} + 25.48\, c \cdot \ln c + 221.0\, c - 229\, c^{3/2}.$$

In the equations above, c is the molar concentration. For conversion from concentration by weight to the molar concentration scale, solution density data are needed. In the dilute solution range (above), the density data have been obtained by using $\rho = \rho_0 + Am$, where ρ is the density of the solution, ρ_0, the density of water, A, a constant equal to 0.0134, and m is the molal concentration. This approach yields cell constants with an accuracy falling within ±0.01% of the demal values.[9] Having the concentration c and using the preceding equations to calculate Λ, the values of the specific conductance and the cell constant follow readily from the conventional equations.

For molten salt conductance cells, it would be desirable to determine the cell constant at the "working temperature" of the molten salt studies. This has been attempted by Franck,[10], Protsenko,[11] Janz,[12] and Forthmann [13] using as calibrants molten $NaNO_3$,[14] KNO_3,[14] KCl,[15] and NaCl,[16] for example. An intercomparison of the cell constant using the NSRDS values [1] for molten $NaNO_3$, KNO_3, KCl, NaCl, NaF, and Na_3AlF_6 with that for 1 N demal KCl has been reported recently by Gagescu.[17] The cell constant was found "constant" within 0.8% for the range 320–

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[3] G. J. Janz and R. P. T. Tomkins, J. Electrochem. Soc., **124**, No. 2, 55c (1977).

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[5] G. Jones and C. Bradshaw, J. Am. Chem. Soc., **55**, 1780 (1933).

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[10] G. Schlichthärle, K. Todheide, and E. U. Franck, J. Chim. Phys., **66**, 70 (1969). High-temperature, high-pressure (800° C, 1200 kbar, upper limits) have been reported by Marshall and Franck. See A. S. Quist, W. L. Marshall, E. U. Franck and W. Osten, J. Phys. Chem. **74**, 2241 (1970).

[11] P. I. Protsenko and N. P. Popovskaya, J. Gen Chem. USSR, **24**, 2087 (1954).

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[15] I. S. Yaffe and E. R. Van Artsdalen, J. Phys. Chem., **60**, 1125 (1956).

[16] M. Blander, editor, "Molten Salt Chemistry", Interscience New York (1964).

[17] D. Gagescu, Chemical Instrumentation, 6 (2), 93 (1975).

TABLE 2. Specific conductivities and concentrations for KCl used for conductance cell calibrations

Concentration by volume [a,b]

Conc'n. (Normality)	KCl g/1000 g of solution (in vacuo)	$\kappa(\Omega^{-1}\ \mathrm{cm}^{-1})$		
		0 °C	18 °C	25 °C
1	71. 3828	a 0. 06541 *b* 0. 06543_0	0. 09822 0. 09820_1	0. 11180 0. 11173_3
0. 1	7. 43344	*a* 0. 00715 *b* 0. 007154_3	0. 01119 0. 011191_9	0. 01288 0. 012886_2
0. 01	0. 746558	*a* 0. 000776 *b* 0. 0007751_2	0. 001225 0. 0012226_9	0. 001413 0. 0014114_5

Concentration by weight [c]

Conc'n. (Demality)	KCl g/1000 g of solution (in vacuo)	$\kappa(\Omega^{-1}\ \mathrm{cm}^{-1})$		
		0 °	18 °	25 °
1	71. 1352	0. 06517_6	0. 09783_8	0. 11134_2
0. 1	7. 41913	0. 007137_9	0. 011166_7	0. 012856_0
0. 01	0. 745263	0. 0007736_4	0. 0012205_2	0. 0014087

[a] Kohlrausch, Holborn, Diesselhorst (1898).
[b] Jones, Prendergast (1937).
[c] Jones, Bradshaw (1933).

1075 °C. One of the outstanding problems is that calibration-quality data are not known (cf, aqueous KCl, table 2). For example, for NaCl, this is illustrated by the work of Van Artsdalen [18] and Ketelaar,[19] and in the preceding communication in this series (Molten Salts: Volume 4, Part 2 [5]). The problem of advancing the data for selected molten salts to the accuracies and precisions required for "calibration-quality" led directly to the cooperative project, now in progress, and known as the Standards Program.[20]

Currently, the calibration of molten salt conductance cells rests, for the most part, on the use of aqueous KCl demal values (table 2) with attention to thermal expansivity effects for changes in cell dimensions at the higher temperatures (see, for example, Braunstein,[21] Brillant,[22] Buckle,[23] Ketelaar,[19] Van Artsdalen,[18] and Janz [12]). An expression advanced by Washburn [24] for the variation in the cell constant (K) with temperature has been used to estimate the effect of thermal expansivity corrections in various types of cells, viz:

$$\frac{1}{K}\frac{dK}{dT}=(b-2a)+\frac{s}{d}\,(b-a).$$

Here b is the coefficient of linear expansion of the material of the cell, a is the linear coefficient of expansion of the platinum, s is the total length of the two platinum rods and d is the distance between the electrodes. In the temperature range (300–1000 °C), the thermal expansivity correction has been estimated to be about 0.05% for quartz and silica cells; by comparison, for pyrex the correction ranges from 0.1–0.2%.

3.2. Percent Application of Techniques

Experimental methods for studying transport properties of molten salt mixtures are cited in sections 3.1–3.4 of "Molten Salts: Volume 4, Part 2—Chlorides and Mixtures" [5]. The following table indicates the "frequency of use" of these techniques in the study of bromide and iodide melts. The Percent Application is defined as the number of investigators employing a particular method relative to the total number of reported studies for that property.

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[18] E. R. Van Artsdalen and I. S. Yaffe, J. Phys. Chem., 59, 118 (1955).

[19] J. A. A. Ketelaar and P. P. E. Maenaut, Electrochim. Acta, 17, 2195 (1972).

[20] G. J. Janz, I. G. Murgulescu, S. Zuca and R. P. T. Tomkins. The Molten Salts Data Center, R. P. I., and the Center for Physical Chemistry, Bucharest, have undertaken a cooperative project to advance the data of selected molten salts to calibration quality. This Standards Program has, as participants, Brenet (France), Chemla (France), Cleaver (UK), Emons (DDR), Ketelaar (Netherlands), Matiasovsky (Czechoslovakia), Nissen (USA), Øye (Norway), Suski (Poland), Zuca (Roumania), Janz (USA).

[21] G. D. Robbins and J. Braunstein, in "Molten Salts: Characterization and Analysis", G. Mamantov, editor, Marcel Dekker, New York (1969).

[22] S. Brillant, Compt. Rend., 262, 447 (1966).

[23] E. R. Buckle and P. E. Tsaoussoglou, J. Chem. Soc., 667 (1964).

[24] E. W. Washburn, J. Am. Chem. Soc., 38, 2431 (1916).

TABLE 3. Percent application of techniques

Method	Percent application	
	Bromides	Iodides
Specific conductance		
Classical ac	96.6	100
Modified potentiometric ac	3.4	
Density		
Archimedean	46.2	45.8
Dilatometric	10.2	16.7
Flotation	10.2	0.4
Maximum bubble pressure	5.1	16.7
Pycnometric	28.2	16.7
Viscosity		
Capillary	50.0	28.4
Oscillating body	50.0	28.4
Falling body		14.2
Torsion method [a]		28.4
Surface tension		
Wilhelmy slide plate	58.8	
Pin detachment	29.4	
Maximum bubble pressure	11.8	

[a] See J. O'M. Bockris, J. L. White, and J. D. Mackenzie, "Physicochemical Measurements at High Temperatures," Academic Press, New York, 1959, for a description of the technique.

3.3. Melt Preparation and Purification

The most common methods of purification of the salts are sublimation, distillation, recrystallization, filtering the fused salt through a quartz filter to remove solid impurities and flushing the melt with an appropriate gas to remove gaseous impurities or reaction products. Zone refining is sometimes used.

Generally, the salts are prepared and handled under an inert atmosphere, but occasionally a reactive atmosphere is used to take advantage of special chemical properties of the impurities, as in the use of a dry oxygen atmosphere in the preparation of $BiBr_3$. Similarly, the salts are usually dried in an inert atmosphere at elevated temperatures or under an atmosphere of the corresponding hydrogen halide. If the bromides and iodides are sensitive to photodecomposition, due precautions to avoid exposure to light are necessary.

Mixtures are usually prepared by fusion of the required amounts of pure components under an inert atmosphere; sometimes they are distilled into the measuring apparatus. Composition and purity of the mixtures are checked by the melting point range or by standard analytical methods.

Short discussions of the procedures used for melt preparation and purification for the single salts and binary mixtures as well as notes on handling and transfer techniques are given in sections 5.3 and 6.1. It should be noted that the commercial sources of certain materials are given for completeness of experimental details; this in no case represents recommendation.

4. Treatment of Data

4.1. Statistical Analysis

The statistical analysis was performed on the computer facilities (IBM 360, PDP 15 and G.E. Mark II Time Sharing Unit) at Rensselaer Polytechnic Institute.

The density, specific conductance, viscosity, and surface tension values were recalculated by a one-dimensional analysis, using the method of least squares to establish equations indicating the variations of the physical quantities with temperature at the experimental composition. For density and surface tension results, where five or more experimental compositions and temperatures or temperature-dependent equations were reported, the values were recalculated by a two dimensional analysis, using a stepwise multiple regression routine. In this way a physical property-temperature-composition matrix was developed. Tabulated values given in brackets indicate that they have been statistically derived from an insufficient number of data points.

a. One-Dimensional Analysis

The criterion for choosing the equation of best fit in the one-dimensional analysis is the standard error of estimate computed from the residuals and defined by

$$s=\sqrt{\frac{\sum^{n}(\gamma_e-\gamma_c)^2}{n-q}},$$

where γ_e=the experimental value at each temperature, γ_c=the value calculated from the least squares equation at the same temperature as γ_e, n=the number of experimental data points, and q=the number of coefficients in the least squares equation (2 for linear, 3 for quadratic).

b. Two-Dimensional Analysis

Computer Programs Used

Programs from the IBM Scientific Subroutine Package [25] were used with the IBM 360/65 computer facility at Rensselaer. The routines consist of STPRG,

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[25] System 360 Scientific Subroutine Package Programmers Manual; IBM H20-0205-3, 1969.

CORRE, LOC and MSTR, the latter two being storage routines which have no effect on the accuracy of the results. In addition the subroutine STOUT is used to print the results of each regression step and the subroutine MATRIX is used for printing a matrix of the final equation.

Statistical Procedure

The abbreviated Doolittle method[26] was used to select the variables entering the regression and for calculation of coefficients. The independent variable included in each step of the analysis was selected by computing the reduction of sums of squares of each variable. The variable causing the largest reduction was added to the equation and deleted from the table of sums of squares. The coefficients, intercept and statistical parameters for the new equation were computed and printed. This procedure was repeated until the maximum proportion of sums of squares to the total reduced was less than a limit set by the programmer. The independent variables used in the initial selection were chosen from a generalized procedure, which generated 30 combinations of the input variables using powers, reciprocals, logarithmic and exponential quantities. It was found that the procedure consistently selected the equation $(T+C)^3$ so that the working program used nine independent variables. After the final equation has been produced, it is transferred to the MATRIX routine, which recalculates values at rounded compositions and temperatures, within specified boundary conditions. In the presentation of the matrix, due cognizance is taken of the experimental range of the investigation and of the phase relationships for the system so that values are always "interpolated" rather than "extrapolated". The final step in the procedure involves the residual analysis, where the deviations of the original values from those computed from the "best" equations are given.

Statistical Parameters

For each step in the regression analysis a summary of significant statistical parameters is given. First the sums of squares reduced (S_i), the proportion of S_i/D, where D is defined below, given by P, the cumulative S_i given by S_{cum} and the cumulative proportion given by (P_{cum}) are listed. These quantities give an indication of the effect of each variable in the final equation. The programmers limit on P was always in the range $0.0001 \leq P \leq 0.001$.

Standard Error of Estimate

The standard error in the estimated y values adjusted for degrees of freedom is given by:

$$\text{s.e.} = \sqrt{\frac{D-S_{\text{cum}}}{n-q-1}},$$

where

$$D=\sum_{j=1}^{n}(y_j-\bar{y})^2$$

y_j = experimental values,

$\bar{y}$ = average of all experimental values,

q = the number of independent variables in the equations.

As a general guide, about 68% of the results lie within the standard error of estimate, 95% within twice this value and approximately 99 percent within three times the value.[27] The standard error of estimate has been reported as a percent in this study. Where this information was reported in the literature as standard deviations, the preceding approach was not possible and we refer to the published error estimates of the original authors.

F Value for Analysis of Variance

This value is used to determine if a particular model is acceptable.[28] Tables of F values indicate that values greater than 2.0 are acceptable for the routine used here. In all cases values of F were greater than 500 and in most cases, greater than 1000. The F value is defined as:

$$F=\frac{S_{\text{cum}/q}}{(D-S_{\text{cum}})/(n-q-1)},$$

where S_{cum}, q, D, and n were defined earlier.

4.2. Value Judgments

The recommendations advanced in this work are based on three criteria: (a) type and quantity of experimental data available, (b) experimental method used and (c) an error analysis of the reported results. The principles followed in selecting the most reliable data were as follows:

(a) Studies reporting either numerical data, results derived from statistically generated equations or data in the form of temperature-dependent equations were preferred over graphical results, except in those cases where the graphical results were based on a more complete investigation (i.e., wider composition or temperature range).

(b) The experimental aspects were examined for systems for which recommendations were advanced. The preparation, purification, stability and analysis of the single salt and binary melts were critically assessed. The reliability of the measuring technique (determined from standard "calibration" checks) was an important further consideration.

(c) The statistical parameters and percent departures as discussed in sections 4.1 and 4.2,

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[26] C. A. Bennet and N. L. Franklin, Statistical Analysis in Chemistry and the Chemical Industry (John Wiley and Sons, 1954).

[27] I. D. Sterling and S. V. Pollack, Introduction to Statistical Data Processing (Prentice-Hall, 1968).

[28] H. Smith and N. R. Draper, Applied Regression Analysis (John Wiley and Sons, 1968).

respectively, were considered. For systems where investigations had similar quantity and quality of data, the results with superior statistical parameters were selected.

For some systems more than one reference may have been used to generate the recommendations. This was done to extend the recommendations to the widest possible ranges of composition and temperature.

4.3. Physical Property Tables

Four types of tables are used to present information relative to the physical properties.

1. Number of investigations. In such tables, the published studies are analyzed with respect to:

- the investigations critically re-examined
- composition and temperature ranges
- a summary of experimental details such as cell material and calibration method
- the minimum and maximum percent departures of the data with respect to [1], [2] or this present work.

The notation (g) indicates the data were presented graphically. Otherwise it is to be assumed that the data were reported in numerical or equation form. Footnotes to these tables call attention to information of unusual importance (technique, experimental uncertainty, etc.). A recommended reference is always indicated by a bold-face reference number. In situations where the composition-temperature-physical property data base is based on more than one investigation, all references used to develop the value judgements are listed in bold-face.

2. Numerical values. The specific conductance, density, viscosity, and surface tension values were computed for each system for the experimental compositions at rounded temperatures using the corresponding "best" equation for the same temperature range for which the investigation was carried out. These values are given in the numerical tables which immediately follow the studies tables for each property of each system. Also given are the temperature-dependent equation(s), the standard error of estimate (or the standard deviation) and a statement giving the recommended reference and experimental technique. For density and surface tension the values were also calculated using a two-dimensional statistical analysis where sufficient data (more than five compositions and temperatures) were given. The matrices produced by the two-dimensional analysis are reported in tabular form at rounded temperatures and compositions. The two-dimensional equation, maximum percent departure and standard error of estimate are also included in these tables. Original values are given in cases where investigations reported only limited data or the one- or two-dimensional analysis was unsuccessful. In some cases, the experimental results were reported in graphical form. In these cases, the graphs have been interpolated, and the results given in tabular form together with a statement giving the recommended reference and the number of significant figures to which interpolation could be carried out. Numerical values are presented only for the recommended studies.

3. Additional investigations (for single salts). These tables summarize information on single salt melts received since the publication of NSRDS–NBS–15 [1] and NSRDS–NBS–28 [2]. (For further discussion, see sections 5.4 and 5.6.)

4. General summary tables. These summarize specific information, such as total number of investigations, recommended references, and experimental techniques, and are in section 6.3.

4.4. Phase Diagrams

Phase diagrams, when known, are included in sections 6.1 and 6.2. It should be understood that these are not advanced as critically evaluated recommendations. The liquidus curves were used as guidelines for imposing the boundary conditions for generating the matrix. References for each phase diagram are given with the diagram.

4.5. Percent Departure

The percent departure has been used to compare the results of different investigations with either previous [1, 2] or current recommendations and has been later considered when evaluating a study for possible recommendation.

The percent departure is given by

$$\text{Percent departure} = \frac{(\text{``compared value''} - \text{``recommended value''}) \cdot 100}{\text{``recommended value''}}.$$

The "compared values" refer either to data given numerically in the study under discussion or to calculated numerical values when the data was reported in equation form. The "recommended values" are those given in NSRDS–NBS–15 [1] or NSRDS–NBS–28 [2] or the present work. Comparison is always made at common temperature and composition. Only the maximum and minimum percent departures of the study under discussion from the NSRDS reference data base are reported. Percent departures are not given for data reported graphically.

5. Single Salts

Sections 5.1 and 5.2 update the recommendations for single salt melts given in NSRDS–NBS–15 [1] and NSRDS–NBS–28 [2]. The discussions for each single salt recommendation and the numerical values together with the temperature-dependent equations are given in sections 5.3 and 5.5. Additional studies for bromides and iodides not included in NSRDS–

NBS-15 [1] and NSRDS-NBS-28 [2] are summarized in sections 5.4 and 5.6.

5.1. New Recommendations

Bromide and iodide salt melts which are being examined here for the first time are listed in table 4.

TABLE 4. New recommendations: Bromides and iodides

Compound	Number of investigations			
	Specific conductance	Density	Viscosity	Surface tension
$AlBr_3$	3	7		
CsBr			1	
$GaBr_3$	1	1	1	
$InBr_3$			1	
LiBr				1
$MgBr_2$			1	
$SbBr_3$	4	3	1	
TlBr			1	
AgI				1
AlI_3			1	
BiI_3		1		
CdI_2			1	
DyI_3	1			
GaI_3	2	1		
GdI_3	1	1		
InI_3			1	
LaI_3	1	1		
LiI				1
NdI_3	1	1		
PbI_2		1		
SbI_3	3	1		
TlI		1	1	
ZnI_2	1			

5.2. Revised Recommendations

Critical analyses of new studies have made it possible to advance better values for certain bromide and iodide molten salt properties than was possible at the time of publication of NSRDS–NBS–15 and NSRDS–NBS–28. Salts for which the older recommedations have been superseded are listed in table 5.

TABLE 5. Revised recommendations: Bromides and Iodides

Compound	Property
$BiBr_3$	density
$PbBr_2$	specific conductance
PbI_2	specific conductance

5.3. Discussions and Numerical Values: Bromide Salts

Single bromide salts for which a new or revised recommendation is reported are discussed in this section with respect to experimental techniques, references, temperature ranges, percent departure values, and melt preparation and purification. Numerical values are given for each property at rounded temperatures together with the temperature-dependent equations.

$AlBr_3$

Melt Preparation and Purification

Johnson, Silva, and Cubicciotti [**59**] treated Fisher certified reagent grade $AlBr_3$ by evacuation overnight at room temperature, followed by sublimation at 70° C through a sintered glass filter into Pyrex ampoules. After approximately half of the $AlBr_3$ had been transferred, the sublimation was stopped and the residue discarded. The ampoules, each containing about 5 g of the salt, were sealed off under vacuum and stored for future use. The bromine content of the preparation was found to average 89.95%, compared to a theoretical content of 89.88%.

Gorenbein [**10**, 12] prepared $AlBr_3$ by direct synthesis from bromine with aluminum shavings. The product was circulated a number of times over excess metal. The $AlBr_3$ was collected in sealed glass ampoules.

Izbekov and Plotnikov [31] also prepared $AlBr_3$ by direct synthesis from bromine and aluminum shavings. They purified their product by distillation.

Olson et al. [70] synthesized $AlBr_3$ by dropping Mallinckrodt analytical reagent grade Br_2 onto J. T. Baker purified granular aluminum in a flask in which a slight positive pressure of dry argon was maintained. After reaction was complete, the $AlBr_3$ was distilled out of the reaction vessel into a clean container. The distillate crystals were transferred to an ampoule. This was then evacuated and sealed. Further purification was effected by growing crystals out of the vapor phase.

Biltz and Voigt [**55**] prepared $AlBr_3$ by the reaction of purified bromine with aluminum powder (Lanta 99.5%) in an atmosphere of CO_2. The product was refluxed after reaction and then distilled in a CO_2 stream into the conductance vessel, pycnometer and sample cells. The $AlBr_3$ thus produced melted at 97.5 ° C.

TABLE 6. Electrical conductance studies: $AlBr_3$

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
55	468–543	Cell material: Thuringer glass; platinized disk electrodes
10, 12[a]	373–423	Cell material: Arrhenius flask; non-platinized vertical electrodes

[a] Results are presented graphically in ref. [12].

TABLE 7. $AlBr_3$: Specific conductance ($ohm^{-1}\ cm^{-1}$)

T	$\kappa(\times 10^7)$	T	$\kappa(\times 10^7)$
468	0. 90	516	1. 8
474	1. 0	523	1. 9
483	1. 2	529	2. 2
498	1. 5	533	2. 0
505	1. 6	539	2. 4
506	1. 6	543	2. 6

The values in this table are those of Biltz and Voigt (classical ac technique) [**55**].

TABLE 8. $AlBr_3$: Specific conductance ($ohm^{-1}\ cm^{-1}$)

T	$\kappa(\times 10^3)$
373	2. 448
383	2. 168
393	1. 946
403	1. 762

The values in this table are those of Gorenbein (classical ac technique) [10]. The values in table 7 are recommended.

TABLE 9. Density studies: $AlBr_3$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
55	373–538	
02	373–773	
59	374. 3–762. 7	Cell material: quartz float; calibration: water
70	365–592	Cell material: borosilicate glass dilatometer; calibration: water
10 [a]	373–433	Cell material: glass pycnometer; calibration: water
12	373	As for [10]
31	373	As for [10]

TABLE 9. Density studies: $AlBr_3$—Continued

Deviations from NSRDS recommendations [this volume]

Ref.	Min. departure	Max. departure
55	−0. 62% (398. 2 K)	2. 16% (498. 2 K)
62	−0. 16% (573 K)	43. 44% (773 K)
10	−0. 23% (393 K)	1. 54% (433 K)
13	−1. 39% (373 K)	
31	2. 71% (373 K)	
70	−0. 11% (373 K)	

[a] See also E. Ya. Gorenbein, Zh. Obshch. Khim. **17**, 871 (1947).

TABLE 10. $AlBr_3$: Density ($g\ cm^{-3}$)

$$\rho = 0.932437 + 2.98824 \cdot 10^{-2} T - 1.28388 \cdot 10^{-4} T^2 + 2.07063 \cdot 10^{-7} T^3 - 1.178122 \cdot 10^{-10} T^4$$

Standard error of estimate: 4.02%

T	ρ	T	ρ
380	2. 6540	580	2. 1429
400	2. 5794	600	2. 0995
420	2. 5104	620	2. 0479
440	2. 4476	640	1. 9843
460	2. 3912	660	1. 9044
480	2. 3410	680	1. 8034
500	2. 2963	700	1. 6761
520	2. 2560	720	1. 5168
540	2. 2184	740	1. 3195
560	2. 1816	760	1. 0774

These values are based on the work of Johnson, Silva and Cubicciotti (flotation technique) [**59**].

$BiBr_3$

Melt Preparation and Purification

Johnson, Cubiciotti, and Silva [**102**] distilled $BiBr_3$ three times under a dry 0_2 atmosphere and, finally, directly into quartz tubes containing dry 0_2 at a pressure of 100 torr. The tubes were evacuated and sealed under vacuum. The 0_2 atmosphere was employed to oxidize any bismuth present to bismuth oxide, which is insoluble in bismuth bromide.

TABLE 11. Density studies: $BiBr_3$

Investigations critically re-examined

Ref.	Temp. range
102[a]	573–1210

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	Min. departure	Max. departure
102	1.65% (593 K)	2.13% (662 K)

[a]The authors of this study [**102**] determined the density of liquid $BiBr_3$ as part of an investigation of the critical parameters of this salt. Quartz floats of known density were constructed by sealing tungsten wire of varying length in quartz tubes. These were introduced into quartz vessels containing sufficient liquid $BiBr_3$ for flotation. The temperature at which the floats sank in the liquid was recorded.

TABLE 12. $BiBr_3$: Density (g cm^{-3})

$$\rho = -7.252658 + 6.538868 \times 10^{-2}T - 1.288650 \times 10^{-4}T^2$$

Standard error of estimate: 0.94%

T	ρ	T	ρ
580	4.5135	900	3.6770
600	4.4766	920	3.6236
620	4.4337	940	3.5691
640	4.3861	960	3.5125
660	4.3349	980	3.4529
680	4.2811	1000	3.3894
700	4.2256	1020	3.3207
720	4.1692	1040	3.2456
740	4.1124	1060	3.1625
760	4.0557	1080	3.0700
780	3.9995	1100	2.9664
800	3.9441	1120	2.8498
820	3.8895	1140	2.7184
840	3.8357	1160	2.5699
860	3.7826	1180	2.4023
880	3.7298	1200	2.2133

These values are based on the work of Johnson, Cubicciotti and Silva (flotation technique) [102] and supersede the recommendations in NSRDS-NBS-15 [1]. The uncertainty in these values is estimated to be ±1.0%.

CsBr

Melt Preparation and Purification

In her viscosity studies, Zuca [**136**] used carefully dried, chemically pure salts. At the end of each determination a chemical analysis was made to see that no change in composition had occurred.

TABLE 13. Viscosity studies: CsBr

Investigations critically re-examined

Ref.	Temp. range (T)	Cell material	Calibration
136	945.1–1094.4	Pt sphere, Pt rod, Mo wire	Water, benzene, aniline

TABLE 14. CsBr: Viscosity (cp)

$$\eta = 16.5746 - 0.0261884T + 1.10449 \cdot 10^{-5}T^2$$

Standard error of estimate: 0.93%

T	η	T	η
950	1.66	1030	1.32
960	1.61	1040	1.28
970	1.56	1050	1.25
980	1.52	1060	1.22
990	1.47	1070	1.20
1000	1.43	1080	1.17
1010	1.39	1090	1.15
1020	1.35		

These values are based on the work of Zuca (oscillating sphere technique) [**136**].

$GaBr_3$

Melt Preparation and Purification

Greenwood and Worrall [**71**] passed bromine gas, dried over P_2O_5 and diluted with nitrogen, over high-purity gallium metal at 130° C. The gallium tribromide produced was purified by repeated vacuum sublimation at 150° C in an all-glass apparatus.

TABLE 15. Electrical conductance studies: $GaBr_3$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
71	398.0–407.2	Cell material: Pyrex; W electrodes; freq. range: 1000 Hz; calibration: aqueous KCl solutions

TABLE 16. Density, viscosity, and surface tensions studies: $GaBr_3$

Investigations critically re-examined

Property	Ref.	Temp. range (T)
ρ	**99**	391–409
η	**99**	390–410
γ	**99**	391–409

TABLE 17. $GaBr_3$: Specific conductance ($ohm^{-1}cm^{-1}$) Density ($g\ cm^{-3}$), viscosity (cp), and surface tension ($dyn\ cm^{-1}$)

$$\kappa=-6.87776\cdot10^{-6}+1.90573\cdot10^{-8}T$$

Standard error of estimate: 1.51%

$$\rho=4.08820-2.46354\times10^{-3}T$$

Standard error of estimate: 0.01%

$$\eta=2.09672\times10^{-2}\exp(3866.5/RT)$$

Standard error of estimate: 0.11%

$$\gamma=94.5-0.15T$$

T	κ ($\times10^6$)	ρ	η	γ
392		3. 123	3. 000	35. 7
394		3. 118	2. 926	35. 4
396		3. 113	2. 854	35. 1
398	7. 070	3. 108	2. 784	34. 8
400	7. 451	3. 103	2. 717	34. 5
402	7. 833	3. 098	2. 652	34. 2
404	8. 214	3. 093	2. 589	33. 9
406	8. 595	3. 088	2. 528	33. 6
408		3. 083	2. 470	33. 3

The data bases for these are specific conductance: Greenwood and Worrall (classical ac technique) [**71**]; density: Greenwood and Worrall (dilatometric technique) [**99**]; viscosity: Greenwood and Worrall (capillary viscometer) [**99**]; and surface tension: Greenwood and Worrall (capillary rise method) [**99**].

$InBr_3$

Melt Preparation and Purification

Schoneborn [**97**] sublimed $InBr_3$ in a stream of dry, oxygen-free nitrogen using a tubular oven heated to 350–370 °C. The white flakes were sublimed into an evacuated glass tube which was then sealed.

TABLE 18. Viscosity studies: $InBr_3$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
97	760–1020	Cell material: quartz; calibration: ethyl bromide, acetone, CS_2

TABLE 19. $InBr_3$: Viscosity (cp)

$$\eta=6.44259-1.19668\times10^{-2}\ T+5.80943\times10^{-6}\ T^2$$

Standard error of estimate: 2.41%

T	η	T	η
760	0. 703	900	0. 378
780	0. 643	920	0. 350
800	0. 587	940	0. 327
820	0. 536	960	0. 308
840	0. 490	980	0. 295
860	0. 448	1000	0. 285
880	0. 411	1020	0. 281

These values are based on the work of Schoneborn (oscillating body method) [**97**].

LiBr

Melt Preparation and Purification

Berge and Holm [51] used reagent grade lithium bromide dried at 400–500 °C under a moderate vacuum (0.1–0.01 torr) and then melted in a platinum crucible in a purified nitrogen atmosphere.

TABLE 20. Surface tension studies: LiBr

Investigations critically re-examined

Ref.	Temp. range (T)	Cell material	Calibration
51	896.2, 974.3, 1069.7	Pt-Rh bob and suspension wire	Water
113	833, 923, 973		
133	~860–1110	Mo crucible	Molten NaCl

Deviations from NSRDS recommendations [this volume]

Ref.	Min. departure	Max. departure
51	−11. 05% (1069. 7 K)	−12. 41% (896. 2 K)
113	−5. 01% (833 K)	−6. 78% (973 K)

TABLE 21. LiBr: Surface tension (dyn cm^{-1})

$\gamma=185.2-0.0691\ T$

T	γ	T	γ
860	125.8	990	116.8
870	125.1	1000	116.1
880	124.4	1010	115.4
890	123.7	1020	114.7
900	123.0	1030	114.0
910	122.3	1040	113.3
920	121.6	1050	112.6
930	120.9	1060	111.9
940	120.2	1070	111.3
950	119.5	1080	110.6
960	118.9	1090	109.9
970	118.2	1100	109.2
980	117.5	1110	108.5

These values are based on the work of Smirnov and Stepanov (maximum bubble pressure method) [**133**].

$MgBr_2$

Melt Preparation and Purification

In his viscosity studies, Grothe [**68**] used p. a. reagents dried and fused in a quartz apparatus under vacuum.

TABLE 22. Viscosity studies: $MgBr_2$

Investigations critically re-examined

Ref.	Temp. range (T)
68	1023–1223

TABLE 23. $MgBr_2$: Viscosity (cp)

$\eta=1.07438\times10^{2}-0.173804T+7.12293\times10^{-5}T^{2}$

Standard error of estimate: 1.87%

T	η	T	η
1040	3.72	1140	1.87
1060	3.24	1160	1.67
1080	2.81	1180	1.53
1100	2.44	1200	1.44
1120	2.13	1220	1.41

These values are based on the work of Grothe (oscillating hollow cylinder) [**68**].

$PbBr_2$

Melt Preparation and Purification

Easteal and Khoo [**67**] crystallized lead bromide (British Drug Houses Laboratory Reagent grade) twice from very dilute hydrobromic acid. The product was dried at 120 °C. All operations were carried out in the absence of sunlight to avoid photodecomposition.

Lantratov and Moiseeva [18] used remelted chemically pure lead bromide preserved in a dry atmosphere.

Andryushchenko and Bergman [23] recrystallized chemically pure lead bromide. The resulting product was found to have a melting point of 376 °C.

Protsenko and Shatskaya [28] synthesized lead bromide by reaction of lead nitrate with hydrobromic acid. The product was dried at 160 °C and 5 torr. The melting point of the dried salt was found to be 375 °C.

TABLE 24. Electrical conductance studies: $PbBr_2$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
67[a]	646–1083	Cell material: quartz U-shaped capillary; platinized Pt electrodes; freq. range: 1000 Hz; calibration: 1.0 D KCl solution
75	773	
18	648–923	Cell material: quartz capillary; freq. range: 1000–3000 Hz; calibration: molten KCl, $PbCl_2$ and KNO_3
23 (g)	673–773	Cell material: Pyrex; Pt electrodes; freq. range: 1000 Hz; calibration: twice recrystallized KNO_3
28 (g)	648–773	Cell material: modified Biltz vessel; calibration: twice recrystallized KNO_3
89 (g)[b]	773	
101	873	

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	Min. departure	Max. departure
67	−0.01% (695 K)	2.22% (765 K)
18	−0.87% (748 K)	−3.07% (723 K)
101	−1.99% (873 K)	

[a] Easteal and Khoo report an overall accuracy of ±0.5% in the specific conductance values.

[b] The equivalent conductivities reported in [89] were calculated from specific conductivity data in [75].

TABLE 25. $PbBr_2$: Specific conductance (ohm^{-1} cm^{-1})

$$\kappa = -2.980 + 7.067 \cdot 10^{-3} T - 2.434 \cdot 10^{-6} T^2$$

Root-mean-square deviation: 0.003

T	κ	T	κ
660	0.624	880	1.354
680	0.700	900	1.409
700	0.774	920	1.461
720	0.846	940	1.512
740	0.917	960	1.561
760	0.985	980	1.608
780	1.051	1000	1.653
800	1.116	1020	1.696
820	1.178	1040	1.737
840	1.239	1060	1.776
860	1.297	1080	1.813

These values are based on the work of Easteal and Khoo (classical ac technique) [67] and supersede the recommendation in NSRDS-NBS-15 [1].

$SbBr_3$

Melt Preparation and Purification

Saito, Ichikawa, and Shimoji [81] purified $SbBr_3$ by distillation or sublimation in vacuo.

Izbekov and Plotnikov [31] prepared $SbBr_3$ by treating the powdered metal with a solution of one part Br_2 to three parts CS_2. The $SbBr_3$ was fractionated twice after the solvent was distilled off. The middle portion was crystallized from the CS_2 by cooling with ice. White silky crystals were obtained from which the mother liquor could be decanted. The remaining solvent was removed under vacuum.

Jander and Weis prepared $SbBr_3$ by direct reaction of liquid bromine and antimony metal shavings, adding the bromine dropwise at such a rate that a fast but controlled reaction was obtained. The product was distilled off and purified by redistillation over solid KBr and antimony metal under a stream of dry CO_2. In each distillation, only the middle portion of the previous one was taken [72].

TABLE 26. Electrical conductance studies: $SbBr_3$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
81[a]	377–534	Cell material: Pyrex; tungsten electrodes; freq. range: 10–1000 Hz.; calibration: standard KCl solutions
11	373–413 (g)	Cell material: glass; non-platinized electrodes
31[b]	373	Cell material: glass; matte (dull) electrodes
72	373	Pt electrodes; calibration: resistance capacity of cell was measured at room temperature and this value was used for measurement at 373 K

[a] Saito, et al. [81] refer to an additional investigation by Hevesy (Medd. Danske Selsk., **3**, 20 (1921)).

[b] Data point lies outside the temperature range of the recommended values.

TABLE 27. $SbBr_3$: Specific conductance (ohm^{-1} cm^{-1}) and equivalent conductance (ohm^{-1} cm^2 $equiv^{-1}$)

$$\kappa = -1.95264 \cdot 10^{-4} + 8.10735 \cdot 10^{-7}\, T - 5.36294 \cdot 10^{-10}\, T^2$$

Standard error of estimate: 1.56%

$$\Lambda = 7.96918 \cdot 10^{-3} - 1.04318 \cdot 10^{-4}\, T + 3.50916 \cdot 10^{-7}\, T^2 - 2.79182 \cdot 10^{-10}\, T^3$$

Standard error of estimate: 1.62%

T	$\kappa(\times 10^5)$	$\Lambda(\times 10^3)$
380	3.537	3.682
390	3.935	4.099
400	4.322	4.521
410	4.699	4.946
420	5.064	5.373
430	5.419	5.800
440	5.763	6.225
450	6.097	6.646
460	6.419	7.062
470	6.731	7.472
480	7.033	7.873
490	7.323	8.263
500	7.603	8.642
510	7.872	9.007
520	8.130	9.357
530	8.378	9.689

These values are based on the work of Saito, Ichikawa, and Shimoji (classical ac technique) [81].

TABLE 28. Density studies: $SbBr_3$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
81	373–529	
12	373–413	Cell material: glass pycnometer; calibration: water
31[a]	372.7	Cell material: glass pycnometer; calibration: water

Deviations from NSRDS recommendations [this volume]

Ref.	Min. departure	Max. departure
81	9.20% (373 K)	9.41% (413 K)

[a] Data point lies outside the temperature range of the recommended values.

TABLE 29. $SbBr_3$: Density (g cm^{-3})

$\rho = 4.322 - 2.510 \cdot 10^{-3}\, T$

T	ρ	T	ρ
380	3.368	460	3.167
390	3.343	470	3.142
400	3.318	480	3.117
410	3.293	490	3.092
420	3.268	500	3.067
430	3.243	510	3.042
440	3.218	520	3.017
450	3.192		

These values are based on the work of Saito, Ichikawa, and Shimoji (pycnometric method) [**81**].

TABLE 30. Viscosity studies: $SbBr_3$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
12	373.2–413.2(g)	Calibration: water

TABLE 31. $SbBr_3$: Viscosity (cp)

T	η	T	η
375	3.5_0	395	2.7_3
380	3.3_3	400	2.5_5
385	3.1_1	405	2.4_1
390	2.8_7	410	2.2_5

These values were interpolated to two significant figures from the graphical presentation of Gorenbein (capillary method) [**12**].

TlBr

Melt Preparation and Purification

Franke [**98**] dried thallous bromide at $10^{-3}-10^{-4}$ torr, first purging several times with dry, oxygen-free nitrogen, and then raising the temperature to 350 °C. The tubes containing the product were sealed off under vacuum.

TABLE 32. Viscosity studies: TlBr

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
98	753–993	Cell material: quartz; calibration: ethyl bromide, acetone, carbon disulfide

TABLE 33. TlBr: Viscosity (cp)

$\eta = -8.53052 + 4.66893 \times 10^{-2} T - 6.33119 \times 10^{-5} T^2 + 2.64850 \times 10^{-8} T^3$

Standard error of estimate: 0.58%

T	η	T	η
760	2.011	880	1.576
770	1.974	890	1.545
780	1.937	900	1.515
790	1.899	910	1.486
800	1.862	920	1.460
810	1.824	930	1.435
820	1.787	940	1.413
830	1.750	950	1.393
840	1.713	960	1.375
850	1.678	970	1.360
860	1.643	980	1.348
870	1.609	990	1.338

These values are based on the work of Franke (oscillating body method) [**98**].

$ZnBr_2$

Melt Preparation and Purification

Susic and Mentus [**134**] dried Merck reagent-grade $ZnBr_2$ by heating in a nitrogen atmosphere and then bubbling HBr through the melt.

TABLE 34. Viscosity studies: $ZnBr_2$

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
134	673–813	Vertical capillary silica viscometer

Deviations from previous NSRDS recommendations [1, p. 17]

Ref.	Min. departure
134	−48.75% (673 K)

TABLE 35. $ZnBr_2$: Viscosity (cp)

$\eta = 7.78814 \cdot 10^{-5} \exp(19713/RT)$

Standard error of estimate: 6.45%

T	η	T	η
680	169	750	43.2
690	137	760	36.4
700	111	770	30.7
710	91.2	780	26.0
720	75.0	790	22.1
730	62.1	800	18.9
740	51.7	810	16.2

These values are based on the work of Susic and Mentus (capillary viscometric technique) [**134**] and supersede the recommendations advanced in NSRDS-NBS-15 [1].

5.4. Additional Studies: Bromide Salts

The following table summarizes information relative to additionl studies for single bromide salt melts that have been reported since the publication of NSRDS–NBS-15 [1] and NSRDS-NBS-28 [2]. This information does not include new systems or cases where a revised recommendation has been introduced; such cases are discussed in detail in section 5.3. The information included in this summary table indicates the authors, reference and maximum and minimum percent departure of the various studies relative to the previously recommended values.

TABLE 36. Deviations from previous NSRDS recommendations: AgBr

Reference	Authors	Min. departure	Max. departure
	Conductance (NSRDS reference data base Doucet, Bizouard (1960) [1], p. 16)		
75	Sandonnini (1920)	−3.0% (773 K)	
79	Markov, Prisyazhnyi (1962)	graphical	
80	Bizouard (1961)	−0.01% (923 K)	0.41% (873 K)
85	Markov, Prisyazhnyi (1965)	graphical	
40	Poillerat (1961)	2.18% (930.0 K)	3.75% (730.9 K)
	Density (NSRDS reference data base Boardman (1949); Lorentz, Höchberg (1916) [1], p. 16)		
85	Markov, Prisyazhnyi (1965)	graphical	
91	Markov, Prisyazhnyi (1963)	graphical	
44	Paul (1974)	0.00% (930 K)	0.06% (720 K)
	Viscosity (NSRDS reference data base Harrap, Heymann (1955) [1], p. 16)		
86	Harrap, Heymann (1951)	graphical	
	Surface tension[a] (NSRDS reference data base Boardman, Palmer, Heymann (1955) [2], p. 59)		
48	Sternberg, Terzi (1972)	4.19% (743 K)	2.82% (893 K)
141	Sternberg, Terzi (1973)	1.56% (990 K)	4.38% (735 K)

[a] Relative to the value reported in NSRDS-NBS-28 [2], the uncertainty estimate should be revised to ±3.0%.

TABLE 37. Deviations from previous NSRDS recommendations: $AlBr_3$

Reference	Authors	Min. departure	Max. departure
Viscosity[a] (NSRDS reference data base: Grothe and Kleinschmit (1966), [1], p. 18)			
10	Gorenbein (1948)	graphical	
12	Gorenbein (1945)	Single data point; outside temperature range of data base	

[a]See also P. Kleinschmit, Ph.D. Thesis, Technical University of Hannover (1968).

TABLE 38. Deviations from previous NSRDS recommendations: $BaBr_2$

Reference	Authors	Min. departure	Max. departure
Conductance[a] (NSRDS reference data base Bockris, et al. (1960) [1], p. 16)			
63	Dworkin, Bronstein, Bredig (1966)	2.88% (1143.15 K)	
Surface tension (NSRDS reference data base Ellis, et al. (1958) [2], p. 65)			
15	Bertozzi, Soldani (1964)	graphical	

[a]Relative to the value reported in NSRDS-NBS-15 [1] the uncertainty estimate should be revised to ± 3.0%

TABLE 39. Deviations from previous NSRDS recommendations: $BiBr_3$

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Grantham (1965) [1], p. 18)			
57	Ichikawa, Shimoji (1966)	graphical	
65	Grantham, Yosim (1963)	graphical	
54	Darnell, et al. (1969)	0.96% (970 K)	3.95% (550 K)
95	Ichikawa, Shimoji (1968)	graphical	

TABLE 40. Deviations from previous NSRDS recommendations: $CdBr_2$

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Bockris, et al. (1960) [1], p. 17)			
26	Moiseeva (1963)	0.03% (923.16 K)	−0.71% (898.16 K)
64	Grantham (1966)	graphical	
61	Markov, Polishchuk (1965)	graphical	
76	Bloom, Heymann (1947)	graphical	
52	Suski, Stachowicz (1972)	2.71% (973.00 K) −1.47% (903.00 K)	3.07% (903.5 K)[a] −1.81% (973.0 K)[b]
101	Voronin, Prizyazhnii, Baranov (1974)	0.66% (873 K)	

TABLE 40. Deviations from previous NSRDS recommendations: $CdBr_2$—Continued

Reference	Authors	Min. departure	Max. departure
Density (NSRDS reference data base Boardman, et al. (1960) [1], p. 17)			
22	Ellis (1967)	−2. 32% (1073. 15 K)	−6. 04% (773. 15 K)
34	Ellis (1961)	−0. 04% (893. S K)	−2. 26% (957. 2 K)
38	Il'yasov, Barsegov (1970)	graphical	
36	Lantratov, Shevlyakova (1963)	graphical	
24	Markov, Prisyazhnyii, Prikhodko (1968)	0. 0% (900 K)	0. 20% (950 K)
Viscosity (NSRDS reference data base Bloom, Harrap, Heyman (1948) [1], p. 17)			
86	Harrap, Heymann (1951)	graphical	
Surface tension (NSRDS reference data base Ellis (1962) [2], p. 61)			
50	Ellis, Freeman (1965)[c]	graphical	
47	Boardman, Palmer, Heymann (1955)		

[a] Cell constant determined with respect to molten KCl.

[b] Cell constant determined with respect to 1 N KCl aqueous solution.

[c] Further discussion of the previous NSRDS data base [2].

TABLE 41. Deviations from previous NSRDS recommendations: CsBr

Reference	Authors	Min. departure	Max. departure
Conductance[a] (NSRDS reference data base Yaffe, van Artsdalen (1965) [1], p. 15)			
87	Zuca, Olteanu (1968)	0. 20% (950 K)	−12. 8% (1130 K)
39	Poillerat (1973)	graphical	
129	Smirnov, Shumov, Khokhlov (1973)[b]	0. 16% (945 K)	−9. 68% (1070 K)
130	Smirnov, Shumov, Stepanov, Khokhlov (1971)	−0. 10% (945 K)	−9. 85% (1070 K)
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 15)			
85	Markov, Prisyazhnyii (1965)[c]	graphical	
87	Zuca, Olteanu (1968)	0. 17% (950 K)	0. 32% (1090 K)
58	Jaeger, Kahn (1916)	0. 06% (975 K)	0. 26% (935 K)
69	Stepanov, Smirnov (1970)[b]	−1. 65% (920 K)	−1. 88% (1070 K)
39	Holm (1971)	0. 13% (1025. 15 K)	0. 38% (1112. 25 K)
Surface tension (NSRDS reference data base Bertozzi (1965) [2], p. 63)			
69	Stepanov. Smirnov (1970)	0. 46% (935 K)	1. 44% (1070 K)
51	Berge, Holm (1970)	−0. 55% (1069. 1 K)	−1. 01% (1024. 0 K)

[a] The trend in the departures noted for the conductance data at higher temperatures is in accord with the possibility of stray capacitance shunts in the Van Artsdalen values; see Molten Salts, Volume 4, Part 2 [5] for additional comments on this point.

[b] See also [121].

[c] See also [91].

TABLE 42. Deviations from previous NSRDS recommendations: CuBr

Reference	Authors	Min. departure	Max. departure
	Conductance (NSRDS reference data base Tubandt (1931) [1], p. 16)		
9	Jander, Brodersen (1951)	graphical	

TABLE 43. Deviations from previous NSRDS recommendations: HgBr$_2$

Reference	Authors	Min. departure	Max. departure
	Conductance (NSRDS reference data base Grantham, Yosim (1966) [1], p. 17)		
7	Belyaev, Mironov (1950)	graphical	
9	Jander, Brodersen (1951)	graphical	
66	Cleaver, Smedley (1971)	graphical	
127	Mentus, Susic (1975)	graphical	
	Density (NSRDS reference data base Janz, McIntyre (1962) [1], p. 17)		
74	Beck (1907)	2.09% (520.2 K)	3.4% (531.2 K)

TABLE 44. Deviations from previous NSRDS recommendations: InBr$_3$

Reference	Authors	Min. departure	Max. departure
	Density (NSRDS reference data base Klemm (1926) [1], p. 18)		
97	Schoneborn	0.02% (753 K)	0.02% (793 K)

TABLE 45. Deviations from previous NSRDS recommendations: KBr

Reference	Authors	Min. departure	Max. departure
	Conductance (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 14)		
26	Moiseeva (1963)	0.16% (1023 K)	
78	Markov, Prisyazhnyii[a] (1962)	graphical	
25	Mehta, Lantelme, Chemla (1969)	0.89% (1023 K)	
33	Fedorov, Petrov, Chudina (1970)	graphical	
19	Buckle, Tsaoussoglou (1964)	0.26% (1040 K)	2.04% (1160 K)
80	Bizouard (1961)	−0.73% (1023 K)	−2.64% (1073 K)
83	Markov, Prisyazhnyii (1965)	graphical	
90	Doucet, Bizouard (1960)	−0.78% (1023 K)	−2.66% (1073 K)
82	Zuca, Ionescu-vasu (1967)	0.11% (1040 K)	−1.20% (1120 K)
94	Matsumura, Mizuno, Nishihara (1967)	−1.05% (1086 K)	−2.33% (1166 K)
40	Poillerat (1973)	graphical	
137	Mehta (1974)	−0.18% (1051.8 K)	1.20% (1018.7 K)
131	Smirnov et al. (1973)	−2.69% (1220 K)	−4.92% (1100 K)

TABLE 45. Deviations from previous NSRDS recommendations: KBr—Continued

Reference	Authors	Min. departure	Max. departure
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 14)			
56	Vasu (1969)	0.00% (1030 K)	
58	Jaeger, Kahn (1916)	0.03% (1059 K)	−0.39% (1024 K)
17	Murgulescu, Zuca (1965)	0.16% (1194 K)	0.21% (1020 K)
20	Buckle, Tsaoussoglou, Ubbelohde (1964)	0.22% (1037 K)	0.56% (1200 K)
91	Markov, Prisyazhnyii (1963)[b]	graphical	
88	Ellis, Smith[c] (1958)	−0.97% (1200 K)	−1.06% (1065 K)
82	Zuca, Ionescu-vasu (1967)	0.00% (1023 K)	0.05% (1200 K)
84	Kunugi, Yamate, Takeuchi (1960)	graphical	
39	Holm (1971)	0.06% (1033 K)	0.42% (1124 K)
100	Bloom, Bendall, Boyd, Laver (1974)	0.10% (1075 K)	0.38% (1200 K)
131	Smirnov, Shumov, Khokhlov, Stepanov, Noskevich, Antonenko (1973)	0.35% (1140 K)	0.38% (1020 K)
Viscosity[d] (NSRDS reference data base Murgulescu, Zuca (1961) [1], p. 14)			
56	Vasu (1969)	0.00% (1030 K)	
17	Murgulescu, Zuca (1965)	0.04% (1103 K)	−0.63% (1163 K)
94	Matsumura, Mizuno, Nishihara (1967)	15.18% (1073 K)	18.55% (1133 K)
Surface Tension (NSRDS reference data base Bloom, Davis, James (1960) [2], p. 63.			
15	Bertozzi, Soldani (1966)	graphical	
50	Ellis, Freeman (1965)[e]	0.69% (1076.2 K)	2.19% (1113.2 K)
47	Boardman, Palmer, Heymann (1955)	graphical	
93	Ellis (1959)[e]	0.73% (1076.2 K)	3.53% (1156.2 K)
51	Berge, Holm (1970)	2.44% (1024.4 K)	3.73% (1126.6 K)
141	Sternberg, Terzi (1973)	2.77% (1145 K)	2.95% (1025 K)
142	Sternberg, Terzi (1975)	2.74% (1175 K)	2.97% (1025 K)

[a] See also [77], [79], [85]. [b] See also [85]. [c] See also [22].

[d] Relative to the value reported in NSRDS-NBS-15 [1] the uncertainty estimate should be revised to ±3.0%.

[e] See also [128].

TABLE 46. Deviations from previous NSRDS recommendations: LiBr

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base van Artsdalen, Yaffe (1956) [1], p. 14)			
25	Mehta, Lantelme, Chemla (1969)	−0.24% (823 K)	1.58% (873 K)
80	Bizouard (1961)	0.02% (973 K)	0.05% (873 K)
23	Andryushchenko, Bergman (1965)	graphical	
96	Zuca, Olteanu (1974)	0.04% (881.2 K)	−2.37% (1004 K)
132	Simirnov, Khokhlov, Stepanov, Shumov (1973)	0.02% (915 K)	2.15% (830 K)
137	Mehta (1974)	0.29% (1014.8 K)	1.87% (917.2 K)
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 14)			
39	Holm (1971)	1.15% (974.95 K)	1.41% (895.45 K)
96	Zuca (1974)	0.00% (940 K)	0.57% (835 K)
132	Smirnov, Khokhlov, Stepanov, Shumov (1973)	−0.30% (1020 K)	−0.47% (830 K)

TABLE 47. Deviations from previous NSRDS recommendations: NaBr

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 14)			
18	Lantratov, Moiseeva (1963)	1.04% (1023 K)	
33	Fedorov, Petrov, Chudina (1970)	graphical	
80	Bizouard (1961)	0.02% (1073 K)	0.11% (1023 K)
82	Zuca, Ionescu-Vasu (1967)	−1.00% (1050 K)	−7.10% (1220 K)
94	Matsumura, Mizuno, Nishihara (1967)	−4.73% (1106 K)	−7.38% (1166 K)
77	Markov, Prisyazhnyii [a] (1962)	graphical	
40	Poillerat (1973)	graphical	
126	Bukhalova, Topshinoeva, Akhtyrskii, Snezhkov (1974)	graphical	
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 14)			
56	Vasu (1969)	0.00% (1060 K)	
58	Jaeger, Kahn (1916)	−0.25% (1102 K)	−0.38% (1060 K)
85	Markov, Prisyazhnyii [b] (1965)	graphical	
82	Zuca, Ionescu-Vasu (1967)	−0.02% (1043 K)	−0.06% (1220 K)
84	Kunugi, Yamate, Takeuchi (1960)	graphical	
39	Holm (1971)	−0.05% (1123.5 K)	−1.81% (1091.3 K)
42	Buckle, Tsaoussoglou (1973)	0.31% (1055 K)	0.41% (1225 K)
126	Bukhalova, Topshinoeva, Akhtyrskii, Snezhkov (1974)	graphical	
Viscosity [c] (NSRDS reference data base Murgulescu, Zuca (1961) [1], p. 14)			
56	Vasu (1969)	−0.25% (1060 K)	
94	Matsumura, Mizuno, Nishihara (1967)	11.47% (1083 K)	35.15% (1213 K)
Surface tension (NSRDS reference data base Sokolova, Voskresenskaya (1962) [2], p. 62)			
15	Bertozzi, Soldani (1965)	graphical	
48	Sternberg, Terzi (1972)	0.49% (1123 K)	−0.95% (1046 K)
47	Boardman, Palmer, Heymann (1955)	graphical	
51	Berge, Holm (1970)	−0.46% (1126.9 K)	−2.21% (1079.2 K)
142	Sternberg, Terzi (1975)	0.03% (1065 K)	1.47% (1170 K)

[a] See also [85]. [b] See also [91].

[c] Relative to the value reported in NSRDS-NBS-15, the uncertainty estimate should be revised to ±3.0%.

TABLE 48. Deviations from previous NSRDS recommendations: $PbBr_2$

Reference	Authors	Min. departure	Max. departure
Density (NSRDS reference data base Boardman, Dorman, Heymann (1949) [1], p. 18)			
17	Murgulescu, Zuca (1965)	0. 64% (770 K)	0. 85% (656 K)
18	Lantratov, Moiseeva (1963)	0. 00% (698 K)	−0. 02% (723 K)
Viscosity (NSRDS reference data base Murgulescu, Zuca (1965) [1], p. 18)			
92	Barsegov, Il'yasov (1970)	graphical	
86	Harrap, Heymann (1951)	graphical	

TABLE 49. Deviations from previous NSRDS recommendations: RbBr

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 15)			
87	Zuca, Olteanu (1968)	−0. 80% (1000 K)	−4. 0% (1120 K)
78	Markov, Prisyazhnyii [a] (1962)	graphical	
40	Poillerat (1973)	graphical	
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 15)			
56	Vasu (1969)	0. 10% (980 K)	
58	Jaeger, Kahn (1916)	0. 00% (970 K)	0. 38% (1053 K)
91	Markov, Prisyazhnyii (1963)	graphical	
87	Zuca, Olteanu (1968)	−0. 80% (1000 K)	−4. 00% (1120 K)
39	Holm (1971)	−0. 04% (1073 K)	0. 04% (1073 K)
42	Buckle, Tsaoussoglou (1973)	0. 12% (1025 K)	0. 13% (1145 K)
Viscosity (NSRDS reference data base Murgulescu, Zuca (1961) [1], p. 15)			
56	Vasu (1969)	0. 01% (980 K)	
Surface Tension (NSRDS reference data base Bertozzi (1965) [2], p. 63)			
15	Bertozzi, Soldani (1966)	graphical	
51	Berge, Holm (1970)	−0. 65% (1074. 7 K)	−1. 24% (1018. 9 K)
142	Sternberg, Terzi (1975)	0. 05% (1065 K)	−1. 38% (995 K)

[a] See also [85].

TABLE 50. Deviations from previous NSRDS recommendations: TlBr

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Grantham, Yosim (1966) [1], p. 18)			
19	Buckle, Tsaoussoglou (1964)	0.03% (800 K)	0.47% (760 K)
28	Protsenko, Shatskaya (1967)	graphical	
Density (NSRDS reference data base Buckle, Tsaoussoglou, Ubbelohde (1964) [1], p. 18)			
98	Franke (1972)	0.00% (873 K)	−0.89% (793 K)

TABLE 51. Deviations from previous NSRDS recommendations: $ZnBr_2$

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Bockris, Crook, Bloom, Richards (1960) [1], p. 17)			
73	Emons, Tautz (1969)	0.62% (733.15 K)	0.87% (823.15 K)
61	Markov, Polishchuk[a] (1965)	graphical	
101	Voronin, Prizyazhnyii, Baranov (1974)	−9.95% (873 K)	
Density[b] (NSRDS reference data base Bockris, Pilla, Barton (1962) [1], p. 17)			
24	Markov, Prisyazhnyii, Prikhodko (1968)	0.13% (690 K)	0.42% (860 K)
100	Bloom, Bendall, Boyd, Laver (1974)	0.63% (880 K)	0.71% (735 K)

[a] See also [60].

[b] Relative to the value reported in NSRDS-NBS 15 [1] the uncertainty estimate should be revised to ±1%.

5.5. Discussions and Numerical Values: Iodide Salts

Single iodide salts for which a new or revised recommendation is reported are discussed in this section in the same manner as single bromide salts were discussed in section 5.3.

AgI

Surface Tension

The only information available for this salt is that presented graphically by Boardman, Palmer and Heymann (maximum bubble pressure method) [**47**]. Two points at 500 and 600 °C are indicated on the graphs for surface tension vs. concentration for the system AgBr-AgI. Interpolation yields values of 114 dyn cm^{-1} at 773 K and 117 dyn cm^{-1} at 873 K at 0 mol percent AgBr, respectively.

TABLE 52. Investigations critically re-examined: AgI

Ref.	Temp. range (*T*)
47	773, 873

AlI_3

Melt Preparation and Purification

Grothe, Kleinschmidt and Franke [**112, 123**] prepared AlI_3 by direct reaction of the elements, using 99.99% pure aluminum metal shavings and subliming the iodine directly into the reaction vessel. The apparatus was purged with dry nitrogen before introducing the materials. During the two-hour reaction, the temperature was maintained at 500–550 °C. A pure white solid was obtained.

TABLE 53. Viscosity studies: AlI_3

Investigations critically re-examined		
Ref.	Temp. range (*T*)	Comments
112, 123	480–660	Cell material: tungsten wire and Ni cylinder; calibration: KNO_3

TABLE 54. AlI_3: *Viscosity (cp)*

$$\eta = 52.1726 - 0.228761\ T + 3.45944 \times 10^{-4} T^2 - 1.77304 \times 10^{-7} T^3$$

Standard error of estimate: 1.312%

T	η	*T*	η
480	2.46	580	1.27
500	2.12	600	1.16
520	1.83	620	1.07
540	1.60	640	0.99
560	1.42	660	0.91

These values are based on the work of Grothe, Kleinschmit and Franke (oscillating body method) [**112, 123**]. The uncertainty of these values is estimated to be ±3%.

BiI_3

Melt Preparation and Purification

Bismuth iodide was prepared by reaction of reagent grade Bi_2O_3 with aqueous HI followed by evaporation of the water under under a nitrogen stream. The crude BiI_3 thus obtained was distilled twice under a stream of dry N_2. The product from the second distillation was ground in a mortar and stored in a desiccator. Since BiI_3 tends to decompose to yield free I_2 when heated, the distilled BiI_3 was tested for the presence of I_2. Duplicate samples of BiI_3 were dissolved under an atmosphere of N_2 in oxygen-free KI solution acidified with HCl and immediately titrated with $Na_2S_2O_3$ solution. Less than 0.03% I_2 was found to be present. The melting point of the pure BiI_3 ranged from 405.9 to 406.6 °C. [**60**].

TABLE 55. Density studies: BiI_3

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
60[a]	698–765	Cell material: Pyrex; calibration: water

[a] It was estimated that the difference between the shapes of the menisci of BiI_3 and H_2O (the calibrant) introduced an error of less than 0.05%.

TABLE 56. BiI_3: Density (g cm^{-3})

$\rho = 6.200 - 22 \cdot 10^{-3} T$

T	ρ	T	ρ
700	4.646	735	4.568
705	4.635	740	4.557
710	4.624	745	4.546
715	4.613	750	4.535
720	4.602	755	4.524
725	4.591	760	4.513
730	4.579	765	4.502

These values are based on the work of Keneshea and Cubicciotti (pycnometric method) [**60**].

CdI_2

Melt Preparation and Purification

Stachowicz and Suski [**125**] used cadmium iodide that was crystallized, fused and filtered under vacuum through a quartz filter.

TABLE 57. Viscosity studies: CdI_2

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
125	675.4–926.7	Cell material: quartz capillary viscometer; calibration: H_2SO_4 and aqueous KCl solutions (293 K) and molten $CdCl_2$ (903.5 K and 1009 K)
92	683, 723, 763, 793(g)	

Stachowicz and Suski [125] reported viscosity data in an equation of the form $\ln \eta = (3545 \pm 87)/T - (2.50 \pm 0.11)$. The experimentally measured times of flow, densities and temperatures were sent March 6, 1975 (L. Suski to G. Janz, private communication). The average of the absolute deviations of the values calculated from the above equation from experimental viscosities is 3.3%.

TABLE 58. CdI_2: Viscosity (cp)

$\ln \eta = 3545/T - 2.50$

T	η	T	η
680	15.1	810	6.53
690	14.0	820	6.19
700	13.0	830	5.88
710	12.1	840	5.59
720	11.3	850	5.32
730	10.6	860	5.06
740	9.88	870	4.83
750	9.27	880	4.61
760	8.71	890	4.41
770	8.20	900	4.22
780	7.73	910	4.04
790	7.30	902	3.87
800	6.90		

These values are based on the work of Stachowicz and Suski (Ostwald capillary technique) [**125**].

DyI_3

Melt Preparation and Purification

The method used by Kutscher and Schneider [**108, 109**] to prepare lanthanide iodides is discussed under GdI_3.

TABLE 59. Electrical conductance studies: DyI_3

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
109	1247. 7–1329. 7	Cell material: quartz capillary; Mo electrodes; freq. range: 100,000–250,000 Hz.; calibration: molten NaCl

TABLE 60. DyI_3: Specific conductance ($ohm^{-1} cm^{-1}$)

T	κ	T	κ
1247. 7	0. 38	1295. 7	0. 44
1257. 7	0. 40	1325. 2	0. 46
1294	0. 44	1329. 7	0. 46

These values have been interpolated to two significant figures from the graphical data of Kutscher and Schneider (classical ac technique) [**107, 109**].

GaI_3

Melt Preparation and Purification

Riebling and Erikson [**111**] prepared GaI_3 by placing weighed amounts of gallium metal (ALCOA 99.99%) and iodine crystals (reagent grade) in a reaction vessel attached to the upper end of a dilatometer. The dilatometer assembly was then evacuated to a pressure of about 0.025 torr, placed in a cold furnace and gradually heated to 359–500 °C. Several days were allowed for the reaction. A similar method was used to prepare the salts used for the conductance study.

Greenwood and Worrall [**71**] prepared GaI_3 by direct synthesis from pure gallium metal and Analar iodine. The gallium was placed in a reaction vessel which was then evacuated. Iodine vapor was cycled over the heated metal until all the gallium had reacted. The excess iodine was then removed by means of a cold trap. The yellow product was purified by six successive sublimations at 160 °C in a 1-cm diameter vacuum train. The melting point of the purified GaI_3 was 211.5±0.1 °C.

TABLE 61. Electrical conductance studies: GaI_3

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
111 [a]	458–673	Cell material: Pyrex; W wire electrodes; freq. range: 1000 Hz; calibration: aqueous KCl solutions
71	485. 2	Cell material: Pyrex; W electrodes; freq. range: 1000 Hz; calibration: aqueous KCl solutions

Comparisons with NSRDS recommendations [this volume]	
Ref.	Departure
71	−84.6% (485.2 K)

[a] Each measurement was repeated five times, with the mean value used to calculate the resistances. The standard deviation of the mean measured resistances varied from ±0.2% for high resistances (of the order of 1000 ohms) to ±1.5% for low resistances (of the order of 100 ohms).

TABLE 62. GaI_3: Specific conductance ($ohm^{-1}cm^{-1}$)

$\kappa=1.0763 \cdot 10^{-1} \exp(-4763/RT)$ (458–495 K)
$\kappa=1.5556 \cdot 10^{-2} \exp(-2854/RT)$ (495–557 K)
$\kappa=2.1915 \cdot 10^{-3} \exp(-6773/RT)$ (557–625 K)
$\kappa=6.1450 \cdot 10^{-5} \exp(3764.6/RT)$ (625–673 K)

T	$\kappa(\times 10^4)$	T	$\kappa(\times 10^4)$
460	5. 874	570	12. 05
465	6. 213	575	12. 11
470	6. 563	580	12. 18
475	6. 925	585	12. 24
480	7. 299	590	12. 30
485	7. 684	595	12. 36
490	8. 082	600	12. 42
495	8. 491	605	12. 47
500	8. 794	610	12. 53
505	9. 048	615	12. 59
510	9. 304	620	12. 65
515	9. 563	625	12. 70
520	9. 823	630	12. 43
525	10. 08	635	12. 14
530	10. 35	640	11. 86
535	10. 61	645	11. 59
540	10. 88	650	11. 33
545	11. 15	655	11. 08
550	11. 42	660	10. 84
555	11. 69	665	10. 61
560	11. 92	670	10. 39
565	11. 99		

These values are based on the work of Riebling and Erickson (classical ac technique) [**111**].

TABLE 63. Density studies: GaI_3

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
111[a]	458–498	Cell material: Pyrex dilatometer; calibration: water

[a] Riebling and Erickson reported an accuracy of ±0.1% in their density measurements.

TABLE 64. GaI_3: Density (g cm^{-3})

$\rho = 4.778 - 2.377 \times 10^{-3} T$

T	ρ	T	ρ
460	3.685	495	3.601
465	3.673	500	3.590
470	3.661	505	3.578
475	3.649	510	3.566
480	3.637	515	3.554
485	3.625	520	3.542
490	3.613	525	3.530

These values are based on the work of Riebling and Erickson (dilatometric method) [**111**].

GdI_3

Melt Preparation and Purification

Kutscher and Schneider [**108, 109**] prepared lanthanide (III) iodides by dissolving the corresponding lanthanide oxide (Auer-Remy, Hamburg, Germany) of 99.99% purity in a mixture of NH_4I (Merck "Suprapur") and HI (Merck "Suprapur"). Following evaporation to dryness, the remaining mixture of iodides was heated under high vacuum, driving off NH_3, H_2O, and HI. The remaining ammonium salt was removed by sublimation. Liberated water was quickly removed to prevent the formation of oxyiodide. The product was further purified by careful sublimation under high vacuum (5×10^{-5} torr) over a period of 10–12 h. The salt was sealed under slightly reduced pressure in an ampoule filled with argon (> 99.99% purity).

TABLE 65. Electrical conductance studies: GdI_3

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
109	1232.7–1331(g)	Cell material: quartz capillary; Mo electrodes; freq. range: 100,000–250,000 Hz; calibration: molten NaCl

TABLE 66. GdI_3: Specific conductance (ohm^{-1} cm^{-1})

T	κ
1232.7	0.43
1243	0.44
1246.7	0.44
1278.7	0.46
1286	0.48
1287.7	0.48
1322	0.51
1324.7	0.51
1331	0.52

These values have been interpolated to two significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 67. Density studies: GdI_3

Investigations critically re-examined			
Ref.	Temp. range (T)	Cell material	Calibration
108	1254.2–1306.2	Quartz	Hg

TABLE 68. GdI_3: Density (g cm^{-3})

$\rho = 5.2097 - 0.9086 \cdot 10^{-3} T$

T	ρ	T	ρ
1255	4.069	1285	4.042
1260	4.065	1290	4.038
1265	4.060	1295	4.033
1270	4.056	1300	4.029
1275	4.051	1305	4.024
1280	4.047		

These value are based on the work of Kutscher and Schneider (dilatometric method) [**108**].

InI_3

Melt Preparation and Purification

Grothe, Franke, and Schoneborn [**97, 118**] used reagent grade InI_3 without further purification. All operations were carried out in a controlled nitrogen atmosphere. The samples were dried at 440 °C under nitrogen and stored under vacuum. A melting point range of 204–208 °C was observed. No decomposition products were found.

TABLE 69. Viscosity studies: InI_3

References critically re-examined		
Ref.	Temp. range (T)	Comments
97, 118	553.2–833.2	Cell material: tungsten torsion wire; calibration: CCl_4, n-hexane, ether, ethylbromide, methyliodide.

TABLE 70. InI_3: Viscosity (cp)

$$\eta=0.051930 \exp (4683.8/RT)$$

Standard error of estimate: 2.31%

T	η	T	η
560	3. 494	700	1. 506
580	3. 022	720	1. 371
600	2. 639	740	1. 255
620	2. 325	760	1. 154
640	2. 065	780	1. 066
660	1. 847	800	0. 988
680	1. 663	820	0. 920

These values are based on the work of Grothe, Franke and Schoneborn (hollow-body torsion method) [**97, 118**]. No uncertainty estimate is possible due to the limited amount of information given.

LaI_3

Melt Preparation and Purification

The method used by Kutscher and Schneider [**108, 109**] to prepare lanthanide iodides is discussed under GdI_3.

TABLE 71. Electrical conductance studies: LaI_3

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
109	1092–1227(g)	Cell material: quartz capillary; Mo electrodes; freq. range: 100,000–250,000 Hz; calibration: molten NaCl

TABLE 72. LaI_3: Specific conductance (ohm^{-1} cm^{-1})

T	κ	T	κ
1092	0. 50	1150. 7	0. 57
1093	0. 50	1193	0. 64
1095	0. 50	1198. 7	0. 65
1140	0. 57	1227	0. 67
1146	0. 57		

These values have been interpolated to two significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 73. Density studies: LaI_3

Investigations critically re-examined			
Ref.	Temp. range (T)	Cell material	Calibration
108	1123. 7–1182. 2	Quartz	Hg

TABLE 74. LaI_3: Density (g cm^{-3})

$$\rho=5.4581-1.1109 \cdot 10^{-3} T$$

T	ρ	T	ρ
1125	4. 208	1155	4. 175
1130	4. 203	1160	4. 169
1135	4. 197	1165	4. 164
1140	4. 192	1170	4. 158
1145	4. 186	1175	4. 153
1150	4. 181	1180	4. 147

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**].

LiI

TABLE 75. Surface tension studies: LiI

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
133	~860–1110	Cell material: Mo crucible; calibration: molten NaCl
113	723, 823, 923, 973	

Deviations from NSRDS recommendations [this volume]		
Ref.	Min. departure	Max. departure
113	−5. 08% (923 K)	−5. 13% (973 K)

TABLE 76. LiI: Surface tension (dyn cm^{-1})

$\gamma = 140.7 - 0.0565\ T$

T	γ	T	γ
860	92.1	990	84.8
870	91.5	1000	84.2
880	91.0	1010	83.6
890	90.4	1020	83.1
900	89.9	1030	82.5
910	89.3	1040	81.9
920	88.7	1050	81.4
930	88.1	1060	80.8
940	87.6	1070	80.2
950	87.0	1080	79.7
960	86.5	1090	79.1
970	85.9	1100	78.5
980	85.3	1110	78.0

These values are based on the work of Smirnov and Stepanov (maximum bubble pressure method) [**133**].

NdI_3

Melt Preparation and Purification

The method used by Kutscher and Schneider [**108**, **109**] to prepare lanthanide iodides is discussed under GdI_3.

TABLE 77. Electrical conductance studies: NdI_3

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
109	1092–1196.7(g)	Cell material: quartz capillary; Mo electrodes; freq. range 100,000–250,000 Hz; calibration: molten NaCl

TABLE 78. NdI_3: Specific conductance (ohm^{-1} cm^{-1})

T	κ	T	κ
1092	0.42	1141.7	0.48
1093	0.42	1187	0.54
1139	0.48	1195.7	0.55
1140.7	0.48	1196.7	0.55

These values have been interpolated to two significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 79. Density studies: NdI_3

Investigations critically re-examined

Ref.	Temp. range (T)	Cell material	Calibration
108	1110.7–1193.2	Quartz	Hg

TABLE 80. NdI_3: Density (g cm^{-3})

$\rho = 5.4069 - 1.0701 \cdot 10^{-3}\ T$

T	ρ	T	ρ
1110	4.219	1155	4.171
1115	4.214	1160	4.165
1120	4.208	1165	4.160
1125	4.203	1170	4.155
1130	4.198	1175	4.149
1135	4.192	1180	4.144
1140	4.187	1185	4.139
1145	4.182	1190	4.133
1150	4.176		

These values are based on the work of Kutscher and Schneider (dilatometric method [**108**].

PbI_2

Melt Preparation and Purification

To remove traces of water, Bogacz and Zuca [**106**] treated the fused PbI_2 in their conductance cell with dry hydrogen iodide (an equilibrium mixture of HI, H_2 and I_2).

TABLE 81. Electrical conductance studies: PbI_2

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
106	723–1073	Cell material: quartz

Deviations from previous NSRDS recommendations [1, p. 84]

Ref.	Min. departure	Max. departure
106	11.73% (873 K)	23.28% (723 K)

TABLE 82. Density studies: PbI_2

Investigations critically re-examined		
Ref.	Temp. range (T)	Comments
106	684–970	Cell material: Pt float; calibration: H_2O

TABLE 83. PbI_2: Specific conductance ($ohm^{-1}\ cm^{-1}$) and density ($g\ cm^{-3}$)

$$\kappa = -1.72999 + 4.11203 \times 10^{-3} T - 1.22890 \times 10^{-6} T^2$$

Standard error of estimate: 0.31%

$$\rho = 6.77966 - 1.5938 \times 10^{-3} T$$

T	κ	ρ
690		5. 680
710		5. 648
730	0. 617	5. 616
750	0. 662	5. 584
770	0. 708	5. 552
790	0. 752	5. 521
810	0. 794	5. 489
830	0. 836	5. 457
850	0. 877	5. 425
870	0. 917	5. 393
890	0. 956	5. 361
910	0. 994	5. 329
930	1. 031	5. 297
950	1. 067	5. 266
970	1. 102	5. 234

The data bases for these are electrical conductance: Bogacz and Zuca (classical ac technique) [106] and density: Bogacz and Zuca (Archimedean method) [106]. The data base for electrical conductance supersedes the previous recommendation [1, p. 84].

SbI_3

Melt Preparation and Purification

Saito, Ichikawa and Shimoji [81] purified SbI_3 by distillation or sublimation in vacuo.

TABLE 84. Electrical conductance and density studies: SbI_3

Investigations critically re-examined			
Property	Ref.	Temp. range (T)	Comments
κ^a	81	482–544	Cell material: quartz; calibration: KCl
	57	443–683 (g)	Cell material: quartz or Pyrex, tungsten electrodes
	127	≃453–813 (g)	Cell material: Pyrex; Pt electrodes; calibration: molten HgI_2
ρ	81	445–595	

[a] Additional reference: G. Hevesy; Medd. Danske Selsk, 3, 17 (1921).

TABLE 85. SbI_3: Specific conductance ($ohm^{-1} cm^{-1}$), equivalent conductance ($ohm^{-1} cm^2 equiv^{-1}$) and density ($g\ cm^{-3}$)

$$\kappa = -6.1327 \times 10^{-3} + 2.2801 \times 10^{-5} T - 1.9491 \times 10^{-8} T^2$$

Standard error of estimate: 1.48%

$$\Lambda = 2.1551 \exp(-3767/RT)$$

Standard error of estimate: 2.21%

$$\rho = 4.590 - 2.483 \times 10^{-3} T$$

T	$\kappa(x10^4)$	$\Lambda(x10^2)$	ρ
455			3. 460
460			3. 448
465			3. 435
470			3. 423
475			3. 411
480			3. 398
485	3. 411	4. 347	3. 386
490	3. 600	4. 524	3. 373
495	3. 781	4. 704	3. 361
500	3. 951	4. 888	3. 349
505	4. 112	5. 075	3. 336
510	4. 262	5. 265	3. 324
515	4. 404	5. 459	3. 311
520	4. 535	5. 655	3. 299
525	4. 657	5. 855	3. 286
530	4. 769	6. 058	3. 274
535	4. 871	6. 264	3. 262
540	4. 963	6. 473	3. 249
545			3. 237
550			3. 224
555			3. 212
560			3. 200
565			3. 187
570			3. 175
575			3. 162
580			3. 150
585			3. 137
590			3. 125
595			3. 113

The data bases for these are, electrical conductance: Saito: Ichikawa and Shimoji (classical ac technique) [81] and density, Saito, Ichikawa and Shimoji (pycnometric method) [81].

TlI

Melt Preparation and Purification

Franke [**98**] evacuated the TlI-containing sample tubes to $10^{-3}-10^{-4}$ torr and purged several times with dry, oxygen-free nitrogen. After drying at 350° C, the tubes were sealed off under vacuum.

TABLE 86. Density studies: TlI

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
98	733–973	Cell material: quartz; calibration: Hg

TABLE 87. TlI: Density (g cm^{-3})

$$\rho = 8.41348 - 4.15488 \times 10^{-3} T + 1.40282 \times 10^{-6} T^2$$

Standard error of estimate: 0.07%

T	ρ	T	ρ
740	6.107	860	5.878
750	6.086	870	5.861
760	6.066	880	5.843
770	6.046	890	5.827
780	6.026	900	5.810
790	6.007	910	5.794
800	5.987	920	5.778
810	5.968	930	5.763
820	5.950	940	5.747
830	5.931	950	5.732
840	5.913	960	5.718
850	5.895		

These values are based on the work of Franke (dilatometric technique) [**98**].

TABLE 88. Viscosity studies: TlI

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
98, 118	733.2–973.2	Cell material: quartz; calibration: CCl_4, n-hexane, ether, ethylbromide, methyliodide

TABLE 89. TlI: Viscosity (cp)

$$\eta = 18.38347 - 0.0376374\,T + 2.48419 \times 10^{-5} T^2 - 4.19035 \times 10^{-9} T^3$$

Standard error of estimate: 0.13%

T	η	T	η
740	2.437	860	1.723
760	2.288	880	1.645
780	2.152	900	1.577
800	2.027	920	1.520
820	1.914	940	1.474
840	1.813	960	1.439

These values are based on the work of Grothe, Franke and Schöneborn (hollow-body torsion method) [**98, 118**]. No uncertainty estimate is given due to the limited amount of information.

ZnI_2

Melt Preparation and Purification

In their studies of metal-metal halide systems, Emons et al. [**73, 121, 139**] used pre-dried salts which they further dried by heating either in a stream of the appropriate hydrogen halide or under vacuum. The aqueous solutions of these salts were essentially neutral. Analysis of the melts was made by standard complexometric and argentometric methods.

TABLE 90. Electrical conductance studies: ZnI_2

Investigations critically re-examined

Ref.	Temp. range (T)	Comments
73	733.2–823.2	Cell material: Armco-iron and Mo; calibration: NaCl, KCl, $CaCl_2$

TABLE 91. ZnI_2: Specific conductance (ohm^{-1} cm^{-1})

$$\kappa = -0.772666 + 0.114918 \times 10^{-2}\,T$$

Standard error of estimate: 2.78%

T	κ
740	0.078
760	0.101
780	0.124
800	0.147
820	0.170

These values are based on the work of Emons and Tautz (classical ac technique) [**73**].

5.6. Additional Studies: Iodide Salts

The following table summarizes information relative to additional studies for single iodide salt melts that have been reported since the publication of NSRDS-NBS-15 [1] and NSRDS-NBS-28 [2]. This information does not include new systems or cases where a revised recommendation has been introduced; such cases are discussed in detail in section 5.5.

TABLE 92. Deviations from previous NSRDS recommendations: AgI

Reference	Authors	Min. departure	Max. departure
Conductance [a] (NSRDS reference data base Biltz, Klemm (1926) [1], p. 21)			
114	Kvist, Josefson (1968)	0.02% (874 K)	4.16% (979 K)

[a] Relative to the value reported in NSRDS–NBS 15 [1] the uncertainty estimate should be revised to ± 5.0%.

TABLE 93. Deviations from previous NSRDS recommendations: AlI_3

Reference	Authors	Min. departure	Max. departure
Density (NSRDS reference data base Biltz, Klemm (1926) [1], p. 23)			
135	Izbekov, Nizhnik (1937)	1.72%	(473 K) [a]

[a] Single data point.

TABLE 94. Deviations from previous NSRDS recommendations: BiI_3

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Grantham, Yosim (1963) [1], p. 23)			
54	Darnell, McCollum, Yosim (1969)	Measurements made at a pressure of 5.4 Kbar	
65	Grantham, Yosim (1963)	graphical	
95	Ichikawa, Shimoji (1968)	graphical	

TABLE 95. Deviations from previous NSRDS recommendations: CdI_2

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Bockris, Crook, Bloom, Richards (1960) [1], p. 22)			
64	Grantham (1966)	0.33% (921.16 K)	2.03% (868.16 K)
52	Suski, Stachowicz (1972)	graphical	
Density (NSRDS reference data base Bloom, Knaggs, Molloy, Welch (1953) [1], p. 22)			
38	Il'yasov, Barsegov (1970)	graphical	
100	Bloom, Bendall, Boyd, Laver (1974)	−0.23% (910 K)	−0.38% (770 K)

TABLE 96. Deviations from previous NSRDS recommendations: CsI

Reference	Authors	Min. departure	Max. departure
Conductance [a] (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 20)			
87	Zuca, Olteanu (1968)	−1.08% (945 K)	−14.61% (1130 K)
96	Zuca, Olteanu (1974)	−3.46% (959.2 K)	−15.41% (1130 K)
129	Smirnov, Shumov, Khokhlov (1971)	−0.28% (935 K)	−11.16% (1070 K)
109	Kutscher, Schneider (1972)	graphical	
130	Smirnov et al. (1973)	−0.54% (935 K)	−11.38% (1070 K)
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 20)			
96	Zuca, Olteanu (1974)	0.36% (1130 K)	0.74% (960 K)
58	Jaeger, Kahn (1916)	0.42% (974.16 K)	0.46% (912.16 K)
87	Zuca, Olteanu (1968)	0.47% (1080 K)	0.77% (940 K)
122	Prisyazhnyii, Bryzgailo (1966)	graphical	
69	Stepanov, Smirnov (1970) [b]	0.50% (1070 K)	0.94% (930 K)
100	Bloom, Bendall, Boyd, Laver (1974)	0.73% (930 K)	0.77% (1045 K)
108	Kutscher, Schneider (1974)	0.50% (1130 K)	0.54% (1025 K)
Surface tension (NSRDS reference data base Jaeger (1917) [2], p. 64)			
69	Stepanov, Smirnov (1970)	0.93% (950 K)	2.10% (1070 K)

[a] The trend in the departures for the conductance data at higher temperatures is in accord with the possibility of stray capacitance shunts in the Van Artsdalen values: see Molten Salts, Volume 4, Part 2 [5] for additional comments on this point.

[b] See also [130] and [138].

TABLE 97. Deviations from previous NSRDS recommendations: HgI_2

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Grantham, Yosim (1966) [1], p. 22)			
115	Darnell, McCollum (1971)	graphical	
66	Cleaver, Medley (1971)	graphical	
105	Belyaev (1953)	6. 57% (543. 16 K)	14. 78% (573. 16 K)
7	Belyaev, Mironov (1950)	graphical	
27	Belyaev, Mironov (1952)	8. 99% (548. 16 K)	27. 63% (623. 16 K)
119	Bergman, Chagin (1940)	7. 24% (548. 16 K)	10. 07% (573. 16 K)
116	Bannard, Treiber (1973)	graphical	
127	Mentus, Susic (1975)	graphical	
Density (NSRDS reference data base Janz, McIntyre (1962) [1], p. 22)			
74	Beck (1907)	2. 20% (537. 16 K)	
Viscosity (NSRDS reference data base Janz, McIntyre (1962) [1], p. 22)			
103	Stromberg (1939)	3. 48% (565 K)	19. 3% (629 K)

TABLE 98. Deviations from previous NSRDS recommendations: InI_3

Reference	Authors	Min. departure	Max. departure
Density (NSRDS reference data base Klemm (1926) [1], p. 22)			
97	Schoneborn (1974)	0. 00% (513 K)	0. 00% (873 K)

TABLE 99. Deviations from previous NSRDS recommendations: KI

Reference	Authors	Min. departure	Max. departure
Conductance[a] (NSRDS reference data base van Artsdalen, Yaffe (1955) [1], p. 19)			
106	Bogacz, Zuca (1966)	0. 01% (1048. 2 K)	1. 30% (998. 2 K)
82	Zuca, Ionescu-Vasu (1967)	0. 02% (1140 K)	1. 26% (1000 K)
96	Zuca, Olteanu (1974)	0. 02% (1106. 8 K)	0. 54% (995. 2 K)
108	Kutscher, Schneider (1974)	graphical	
131	Smirnov et al. (1973)	0. 02% (1045 K)	4. 17% (965 K)
Density (NSRDS reference data base van Artsdalen, Yaffe (1955) [1], p. 19)			
96	Zuca, Olteanu (1974)	0. 04% (1000 K)	0. 23% (1160 K)
106	Bogacz, Zuca (1966)	0. 03% (1150 K)	0. 03% (1060 K)
128	Prisyazhnyii, Bryzgailo (1966)	graphical	
82	Zuca, Ionescu-Vasu (1967)	−0. 04% (1000 K)	−0. 25% (1180 K)
85	Markov, Prisyazhnyii (1965)[b]	graphical	
131	Smirnov et al. (1973)	0. 38% (1090 K)	0. 45% (1005 K)
108	Kutscher, Schneider (1974)	0. 02% (1025 K)	0. 41% (1180 K)

[a] Relative to the value reported in NSRDS–NBS–15 [1] the uncertainty estimate should be revised to ±1.5%.

[b] See also [127].

TABLE 100. Deviations from previous NSRDS recommendations: LiI

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Johnson (1968) [1], p. 19)			
96	Zuca, Olteanu (1974)	−0. 02% (871. 8 K)	−0. 46% (778. 7 K)
132	Smirnov, Khokhlov, Stepanov, Shumov (1973)	0. 29% (875 K)	0. 40% (760 K)
Density (NSRDS reference data base van Artsdalen (1956) [1], p. 19)			
96	Zuca, Olteanu (1974)	0. 00% (835 K)	−0. 23% (765 K)
132	Smirnov, Khokhlov, Stepanov, Shumov (1973)	0. 48% (760 K)	0. 49% (880 K)

TABLE 101. Deviations from previous NSRDS recommendations: NaI

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 19)			
106	Bogacz, Zuca (1966)	0.24% (1048.2 K)	4.99% (948.2 K)
82	Zuca, Ionescu-vasu (1967)	−0.13% (1055 K)	5.11% (945 K)
96	Zuca, Olteanu (1974)	−0.04% (1053.2 K)	4.79% (945 K)
109	Kutscher, Schneider (1972)	graphical	
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 19)			
101	Bogacz, Zuca[a] (1966)	0.07% (1140 K)	0.13% (950 K)
85	Markov, Prisyazhnyii[b] (1965)	graphical	
124	Bukhalova, Shegurova, Yagubyan (1973)	Single point at 1273 K, outside range of data base	
96	Zuca, Olteanu (1974)	−0.07% (1120 K)	−0.13% (945 K)
108	Kutscher, Schneider (1974)	0.08% (1025 K)	0.42% (1180 K)

[a] See also [82]. [b] See also [120].

TABLE 102. Deviations from previous NSRDS recommendations: RbI

Reference	Authors	Min. departure	Max. departure
Conductance (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 20)			
87	Zuca, Olteanu (1968)	−0.02% (995 K)	−1.44% (1095 K)
96	Zuca, Olteanu (1974)	0.03% (933.7 K)	−3.63% (1130.8 K)
Density (NSRDS reference data base Yaffe, van Artsdalen (1956) [1], p. 20)			
87	Zuca, Olteanu (1968)	0.00% (940 K)	0.12% (1120 K)
96	Zuca, Olteanu (1974)	0.00% (945 K)	−0.10% (1095 K)

6. Binary Mixtures

6.1. Bromide-Bromide Systems

This section contains the studies tables and the numerical tables for the physical properties of bromide-bromide melts. It also includes, for each system, a summary of the methods used for melt preparation and purification and a temperature-liquidus phase diagram when available. See sections 3.3, 4.2, and 4.3 for information on the form of presentation of this material.

AgBr-CsBr

Melt Preparation and Purification

Poillerat [**40**] dried "Suprapur" Merck CsBr under vacuum in a furnace at 450 °C. Reagent-grade AgBr was melted and Br_2 allowed to bubble through the melt. This was then filtered and purified by zone-refining.

The method used by Brooks and Paul [**44**, **46**] to purify AgBr is given under the system AgBr-KBr. CsBr (99.9% B.D.H.) was dried by heating under vacuum at 200 °C for three days, followed by treatment with a stream of freshly-prepared, dry HBr for two hours while slowly raising the temperature to the melting point. Finally, dry N_2 was bubbled through the melt for two hours to remove all traces of the HBr.

TABLE 103. Electrical conductance studies: AgBr-CsBr

Investigations critically re-examined			
Ref.	CsBr mol %	Temp. range (T)	Comments
40	0–100 (g)	570–1020	Cell material: quartz; Pt electrodes; calibration: 0.1 N NaCl and 0.1 N KCl at 20 °C and 25 °C.

Mixtures were prepared under argon. The uncertainty in the composition of the mixtures was estimated to be 0.1%; temperature control was ±0.3%, while the resistance was measured with an uncertainty of 0.1% [**40**].

TABLE 104. AgBr-CsBr: Specific conductance ($ohm^{-1}cm^{-1}$)

CsBr mol %	600 K	650 K	700 K	750 K	800 K	850 K	900 K	950 K
0			2. 98	3. 08	3. 18	3. 28	3. 38	3. 48
20	1. 18	1. 35	1. 48	1. 58	1. 68	1. 75	1. 82	1. 90
30	0. 80	0. 98	1. 10	1. 20	1. 32	1. 42	1. 50	1. 58
50	0. 32	0. 48	0. 55	0. 70	0. 82	0. 90	0. 98	1. 08
60		0. 38^a	0. 48	0. 60	0. 70	0. 80	0. 90	1. 00
80					0. 65^a	0. 72	0. 85	0. 95
100					0. 50^a	0. 65^a	0. 77	0. 92

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Poillerat (modified potentiometric ac method) [40].

TABLE 105. Density studies: AgBr-CsBr

Investigations critically re-examined

	CsBr	Temp. range (T)	Comments
44, 46	50	749–1077	Cell material: Pt bob and suspension wire; calibration: H_2O

TABLE 106. AgBr-CsBr: Density (g cm^{-3})

Mol % CsBr=50

T	ρ	T	ρ
760	4. 027	920	3. 823
780	4. 001	940	3. 798
800	3. 976	960	3. 772
820	3. 951	980	3. 745
840	3. 925	1000	3. 721
860	3. 900	1020	3. 696
880	3. 874	1040	3. 671
900	3. 849	1060	3. 645

temperature-dependent equation

$$\rho = a - bT$$

Mol % CsBr	a	$b \times 10^3$
50	4.993_8	1.272_3

These values are based on the work of Brooks and Paul (Archimedean method) [44, 46].

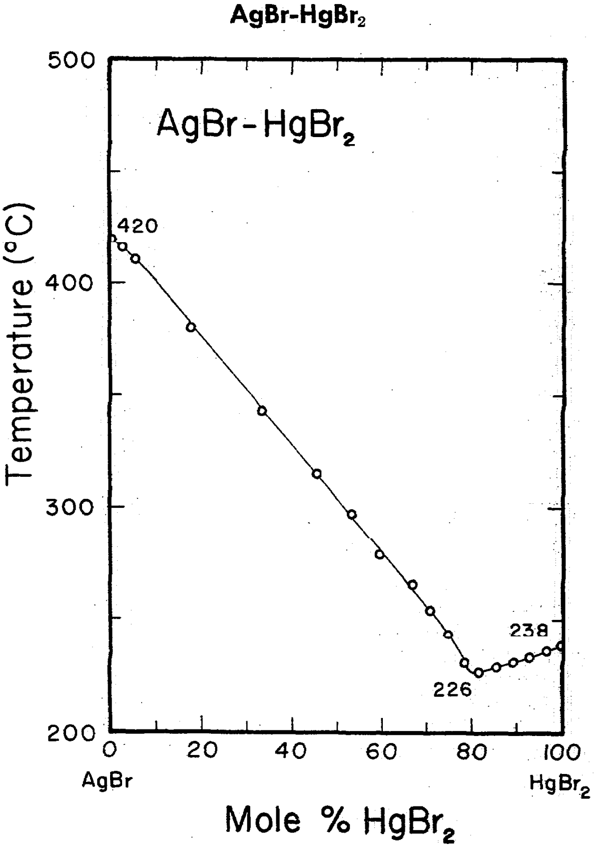

FIGURE 1. Temperature-composition phase diagram for AgBr-$HgBr_2$.

A. G. Bergman and L. A. Genke, Protokoly zasedanii Odeleniya khim., Russ. Fiz-Khim. O., **32**, 12 (1926); Tekhnicheskaya Entisklopediya, **7**, 190.

Melt Preparation and Purification

Jander and Brodersen [9] stated that the $HgBr_2$ was sublimed several times.

TABLE 107. Electrical conductance studies: $AgBr-HgBr_2$

Investigations critically re-examined			
Ref.	AgBr mol %	Temp. range (T)	Comments
9[a]	0. 0–0. 189	515. 2	Cell material: Jena glass or Duran glass; Pt-Ir alloy electrodes; calibration:0.01 N KCl solutions

[a] Jander and Brodersen used a sealed conductance cell. Any sublimed $HgBr_2$ was remelted prior to experimental measurement. Results were reported as equivalent conductivities with concentrations in moles of AgBr per 1000 cm^3 of melt, i.e. molarity. No density data were given.

TABLE 108. $AgBr-HgBr_2$: Specific conductance ($ohm^{-1}cm^{-1}\times 10^4$)

AgBr molarity	515.2 K
0	1. 45
0. 007763	0. 8944
0. 02188	2. 980
0. 03467	4. 972
0. 1042	19. 70
0. 1679	38. 27
0. 1888	47. 38

These values are based on the work of Jander and Brodersen (classical ac technique) [9].

TABLE 109. Viscosity studies: $AgBr-HgBr_2$

Investigations critically re-examined			
Ref.	$HgBr_2$ mol %	Temp. range (T)	Comments
9[a]	92. 96–100	528, 538, 548	Cell material: Jena glass; calibration: Hg

[a] Extrapolated values at 518 kelvins were also reported. Viscosity values for pure $HgBr_2$ are those recommended in NSRDS-NBS-15 [1].

TABLE 110. $AgBr-HgBr_2$: Viscosity (cp)

	Mol percent $HgBr_2$				
T	100	99. 86	98. 97	97. 68	92. 96
528. 2	2. 20	2. 15	1. 89	2. 24	2. 33
538. 2	2. 00	1. 99	1. 70	1. 99	2. 19
548. 2	1. 84	1. 94	1. 72	1. 85	1. 98

Due to limited data, the values in this table are those reported by Jander and Brodersen (capillary method) [9].

AgBr-KBr

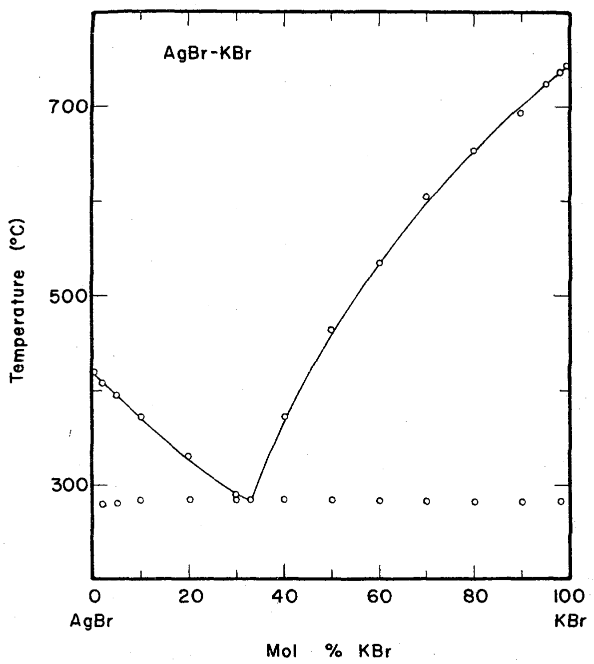

FIGURE 2. Temperature-composition phase diagram for AgBr-KBr.

S. F. Zhemchuzhnyi, Zh. Russ. Fiz.-Khim. O., Chast. Khim., *48, 203 (1916)*; *Z. Anorg. Allg. Chem.*, **153**, 47 (1926).

Melt Preparation and Purification

Boardman, Heymann and associates [8, **14**, **47**] used salts either of analytical reagent grade purity or prepared from reagent-grade salts and recrystallized. Silver bromide was prepared by precipitation from $AgNO_3$ solution with hydrobromic acid, followed by evaporation to dryness with excess acid, care being taken to avoid photodecomposition. Fusion and resolidification of the AgBr resulted in a transparent solid wherein small amounts of silver could be detected visually. Mixtures were analyzed by leaching out the soluble salt with warm water or by dissolving the solidified melt in concentrated ammonia, followed by precipitation of AgBr with nitric acid.

Brooks and Paul [44, **46**] used 99.9% B.D.H. KBr dried by heating under vacuum at 200 °C for three days followed by treatment with a stream of freshly-prepared, dry HBr for two hours while slowly raising the temperature to the melting point. Dry nitrogen was then bubbled through the melt to remove all traces of HBr. The silver bromide used was 99.9% pure AgBr (Research Organic/Inorganic Chemical Corporation). It was dried in the same manner as the KBr.

TABLE 111. Electrical conductance studies: AgBr-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (T)	Comments
14[a]	0–59.1	623–873	Cell material: B.T.H.-C14 glass; Pt electrodes; freq. range: ≃3000 Hz; calibration: 1 N KCl solution
40	0–100 (g)	720–1020	Cell material: quartz; Pt electrodes; freq. range: 1500–2000 Hz; calibration: saturated NaCl and 0.1 N KCl

[a] Melts containing AgBr were not heated above 600° C due to decomposition and liberation of bromine gas.

TABLE 112. AgBr-KBr: Specific conductance (ohm^{-1} cm^{-1})

Mol percent KBr

T	59.1	49.3	30.8	14.9	0.0
630			1.280	1.840	
640			1.314	1.872	
650			1.347	1.903	
660			1.380	1.934	
670			1.411	1.964	
680			1.442	1.993	
690			1.472	2.021	
700			1.502	2.049	
710			1.531	2.076	
720			1.559	2.102	
730			1.586	2.128	2.922
740			1.613	2.153	2.947
750			1.639	2.177	2.971
760			1.664	2.201	2.994
770			1.689	2.224	3.017
780		1.309	1.713	2.247	3.039
790		1.336	1.736	2.268	3.060
800		1.363	1.758	2.289	3.081
810		1.390	1.780	2.310	3.100
820		1.416	1.801	2.329	3.119
830	[1.325]	1.441	1.822	2.348	3.138
840	[1.353]	1.466	1.841	2.367	3.155
850	[1.378]	1.491	1.860	2.385	3.172
860	[1.402]	1.515	1.878	2.402	3.189
870	[1.422]	1.538	1.896	2.418	3.204

Temperature-dependent equations

$\kappa = a + bT + cT^2$

Mol % KBr	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
0.0	−0.8236	7.7462	−3.5826	0.06%
14.9	−1.5111	7.4299	−3.3493	0.21%
30.8	−2.2781	7.8807	−3.5438	0.25%
49.3	−2.2686	6.4124	−2.3408	0.02%
59.1	[−9.9384]	[24.1939]	[−12.800]	0.00%

These values are based on the work of Harrap and Heymann (classical ac technique) [14].

TABLE 112. AgBr-KBr: Specific conductance (ohm^{-1} cm^{-1})—Continued

Temperature-dependent equations

$\rho = a + bT$

Mol % KBr	a	$b \cdot 10^3$
0	6.316	−1.05
20.8	5.462	−1.12
39.9	4.657	−1.03
60.5	3.954	−0.98

These values are based on the work of Boardman, Dorman, and Heymann (pycnometric method) [8].

TABLE 113. Density studies: AgBr-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (T)	Comments
8[a]	0, 20.8, 39.9, 60.5	653–973	Cell material: silica glass dilatometer; calibration: method checked with molten $AgNO_3$
44, 46	50	852–1087	Cell material: Pt bob, Pt suspension wire; calibration: water

[a] Boardman et al. applied corrections for the shape of the meniscus, buoyancy, and expansion of the silica glass dilatometer. The authors state that the method cannot be used above 700–750° C due to chemical attack on the silica glass. A maximum error of ±0.25% in the density values was reported.

TABLE 114. AgBr-KBr: Density (g cm^{-3})

	Mol percent KBr			
T	60.5	39.9	20.8	0
660		3.977	4.723	
670		3.968	4.712	
680		3.957	4.700	
690		3.946	4.689	
700		3.936	4.678	
710		3.926	4.667	
720		3.915	4.656	5.560
730		3.905	4.644	5.550
740		3.895	4.633	5.539
750		3.885	4.622	5.529
760		3.874	4.611	5.518
770		3.864	4.600	5.508
780		3.854	4.588	5.407
790		3.843	4.577	5.487
800		3.833	4.566	5.476
810		3.823	4.555	5.466
820		3.812	4.544	5.455
830		3.802	4.532	5.445
840		3.792	4.521	5.434
850		3.782	4.510	5.424
860		3.771	4.499	5.413
870	3.101	3.761	4.488	5.403
880	3.092			
890	3.082			
900	3.072			
910	3.062			
920	3.052			
930	3.043			
940	3.033			
950	3.023			
960	3.013			
970	3.003			

Temperature-dependent equations

$\rho = a + bT$

Mol % KBr	a	$b \cdot 10^3$
0	6.316	−1.05
20.8	5.462	−1.12
39.9	4.657	−1.03
60.5	3.954	−0.98

These values are based on the work of Boardman, Dorman, and Heymann (pycnometric method) [8].

TABLE 115. Viscosity studies: AgBr-KBr

Investigations ctitically re-examined			
Ref.	KBr mol %	Temp. range (T)	Comments
14[a]	0–54.3	623–873	Cell material: B.T.H.-C14 glass; calibration: molten KNO_3

[a] Reference 14 is the NSRDS reference data base for the viscosity of molten AgBr.

TABLE 116. AgBr-KBr: Viscosity (cp)

	Mol percent KBr				
T	54. 3	44. 8	30. 8	20. 3	0. 0
630			4. 46	4. 30	
640			4. 23	4. 11	
650			4. 01	3. 93	
660			3. 81	3. 76	
670			3. 62	3. 60	
680			3. 45	3. 45	
690			3. 29	3. 31	
700			3. 15	3. 18	
710			3. 01	3. 06	
720			2. 89	2. 94	
730		2. 78	2. 78	2. 84	3. 19
740		2. 68	2. 67	2. 74	3. 10
750		2. 58	2. 57	2. 64	3. 02
760		2. 48	2. 49	2. 56	2. 94
770		2. 39	2. 41	2. 48	2. 86
780		2. 30	2. 34	2. 40	2. 79
790		2. 22	2. 27	2. 33	2. 72
800		2. 14	2. 20	2. 26	2. 66
810		2. 06	2. 14	2. 20	2. 59
820		2. 00	2. 08	2. 14	2. 53
830	1. 99	1. 94	2. 02	2. 08	2. 48
840	1. 92	1. 88	1. 97	2. 03	2. 42
850	1. 86	1. 83	1. 91	1. 98	2. 37
860	1. 80	1. 79	1. 85	1. 92	2. 32
870	1. 75	1. 76	1. 79	1. 87	2. 28

Temperature-dependent equations

$$\eta=a+bT+cT^2+dT^3$$

$$\eta=A\cdot\exp(E/RT)$$

Mol % KBr	a	$b\cdot10^2$	$c\cdot10^5$	$d\cdot10^8$	$A\cdot10$	E (cal mol^{-1})	Stand. error of estimate
0. 0					3. 931	3036	0. 31%
20. 3	60. 9084	−19. 2047	21. 3312	−8. 1108			0. 24%
30. 8	90. 9705	−30. 6847	35. 8952	−14. 2617			0. 56%
44. 8	5. 0943	2. 5533	−6. 8278	3. 9676			0. 45%
54. 3					1. 145	4710	0. 18%

These values are based on the work of Harrap and Heymann (capillary method) [14].

TABLE 117. Surface tension studies: AgBr-KBr

Investigations critically re-examined			
Ref.	KBr mol %	Temp. range (T)	Comments
47 [a]	0–100 (g)	973,1023	Cell material: capillary made from B.T.H.-C46 glass and melt-containing tube of B.T.H.-C14 glass; calibration: water

[a] Boardman et al. reported a maximum error of ±1% in their surface tension measurements.

TABLE 118. AgBr-KBr: Surface tension (dyn cm^{-1})

Mol % KBr	973 K	1023 K
0	150	147
10	126	122
20	112	108
30	104	101
40	100	97
50	98	95
60	97	94
70	97	93
80	96	92
90	96	91
100	96	91

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Boardman, Palmer and Heymann (maximum bubble pressure method) [47].

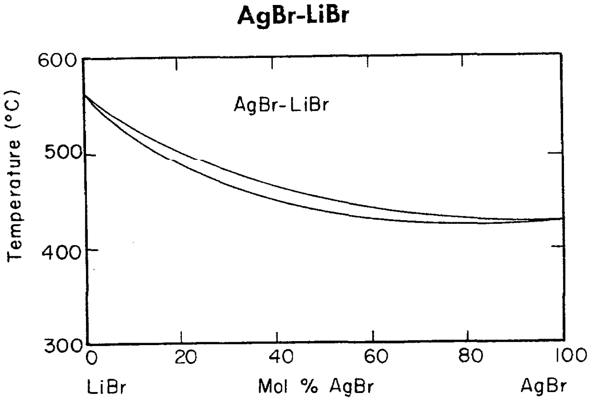

FIGURE 3. Temperature-composition phase diagram for AgBr-LiBr.

C. Sandonnini and G. Scarpa, Atti R. Accad. Naz. Lincei, Sez. II, 22, 519 (1913).

Melt Preparation and Purification

Brooks and Paul [44, 46] used 99.9% (Research Organic/Inorganic Chemical Corporation) LiBr, dried by heating under vacuum at 200 °C for three days followed by treatment with a stream of dry HBr for two hours while slowly raising the temperature to the melting point. Nitrogen was bubbled through the melt for two hours to remove all traces of HBr. The method used by these authors to prepare AgBr is described under the system AgBr-KBr.

TABLE 119. Density studies AgBr-LiBr

Investigations critically re-examined			
Ref.	LiBr mol %	Temp. range (*T*)	Comments
44, 46	50	801–963	Cell material: Pt bob and suspension wire calibration: H_2O

TABLE 120. AgBr-LiBr: Density (g cm^{-3})

Mol % LiBr=50			
T	*ρ*	*T*	*ρ*
810	4.021	890	3.949
820	4.012	900	3.940
830	4.003	910	3.931
840	3.994	920	3.923
850	3.985	930	3.914
860	3.976	940	3.905
870	3.967	950	3.896
880	3.958	960	3.887

Temperature-dependent equation

$$\rho = a - bT$$

Mol % LiBr	*a*	$b \times 10^3$
50	4.743_9	0.892_8

These values are based on the work of Brooks and Paul (Archimedean method) [44, 46].

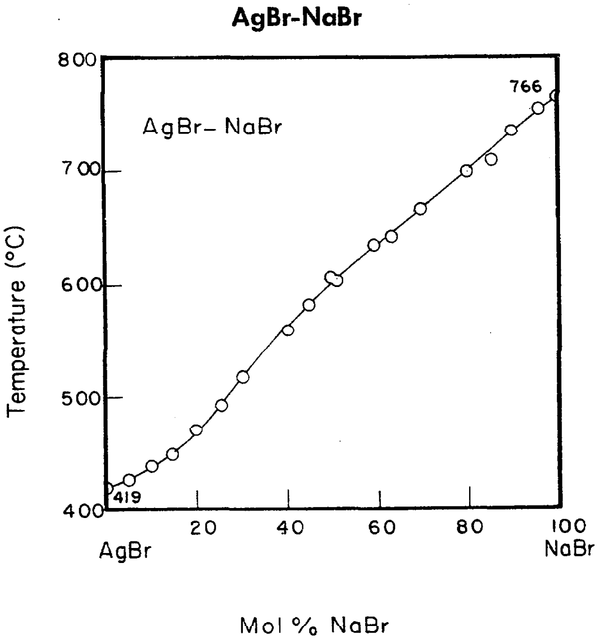

FIGURE 4. Temperature-composition phase diagram for AgBr-NaBr.

S. F. Zhemchuzhnyi, Z. Anorg. Allg. Chem., 153, 47 (1926).

Melt Preparation and Purification

Poillerat [40] used "Suprapur" Merck NaBr dried under vacuum in a furnace at 450 °C. The method of purifying the AgBr is described under the system AgBr-CsBr.

Brooks and Paul [44, 46] used 99.9% B.D.H. NaBr dried by heating under vacuum at 200 °C for three days, followed by treatment with a stream of freshly-prepared, dry HBr for two hours, while slowly raising the temperature to the melting point. Nitrogen was then bubbled through the melt for two hours to remove all traces of HBr. The method used to purify AgBr is described under the system AgBr-KBr.

Sternberg and Terzi [48] used pre-melted AgBr prepared from chemically pure silver nitrate and hydrogen bromide. Chemically pure NaBr was recrystallized and melted in dried gaseous HBr to remove traces of moisture. The gaseous HBr was obtained from its aqueous solution by dehydration with concentrated sulfuric acid.

TABLE 121. Electrical conductance studies: AgBr-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
40 [a]	0–100 (g)	720–1020	Cell material: quartz; Pt electrodes; calibration: 0.1 N NaCl and 0.1 N KCl at 20 °C and 25 °C

[a] Mixtures were prepared under argon. The uncertainty in the composition of the mixtures was estimated to be 0.1%; temperature control was ±0.3%, while the resistance was measured with an uncertainty of 0.1%.

TABLE 122. AgBr-NaBr: Specific conductance (ohm^{-1} cm^{-1})

Mol % AgBr	700 K	750 K	800 K	850 K	900 K	950 K	1000 K
0							2. 83
40					2. 67	2. 76	
60			2. 52	2. 67	3. 77	3. 84	
80	2. 64[a]	2. 76[a]	2. 86	2. 97	3. 04	3. 17	
100	3. 00	3. 10	3. 20	3. 28	3. 35	3. 42	3. 25

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Poillerat (modified potentiometric ac technique) [40]. The experimental uncertainty of the measurements is estimated to be ±0.5%.

[a] Extrapolated values.

TABLE 123. Density studies: AgBr-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
44, 46	50	929–1069	Cell material: Pt bob and suspension wire; calibration: H_2O

TABLE 124. AgBr-NaBr: Density (g cm^{-3})

Mol % NaBr=50

T	ρ	T	ρ
930	3. 692	1000	3. 622
940	3. 682	1010	3. 612
950	3. 672	1020	3. 602
960	3. 662	1030	3. 592
970	3. 652	1040	3. 582
980	3. 642	1050	3. 572
990	3. 632	1060	3. 562

Temperature-dependent equation

$$\rho=a-bT$$

Mol % NaBr	a	$b\times10^3$
50	4.626^2	1.004_2

These values are based on the work of Brooks and Paul (Archimedean method) [44, 46].

TABLE 125. Surface tension studies: AgBr-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
48 [a]	0–100	733–1193	Cell material: Pt pin, quartz vessel; calibration: distilled water, benzene, CCl_4, and acetone at 20° C

Deviations from previous NSRDS recommendations [2, pp. 59, 62]

Ref.	NaBr mol %	Min. departure	Max. departure
48	100	0. 10% (1053 K)	1. 63% (1173 K)
48	0	2. 82% (893 K)	4. 19% (733 K)

[a] Sternberg and Terzi reported their experimental results were reproducible within 1 percent.

TABLE 126. AgBr-NaBr: Surface tension (dyn cm^{-1})

	Mol percent NaBr										
T	100	90	80	70	60	50	40	30	20	10	0
760											158. 8
780										148. 9	158. 1
800										148. 1	157. 3
820										147. 3	156. 5
840									139. 0	146. 5	155. 7
860								132. 2	138. 2	145. 6	154. 8
880								131. 3	137. 3	144. 7	153. 9
900							125. 7	130. 4	136. 3	143. 8	153. 0
920							124. 7	129. 4	135. 3	142. 8	152. 0
940						120. 0	123. 6	128. 3	134. 3	141. 8	151. 0
960					116. 0	118. 9	122. 6	127. 3	133. 2	140. 7	149. 9
980				112. 5	114. 9	117. 8	121. 4	126. 1	132. 1	139. 6	148. 7
1000				111. 3	113. 7	116. 6	120. 3	125. 0	130. 9	138. 4	147. 6
1020			108. 1	110. 1	112. 5	115. 4	119. 1	123. 7			
1040		104. 8	106. 8	108. 9	111. 2	114. 1	117. 8				
1060	101. 4	103. 5	105. 5	107. 5	109. 9	112. 8	116. 5				
1080	100. 0	102. 1	104. 1	106. 2	108. 5	111. 4					
1100	98. 6	100. 7	102. 7	104. 7	107. 1	110. 0					
1120	97. 1	99. 2	101. 2	103. 3	105. 6	108. 5					
1140	95. 6	97. 7	99. 7								
1160	94. 0	96. 1	98. 1								
1180	92. 4	94. 5									

Two-dimensional equation and statistical parameters

$$\gamma = a + bC + cC^2 + dT^3 + eC^3$$

a	$b\cdot 10^1$	$c\cdot 10^3$	$d\cdot 10^8$	$e\cdot 10^5$	Max percent departure	Stand. error of est.
125. 09779	2. 32356	−2. 06387	−1. 99390	3. 98201	−0. 92% (1000.2 K, 100 mol % AgBr)	0. 35%

These values are based on the work of Sternberg and Terzi (pin detachment method) [48]. Here C = mol % *AgBr*.

Table 127. AgBr-NaBr: Surface tension (dyn cm^{-1})

	Mol percent NaBr							
T	100	90	70	50	30	20	10	0
760								158. 54
780							149. 12	157. 74
800							148. 15	156. 94
820							147. 18	156. 14
840					133. 50	140. 09	146. 21	155. 34
860					132. 39	138. 89	145. 24	154. 54
880					131. 28	137. 68	144. 27	153. 75
900					130. 17	136. 48	143. 30	152. 95
920					129. 05	135. 27	142. 33	152. 15
940					127. 94	134. 07	141. 36	151. 35
960				119. 05	126. 83	132. 86	140. 39	150. 55
980			113. 00	117. 82	125. 72	131. 66	139. 42	149. 75
1000			111. 55	116. 59	124. 61	130. 45	138. 45	148. 95
1020			110. 10	115. 36	123. 50			
1040		105. 13	108. 66	114. 13				
1060	101. 19	103. 57	107. 21	112. 90				
1080	99. 82	102. 00	105. 76	111. 67				
1100	98. 46	100. 44	104. 32	110. 44				
1120	97. 09	98. 87	102. 87	109. 21				
1140	95. 73	97. 31						
1160	94. 37	95. 74						
1180	93. 00	94. 18						

Temperature-dependent equations

$$\gamma = a + bT$$

Mol % NaBr	*a*	$b \cdot 10^2$	Standard deviation
0	188. 918	−3. 9969	±0. 426
10	186. 921	−4. 8467	±0. 063
20	190. 705	−6. 0253	±0. 079
30	180. 177	−5. 5568	±0. 189
50	178. 118	−6. 1527	±0. 220
70	183. 874	−7. 2324	±0. 237
90	186. 480	−7. 8221	±0. 192
100	173. 472	−6. 8195	±0. 256

These values are based on the work of Sternberg and Terzi (pin detachment method) [48].

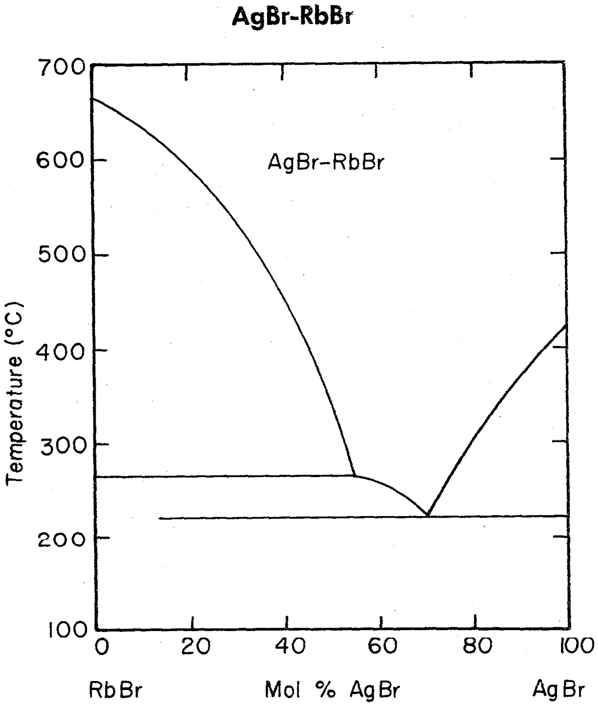

FIGURE 5. Temperature-composition phase diagram for AgBr-RbBr.

C. Sandonnini, Atti R. Accad. Naz. Lincei, Sez. I, **21**, 108 (1012).

Melt Preparation and Purification

Brooks and Paul [**44, 46**] used 99.8% RbBr (Ventron Corporation), dried by heating under vacuum at 200 °C for three days, followed by treatment with a stream of freshly-prepared, dry HBr for two hours, while slowly raising the temperature to the melting point. Nitrogen was bubbled through the melt for two hours to remove all traces of HBr. The method used by these authors to prepare AgBr is described under the system AgBr-KBr.

Poillerat [**40**] dried "Suprapur" Merck RbBr under vacuum in a furnace at 450 °C. The method used by Poillerat to purify AgBr is given under the system AgBr-CsBr.

TABLE 128. Electrical conductance studies: AgBr-RbBr

Investigations critically re-examined

Ref.	RbBr mol %	Temp. range (T)	Comments
40[a]	0–100 (g)	620–1020	Cell material: quartz; Pt. electrodes; calibration: 0.1 N NaCl and 0.1 N KCl at 20 °C and 25 °C

[a] Mixtures were prepared under argon. The uncertainty in the composition of the mixtures was estimated to be 0.1%; temperature control was ±0.3%, while the resistance was measured with an uncertainty of 0.1%.

TABLE 129. AgBr-RbBr: Specific conductance (ohm^{-1} cm^{-1})

Mol % AgBr	600 K	650 K	700 K	750 K	800 K	850 K	900 K	950 K	1000 K
0							0. 88[a]	1. 03[a]	1. 18
20						0. 86[a]	1. 00[a]	1. 10	
40			0. 67[a]	0. 82[a]	0. 95	1. 09	1. 19	1. 30	
60	0. 68[a]	0. 85	1. 00	1. 11	1. 26	1. 35	1. 42	1. 48	1. 52
70	0. 97[a]	1. 14[a]	1. 28	1. 39	1. 50	1. 61	1. 67	1. 73	1. 78
80	1. 48[a]	1. 68	1. 82	1. 92	2. 02	2. 11	2. 15	2. 18[a]	
100			3. 00[a]	3. 10	3. 23	3. 31	3. 37	3. 40	

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Poillerat (modified potentiometric ac technique) [**40**].

[a] Extrapolated value.

TABLE 130. Density studies: AgBr-RbBr

Investigations critically re-examined			
Ref.	RbBr moll %	Temp. range (T)	Comments
44, 46	50	808–1052	Cell material: Pt bob and suspension wire; calibration: H_2O

TABLE 131. AgBr-RbBr: Density (g cm^{-3})

Mol % RbBr=50			
T	ρ	T	ρ
810	3.791	950	3.629
830	3.768	970	3.606
850	3.744	990	3.582
870	3.721	1010	3.559
890	3.698	1030	3.536
910	3.675	1050	3.513
930	3.652		

Temperature-dependent equation

$$\rho=a-bT$$

Mol % RbBr	a	$b\times10^3$
50	4.727_5	1.156_6

These values are based on the work of Brooks and Paul (Archimedean method) [44, 46].

$AlBr_3$-$CoBr_2$

Melt Preparation and Purification

Isbekov and Plotnikov [31] prepared $AlBr_3$ by reaction of aluminum metal with bromine gas. The liquid was purified by distillation.

TABLE 132. Electrical conductance studies: $AlBr_3$-$CoBr_2$

Investigations critically re-examined		
Ref.	$CoBr_2$ mol %	Temp. range (T)
31	17.7	423

TABLE 133. $AlBr_3$-$CoBr_2$: Specific conductance (ohm^{-1}cm^{-1})

Mol % $CoBr_2$	Temperature	κ
17.7	423	0.0008

This value is the only one reported by Izbekov and Plotnikov (classical ac technique) [31]

$AlBr_3$-$FeBr_3$

Melt Preparation and Purification

The preparation of $AlBr_3$ by Isbekov and Plotnikov [31] is described under the system $AlBr_3$-$CoBr_2$.

TABLE 134. Electrical conductance studies: $AlBr_3$-$FeBr_3$

Investigations critically re-examined		
Ref.	$FeBr_3$ mol %	Temp. range (T)
31	18.4	423

TABLE 135. $AlBr_3$-$FeBr_3$: Specific conductance (ohm^{-1} cm^{-1})

Mol % $FeBr_3$	Temperature	κ
18.4	423	0.001

This value is the only one reported by Isbekov and Plotnikov (classical ac technique) [31].

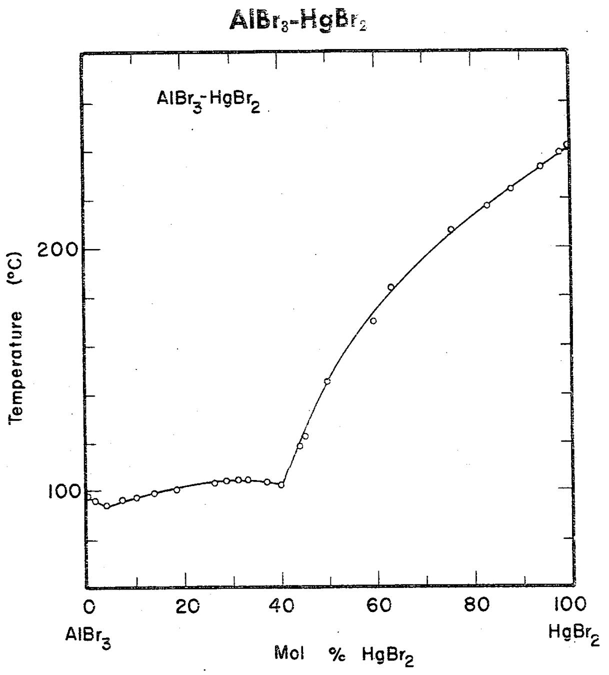

FIGURE 6. Temperature-composition phase diagram for $AlBr_3$-$HgBr_2$.

J. Kendall, E. D. Crittenden and H. K. Miller, J. Am. Chem. Soc., **45**, 963 (1923).

Melt Preparation and Purification

Gorenbein [**21**] prepared $AlBr_3$ and $HgBr_2$ by the reaction of bromine gas with aluminum filings and mercury metal, respectively. Aluminum bromide was refluxed over solid Al and kept in glass ampoules. Mercury bromide was sublimed and the pure crystals were stored in a desiccator.

The preparation of $AlBr_3$ by Isbekov and Plotnikov [**31**] is described under the $AlBr_3$-$CoBr_2$ system.

TABLE 136. Electrical conductance studies: $AlBr_3$-$HgBr_2$

Investigations critically re-examined		
Ref.	$HgBr_2$ mol %	Temp. range (T)
21	7.9–33.3	383–413
31	1.0–23.9	373–463

TABLE 137. $AlBr_3$-$HgBr_2$: Specific conductance ($ohm^{-1}cm^{-1}\times 10^3$)

	Mol percent $HgBr_2$					
T	33.33	32.57	29.46	25.86	16.43	7.94
385	14.357	14.033	12.618	10.402	4.339	0.647
390	16.173	15.713	13.933	11.418	4.593	0.646
395	17.989	17.393	15.249	12.435	4.847	0.681
400	19.805	19.074	16.564	13.452	5.101	0.698
405	21.621	20.754	17.879	14.469	5.355	0.715
410	23.436	22.434	19.194	15.485	5.609	0.733

Temperature-dependent equations

$$\kappa=a+bT$$

Mol % $HgBr_2$	$a\cdot 10^2$	$b\cdot 10^4$	Stand. error of est.
7.94	−0.0670	0.0342	0.63%
16.43	−1.52104	0.5078	1.10%
25.86	−6.78856	2.0334	0.17%
29.46	−8.86502	2.6303	0.41%
32.57	−11.53525	3.3607	0.43%
33.33	−12.54627	3.6317	1.34%

These values are based on the work of Gorenbein (classical ac technique) [**21**].

TABLE 138. Density studies: $AlBr_3$-$HgBr_2$

Investigations critically re-examined		
Ref.	$HgBr_2$ mol %	Temp. range (T)
21	0–33.3	383–413
31	0, 7.6, 14.3, 22.5	373

TABLE 139. $AlBr_3$-$HgBr_2$: Density (g cm^{-3})

	Mol percent $HgBr_2$								
T	33. 33	30. 49	28. 13	26. 46	23. 06	19. 85	15. 20	7. 34	0
385	3. 573	3. 496	3. 408	3. 364	3. 272	3. 169	3. 027	2. 822	2. 619
390	3. 561	3. 484	3. 399	3. 353	3. 260	3. 157	3. 015	2. 810	2. 608
395	3. 549	3. 472	3. 361	3. 341	3. 248	3. 144	3. 003	2. 798	2. 596
400	3. 537	3. 459	3. 380	3. 330	3. 235	3. 131	2. 992	2. 786	2. 585
405	3. 525	3. 447	3. 371	3. 318	3. 223	3. 119	2. 980	2. 774	2. 574
410	3. 513	3. 435	3. 361	3. 307	3. 211	3. 106	2. 968	2. 762	2. 562
415									2. 551

Temperature-dependent equations

$\rho=a+bT$			
Mol % $HgBr_2$	*a*	$b\cdot 10^3$	Stand. error of est.
0	3. 4969	−2. 2801	0. 03%
7. 34	3. 7383	−2. 3801	0. 03%
15. 20	3. 9315	−2. 3501	0. 07%
19. 85	4. 1432	−2. 5300	0. 03%
23. 06	4. 2233	−2. 4700	0. 03%
26. 46	4. 2456	−2. 2900	0. 06%
28. 13	4. 1321	−1. 8800	0. 12%
30. 49	4. 4393	−2. 4499	0. 05%
33. 33	4. 4973	−2. 4002	0. 05%

These values are based on the work of Gorenbein (pycnometric method) [21].

TABLE 140. Viscosity studies: $AlBr_3$-$HgBr_2$

Investigations critically re-examined

Ref.	$HgBr_2$ mol %	Temp. range (*T*)
21	0–33. 3	383–413

Deviations from previous NSRDS recommendations [2, p. 18]

Ref.	$HgBr_2$ mol %	Min. departure	Max. departure
21	0	1. 4% (423 K)	2. 6% (383 K)

TABLE 141. $AlBr_3$-$HgBr_2$: Viscosity (cp)

	Mol percent $HgBr_2$								
T	33. 33	30. 49	28. 13	26. 46	23. 06	19. 85	15. 20	7. 34	0. 0
385	23. 57	21. 05	18. 46	17. 09	13. 67	11. 47	7. 09	3. 62	2. 11
390	20. 33	18. 39	16. 16	15. 02	12. 05	10. 07	6. 39	3. 33	2. 00
395	17. 60	16. 13	14. 20	13. 25	10. 66	8. 88	5. 77	3. 07	1. 91
400	15. 29	14. 19	12. 51	11. 72	9. 45	7. 85	5. 22	2. 84	1. 81
405	13. 34	12. 52	11. 06	10. 40	8. 41	6. 96	4. 74	2. 63	1. 73
410	11. 67	11. 08	9. 81	9. 25	7. 51	6. 19	4. 31	2. 44	1. 65
415									1. 57

TABLE 141. $AlBr_3$-$HgBr_2$: Viscosity (cp)—Continued

Temperature-dependent equations

$\eta = A \cdot \exp(E/RT)$

Mol % $HgBr_2$	$A \cdot 10^2$	E (cal mol^{-1})	Stand. error of est.
0.0	3.288	3190	0.41%
7.34	0.548	4967	0.26%
15.20	0.216	6229	1.88%
19.85	0.0471	7727	2.05%
23.06	0.0732	7523	0.13%
26.46	0.0727	7700	0.78%
28.13	0.0578	7934	1.58%
30.49	0.0570	8046	1.87%
33.33	0.0230	8826	2.04%

These values are based on the work of Gorenbein (capillary method) [21].

$AlBr_3$-KBr

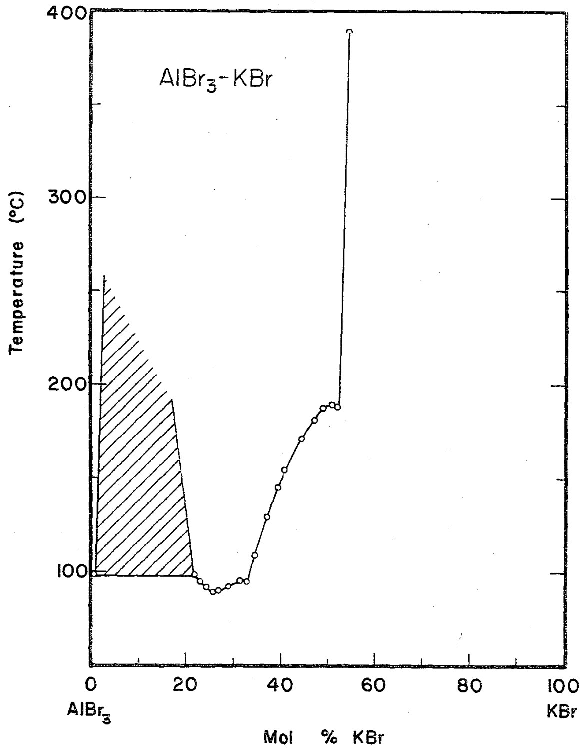

FIGURE 7. Temperature-composition phase diagram for $AlBr_3$-KBr.

J. Kendall, E. D. Crittenden and H. K. Miller, J. Am. Chem. Soc., **45**, 963 (1923).

Melt Preparation and Purification

Gorenbein [**10, 11, 12**] recrystallized KBr from water several times, dried it at 150 °C and stored the purified crystals over phosphorous pentoxide. Isbekov and Plotnikov [**31**] recrystallized pure KBr from water.

Gorenbein's preparation of pure $AlBr_3$ is described under the system $AlBr_3$-$HgBr_2$. The preparation of $AlBr_3$ by Isbekov and Plotnikov [**31**] is described under the system $AlBr_3$-$CoBr_2$.

TABLE 142. Electrical conductance studies: $AlBr_3$-KBr

Investigations critically re-examined

Ref.	KBr, mol %	Temp. range (T)
10	0, 33.3	363–443
11	23.4–33.3	383–413
12	21.7–33.3	373
31	21.7–31–2	373–463

Deviations from previous NSRDS recommendations [2, p. 85]

Ref.	KBr mol %	Min. departure	Max. departure
31	25	−11.7% (293 K)	−19.4% (303 K)

Table 143. $AlBr_3$-KBr: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent KBr					
T	33. 33	31. 23	28. 79	26. 34	24. 34	23. 41
383. 2	0. 03603	0. 03308	0. 03009	0. 02687		0. 02331
393. 2	0. 04315	0. 03982		0. 03224	0. 02903	0. 02781
403. 2	0. 05138	0. 04735	0. 04281	0. 03782	0. 03453	0. 03243
413. 2	0. 06009	0. 05459	0. 04928	0. 04389		0. 03785

These values are taken from the work of Gorenbein and Kriss (classical ac technique) [11]. The experimental values are given.

Table 144. Density studies: $AlBr_3$-KBr

Investigations critically re-examined		
Ref.	KBr, mol %	Temp. range (*T*)
10	0, 33. 3	353–443
11	23. 4–33. 3	383–413
12	0–33. 3	373
31	0–34. 5	373

Table 145. $AlBr_3$-KBr: Density (g cm^{-3})

	Mol percent KBr					
T	33. 33	31. 23	28. 79	26. 34	24. 34	23. 41
385	2. 815	2. 814			2. 794	2. 787
390	2. 808	2. 806			2. 786	2. 779
395	2. 801	2. 799	2. 791		2. 778	2. 771
400	2. 793	2. 791	2. 784		2. 770	2. 763
405	2. 786	2. 784	2. 776		2. 762	2. 754
410	2. 779	2. 776	2. 769	[2. 755]	2. 754	2. 746

Temperature-dependent equations

$$\rho = a + bT$$

Mol % KBr	*a*	$b \cdot 10^3$	Stand. error of est.
23. 41	3. 4186	−1. 6401	0. 01%
24. 34	3. 4219	−1. 6301	0. 03%
28. 79	3. 3838	−1. 5001	0. 00%
31. 23	3. 3951	−1. 5102	0. 07%
33. 33	3. 3615	−1. 4202	0. 03%

These values are based on the work of Gorenbein and Kriss (pycnometric method [**11**] except that for 26.34 mol % KBr, the value in brackets is the only experimental value reported by these authors at this concentration.

Table 146. Viscosity studies: $AlBr_3$-KBr

Investigations critically re-examined		
Ref.	KBr, mol %	Temp. Range (*T*)
10	0, 33. 3	353–443
11	23. 4–33. 3	383–413
12	0–33. 3	373

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	KBr mol %	Min. departure	Max. departure
10	0	1.4% (423 K)	3.8% (433 K)

Table 147. $AlBr_3$-KBr: Viscosity (cp)

	Mol percent KBr					
T	33. 33	31. 23	28. 78	26. 34	24. 34	23. 41
383. 2		19. 19	18. 96	17. 82	16. 62	15. 84
393. 2	15. 73	15. 20	14. 97	14. 09	13. 30	12. 63
403. 2	12. 93	12. 37	12. 26	11. 76	10. 87	10. 49
413. 2	10. 82	10. 50	10. 14	9. 74	9. 06	8. 65

These values are taken from the work of Gorenbein and Kriss (capillary technique) [**64**]. The experimental values are given.

$AlBr_3$-$MnBr_2$

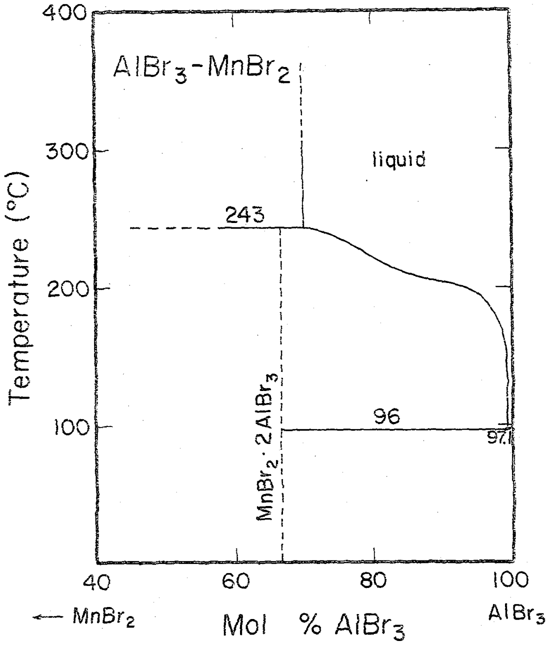

FIGURE 8. Temperature-composition phase diagram for $AlBr_3$-$MnBr_2$.

J. Kendall, E. D. Crittenden, H. K. Miller, J. Am. Chem. Soc., **45**, 975 (1923).

Melt Preparation and Purification

The preparation of $AlBr_3$ by Isbekov and Plotnikov [**31**] is described under the system $AlBr_3$-$CoBr_2$.

TABLE 148. Electrical conductivity studies: $AlBr_3$-$MnBr_2$

Investigations critically re-examined		
Ref.	$MnBr_2$, mol%	Temp. range (T)
31	18	433

TABLE 149. $AlBr_3$-$MnBr_2$: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent $MnBr_2$
T	18
433.2	0.001

This value is the only one reported by Isbekov and Plotnikov (classical ac technique) [**31**].

$AlBr_3$-NaBr

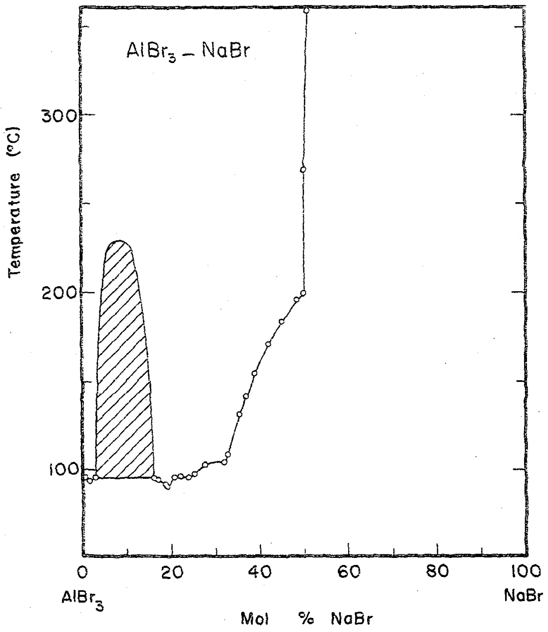

FIGURE 9. Temperature-composition phase diagram for $AlBr_3$-NaBr.

J. Kendall, E. D. Crittenden and H. K. Miller, J. Amer. Chem. Soc., **45**, 963 (1923).

Melt Preparation and Purification

Boston et al. [**30, 32**] prepared aluminum bromide by direct synthesis from zone-refined aluminum metal and either high-purity hydrogen bromide gas (99.99% Precision Gas Products, Inc., Rahway, N.J.) or freshly-prepared HBr obtained by bubbling H_2 through Br_2 and passing the resulting mixture over a platinum catalyst. The reaction was carried out at a temperature slightly higher than the melting point of aluminum (660 °C). The $AlBr_3$ vapor was passed through a sintered disk before condensation. A second method used by these authors consisted in the purification of commerical $AlBr_3$ (anhydrous, technical grade, Matheson, Coleman and Bell) by digesting the salt at 230–250 °C with aluminum metal followed by two distillations. Aluminum bromide prepared by these two methods gave identical conductivity results. The NaBr used by these authors was reagent-grade treated by passing dry HBr through the melt in a quartz apparatus, followed by filtration through a sintered quartz disk.

Gorenbein's [10, 11] method of preparing pure $AlBr_3$ is given under the system $AlBr_3$-$HgBr_2$. The NaBr was recrystallized several times, dried and stored in sealed ampoules.

TABLE 150. Electrical conductance studies: $AlBr_3$-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
10	33. 3	383–443	
11[a]	24. 3–33. 2	393–413	
30	2–75	443–1288	Cell material: quartz; tungsten electrodes; calibration: redistilled Hg and KCl solutions[b]

[a] Graphical for the temperature range 423–443.

[b] Boston [**30**], in order to prevent cell rupture, applied external pressures to the conductivity cell for the more volatile melts containing 80, 92, and 98 mol % $AlBr_3$.

TABLE 151. $AlBr_3$-NaBr: Specific conductance (ohm^{-1}cm^{-1})

	Mol percent NaBr					
T	75	67	58	50	33	2
450				0. 307		
475				0. 362		2. 939
500				0. 414	0. 165	3. 805
525				0. 464	0. 194	4. 578
550				0. 512	0. 223	5. 256
575				0. 558	0. 252	5. 840
600				0. 602	0. 280	6. 330
625				0. 644	0. 308	6. 726
650				0. 683	0. 335	7. 027
675				0. 720	0. 362	7. 235
700				0. 756	0. 389	7. 349
725				0. 789	0. 415	
750				0. 819	0. 440	
775				0. 848	0. 466	
800				0. 875	0. 490	
825				0. 899	0. 515	
850		0. 817		0. 921	0. 538	
875		0. 842		0. 941	0. 562	
900		0. 866	0. 842	0. 959	0. 585	
925	1. 055	0. 890	0. 857	0. 975	0. 607	
950	1. 080	0. 913	0. 872	0. 989	0. 629	
975	1. 105	0. 936	0. 887	1. 000	0. 651	
1000	1. 128	0. 958	0. 901	1. 010		
1025	1. 152	0. 980	0. 915	1. 017		
1050	1. 174	1. 001	0. 928	1. 022		
1075	1. 196	1. 022	0. 941	1. 025		
1100	1. 217	1. 042	0. 953	1. 026		
1125	1. 237	1. 062	0. 965	1. 024		
1150	1. 256	1. 081	0. 976	1. 021		
1175	1. 275	1. 099	0. 987	1. 015		
1200	1. 293	1. 117	0. 998	1. 007		
1225	1. 311	1. 135	1. 008	0. 997		
1250	1. 327	1. 152	1. 017	0. 985		
1275	1. 343	1. 168	1. 026	0. 971		

Temperature-dependent equations

$$\kappa=a+bT+cT^2$$

NaBr mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
2	−31. 3972	108. 0408	−75. 2708	2. 99%
33	−0. 5182	1. 5422	−0. 3519	2. 32%
50	−1. 0423	3. 7731	−1. 7211	1. 68%
58	−0. 0196	1. 2857	−0. 3650	0. 55%
67	−0. 3356	1. 7093	−0. 4155	0. 92%
75	−0. 3930	2. 1024	−0. 5810	0. 86%

These values are based on the work of Boston (classical ac technique) [**30**]. For mixtures containing 8 and 20 mol % NaBr, the experimental values are given in the following table.

TABLE 152. $AlBr_3$-NaBr: Specific conductance ($ohm^{-1}cm^{-1}$)

T	20 mol % NaBr	T	8 mol % NaBr
485. 2	0. 0593	506. 2	0. 0107
501. 2	0. 0659	521. 2	0. 0118
524. 2	0. 0750	535. 2	0. 0127
546. 2	0. 0833	551. 2	0. 0140
566. 2	0. 0921	568. 2	0. 0152
595. 2	0. 104	584. 2	0. 0166
614. 2	0. 113	602. 2	0. 0182
626. 2	0. 119	619. 2	0. 0199
645. 2	0. 132	635. 2	0. 0219
660. 2	0. 142	663. 2	0. 0261
674. 2	0. 147	713. 2	0. 0441
688. 2	0. 158	748. 2	0. 0935
707. 2	0. 175	773. 2	0. 134
727. 2	0. 195	800. 2	0. 171
747. 2	0. 219	825. 2	0. 199
762. 2	0. 237	851. 2	0. 226
785. 2	0. 270	878. 2	0. 251
802. 2	0. 288	907. 2	0. 275
822. 2	0. 314	968. 2	0. 315
834. 2	0. 328	981. 2	0. 316
867. 2	0. 359	988. 2	0. 329
887. 2	0. 375	1028. 2	0. 348
914. 2	0. 400	1077. 2	0. 363
948. 2	0. 392	1111. 2	0. 372
962. 2	0. 400	1151. 2	0. 377
974. 2	0. 403	1174. 2	0. 375
987. 2	0. 405		
1000. 2	0. 395		
1006. 2	0. 398		

Due to changes in the melt composition during the conductance measurements at 8 and 20 mol percent NaBr, the experimental values of Boston (classical ac technique) [30] are reported in this table.

TABLE 153. Density studies: $AlBr_3$-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
10	33. 3	383–443	
11	24. 3–33. 3	393–413	
32[a]	20. 0, 33. 3, 50. 0, 66. 7	398–1157	Cell material: quartz floats; calibration: water

Deviations from NSRDS recommendations [this volume]

Ref.	NaBr mol. %	Min. departure
10	33. 3	−7. 1% (443 K)

[a] Density results in reference [32] were given in the form of linear temperature dependent equations with standard deviations in the range: 5×10^{-3} g cm^{-3} (20 mol % NaBr) to 7×10^{-3} g cm^{-3} (50 mol % NaBr).

TABLE 154. $AlBr_3$-NaBr: Density (g cm^{-3})

	Mol percent NaBr			
T	66.7	50.0	33.3	20.0
400				2. 741
420				2. 707
440				2. 673
460			2. 713	2. 639
480			2. 687	2. 605
500			2. 661	2. 571
520			2. 634	2. 537
540			2. 608	2. 503
560			2. 581	2. 469
580			2. 555	2. 435
600		2. 589	2. 529	2. 401
620		2. 566	2. 502	2. 367
640		2. 543	2. 476	2. 333
660		2. 521	2. 449	2. 299
680		2. 498	2. 423	
700		2. 476	2. 397	
720		2. 453	2. 370	
740		2. 430	2. 344	
760		2. 408	2. 317	
780		2. 385	2. 291	
800		2. 363	2. 265	
820		2. 340		
840		2. 317		
860		2. 295		
880		2. 272		
900		2. 250		
920		2. 227		
940		2. 205		
960	2. 246	2. 182		
980	2. 230	2. 159		
1000	2. 214	2. 137		
1020	2. 198	2. 114		
1040	2. 181	2. 092		
1060	2. 165	2. 069		
1080	2. 149	2. 046		
1100	2. 133	2. 024		
1120	2. 116	2. 001		
1140	2. 100	1. 979		

Temperature-dependent equations

$\rho = a + bT$

NaBr mol %	a	$b\cdot10^4$	Standard deviation
20. 0	3. 421	−17. 0	0. 005
33. 3	3. 321	−13. 2	0. 006
50. 0	3. 267	−11. 3	0. 007
66. 7	3. 026	−8. 12	0. 006

These values are based on the work of Boston and Ewing (flotation method) [32].

TABLE 155. Viscosity studies: $AlBr_3$-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (*T*)
10	0, 33. 3	383–443
11[a]	24. 54–33. 33	393–443

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	NaBr mol %	Min. departure	Max. departure
10	0	1.4% (423 K)	3. 8% (433 K)

[a] Viscosity results for the temperature range 423–443 K were presented in graphical form.

TABLE 156. $AlBr_3$-NaBr: Viscosity (cp)

	Mol percent NaBr			
T	33. 33	30. 38	26. 30	24. 54
393. 2	15. 32	14. 76	13. 73	13. 34
403. 2	12. 35	12. 00	11. 32	11. 03
413. 2	10. 33	9. 94	9. 69	9. 29

These values are taken from the work of Gorenbein and Kriss (capillary technique) [11]. The experimental values are given.

$AlBr_3$-NH_4Br

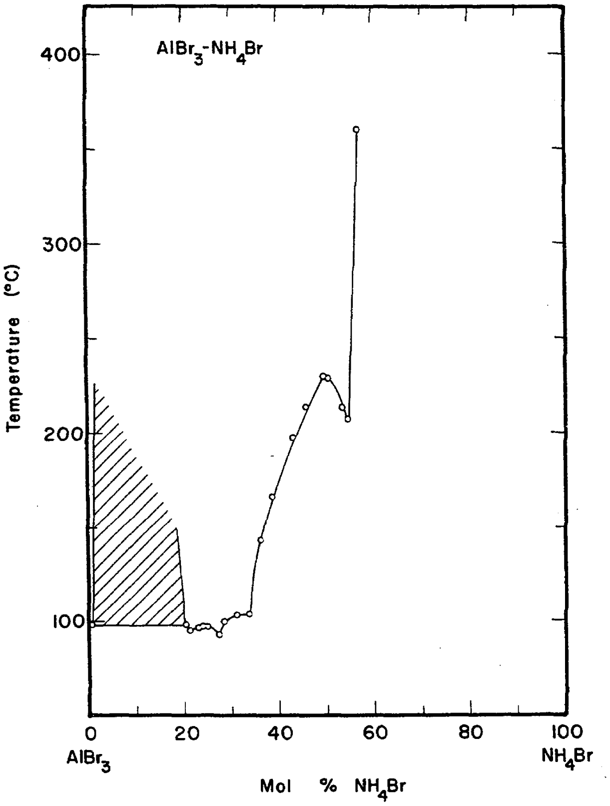

FIGURE 10. Temperature-composition phase diagram for $AlBr_3$-NH_4Br.

J. Kendall, E. D. Crittenden and H. K. Miller, J. Am. Chem. Soc., **45**, 963 (1923).

Melt Preparation and Purification

Gorenbein [10, **21**] recrystallized NH_4Br twice from water and kept the dried salt desiccated until used. His purification of $AlBr_3$ is described under the system $AlBr_3$-$HgBr_2$.

TABLE 157. Electrical conductance studies: $AlBr_3$-NH_4Br

Investigations critically re-examined

Ref.	NH_4Br, mol %	Temp. range (*T*)
10	33. 3	383–433
21	21. 6–33. 3	383–432

TABLE 158. $AlBr_3$-NH_4Br: Specific conductance (ohm^{-1} $cm^{-1}\times 10^3$)

	Mol percent NH_4Br				
T	33. 31	29. 10	25. 22	24. 37	21. 60
385	22. 939	19. 613	17. 224	16. 243	14. 541
390	25. 517	21. 782	19. 047	17. 855	15. 932
395	28. 095	23. 951	20. 870	19. 466	17. 323
400	30. 673	26. 120	22. 693	21. 078	18. 714
405	33. 252	28. 289	24. 516	22. 690	20. 105
410	35. 830	30. 457	26. 338	24. 302	21. 496
415	38. 408	32. 626	28. 161	25. 913	22. 888
420	40. 986	34. 795	29. 984	27. 525	24. 279

Temperature-dependent equations

$\kappa=a+bT$

NH_4Br mol %	$a\cdot 10^1$	$b\cdot 10^4$	Stand. error of est.
21. 60	−0. 925733	2. 7822	0. 75%
24. 37	−1. 078633	3. 2235	1. 03%
25. 22	−1. 231320	3. 6456	1. 09%
29. 10	−1. 473934	4. 3378	1. 08%
33. 31	−1. 755797	5. 1563	0. 49%

These values are based on the work of Gorenbein (classical ac technique) [**21**].

TABLE 159. Density studies: $AlBr_3$-NH_4Br

Investigations critically re-examined

Ref.	NH_4Br mol %	Temp. range (*T*)
10	33. 3	383–433
21	0–33. 3	383–423

TABLE 160. $AlBr_3$-NH_4Br: Density (g cm^{-3})

	Mol percent NH_4Br					
T	33. 31	29. 10	25. 22	24. 37	21. 60	0
385	2. 697	2. 709	2. 715	2. 712	2. 710	2. 619
390	2. 691	2. 702	2. 707	2. 705	2. 702	2. 608
395	2. 684	2. 695	2. 700	2. 697	2. 694	2. 596
400	2. 677	2. 687	2. 693	2. 690	2. 686	2. 585
405	2. 671	2. 680	2. 686	2. 682	2. 678	2. 573
410	2. 664	2. 673	2. 678	2. 674	2. 670	2. 562
415	2. 658	2. 666	2. 671	2. 667	2. 662	2. 551
420	2. 651	2. 659	2. 664	2. 659	2. 654	2. 539

Temperature-dependent equations

$\rho=a+bT$

NH_4Bf mol %	*a*	$b\cdot 10^3$	Stand. error of est.
0	3. 4989	−2. 2849	0. 03%
21. 60	3. 3275	−1. 6029	0. 02%
24. 37	3. 2968	−1. 5179	0. 05%
25. 22	3. 2763	−1. 4586	0. 01%
29. 10	3. 2491	−1. 4040	0. 00%
33. 31	3. 2035	−1. 3152	0. 02%

These values are based on the work of Gorenbein (pycnometric method) [**21**].

TABLE 161. Viscosity studies: $AlBr_3$-NH_4Br

Investigations critically re-examined

Ref.	NH_4Br, mol %	Temp. range (T)
10	0, 33. 3	383–433
21	0–33. 3	383–423

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	NH_4Br mol %	Min. departure	Max. departure
21	0	1. 4% (423 K)	2. 6% (383 K)

TABLE 162. $AlBr_3$-NH_4Br: Viscosity (cp)

	Mol percent NH_4Br					
T	33. 31	29. 10	25. 22	24. 37	21. 60	0
385		16. 34	15. 29	14. 63	12. 93	2. 11
390		14. 71	13. 83	13. 22	11. 75	2. 00
395	13. 86	13. 28	12. 55	11. 97	10. 70	1. 91
400	12. 58	12. 02	11. 41	10. 87	9. 77	1. 81
405	11. 44	10. 90	10. 40	9. 89	8. 94	1. 73
410	10. 43	9. 91	9. 50	9. 02	8. 20	1. 65
415	9. 53	9. 04	8. 70	8. 25	7. 53	1. 57
420	8. 73	8. 26	7. 98	7. 55	6. 93	1. 50

Temperature-dependent equations

$$\eta = A \cdot \exp\ (E/RT)$$

NH_4Br mol %	$A \cdot 10^2$	E (cal mol^{-1})	Stand. error or est.
0. 0	3. 288	3190	0. 41%
21. 60	0. 730	5722	1. 07%
24. 37	0. 524	6069	1. 11%
25. 22	0. 628	5965	1. 63%
29. 10	0. 451	6268	1. 12%
33. 31	0. 589	6093	1. 32%

These values are based on the work of Gorenbein (capillary method) [21].

$AlBr_3$-$SbBr_3$

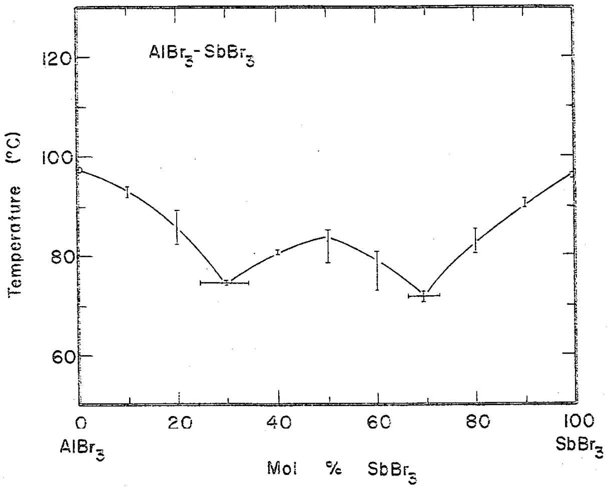

FIGURE 11. Temperature-composition phase diagram for $AlBr_3$-$SbBr_3$.

A. T. Nizhnik, J. Gen. Chem. USSR, 7, 1935 (1937).

J. Kendall, E. D. Crittenden and H. K. Miller, J. Am. Chem. Soc., 45, 963–96 (1923).

Melt Preparation and Purification

Gorenbein [10, 12, 59] prepared $SbBr_3$ by direct synthesis from powdered antimony metal and bromine gas. The resulting product was distilled several times, collected in glass ampoules and sealed off.

Izbekov and Plotnikov [29] reacted antimony metal with a solution of Br_2 in carbon disulfide. The salt was recrystallized from this solvent and dried under vacuum.

The preparation of $AlBr_3$ by Gorenbein and Izbekov is described under the ($AlBr_3$-$HgBr_2$) and ($AlBr_3$-$CoBr_2$) systems, respectively.

TABLE 163. Electrical conductance studies: $AlBr_3$-$SbBr_3$

Investigations critically re-examined

Ref.	$SbBr_3$ mol %	Temp. range (T)
10	50	353–443
12	0–100 (graphical)	373–413
57	50	358–373
29	0. 8–98. 7	373–463

TABLE 164. $AlBr_3$-$SbBr_3$: Specific conductance ($ohm^{-1}cm^{-1}$)

	Mol percent $SbBr_3$	
T	50	0
353. 2	0. 00841	
363. 2	0. 00937	
373. 2	0. 01164	0. 002448
383. 2	0. 01448	0. 002168
393. 2	0. 01738	0. 001946
403. 2	0. 02025	0. 001762
413. 2	0. 02337	
423. 2	0. 02628	
433. 2	0. 02916	
443. 2	0. 03215	

These values are those of Gorenbein (classical ac technique). A one-dimensional statistical analysis for the 50.0 mol % $SbBr_3$ mixture was unsuccessful: therefore the experimental values are reported [**10**]. See also the following table for the results of an interpolation of his graphically presented data over the entire composition range 0–100 mol % $SbBr_3$.

TABLE 165. $AlBr_3$-$SbBr_3$: Specific conductance ($ohm^{-1}cm^{-1}$)

$SbBr_3$ mol %	373 K	383 K	393 K	403 K	413 K
0	0. 0000	0. 0000	0. 0000	0. 0000	0. 0000
10	0. 0010	0. 0010	0. 0010	0. 0010	0. 0010
20	0. 0035	0. 0045	0. 0055	0. 0060	0. 0065
30	0. 0060	0. 0075	0. 0090	0. 0105	0. 0120
40	0. 0080	0. 0095	0. 0110	0. 0130	0. 0150
50	0. 0105	0. 0115	0. 0150	0. 0170	0. 0200
60	0. 0145	0. 0165	0. 0195	0. 0220	0. 0240
70	0. 0175	0. 0195	0. 0205	0. 0235	0. 0260
80	0. 0170	0. 0175	0. 0185	0. 0270	0. 0235
90	0. 0110	0. 0110	0. 0110	0. 0130	0. 0155
100	0. 0000	0. 0000	0. 0000	0. 0000	0. 0000

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Gorenbein (classical ac technique) [**12**].

TABLE 166. Density studies: $AlBr_3$-$SbBr_3$

Investigations critically re-examined		
Ref.	$SbBr_3$ mol %	Temp. range (*T*)
10	50	353–443
12	0–100	373–413
59	50	358–373
31	0–100	373

TABLE 167. $AlBr_3$-$SbBr_3$: Density (g cm^{-3})

T	Mol percent $SbBr_3$																				
	100	95.61	84.53	75.31	71.50	65.94	60.37	58.70	49.92	46.37	44.97	38.36	34.35	26.31	22.34	20.38	17.23	16.31	12.89	6.67	0
375	3.693	3.683	3.605	3.540	3.550	3.470	3.413	3.398	3.316	3.276	3.263	3.189	3.133	3.031	2.968	2.937	2.895	2.877	2.830	2.734	2.641
380	3.680	3.663	3.592	3.528	3.520	3.459	3.402	3.387	3.304	3.265	3.253	3.178	3.121	3.020	2.957	2.925	2.883	2.866	2.818	2.722	2.630
385	3.667	3.645	3.580	3.516	3.493	3.448	3.390	3.375	3.292	3.254	3.242	3.166	3.110	3.008	2.945	2.914	2.871	2.855	2.806	2.710	2.619
390	3.654	3.628	3.567	3.505	3.471	3.437	3.379	3.364	3.280	3.243	3.231	3.154	3.098	2.996	2.934	2.902	2.860	2.844	2.794	2.698	2.608
395	3.641	3.613	3.555	3.493	3.452	3.426	3.367	3.352	3.268	3.232	3.221	3.142	3.087	2.985	2.923	2.890	2.848	2.833	2.782	2.686	2.597
400	3.628	3.600	3.542	3.481	3.438	3.414	3.356	3.341	3.256	3.220	3.210	3.130	3.075	2.973	2.912	2.879	2.836	2.822	2.771	2.674	2.586
405	3.615	3.589	3.530	3.469	3.429	3.403	3.344	3.329	3.245	3.209	3.199	3.118	3.064	2.961	2.900	2.867	2.824	2.811	2.759	2.662	2.574
410	3.602	3.579	3.517	3.457	3.423	3.392	3.333	3.318	3.233	3.198	3.189	3.107	3.052	2.950	2.889	2.855	2.812	2.800	2.747	2.650	2.563

Temperature-dependent equations

$$\rho = a + bT + cT^2$$

$SbBr_3$ mol %	a	$b \cdot 10^3$	$c \cdot 10^5$	Stand. error of est.
0	3.4797	−2.2354	0	0.05%
6.67	3.6406	−2.4165	0	0.05%
12.89	3.7167	−2.3655	0	0.02%
16.31	3.7046	−2.2065	0	0.00%
17.23	3.7832	−2.3679	0	0.05%
20.38	3.8130	−2.3362	0	0.04%
22.34	3.8138	−2.2552	0	0.03%
26.31	3.9073	−2.3359	0	0.04%
34.35	3.9943	−2.2972	0	0.02%
38.36	4.0764	−2.3651	0	0.02%
44.97	4.0644	−2.1363	0	0.01%
46.37	4.1157	−2.2384	0	0.03%
49.92	4.2046	−2.3704	0	0.05%
58.70	4.2530	−2.2804	0	0.01%
60.37	4.2680	−2.2804	0	0.02%
65.94	4.3050	−2.2264	0	0.02%
71.50	17.8202	−69.5308	8.3941	0.36%
75.31	4.4314	−2.3764	0	0.05%
84.53	4.5433	−2.5024	0	0.05%
95.61	10.2864	−30.9873	3.5678	0.13%
100	4.6695	−2.6044	0	0.03%

These values are based on the work of Gorenbein (pycnometric method) [12].

TABLE 168. Viscosity studies: $AlBr_3$-$SbBr_3$

Investigations critically re-examined

Ref.	$SbBr_3$ mol %	Temp. range (*T*)
10	0, 50	363-443
12	0-100 [a]	373-413
29	50	358-373

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	$SbBr_3$ mol %	Min. departure	Max. departure
10	0	1.4% (423 K)	3.8% (433 K)

[a] Graphical except for pure $AlBr_3$.

TABLE 169. $AlBr_3$-$SbBr_3$: Viscosity (cp)

	Mol percent $SbBr_3$	
T	50	0
363.2	21.972	
373.2	15.634	
383.2	11.589	
393.2	9.016	
403.2	7.083	
413.2	5.754	1.610
423.2	4,796	1.453
433.2	3.998	1.368
443.2	3.405	

These values are those of Gorenbein (capillary method). A one-dimensional statistical analysis was unsuccessful: therefore the experimental values are reported [**10**]. See also the following table for the results of an interpolation of his graphically presented data over the entire composition range 0-100 mol % $SbBr_3$.

TABLE 170. $AlBr_3$-$SbBr_3$: Viscosity (cp)

$SbBr_3$ mol %	373 K	383 K	393 K	403 K	413 K
0	2.5	2.2	2.0	1.8	1.5
10	3.8	3.2	3.0	2.5	2.2
20	8.8	6.8	5.5	4.5	4.0
30	14.0	10.5	8.0	6.2	5.2
40	15.2	11.5	9.0	7.0	5.8
50	15.0	11.5	8.8	7.0	5.8
60	11.5	9.0	7.5	6.0	5.0
70	7.5	6.5	5.5	4.8	4.2
80	6.0	5.0	4.5	4.0	3.5
90	4.5	4.0	3.5	3.2	2.8
100	4.0	3.5	3.0	2.8	2.5

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Gorenbein (capillary method) [**12**].

$AlBr_3$-$ZnBr_2$

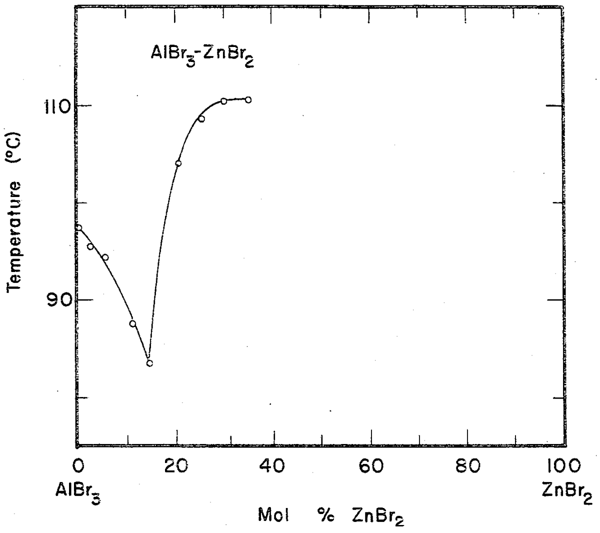

FIGURE 12. Temperature-composition phase diagram for $AlBr_3$-$ZnBr_2$.

J. Kendall, E. D. Crittenden and H. K. Miller, J. Am. Chem. Soc., **45**, 963 (1923).

Melt Preparation and Purification

Gorenbein [**10**, **12**, **16**] prepared zinc bromide by reacting zinc metal and bromine gas in a solution of bromine water. The water and excess bromine were evaporated off and the product transferred to a retort and distilled twice. The pure $ZnBr_2$ was collected in glass ampoules. Gorenbein's preparation of $AlBr_3$ is given under the system ($AlBr_3$-$HgBr_2$).

TABLE 171. Electrical conductance studies: $AlBr_3$-$ZnBr_2$

Investigations critically re-examined

Ref.	$ZnBr_2$, mol %	Temp. range (*T*)
10	0, 33.3	373-453
12	≃13-33 (g)	373-423
16	33.3	383

TABLE 172. $AlBr_3$-$ZnBr_2$: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent $ZnBr_2$	
T	33. 3	0
380	0. 00645	0. 002255
390	0. 00867	0. 002012
400	0. 01122	0. 001815
410	0. 01412	
420	0. 01736	
430	0. 02095	
440	0. 02488	
450	0. 02916	

Temperature-dependent equations
$\kappa=a+bT+cT^2$

$ZnBr_2$ mol %	$a\cdot 10^7$	$b\cdot 10^4$	$c\cdot 10^7$	Stand. error of est.
0	4. 5550	—2. 0130	2. 2991	0. 17%
33. 3	17. 9707	11. 1462	17. 3350	1. 17%

These values are based on the work of Gorenbein (classical ac technique) [10]. See also the following table for the results of an interpolation of his graphically presented data over the composition range 13–30 mol % $ZnBr_2$.

TABLE 173. $AlBr_3$-$ZnBr_2$: Specific conductance (ohm^{-1} cm^{-1})

	Mol per $ZnBr_2$			
T	≃13	≃20	≃25	≃33. 3
373	<0. 001	0. 003	0. 005	0. 005
383	<0. 001	0. 004	0. 006	0. 007
393	<0. 001	0. 004	0. 008	0. 009
403	<0. 001	0. 005	0. 010	0. 013
413	<0. 001	0. 006	0. 012	0. 016
423	<0. 001	0. 007	0. 015	0. 020

These values have been interpolated to a maximum of two significant figures from the graphical presentation of Gorenbein [12].

TABLE 174. Density studies: $AlBr_3$-$ZnBr_2$

Investigations critically re-examined

Ref.	$ZnBr_2$ mol %	Temp. range (*T*)
10	0, 33. 3	373–453
12	0–33. 2	373–423
16	33. 3	383

TABLE 175. $AlBr_3$-$ZnBr_2$: Density (g cm^{-3})

	Mol percent $ZnBr_2$							
T	33. 20	28. 86	25. 32	22. 62	20. 06	17. 33	13. 46	0
375	3. 007		2. 909	2. 877	2. 845	2. 809	2. 763	2. 641
380	2. 997		2. 899	2. 867	2. 834	2. 798	2. 752	2. 631
385	2. 987	2. 934	2. 889	2. 856	2. 824	2. 787	2. 741	2. 620
390	2. 978	2. 924	2. 879	2. 845	2. 813	2. 776	2. 730	2. 609
395	2. 968	2. 915	2. 868	2. 835	2. 802	2. 766	2. 719	2. 598
400	2. 959	2. 904	2. 858	2. 824	2. 791	2. 755	2. 708	2. 586
405	2. 949	2. 894	2. 848	2. 814	2. 780	2. 744	2. 697	2. 574
410	2. 940	2. 883	2. 838	2. 803	2. 769	2. 734	2. 686	2. 561
415	2. 930	2. 871	2. 827	2. 792	2. 758	2. 723	2. 675	2. 548
420	2. 921	2. 859	2. 817	2. 782	2. 747	2. 712	2. 664	2. 535

Temperature-dependent equations

$\rho=a+bT+cT^2$

$ZnBr_2$ mol %	*a*	$b\cdot 10^3$	$c\cdot 10^6$	Stand. error of est.
0	2. 1557	4. 5570	−8. 7018	0. 07%
13. 46	3. 5915	−2. 2083	0	0. 03%
17. 33	3. 6119	−2. 1424	0	0. 06%
20. 06	3. 6617	−2. 1771	0	0. 02%
22. 62	3. 6714	−2. 1181	0	0. 02%
25. 32	3. 6790	−2. 0521	0	0. 04%
28. 86	2. 3797	4. 7133	−8. 5045	0. 08%
33. 20	3. 7214	−1. 9062	0	0. 04%

These values are based on the work of Gorenbein (pycnometric method) [12].

Table 176. Viscosity studies: $AlBr_3$-$ZnBr_2$

Investigations critically re-examined

Ref.	$ZnBr_2$ mol %	Temp. range (T)
10	0, 33.3	373–453
12	0–33.3[a]	383–423
16	33.3	383

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	$ZnBr_2$ mol %	Min. departure	Max. departure
10	0	1.4% (423 K)	3.8% (433 K)

[a] Graphical except for pure $AlBr_3$.

Table 177. $AlBr_3$-$ZnBr_2$: Viscosity (cp)

	Mol percent $ZnBr_2$	
T	33.3	0
393.2	99.52	
403.2	70.78	
413.2	48.89	1.610
423.2	36.42	1.453
433.2	27.84	1.368
443.2	22.23	
453.2	17.93	

These values are those of Gorenbein (capillary method). A one-dimensional statistical analysis was unsuccessful: therefore the experimental values are reported [**10**]. See also the following table for the results of an interpolation of his graphically presented data over the composition range 0–33.3 mol % $ZnBr_2$.

Table 178. $AlBr_3$-$ZnBr_2$: Viscosity (cp)

$ZnBr_2$, mol %	383 K	393 K	403 K	413 K	423 K
0	1	1	1	1	1
5	2	2	1	1	1
10	3	3	3	2	1
15	6	5	4	3	3
20	13	9	7	6	5
25	23	16	13	10	7
33.3		75	44	32	24

These values have been interpolated to a maximum of two significant figures from the graphical presentation of Gorenbein (capillary method) [12].

$BaBr_2$-CsBr

Melt Preparation and Purification

In their surface tension studies, Bertozzi and Soldani [**15**] used carefully dried Merck and B. D. H. salts of analytical purity without further purification.

Table 179. Surface tension studies: $BaBr_2$-CsBr

Investigations critically re-examined

Ref.	CsBr mol %	Temp. range (T)
15[a]	0–100 (g)	1123

[a] Bertozzi and Soldani [**15**] used a platinum plate 15 mm in length and 0.1 mm thick. Results were stated to be reproducible within 0.5%.

Table 180. $BaBr_2$-CsBr: Surface tension (dyn cm^{-1})

Mol % $BaBr_2$	1123 K	Mol % $BaBr^2$	1123 K
0	69.0	60	97.0
10	73.0	70	102
20	78.0	80	112
30	82.0	90	126
40	86.5	100	153
50	91.5		

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Bertozzi and Soldani (Wilhelmy slide plate method) [**15**].

BaBr₂-KBr

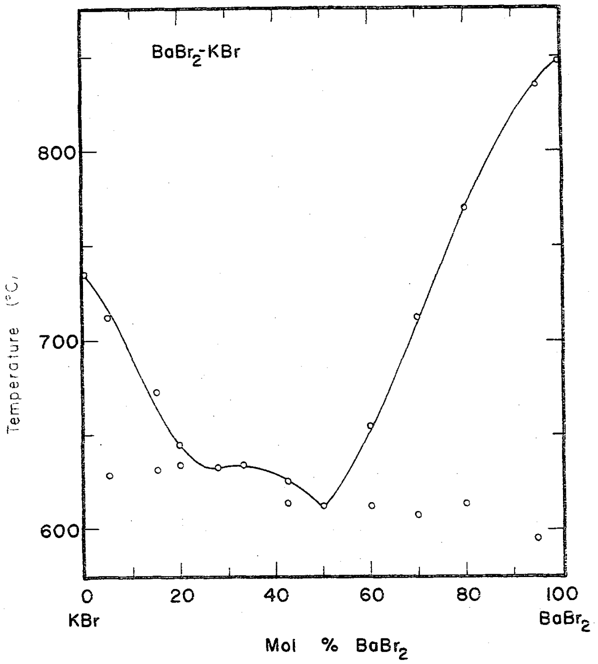

FIGURE 13. Temperature-composition phase diagram for $BaBr_2$-KBr.

G. Kellaer, Z. Anorg. Allgem. Chem., **99**, 137, (1917).

Melt Preparation and Purification

Bloom et al. [**13**] used salts of A.R. quality or of a purity not less than 99.8%. Mixtures were prepared by weighing the dry pure salts which had been previously fused and cooled in desiccators. Standard methods of analysis were used.

TABLE 181. Electrical conductance studies: $BaBr_2$-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (*T*)	Comments
13[a]	15–100	893–1123	Cell material: silica or B.T.H. #37 glass capillary cells; Pt electrodes; freq. range: 100–10,000 Hz; calibration: 1 N KCl solution at 25 °C

Deviations from previous NSRDS recommendations [1, p. 14]

Ref.	KBr mol %	Min. departure	Max. departure
13	100	−0.67% (1020 K)	−4.0% (1100 K)

[a] Bloom et al. [13] report an overall accuracy of ±0.5% in their conductance measurements.

TABLE 182. $BaBr_2$-KBr: Specific conductance ($ohm^{-1}cm^{-1}$)

	Mol percent KBr								
T	100	79. 5	75. 7	66. 7	60. 0	48. 0	35. 0	25. 0	15. 0
910						0. 736			
920				0. 911	0. 741	0. 760			
930		1. 070	1. 032	0. 933	0. 762	0. 783			
940		1. 094	1. 056	0. 956	0. 784	0. 806			
950		1. 117	1. 079	0. 979	0. 805	0. 830			
960		1. 140	1. 103	1. 002	0. 827	0. 854			
970		1. 163	1. 126	1. 025	0. 848	0. 877	0. 805		
980		1. 187	1. 150	1. 048	0. 870	0. 902	0. 830		
900		1. 210	1. 174	1. 071	0. 892	0. 926	0. 855		
1000		1. 233	1. 197	1. 094	0. 914	0. 950	0. 880		
1010		1. 256	1. 221	1. 117	0. 936	0. 975	0. 906		
1020	1. 628	1. 280	1. 245	1. 141	0. 958	1. 000	0. 932		
1030	1. 649	1. 303	1. 268	1. 164	0. 980	1. 024	0. 958	0. 940	
1040	1. 670	1. 326	1. 292	1. 187	1. 002	1. 049	0. 984	0. 966	
1050	1. 690	1. 349	1. 315	1. 210	1. 025	1. 074	1. 010	0. 992	
1060	1. 710	1. 372	1. 339	1. 233	1. 047	1. 099	1. 037	1. 019	
1070	1. 730	1. 395	1. 362	1. 257	1. 070	1. 125	1. 064	1. 045	
1080	1. 750	1. 418	1. 386	1. 280	1. 092	1. 150	1. 091	1. 072	
1090	1. 770	1. 441	1. 409	1. 303	1. 115	1. 176	1. 118	1. 099	1. 037
1100	1. 790	1. 463	1. 433	1. 326	1. 137	1. 201	1. 145	1. 127	1. 067
1110	1. 810	1. 486	1. 456	1. 340	1. 160	1. 227	1. 173	1. 154	1. 097
1120	1. 829	1. 509	1. 479	1. 372	1. 182	1. 252	1. 200	1. 182	1. 127

Temperature-dependent equations

$\kappa = A \cdot \exp(-E/RT)$		
KBr mol %	*A*	*E* (cal mol^{-1})
15. 0	23. 4	6750
25. 0	16. 3	5840
35. 0	15. 9	5750
48. 0	12. 5	5120
60. 0	10. 13	4780
66. 7	9. 06	4200
75. 7	8. 61	3920
79. 5	8. 10	3740
100	5. 99	2640

These values are based on the work of Bloom et al. (classical ac technique) [13]

TABLE 183. Density studies: $BaBr_2$-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (*T*)
13[a]	0–100	893–1123

Deviations from previous NSRDS recommendations [1, p. 14]

Ref.	KBr mol %	Min. departure	Max. departure
13	100	0. 75% (1020 K)	1. 3% (1100 K)

[a] Bloom et al. [**13**] used a sinker and suspension wire of 10% Rh–Pt. The accuracy of the density results was reported to be ±0.1%.

TABLE 184. $BaBr_2$-KBr: Density (g cm^{-3})

	Mol percent KBr										
T	100	90	80	70	60	50	40	30	20	10	48. 5
920				2. 911	3. 111	3. 300					
930			2. 688	2. 901	3. 102	3. 201					
940			2. 679	2. 892	3. 093	3. 282					3. 310
950			2. 670	2. 883	3. 084	3. 273					3. 301
960			2. 661	2. 874	3. 074	3. 264	3. 445				3. 292
970		2. 424	2. 652	2. 865	3. 065	3. 255	3. 436				3. 283
980		2. 415	2. 643	2. 856	3. 056	3. 246	3. 427				3. 274
990		2. 406	2. 634	2. 847	3. 047	3. 237	3. 418				3. 265
1000		2. 397	2. 625	2. 838	3. 038	3. 228	3. 409	3. 584			3. 255
1010		2. 388	2. 616	2. 829	3. 029	3. 219	3. 400	3. 575			3. 246
1020	2. 133	2. 379	2. 607	2. 820	3. 020	3. 210	3. 391	3. 566			3. 237
1030	2. 124	2. 370	2. 598	2. 811	3. 011	3. 201	3. 382	3. 557			3. 228
1040	2. 115	2. 361	2. 589	2. 802	3. 002	3. 192	3. 373	3. 548			3. 219
1050	2. 106	2. 352	2. 580	2. 793	2. 993	3. 183	3. 364	3. 539	3. 711		3. 210
1060	2. 097	2. 343	2. 571	2. 784	2. 984	3. 174	3. 355	3. 530	3. 702		3. 201
1070	2. 088	2. 334	2. 562	2. 775	2. 975	3. 165	3. 346	3. 521	3. 693		3. 192
1080	2. 079	2. 325	2. 553	2. 766	2. 966	3. 155	3. 337	3. 512	3. 684		3. 183
1090	2. 070	2. 316	2. 544	2. 757	2. 957	3. 146	3. 328	3. 503	3. 675		3. 174
1100	2. 061	2. 307	2. 535	2. 748	2. 948	3. 137	3. 319	3. 494	3. 665	3. 836	3. 165
1110	2. 052	2. 297	2. 526	2. 739	2. 939	3. 128	3. 310	3. 485	3. 656	3. 827	3. 156
1120	2. 043	2. 288	2. 517	2. 730	2. 930	3. 119	3. 301	3. 476	3. 647	3. 818	3. 147

Two-dimensional equation and statistical parameters

$$\rho = a + bT + cC + dC^2 + eC^3$$

a	$b \cdot 10^4$	$c \cdot 10^2$	$d \cdot 10^3$	$e \cdot 10^8$	Max. percent departure	Stand. error of estimate
3. 05559	−9. 04391	2. 55287	−9. 91918	3. 85213	0. 57% (921.0 K, 24.3 mol % $BaBr_2$)	0. 27%

These values are based on the work of Bloom, Knaggs, Molloy, and Welch (Archimedean method) [**13**]. Here C=mol % $BaBr_2$.

TABLE 185. $BaBr_2$-KBr: Density (g cm^{-3})

	Mol percent KBr									
T	100	79.5	75.7	66.7	60.0	48.0	35.0	25.0	15.0	0
910						3. 356				
920				2. 979	3. 118	3. 346				
930		2. 703	2. 766	2. 970	3. 109	3. 337				
940		2. 693	2. 758	2. 961	3. 100	3. 328				
950		2. 684	2. 749	2. 952	3. 090	3. 319				
960		2. 674	2. 741	2. 943	3. 081	3. 310				
970		2. 665	2. 732	2. 934	3. 072	3. 301	3. 507			
980		2. 656	2. 724	2. 925	3. 063	3. 292	3. 498			
990		2. 646	2. 715	2. 916	3. 053	3. 283	3. 490			
1000		2. 637	2. 707	2. 907	3. 044	3. 274	3. 481			
1010		2. 628	2. 699	2. 898	3. 035	3. 265	3. 472			
1020	2. 132	2. 618	2. 690	2. 889	3. 025	3. 256	3. 464			
1030	2. 124	2. 609	2. 682	2. 880	3. 016	3. 247	3. 455	3. 050		
1040	2. 116	2. 600	2. 673	2. 871	3. 007	3. 238	3. 446	3. 640		
1050	2. 108	2. 590	2. 665	2. 862	2. 997	3. 229	3. 437	3. 630		
1060	2. 100	2. 581	2. 656	2. 853	2. 988	3. 220	3. 428	3. 620		
1070	2. 092	2. 571	2. 648	2. 844	2. 979	3. 211	3. 420	3. 609		
1080	2. 084	2. 562	2. 639	2. 835	2. 970	3. 202	3. 411	3. 599		
1090	2. 077	2. 553	2. 631	2. 826	2. 960	3. 192	3. 402	3. 589	3. 761	
1100	2. 069	2. 543	2. 622	2. 817	2. 951	3. 183	3. 393	3. 579	3. 753	
1110	2. 061	2. 534	2. 614	2. 808	2. 942	3. 174	3. 385	3. 568	3. 746	
1120	2. 053	2. 525	2. 605	2. 799	2. 932	3. 165	3. 376	3. 558	3. 739	4. 000

Temperature-dependent equations

$$\rho = a + bT$$

KBr mol %	*a*	$b \cdot 10^4$
0	5. 035	−9. 24
15. 0	4. 551	−7. 25
25. 0	4. 704	−10. 23
35. 0	4. 356	−8. 75
48. 0	4. 180	−9. 06
60. 0	3. 974	−9. 30
66. 7	3. 803	−8. 96
75. 7	3. 556	−8. 49
79. 5	3. 574	−9. 37
100	2. 942	−7. 94

These values are based on the work of Bloom, Knaggs, Molloy, and Welch (Archimedean method) [13].

TABLE 186. Surface tension studies: $BaBr_2$-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (*T*)
15[a]	0–100 (g)	1123

[a] Bertozzi and Soldani [**15**] used a platinum plate of length and thickness of 15 mm and 0.1 mm, respectively. Results were reported to be reproducible to 0.5%.

TABLE 187. $BaBr_2$-KBr: Surface tension (dyn cm^{-1})

Mol % $BaBr_2$	1123 K	Mol % $BaBr_2$	1123 K
0	83	60	114
10	87	70	120
20	92	80	127
30	97	90	138
40	102	100	153
50	108		

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Bertozzi and Soldani (Wilhelmy slide plate method) [**15**].

$BaBr_2$-NaBr

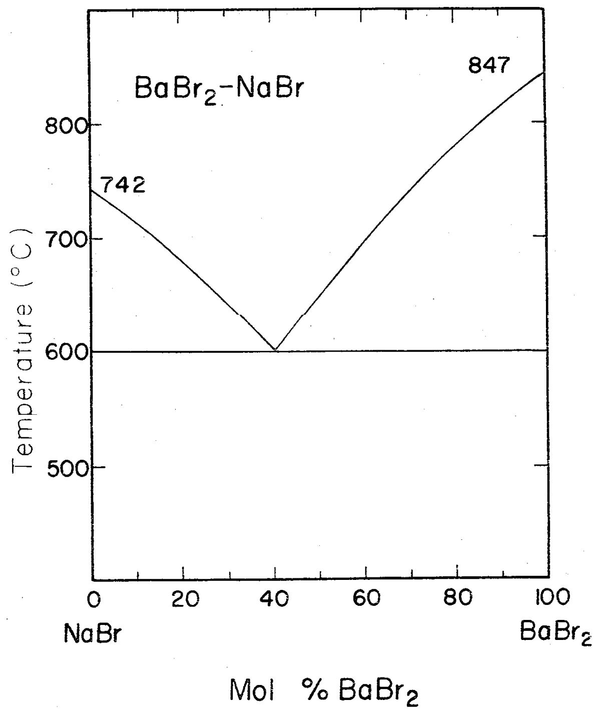

FIGURE 14. Temperature-composition phase diagram for $BaBr_2$-NaBr.

G. Kellaer, Z. Anorg. Allgem, Chem., **99**, 164 (1917).

Melt Preparation and Purification

In their surface tension studies, Bertozzi and Soldani [**15**] used carefully dried Merck and B. D. H. salts of analytical purity without further purification.

TABLE 188. Surface tension studies: $BaBr_2$-NaBr

Investigations critically re-examined

Ref.	NaBr, mol %	Temp. range (*T*)
15 [a]	0–100 (g)	1123

[a] Results in reference [**15**] were reported to be reproducible to within 0.5%.

TABLE 189. $BaBr_2$-NaBr: Surface tension (dyn cm^{-1})

Mol % $BaBr_2$	1123 K	Mol % $BaBr_2$	1123 K
0	97	60	129
10	102	70	135
20	107	80	140
30	112	90	146
40	118	100	153
50	123		

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Bertozzi and Soldani (Wilhelmy slide plate method) [**15**].

$BaBr_2$-RbBr

Melt Preparation and Purification

In their surface tension studies, Bertozzi and Soldani [**15**] used carefully dried Merck and B. D. H. salts of analytical purity without further purification.

TABLE 190. Surface tension studies: $BaBr_2$-RbBr

Investigations critically re-examined

Ref.	RbBr, mol %	Temp. range (*T*)
15 [a]	0–100 (g)	1123

[a] Results in reference [**15**] were reported to be reproducible to within 0.5%.

TABLE 191. $BaBr_2$-RbBr: Surface tension (dyn cm^{-1})

Mol % $BaBr_2$	1123 K	Mol % $BaBr_2$	1123 K
0	77	60	103
10	81	70	109
20	85	80	119
30	89	90	132
40	93	100	152
50	98		

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Bertozzi and Soldani (Wilhelmy slide plate method) [15].

$CdBr_2$-KBr

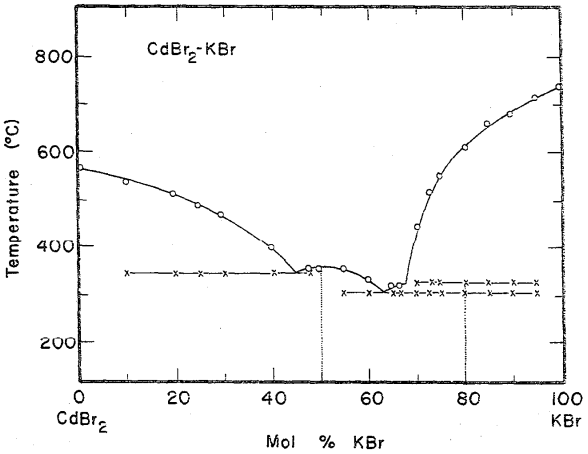

FIGURE 15. Temperature-composition phase diagram for $CdBr_2$-KBr.

H. Brand, Neues Jahrb. Mineral., Geol., Palaeontol. **35**, 9 (1913).

Melt Preparation and Purification

Ellis [22, **34**, **35**, 50] ground oven-dried Baker and Adamson reagent-grade $CdBr_2$ and KBr together in a ball mill. The resulting mixtures were dried by heating at 400 °C in vacuum. Those mixtures rich in KBr were fused in a Vycor apparatus and reground before use. Melt compositions were determined after each experiment using EDTA titration for cadmium and potentiometric $AgNO_3$ titration for bromide.

Moiseeva [**26**] fused the salts and stored them in sealed, evacuated flasks.

TABLE 192. Electrical conductance studies: $CdBr_2$-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (*T*)	Comments
26	0–100	673–1023	Cell material: quartz vessels; Pt electrodes; freq. range: 1000–3000 Hz; calibration: molten KNO_3 and $PbCl_2$
41	0–100	1023 (g)	

Deviations from previous NSRDS recommendations: [1, pp. 14, 17]

Ref.	KBr mol %	Min. departure	Max. departure
26	100	0. 18%	(1023 K)
26	0	0. 0% (848 K)	0. 56% (1023 K)

TABLE 193. $CdBr_2$-KBr: Specific conductance ($ohm^{-1}cm^{-1}$)

	Mol percent KBr								
T	100	80	70	63	53	43	26	12	0
680			0. 579	0. 595	0. 653	0. 747			
690			0. 602	0. 617	0. 677	0. 770			
700			0. 624	0. 640	9. 700	0. 794			
710			0. 646	0. 662	0. 723	0. 817			
720			0. 668	0. 684	0. 746	0. 839			
730			0. 689	0. 706	0. 768	0. 862			
740			0. 711	0. 727	0. 790	0. 883			
750			0. 732	0. 749	0. 811	0. 905			
760			0. 753	0. 770	0. 833	0. 926			
770			0. 774	0. 791	0. 853	0. 947			
780			0. 794	0. 811	0. 874	0. 967	1. 003		
790			0. 815	0. 832	0. 894	0. 987	1. 023		
800			0. 835	0. 852	0. 914	1. 007	1. 043		
810			0. 855	0. 872	0. 934	1. 026	1. 063		
820			0. 875	0. 892	0. 953	1. 045	1. 082		
830			0. 895	0. 912	0. 972	1. 063	1. 102	1. 075	
840			0. 914	0. 932	0. 990	1. 081	1. 120	1. 094	
850			0. 934	0. 951	1. 009	1. 099	1. 139	1. 114	1. 074
860			0. 953	0. 970	1. 026	1. 117	1. 158	1. 133	1. 095
870			0. 972	0. 989	1. 044	1. 134	1. 176	1. 152	1. 115
880		1. 118	. 0990	1. 007	1. 061	1. 150	1. 194	1. 171	1. 135

TABLE 193. $CdBr_2$-KBr: Specific conductance (ohm^{-1} cm^{-1})—Continued

	Mol percent KBr								
T	100	80	70	63	53	43	26	12	0
890		1.142	1.009	1.026	1.078	1.166	1.211	1.190	1.156
900		1.166	1.027	1.044	1.095	1.182	1.229	1.209	1.176
910		1.189	1.046	1.062	1.111	1.198	1.246	1.228	1.196
920		1.211	1.064	1.080	1.127	1.213	1.263	1.246	1.217
930		1.232	1.082	1.098	1.142	1.228	1.279	1.264	1.237
940		1.253	1.099	1.115	1.157	1.242	1.295	1.283	1.257
950		1.273	1.117	1.132	1.172	1.256	1.311	1.301	1.278
960		1.292	1.134	1.149	1.187	1.269	1.327	1.319	1.298
970		1.310	1.151	1.166	1.201	1.283	1.343	1.336	1.319
980		1.327	1.168	1.183	1.215	1.296	1.358	1.354	1.339
990		1.344	1.185	1.199	1.228	1.308	1.373	1.372	1.359
1000		1.360	1.201	1.215	1.242	1.320	1.388	1.389	1.380
1010		1.375	1.218	1.231	1.255	1.332	1.402	1.406	1.400
1020		1.390	1.234	1.247	1.267	1.343	1.417	1.423	1.420
1023.2	1.650[a]								

Temperature-dependent equations

$\kappa = a + bT + cT^2$

KBr mol %	*a*	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
0	−0.6551	2.0347	0	0.35%
12	−1.0434	3.1368	−0.7045	0.23%
26	−1.3855	4.0855	−1.3122	0.52%
43	−1.7499	4.9486	−1.8786	0.45%
53	−1.7375	4.6561	−1.6770	0.67%
63	−1.4252	3.6717	−1.0310	0.20%
70	−1.3775	3.5127	−0.9339	0.41%
80	−4.0211	9.2014	−3.8202	0.43%

These values are based on the work of Moiseeva (classical ac technique) [26].

[a] For 100 mol % KBr, the only experimental value is given.

TABLE 194. Density Studies: $CdBr_2$-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (*T*)	Comments
22	0–100	670–1271	Capillary of 89%Pt-11% Rh
34[a]	0–80	773–1173	As for 22
35[a]	69.7, 74.5	873–1123	As for 22
36	0–75	873	As for 22

Deviations from NSRDS recommendations [1, pp. 14, 17 and this volume]

Ref.	KBr mol %	Min. departure	Max. departure
22	100	−0.97% (1200 K)	
36	70	−3.2% (873 K)	
22	0	−0.05% (960 K)	−1.14% (880 K)
36	0	0.02% (893 K)	1.8% (1031 K)

[a] Densities were obtained by Ellis by measuring the difference in maximum bubble pressure at two depths of immersion. Measurements were made to ±0.0001 cm, and corrections were applied for thermal expansion.

TABLE 195. $CdBr_2$-KBr: Density (g cm^{-3})

	Mol percent KBr						
T	80.0	74.5	69.7	60.0	39.0	19.8	0.0
780				3.028			
790				3.023			
800				3.017			
810				3.011			
820				3.005			
830				2.998			
840				2.991			
850				2.984			
860				2.977			
870		2.679		2.969			
880		2.676		2.961		3.693	
890		2.672	2.763	2.953		3.689	
900		2.667	2.758	2.945		3.685	3.979
910		2.663	2.753	2.936		3.679	3.973
920		2.658	2.748	2.927	3.277	3.673	3.968
930		2.653	2.742	2.918	3.269	3.666	3.963
940	2.566	2.648	2.736	2.909	3.260	3.658	3.957
950	2.557	2.642	2.730	2.899	3.252	3.649	3.952
960	2.547	2.636	2.723	2.889	3.243	3.639	3.947
970	2.538	2.630	2.715	2.879	3.234	3.629	3.941
980	2.529	2.624	2.708	2.868	3.226	3.617	3.936
990	2.519	2.617	2.700	2.858	3.217	3.605	3.930
1000	2.510	2.610	2.691	2.847	3.209	3.592	3.925
1010	2.501	2.603	2.682	2.835	3.200	3.578	3.920
1020	2.492	2.595	2.673		3.192	3.563	3.914
1030	2.482	2.588	2.663		3.183	3.547	3.909
1040	2.473	2.580	2.653		3.174		3.903
1050	2.464	2.571	2.643		3.166		3.898
1060	2.454	2.563	2.632		3.157		3.893
1070	2.445	2.554	2.620		3.149		
1080	2.436	2.545	2.609		3.140		
1090	2.427	2.536	2.597		3.132		
1100	2.417	2.526	2.584		3.123		
1110	2.408	2.516					
1120	2.399	2.506					
1130	2.389						
1140	2.380						
1150	2.371						
1160	2.316						
1170	2.352						

Temperature-dependent equations

$$\rho=a+bT+cT^2$$

KBr mol %	*a*	$b\cdot10^4$	$c\cdot10^6$	Stand. error of est.
0	4.4627	−5.3769	0	0.77%
19.8	0.6046	73.3905	−4.3519	0.35%
39.0	4.0665	−8.5782	0	0.19%
60.0	2.6552	14.9489	−1.3035	0.36%
69.7	1.5696	31.1338	−1.9919	0.40%
74.5	1.9731	19.8200	−1.3449	0.78%
80.0	3.4395	−9.2928	0	0.59%

These values are based on the work of Ellis (modified maximum bubble pressure method) [**34**, **35**].

TABLE 196. Surface tension studies: $CdBr_2$-KBr

Investigations critically re-examined

Ref.	KBr mol %	Temp. range (*T*)	Comments
22	0–100	773–1245	Capillary of 89% Pt-11 % Rh alloy
34[a]	0–80	773–1093	As for 22
35[a]	69.7, 74.5	873–1123	As for 22
50	0–100	773–1245	As for 22

Deviations from previous NSRDS recommendations [2, p. 63]

Ref.	KBr mol %	Min. departure	Max. departure
50	100	1. 9% (1073 K)	3.1% (1223 K)
22	100	1. 9% (1073 K)	3.1% (1223 K)

[a] Ellis measured to ±0.0001 cm and applied corrections for the thermal expansion of the capillary. Numerical data were reported in references 34 and 35, whereas linear temperature-dependent equations were given in references 22 and 50. Reference 34 is the NSRDS reference data base for the surface tension of molten $CdBr_2$.

TABLE 197. $CdBr_2$-KBr: Surface tension (dyn cm^{-1})

	Mol percent KBr						
T	80. 0	74. 5	69. 7	60. 0	39. 0	19. 8	0
780				83. 20			
790				82. 62			
800				82. 04			
810				81. 45			
820				80. 77			
830				80. 28	78. 71	73. 99	
840				79. 70	78. 09	73. 41	
850				79. 11	77. 48	72. 84	
860				78. 53	76. 87	72. 26	
870		85. 18		77. 94	76. 26	71. 68	
880		84. 64		77. 36	75. 64	71. 11	
890		84. 09	82. 61	76. 78	75. 03	70. 53	
900		83. 55	82. 10	76. 19	74. 42	69. 95	
910		83. 01	81. 60	75. 61	73. 81	69. 38	64. 81
920		82. 46	81. 09	75. 02	73. 20	68. 80	64. 49
930		81. 92	80. 59	74. 44	72. 58	68. 23	64. 18
940		81. 38	80. 08	73. 85	71. 97	67. 65	63. 86
950	88. 39	80. 83	79. 58	73. 27	71. 36	67. 07	63. 55
960	87. 68	80. 29	79. 07	72. 68	70. 75	66. 50	63. 24
970	86. 96	79. 74	78. 57	72. 10	70. 13	65. 92	62. 92
980	86. 24	79. 20	78. 06	71. 52	69. 52	65. 34	62. 61
990	85. 53	78. 66	77. 56	70. 93	68. 91	64. 77	62. 20
1000	84. 81	78. 11	77. 05	70. 35	68. 30	64. 19	61. 98
1010	84. 10	77. 57	76. 54	69. 76	67. 68	63. 62	61. 67
1020	83. 38	77. 03	76. 04		67. 07	63. 04	61. 35
1030	82. 66	76. 48	75. 54		66. 46		61. 04

TABLE 197. $CdBr_2$-KBr: Surface tension (dyn cm^{-1})—Continued

	Mol percent KBr						
T	80.0	74.5	69.7	60.0	39.0	19.8	0
1040	81.95	75.94	75.03		65.85		60.72
1050	81.23	75.40	74.53		65.24		
1060	80.51	74.85	73.52		64.62		
1070	79.80	74.31	74.53		64.01		
1080	79.08	73.77	73.01		63.40		
1090	78.36		72.51		62.79		
1100			72.00				

Temperature-dependent equations

$\gamma = a + bT$

KBr mol %	*a*	$b \cdot 10^2$	Stand. error of est.
0	93.38	−3.14	0.01%
19.8	122.40	−5.76	2.27%
39.0	130.14	−6.12	1.48%
60.0	128.79	−5.84	0.21%
69.7	127.55	−5.05	0.53%
74.5	132.47	−5.44	0.71%
80.0	156.46	−7.16	0.92%

These values are based on the work of Ellis (maximum bubble pressure method) [34, 35].

$CdBr_2$-NaBr

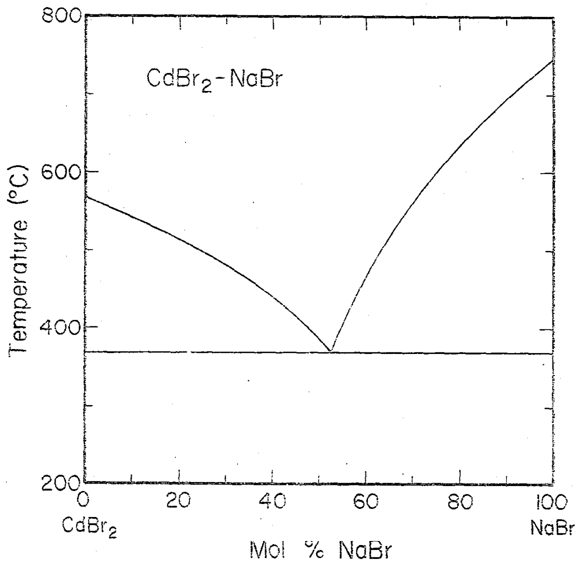

FIGURE 16. Temperature-composition phase diagram for $CdBr_2$-NaBr.

H. Brand, Neues Jahrb. Mineral., Geol., 35, 15 (1913).

Melt Preparation and Purification

Moiseeva [26] gave no information on starting materials or purification, but only reports that the salts were melted and later stored in hermetically sealed flasks in a desiccator.

TABLE 198. Electrical conductance studies: $CdBr_2$-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (*T*)	Comments
26	0–94	773–1023	Cell material: quartz vessels; Pt electrodes; freq. range: 1000–3000 Hz; calibration: molten KNO_3 and $PbCl_2$

Deviations from previous NSRDS recommendations [1, p. 17]

Ref.	NaBr mol %	Min. departure	Max. departure
26	0	0.0% (848 K)	0.56% (1023 K)

TABLE 199. $CdBr_2$-NaBr: Sepcific conductance ($ohm^{-1}cm^{-1}$)

	Mol percent NaBr								
T	94	78	68	63	48	38. 5	26	13	0
780				1. 470	1. 388	1. 301			
790				1. 504	1. 419	1. 332			
800				1. 538	1. 449	1. 363			
810				1. 571	1. 478	1. 392			
820				1. 603	1. 507	1. 421			
830		1. 780	1. 682	1. 634	1. 535	1. 450	1. 333	1. 298	
840		1. 811	1. 714	1. 664	1. 562	1. 477	1. 358	1. 223	
850		1. 842	1. 744	1. 694	1. 588	1. 504	1. 383	1. 248	1. 074
860		1. 872	1. 775	1. 723	1. 614	1. 530	1. 408	1. 272	1. 095
870		1. 902	1. 804	1. 750	1. 639	1. 555	1. 431	1. 296	1. 115
880		1. 931	1. 832	1. 777	1. 664	1. 580	1. 454	1. 319	1. 135
890		1. 959	1. 860	1. 804	1. 688	1. 604	1. 477	1. 341	1. 156
900		1. 987	1. 887	1. 829	1. 711	1. 627	1. 499	1. 363	1. 176
910		2. 014	1. 913	1. 853	1. 733	1. 649	1. 521	1. 385	1. 196
920		2. 040	2. 939	1. 877	1. 755	1. 671	1. 542	1. 405	1. 217
930		2. 066	1. 964	1. 900	1. 776	1. 692	1. 562	1. 426	1. 237
940		2. 091	1. 987	1. 922	1. 796	1. 712	1. 582	1. 445	1. 257
950		2. 115	2. 011	1. 943	1. 816	1. 731	1. 602	1. 465	1. 278
960		2. 139	2. 033	1. 963	1. 835	1. 750	1. 620	1. 483	1. 298
970		2. 162	2. 055	1. 983	1. 853	1. 768	1. 639	1. 501	1. 319
980	[2. 438]	2. 184	2. 075	2. 001	1. 871	1. 785	1. 657	1. 519	1. 339
990	[2. 457]	2. 206	2. 095	2. 019	1. 888	1. 801	1. 674	1. 536	1. 359
1000	[2. 476]	2. 227	2. 115	2. 036	1. 904	1. 817	1. 691	1. 552	1. 380
1010	[2. 495]	2. 247	2. 133	2. 052	1. 919	1. 832	1. 707	1. 568	1. 400
1020	[2. 514]	2. 267	2. 151	2. 068	1. 934	1. 846	1. 722	1. 583	1. 420

Temperature-dependent equations

	$\kappa=a+bT+cT^2$			
NaBr, mol %	a	$b\cdot10^3$	$c\cdot10^6$	Stand. error of est.
0	−0. 6551	2. 0347	0	0. 35%
13	−2. 8298	7. 1490	−2. 7670	0. 52%
26	−2. 6481	7. 0331	−2. 6945	0. 41%
38. 5	−3. 4063	8. 9128	−3. 6894	0. 22%
48	−3. 1279	8. 4772	−3. 4453	0. 58%
63	−3. 8010	10. 0199	−4. 1827	0. 77%
68	−3. 6427	9. 6271	−3. 8698	0. 78%
78	−3. 1109	8. 6007	−3. 2630	0. 90%
94	[0. 5759]	[1. 9000]	0	0. 00%

These values are based on the work of Moiseeva (classical ac technique) [26].

Table 200. Density studies: $CdBr_2$-NaBr

Investigations critically re-examined

Ref.	NaBr, mol %	Temp. range (*T*)
36	0–60	873

Deviations from previous NSRDS recommendations [1, p. 17]

Ref.	NaBr, mol %	Min. departure
36	0	−0.10% (873 K)

Table 201. $CdBr_2$-NaBr: Density (g cm^{-3})

	Mol percent NaBr					
T	60	50	40	30	20	0
873.2	3.427	3.529	3.668	3.779	3.876	4.036

Due to limited data, the values in this table are those reported by Lantratov and Shevlyakova (Archimedean method) [**36**].

$CdBr_2$-TlBr

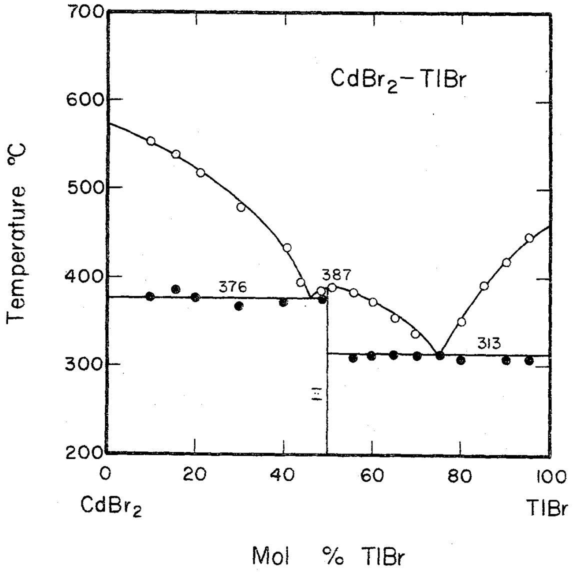

Figure 17. Temperature-composition phase diagram for $CdBr_2$-TlBr.

C. Sinister, R. Riccardi, and A. Magistris, Ber. Bunsenges. Phys. Chem., **71**, 376 (1967)

Table 202. Density studies: $CdBr_2$-TlBr

Investigations critically re-examined

Ref.	TlBr, mol %	Temp. range (*T*)
38	≃0−89 (g)	873

Table 203. $CdBr_2$-TlBr: Density (g cm^{-3})

Mol % $CdBr_2$	873 K	Mol % $CdBr_2$	873 K
10	5.50	60	4.61
20	5.22	70	4.36[a]
30	5.05	80	4.26[a]
40	4.90	90	4.14[a]
50	4.75	100	4.03

These values have been interpolated to a maximum of three significant figures from the graphical presentations of Il'yasov and Barsegov (Archimedean method) [**38**].

[a] Extrapolated value.

$CdBr_2$-$ZnBr_2$

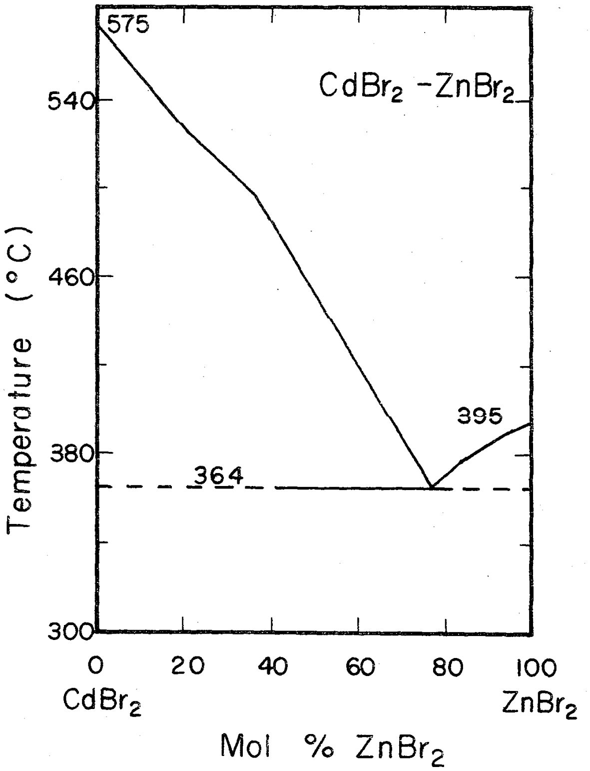

Figure 18. Temperature-composition phase diagram for $CdBr_2$-$ZnBr_2$.

G. A. Zakharclenko, Sborniktrudov pusvyashehennyi yubileyu Kuibyshevskogo industrial'nogo instituta im. Kuibysheva, p. 171, 1050; Zh. Obshch. Khim, **21**, 453 (1951).

Melt Preparation and Purification

Markov et al. [24] used analytical-grade cadmium bromide, purified by recrystallization and dried by treatment with anhydrous HBr. Zinc bromide was prepared by dissolving very pure zinc metal (99.999% Zn) in distilled chemically pure hydrobromic acid, followed by drying and distillation. The salt mixtures were weighed and prepared in a dry chamber and were transferred to quartz floats under an atmosphere of dry argon.

TABLE 204. Density studies: $CdBr_2$-$ZnBr_2$

Investigations critically re-examined

Ref.	$ZnBr_2$ mol %	Temp. range (T)	Comments
24 [a]	0–100	683–953	Cell material: quartz ball containing tungsten for weight; calibration: water and CCl_4

Deviations from previous NSRDS recommendations [1, p. 17]

Ref.	$ZnBr_2$ mol %	Min. departure	Max. departure
24	100	0.12% (700 K)	0.42% (860 K)
24	0	0.00% (900 K)	0.15% (940 K)

[a] Markov et al. [24] made no corrections for the thermal expansion of the quartz float since the errors involved were considerably less than the accuracy of the density measurements (±0.2%).

TABLE 205. $CdBr_2$-$ZnBr_2$: Density (g cm^{-3})

	Mol percent $ZnBr_2$										
T	100	90	80	70	60	50	40	30	20	10	0	78.8
700	3.445	3.519	3.593									
710	3.436	3.510	3.584									3.593
720	3.427	3.501	3.576									3.584
730	3.418	3.493	3.567	3.641								3.576
740	3.410	3.484	3.558	3.632								3.567
750	3.401	3.475	3.549	3.623								3.558
760	3.392	3.466	3.540	3.614								3.549
770	3.383	3.457	3.531	3.606	3.680							3.540
780	3.374	3.448	3.523	3.597	3.671							3.531
790	3.366	3.440		3.588	3.662							3.523
800	3.357			3.579	3.653							
810	3.348			3.570	3.644							
820	3.339			3.561	3.636	3.710	3.784					
830	3.330				3.627	3.701	3.775					
840	3.321				3.618	3.692	3.766	3.840				
850	3.313				3.609	3.683	3.757	3.831				
860	3.304				3.600	3.674	3.748	3.823	3.897	3.971		
870					3.591	3.666	3.740	3.814	3.888	3.962	4.036	
880						3.657	3.731	3.805	3.879	3.953	4.027	
890						3.648	3.722	3.796	3.870	3.944	4.018	
900						3.639	3.713	3.787	3.861	3.936	4.010	
910						3.630	3.704	3.778	3.853	3.927	4.001	
920							3.696	3.770	3.844	3.918	3.992	
930							3.687	3.761	3.835	3.909	3.983	
940											3.974	
950											3.966	

TABLE 205. $CdBr_2$-$ZnBr_2$: Density (g cm^{-3})—Continued

Two-dimensional equation and statistical parameters

$\rho = a + bT + cC$

a	$b \cdot 10^4$	$c \cdot 10^3$	Max. percent departure	Stand. error of est.
4. 06293	−8. 82782	7. 41224	0.13% (813.2 K, 60 mol % $CdBr_2$)	0. 05%

These values are based on the work of Markov, Prisyazhnyii, and Prikhodko (Archimedean method) [24]. *C*=mol % $CdBr_2$.

TABLE 206. $CdBr_2$-$ZnBr_2$: Density (g cm^{-3})

	Mol percent $ZnBr_2$									
T	100	90	80	70	50	40	30	20	10	0
690	3. 456	3. 530								
700	3. 447	3. 521	3. 592							
710	3. 438	3. 512	3. 583							
720	3. 429	3. 503	3. 574	3. 650						
730	3. 420	3. 494	3. 566	3. 641						
740	3. 410	3. 485		3. 642						
750	3. 401	3. 476		3. 623						
760	3. 392	3. 466		3. 615						
770	3. 383	3. 457		3. 606						
780	3. 374	3. 448		3. 597						
790	3. 365	3. 439		3. 588						
800	3. 356	3. 430		3. 579						
810	3. 347	3. 421		3. 570						
820	3. 338	3. 412		3. 562	3. 709	3. 779				
830	3. 329	3. 403		3. 553	3. 701	3. 771	3. 849			
840	3. 320				3. 692	3. 762	3. 840			
850	3. 311				3. 684	3. 754	3. 831			
860	3. 302				3. 676	3. 745	3. 822	3. 895	3. 973	
870					3. 667	3. 737	3. 814	3. 887	3. 964	4. 038
880					3. 659	3. 728	3. 805	3. 878	3. 955	4. 029
890					3. 650	3. 720	3. 796	3. 869	3. 946	4. 020
900					3. 642	3. 712	3. 788	3. 860	3. 937	4. 010
910					3. 633	3. 703	3. 779	3. 852	3. 928	4. 001
920					3. 625	3. 695	3. 770	3. 843	3. 919	3. 992
930					3. 616	3. 686	3. 762	3. 834	3. 910	3. 983
940					3. 608					3. 974
950										3. 965

Temperature-dependent equations

$\rho = a + bT$

$ZnBr_2$ mol %	a	$b \cdot 10^4$
0	4. 834	−9. 15
10	4. 747	−9. 00
20	4. 645	−8. 72
30	4. 571	−8. 70
40	4. 470	−8. 43
50	4. 403	−8. 46
70	4. 287	−8. 84
80	4. 209	−8. 81
90	4. 157	−9. 09
100	4. 080	−9. 05

These values are based on the work of Markov, Prisyazhnyii, and Prikhodko (Archimedean method) [24].

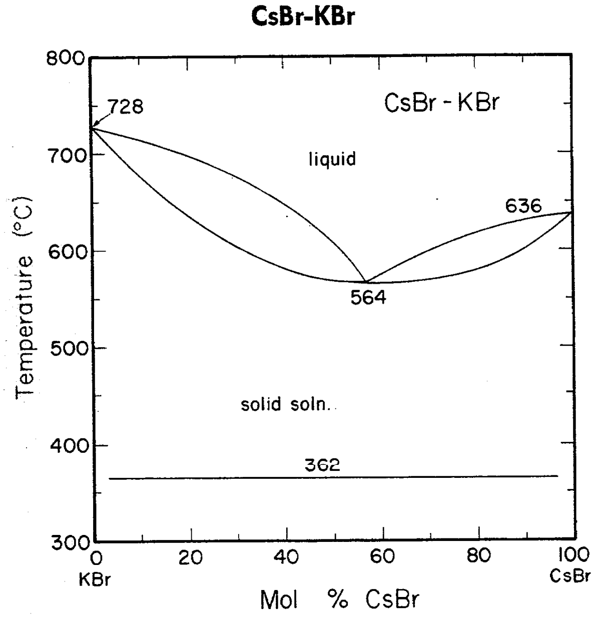

FIGURE 19. Temperature-composition phase diagram for CsBr-KBr.

V. E. Plyaslehev and R. G. Samuseva, Zh. Neorgan. Khim., **9** [9], 2179 (1964): Russ. J. Inorg. Chem. (English Transl.) 1177 (1964).

Melt Preparation and Purification

The method used by Brooks and Paul [**44, 46**] for the preparation of CsBr and KBr melts is described under the systems (AgBr-CsBr) and (AgBr-KBr).

TABLE 207. Density studies: CsBr-KBr

Investigations critically re-examined			
Ref.	KBr mol %	Temp. range (T)	Comments
44, 46	50	980-1119	Cell material: Pt bob and suspension wire; calibration: H_2O

TABLE 208. CsBr-KBr: Density (g cm^{-3})

Mol % KBr=50			
T	ρ	T	ρ
980	2.635	1050	2.564
990	2.625	1060	2.554
1000	2.615	1070	2.544
1010	2.605	1080	2.534
1020	2.595	1090	2.524
1030	2.585	1100	2.514
1040	2.575	1110	2.504

Temperature dependent equation

$$\rho=a-bT$$

Mol % KBr	a	$b\times10^3$
50	3.624_1	1.009_2

These values are based on the work of Brooks and Paul (Archimedean method) [**44, 46**].

TABLE 209. Surface tension studies: CsBr-KBr

Investigations critically re-examined		
Ref.	KBr, mol %	Temp. range (T)
49[a]	0-100	880-1173

Deviations from previous NSRDS recommendations [2, p. 63]

Ref.	KBr mol	Min. departure	Max. departure
49	100	2.89% (1023 K)	3.02% (1123 K)

[a] Reference [**49**] contained only graphical data in the form of surface tension-composition isotherms at 800°C. Numerical data given here were obtained through a private communication. Bertozzi reported a reproducibility for his data of 0.5%. Reference **49** is the NSRDS reference data base for the surface tension of molten CsBr [2].

TABLE 210. CsBr-KBr: Surface tension (dyn cm^{-1})

	Mol percent KBr										
T	100	90	80	70	60	50	40	30	20	10	0	43
880						91. 65	90. 28					90. 67
895						90. 61	89. 24	87. 98				98. 64
910					91. 07	89. 57	88. 19	86. 93	85. 80			88. 59
925					90. 04	88. 53	87. 15	85. 89	84. 75			87. 55
940					88. 99	87. 48	86. 10	84. 84	83. 71	82. 70	81. 82	86. 50
955				89. 59	87. 95	86. 44	85. 05	83. 79	82. 66	81. 66	80. 78	85. 45
970				88. 55	86. 90	85. 38	84. 00	82. 74	81. 62	80. 62	79. 75	84. 40
985				87. 50	85. 85	84. 33	82. 95	81. 69	80. 57	79. 58	78. 72	83. 35
1000			88. 24	86. 45	84. 80	83. 28	81. 89	80. 64	79. 52	78. 54	77. 69	82. 29
1015	91. 18	89. 12	87. 19	85. 40	83. 74	82. 22	80. 84	79. 59	78. 48	77. 50	76. 66	81. 24
1030	90. 14	88. 07	86. 14	84. 34	82. 69	81. 17	79. 79	78. 54	77. 44	76. 47	75. 64	80. 19
1045	89. 10	87. 02	85. 08	83. 29	81. 63	80. 11	78. 73	77. 49	76. 39	75. 43	74. 61	79. 13
1060	88. 05	85. 97	84. 03	82. 23	80. 57	79. 05	77. 68	76. 44	75. 35	74. 40	73. 59	78. 08
1075	87. 01	84. 92	82. 97	81. 17	79. 51	76. 00	76. 62	75. 40	74. 31	73. 37	72. 58	77. 02
1090	85. 96	83. 86	81. 91	80. 11	78. 45	76. 94	75. 57	74. 35	73. 28	72. 35	71. 56	75. 97
1105	84. 90	82. 80	80. 85	79. 05	77. 39	75. 88	74. 52	73. 31	72. 24	71. 33		74. 92
1120	83. 85	81. 74	79. 79	77. 99	76. 33	74. 83	73. 47	72. 27	71. 21	70. 31		73. 86
1135		80. 68	78. 73	76. 93	75. 27	73. 78	72. 43	71. 23	70. 19	69. 29		72. 82
1150		79. 62	77. 67	75. 87	74. 22	72. 72	71. 38	70. 20	69. 16			71. 77
1165			76. 61	74. 81	73. 16	71. 67	70. 34	69. 16	68. 14			70. 72

Two-dimensional equation and statistical parameters

$$\gamma = a + bT^2 + cT^3 + dTC + eTC^2 + fCT^2$$

a	$b\cdot10^5$	$c\cdot10^8$	$d\cdot10^4$	$e\cdot10^7$	$f\cdot10^7$	Max. percent departure	Stand. error of est.
134. 64467	−5. 86184	1. 61815	−3. 58115	6. 68057	1. 46125	−0. 19% (1013.0 K) 0 mol % CsBr)	0. 07%

These values are based on the work of Bertozzi (Wilhelmy slide plate method) [49]. Here C=mol % CsBr.

TABLE 211. CsBr-KBr: Surface tension (dyn cm^{-1})

	Mol percent KBr				
T	100	75	50	25	0
880			91. 6		
890			90. 9		
900			90. 2	87. 1	
910			89. 5	86. 4	
920			88. 8	85. 7	
930			88. 1	85. 0	
940			87. 4	84. 3	81. 8
950			86. 7	83. 6	81. 1
960			86. 0	82. 9	80. 4
970		89. 4	85. 3	82. 2	79. 7
980		88. 7	84. 6	81. 5	79. 1
990		88. 0	83. 9	80. 8	78. 4
1000		87. 3	83. 2	80. 1	77. 7
1010		86. 6	82. 5	79. 4	77. 0
1020	90. 1	85. 9	81. 8	78. 7	76. 3
030	90. 3	85. 2	81. 1	78. 0	75. 7
040	89. 5	84. 5	80. 4	77. 3	75. 0
1050	88. 8	83. 8	79. 7	76. 6	74. 3
1060	88. 1	83. 1	79. 0	79. 9	73. 6
1070	87. 3	82. 4	78. 3	75. 2	72. 9
1080	86. 6	81. 7	77. 6	74. 5	72. 3
1090	85. 9	81. 0	76. 9	73. 8	71. 6
1100	85. 1	80. 3	76. 2	73. 1	70. 9
1110	84. 4	79. 6	75. 5	72. 4	
1120	83. 7	78. 9	74. 8	71. 7	
1130		78. 2	74. 1	71. 0	
1140		77. 5	73. 4	70. 3	
1150		76. 8	72. 7	69. 6	
1160		76. 1	72. 0	68. 9	
1170		75. 4	71. 3	68. 2	

Temperature-dependent equations

$$\gamma = a + bT$$

KBr, mol %	*a*	$b \cdot 10^2$
0	145. 7	−6. 8
25	150. 1	−7. 0
50	153. 2	−7. 0
75	157. 3	−7. 0
100	165. 4	−7. 3

These values are based on the work of Bertozzi (Wilhelmy slide plate method) [49].

CsBr-LiBr

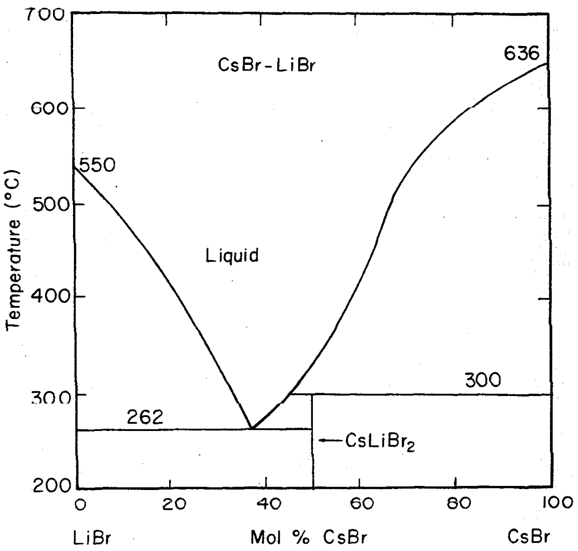

FIGURE 20. Temperature-composition phase diagram for CsBr-LiBr.

V. E. Plyushchev and R. G. Samuseva, Zh. Neorgan. Khim., **9**, 2179 (1964); Russ. J. Inorg. Chem., **9**, 1177 (1964).

Melt Preparation and Purification

Holm and Berge [**39**, **51**] used Merck, Suprapur CsBr and 99.0% (Matheson, Coleman and Bell) LiBr. The salts were dried at about 400–500° C under moderate vacuum (0.1–0.01 torr) and then melted in a platinum crucible in an atmosphere of purified N_2.

TABLE 212. Density studies: CsBr-LiBr

Investigations critically re-examined

Ref.	LiBr mol %	Temp. range (*T*)	Comments
39[a]	0.0, 40.1, 50.0, 60.0, 100.0	1073	Cell material: Pt-10% Rh sinker; calibration: water

Deviations from previous NSRDS recommendations [1, p. 15]

Ref.	LiBr mol %	Min. departure
39	100	−0.24% (1073 K)

[a] Measurements were carried out in a dry N_2 atmosphere, after the system had been evacuated to 10^{-4} torr. The temperature gradients around the crucible were less than 0.1 °C/cm. Corrections were applied for the buoyancy in air or nitrogen and for the surface tension effect on the suspension wire of the sinker. An accuracy of 0.2–0.4% was reported for density measurements.

TABLE 213. CsBr-LiBr: Density (g cm^{-3})

Mol % LiBr	1073 K
0. 0	2. 939
40. 1	2. 783
50. 0	2. 730
60. 0	2. 678
100. 0	2. 385

These values are taken from the work of Holm (hydrostatic weighing method) [39]. The experimental values are given.

TABLE 214. Surface tension studies: CsBr-LiBr

Investigations critically re-examined

Ref.	LiBr mol %	Temp. range (T)	Comments
51	40. 1, 50. 0, 60. 0	1073	Cell material: Pt-10% Rh sinker; calibration: water

TABLE 215. CsBr-LiBr: Surface tension (dyn cm^{-1})

Mol % LiBr	1073 K
40. 1	76. 0
50. 0	76. 5
60. 0	77. 6

These values are taken from the work of Berge and Holm (pin detachment method) [51]. The experimental values are given.

CsBr-NaBr

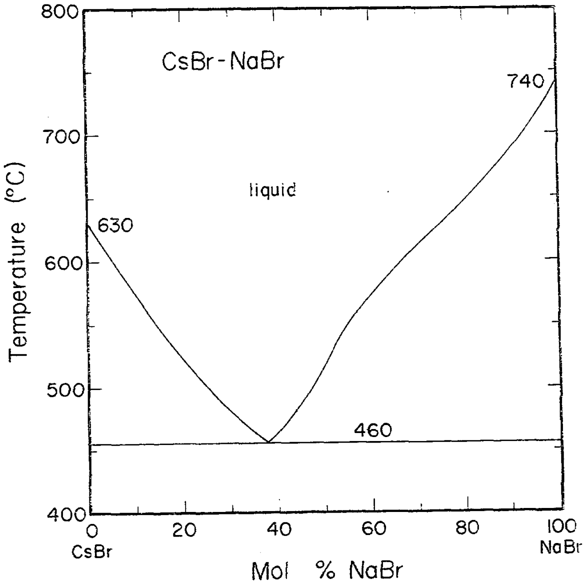

FIGURE 21. Temperature-composition phase diagram for CsBr-NaBr.

R. G. Samuseva and V. E. Piyashelev, Zh. Neorgan. Khim., 6 [9], 2139 (1961); Russ. J. Inorg. Chem. (English Transl.), *1093 (1961)*.

Melt Preparation and Purification

In their surface tension studies, Bertozzi and Soldani [15] used carefully dried Merck and B. D. H. salts of analytical purity without further purification.

TABLE 216. Surface tension studies: CsBr-NaBr

Investigations critically re-examined

Ref.	NaBr, mol %	Temp. range (T)
15[a]	0–100	800–1143

Deviations from previous NSRDS recommendations [2, p. 62]

Ref.	NaBr mol %	Min. departure	Max. departure
15	100	−0. 31% (1033 K)	0. 81% (1133 K)

[a] Reference [15] contained only graphical data in the form of surface tension—composition isotherms at 800° C. Numercial data given here was obtained through a private communication. Bertozzi reported a reproducibility for his data of 0.5%. The experimental values reported in [15] for CsBr were those reported in [49] (Bertozzi). Reference 49 is the NSRDS reference data base for the surface tension of molten CsBr [2].

TABLE 217. CsBr-NaBr: Surface tension (dyn cm^{-1})

	Mol percent NaBr											
T	100	90	80	70	60	50	40	30	20	10	0	37. 5
800							95. 65	94. 88				95. 43
820							94. 27	93. 43	92. 75			94. 03
840						94. 17	92. 89	91. 99	91. 26			92. 64
860						92. 86	91. 52	90. 57	89. 78			91. 26
880					93. 52	91. 55	90. 16	89. 16	88. 32	87. 43		89. 88
900					92. 26	90. 24	88. 81	87. 76	86. 88	85. 94		88. 52
920				93. 85	90. 99	88. 93	87. 46	86. 38	85. 45	84. 48		87. 17
940				92. 61	89. 72	87. 63	86. 13	85. 01	84. 05	83. 04	81. 78	85. 82
960				91. 37	88. 44	86. 32	84. 80	83. 65	82. 67	81. 63	80. 34	84. 48
980			94. 08	90. 11	87. 17	85. 03	83. 48	82. 31	81. 30	80. 24	78. 92	83. 16
1000			92. 83	88. 85	85. 89	83. 73	82. 16	80. 98	79. 95	78. 88	77. 54	81. 84
1020		96. 80	91. 58	87. 58	84. 61	82. 44	80. 86	79. 66	78. 62	77. 54	76. 19	80. 53
1040	102. 22	95. 54	90. 30	86. 30	83. 32	81. 14	79. 50	78. 35	77. 31	76. 22	74. 87	79. 23
1060	100. 93	94. 25	89. 02	85. 01	82. 03	79. 85	78. 27	77. 06	76. 02	74. 93	73. 57	77. 94
1080	99. 63	92. 95	87. 72	83. 72	80. 74	78. 57	76. 99	75. 79	74. 75	73. 66	72. 31	76. 66
1100	98. 29	91. 62	86. 40	82. 42	79. 45	77. 28	75. 71	74. 52	73. 49	72. 42	71. 06	75. 39
1120	96. 93	90. 28	85. 08	81. 10	78. 15	76. 00	74. 45	73. 27	72. 26	71. 19		74. 13
1140							73. 19	72. 03				72. 87

Temperature-dependent equation

$$\gamma = a + bT$$

NaBr mol %	a	$b \cdot 10^2$
0	145. 7	−6. 8
25	148. 6	−6. 8
50	146. 9	−6. 3
75	158. 7	−6. 8
100	175. 3	−7. 0

These values are based on the work of Bertozzi (Wilhelmy slide plate method) [15].

TABLE 218. CsBr-NaBr: Surface tension (dyn cm^{-1})

	Mol percent NaBr				
T	100	75	50	25	0
800				94. 18	
820			95. 25	92. 82	
840			93. 99	91. 46	
860			92. 73	90. 10	
880			91. 47	88. 74	
900			90. 21	87. 38	
920			98. 85	86. 02	
940		94. 76	87. 69	84. 66	81. 76
960		93. 40	86. 43	83. 30	80. 40
980		92. 04	85. 17	81. 94	79. 04
1000		90. 68	83. 91	80. 58	77. 68
1020		89. 32	82. 65	79. 22	76. 32
1040	102. 5	87. 96	81. 39	77. 86	74. 96
1060	101. 1	86. 60	80. 13	76. 30	73. 60
1080	99. 72	85. 24	78. 87	75. 14	72. 24
1100	98. 32	83. 88	77. 61	73. 78	70. 88
1120	96. 92	82. 52	76. 35	72. 42	
1140		81. 16	75. 09	71. 06	

Two-dimensional equation and statistical parameters

$$\gamma = a + bT^2 + cC^2 + dC^3 + eTC + fCT^2$$

a	$b \cdot 10^5$	$c \cdot 10^3$	$d \cdot 10^5$	$e \cdot 10^3$	$f \cdot 10^7$	Max. percent departure	Stand. error of est.
135. 29790	−3. 05835	8. 30359	−3. 56271	−1. 41970	6. 73894	0.66% (1140.0 K, 75 mol % CsBr)	0. 29%

These values are based on the work of Bertozzi (Welhelmy slide plate method) [15]. Here *C*=mol % CsBr.

$CuBr$-$HgBr_2$

Melt Preparation and Purification

Jander and Brodersen [9] stated that their $HgBr_2$ was sublimed several times.

TABLE 219. Electrical conductance studies: $CuBr$-$HgBr_2$

Ref.	$HgBr_2$, mol %	Temp. range (*T*)	Comments
9[a]	0–0.157	515. 2	Cell material: Jena glass or Duranglass; Pt-Ir alloy electrodes; calibration: 0.01 N KCl solution

[a] A sealed conductance cell was used due to the volatility of $HgBr_2$ and any of this salt which sublimed was remelted before making experimental measurements. Concentrations in this study were given in moles CuBr per 1000 cm^3 of melt. No density values were reported.

TABLE 220. $CuBr$-$HgBr_2$: Specific conductance ($ohm^{-1} cm^{-1}$)

CuBr molarity	$\kappa \cdot 10^4$ (515.2 K)
0	1. 45
0. 02239	1. 912
0. 05623	4. 888
0. 1288	1. 353
0. 1574	1. 747

These values are based on the work of Jander and Brodersen (classical ac technique) [9]. Their data were reported as equivalent conductance.

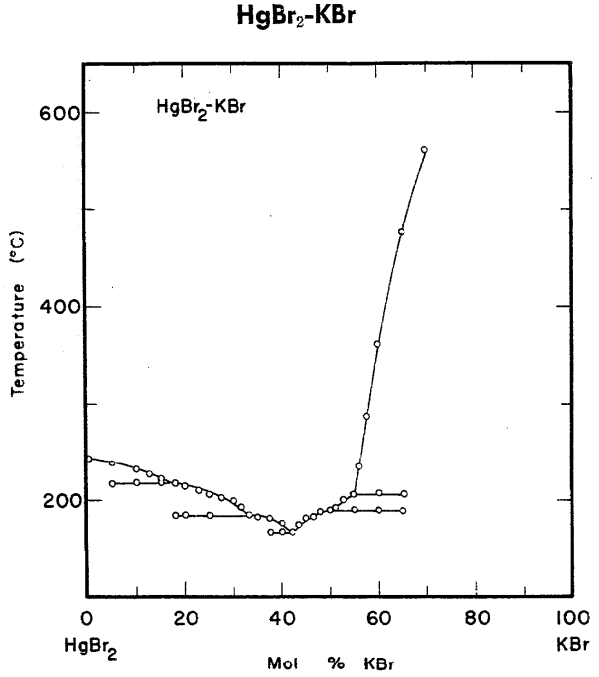

FIGURE 22. Temperature-composition phase diagram for $HgBr_2$-KBr.

I. N. Belyaev and K. E. Mironov, Zh. Obshch. Khim., 22, 1490 (1952).

Melt Preparation and Purification

Jander and Brodersen [9] stated that their $HgBr_2$ was sublimed several times.

TABLE 221. Electrical conductance studies: $HgBr_2$-KBr

Investigations critically re-examined			
Ref.	KBr mol %	Temp. range (T)	Comments
9 [a]	0–10	515. 2	Cell material: Jena glass or Duranglass; Pt-Ir alloy electrodes; calibration: 0.01 N KCl solutions

[a] Concentrations were reported in moles of KBr per 1000 cm^3 of melt. No density values were reported. See the system (CuBr-$HgBr_2$) for a note on the technique used.

TABLE 222. $HgBr_2$-KBr: Specific conductance (ohm^{-1} cm^{-1})

KBr molarity	$\kappa \cdot 10^4$ (515.2 K)	KBr molarity	$\kappa \cdot 10^4$ (515.2 K)
0	1. 45	0. 4467	432. 3
0. 003162	1. 635	0. 6384	651. 6
0. 005753	2. 850	0. 7413	768. 0
0. 006919	3. 529	0. 9982	1040
0. 01318	6. 855	1. 122	1102
0. 01862	10. 09	1. 380	1245
0. 04074	22. 37	1. 950	1538
0. 06310	36. 03	2. 570	1776
0. 08913	55. 70	3. 389	1982
0. 1288	91. 07	5. 495	2335
0. 1905	144. 2	10. 00	2310

These values are based on the work of Jander and Brodersen (classical ac technique) [9]. The data were reported as equivalent conductance.

TABLE 223. Viscosity studies: $HgBr_2$-KBr

Investigations critically re-examined			
Ref.	KBr mol %	Temp. range (T)	Comments
9[a]	0, 0.1, 0.8, 4.91	528–548[b]	Cell material: Jena glass or Duranglass; calibration: Hg

[a] Reference 9 is the NSRDS reference data base for the viscosity of molten mercuric bromide [1].

[b] Extrapolated values at 515 K were also reported.

TABLE 224. $HgBr_2$-KBr: Viscosity (cp)

	Mol percent KBr			
T	4. 91	0. 80	0. 10	0
528. 2	2. 29	1. 68	1. 78	2. 20
538. 2	2. 02	1. 62	1. 68	2. 00
548. 2	1. 94	1. 55	1. 60	1. 84

These values are taken from the work of Jander and Brodersen (capillary technique) [9]. The experimental values are reported.

$HgBr_2$-NaBr

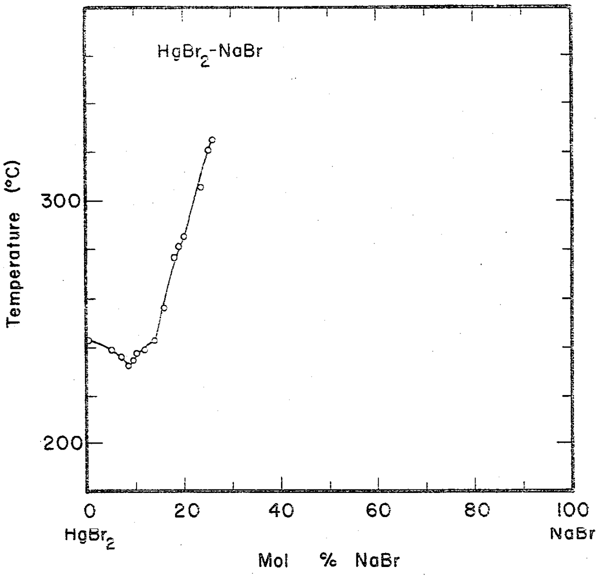

FIGURE 23. Temperature-composition phase diagram for $HgBr_2$-NaBr.

I. N. Belyaev and K. E. Mironov, Zh. Obshch. Khim., 22, 1490 (1952).

Melt Preparation and Purification

Details concerning the purification of $HgBr_2$ in reference [9] are given under the system $HgBr_2$-KBr.

TABLE 225. Electrical conductance studies: $HgBr_2$-NaBr

Investigations critically re-examined			
Ref.	NaBr mol %	Temp. range (T)	Comments
9[a]	0-1.1	515.2	Cell material: Jena glass or Duranglass; Pt-Ir alloy electrodes; calibration: 0.01 N KCl solution

[a] Concentrations were reported in moles of NaBr per 1000 cm^3 of melt. No density values were reported. A short discussion of the experimental technique is given under the system ($AgBr$-$HgBr_2$).

TABLE 226. $HgBr_2$-NaBr: Specific conductance (ohm^{-1} cm^{-1})

NaBr molarity	$\kappa \cdot 10^4$ (515.2 K)	NaBr molarity	$\kappa \cdot 10^4$ (515.2 K)
0	1.45	0.2399	117.5
0.02630	8.311	0.2951	159.7
0.03467	11.37	0.4571	311.4
0.06166	20.96	0.6166	437.7
0.08709	30.57	1.000	768.0
0.1071	42.00	1.096	837.7
0.2018	94.65		

These values are based on the work of Jander and Brodersen (classical ac technique) [9].

TABLE 227. Viscosity studies: $HgBr_2$-NaBr

Investigations critically re-examined			
Ref.	NaBr mol %	Temp. range (T)	Comments
9[a]	0.0, 0.12 1.49, 4.29	528-548[b]	Cell material: Jena glass; calibration: Hg

[a] Reference 9 is the NSRDS reference data base for the viscosity of molten mercuric bromide.

[b] Extrapolated values at 515 K were also reported.

TABLE 228. $HgBr_2$-NaBr: Viscosity (cp)

	Mol percent NaBr			
T	4.29	1.49	0.12	0
528.2	2.25	2.03	2.01	2.20
538.2	2.21	1.96	1.93	2.00
548.2	2.04	1.78	1.77	1.84

These values are taken from the work of Jander and Brodersen (capillary technique) [9]. The experimental values are given.

TABLE 273. Density studies: KBr-$ZnBr_2$

Investigations critically re-examined

Ref.	$ZnBr_2$ mol %	Temp. range (T)	Comments
100[a]	0–100	665–1262	Cell material: Pt-10% Rh sinker, Pt suspension wire; calibration: water

Deviations from previous NSRDS recommendations [1, pp. 14, 17]

Ref.	$ZnBr_2$ mol %	Min. departure	Max. departure
100	0	0. 10% (1075 K)	0. 38% (1200 K)
100	100	0. 63% (880 K)	0. 71% (735 K)

[a] The raw density data of Bloom, et al. [100] were corrected for thermal expansion of the sinker, but corrections due to surface tensions of the molten salts (~70 dyn cm^{-1}, i.e. approx. the same as water) and upthrust due to the buoyancy of the sinker (0.005%) were neglected as being too small to be significant. An accuracy of better than 0.1% was reported.

TABLE 274. KBr-$ZnBr_2$: Density (g cm^{-3})

	Mol percent $ZnBr_2$									
T	100	89. 2	78. 5	78. 0	66. 6	56. 1	38. 4	29. 6	20. 7	9. 8	0. 0
680						3. 095					
700			3. 279	3. 284		3. 074					
720			3. 258	3. 262	3. 128	3. 054					
740	3. 427		3. 236	3. 240	3. 107	3. 033					
760	3. 408	3. 102	3. 215	3. 218	3. 085	3. 012					
780	3. 388	3. 070	3. 193	3. 197	3. 064	2. 992					
800	3. 368	3. 038	3. 172	3. 175	3. 043	2. 971					
820	3. 349	3. 006	3. 150	3. 153	3. 021	2. 950	2. 749				
840	3. 329	2. 974			3. 000		2. 730				
860	3. 309	2. 942			2. 979		2. 711				
880	3. 290	2. 910			2. 957		2. 692	2. 596			
900		2. 878					2. 673	2. 578			
920							2. 654	2. 561			
940							2. 636	2. 543			
960							2. 617	2. 525			
980							2. 598	2. 508			
1000							2. 579	2. 490	2. 369		
1020								2. 472	2. 352		
1040								2. 455	2. 336	2. 222	
1060								2. 437	2. 319	2. 206	
1080								2. 419	2. 303	2. 190	2. 069
1100									2. 286	2. 174	2. 054
1120									2. 270	2. 157	2. 038
1140									2. 253	2. 141	2. 022
1160										2. 125	2. 007
1180										2. 109	1. 991
1200										2. 093	1. 975
1220										2. 077	1. 960
1240										2. 061	1. 944
1260											1. 928

TABLE 247. KBr-ZnBr$_2$: Density (g cm^{-3})—Continued

Temperature-dependent equations

$$\rho = a - bT$$

ZnBr$_2$ mol %	a	$b \cdot 10^3$	Standard deviation
0	2. 9134	0. 7817	0. 000486
9. 8	3. 0584	0. 8044	0. 000409
20. 7	3. 1981	0. 8291	0. 000715
29. 6	3. 3719	0. 8819	0. 000478
38. 4	3. 5238	0. 9449	0. 000663
56. 1	3. 7890	1. 0337	0. 000812
66. 6	3. 8976	1. 0687	0. 000677
78. 0	4. 0469	1. 0900	0. 000373
78. 5	4. 0334	1. 0771	0. 000556
89. 2	4. 3189	1. 601	0. 00151
100	4. 1545	0. 9827	0. 000773

These values are based on the work of Bloom, Bendall, Boyd, and Laver (Archimedean method) [**100**].

LiBr-NaBr

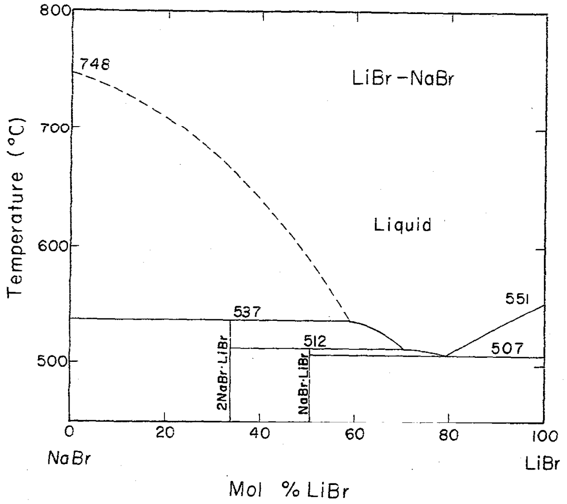

FIGURE 34. Temperature-composition phase diagram for LiBr-NaBr.

A. S. Arabadzhan and A. G. Bergman, Zh. Neorgan. Khim., 8 [3], 720 (1963); Russ. J. Inorg. Chem. (English Transl.), 365 (1963).

Melt Preparation and Purification

Zuca and Olteanu [**6**] used Merck p.a. reagent dried for 24 hours at 150 °C.

Berge and Holm [**51**] dried 99.0% (M.C.B.) LiBr and 99.4% Baker Analyzed NaBr at 400–500 °C under moderate vacuum (0.1–0.01 torr). The salts were melted in a platinum crucible in an atmosphere of nitrogen.

TABLE 275. Electrical conductance studies: LiBr-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
6	50	923–1093	Cell material: quartz or silica capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions

TABLE 276. LiBr-NaBr: Specific conductance (ohm^{-1} cm^{-1})

Mol percent NaBr

T	100	50	T	100	50
930		3. 409	1080	2. 998	3. 821
940		3. 440	1090	3. 015	3. 844
950		3. 471	1100	3. 033	
960		3. 502	1110	3. 050	
970		3. 532	1120	3. 067	
980		3. 561	1130	3. 085	
990		3. 589	1140	3. 102	
1000		3. 618	1150	3. 119	
1010		3. 645	1160	3. 137	
1020		3. 672	1170	3. 154	
1030		3. 698	1180	3. 172	
1040		3. 724	1190	3. 189	
1050	2. 946	3. 749	1200	3. 206	
1060	2. 963	3. 774	1210	3. 224	
1070	2. 981	3. 797	1220	3. 241	

TABLE 276. LiBr: Specific conductance ($ohm^{-1}\ cm^{-1}$)—Continued

Temperature-dependent equations

$\kappa = a + bT + cT^2$

NaBr mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
50	−2. 0769	8. 6133	−2. 9189	0. 12%
100	1. 1218	1. 7371	0	0. 18%

These values are based on the work of Zuca and Olteanu (classical ac technique) [6].

TABLE 277. Density studies: LiBr-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
39	0–100	1073	Calibration: water
6 [a]	50	1003–1103	Cell material: Pt ball; calibration: water

Deviations from previous NSRDS recommendations [1, p. 14]

Ref.	NaBr mol %	Departure
39	100	−0.13% (1073 K)

[a] Results in reference [6] for the equimolar mixture were presented in the form of a linear temperature-dependent equation with a standard deviation of 1.0×10^{-3} g cm^{-3}.

TABLE 278. LiBr-NaBr: Density ($g\ cm^{-3}$)

	Mol percent NaBr				
T	100	50	T	100	50
1010		2. 370	1090	2. 284	2. 307
1020		2. 362	1100	2. 276	2. 299
1030		2. 354	1120	2. 259	
1040		2. 346	1140	2. 243	
1050	2. 317	2. 339	1160	2. 226	
1060	2. 309	2. 331	1180	2. 210	
1070	2. 300	2. 323	1200	2. 194	
1080	2. 292	2. 315	1220	2. 177	

Temperature-dependent equations

$\rho - a + bT$

NaBr mol %	a	$b \cdot 10^3$	Standard deviation
50	3. 5197	−0. 7821	0. 0010
100	3. 1799	−0. 8220	

These values are based on the work of Zuca and Olteanu (Archimedean method) [6].

TABLE 279. Surface tension studies: LiBr-NaBr

Investigations critically re-examined

Ref.	NaBr mol %	Temp. range (T)	Comments
51	40. 0, 50. 1, 60. 5	1073	Cell material: Pt-10% Rh sinker; calibration: water

TABLE 280. LiBr-NaBr: Surface tension ($dyn\ cm^{-1}$)

Mol % NaBr	1073 K
40. 0	98. 7
50. 1	98. 5
60. 5	98. 3

These values are taken from the work of Berge and Holm (pin detachment method) [51]. The experimental values are given.

LiBr-PbBr$_2$

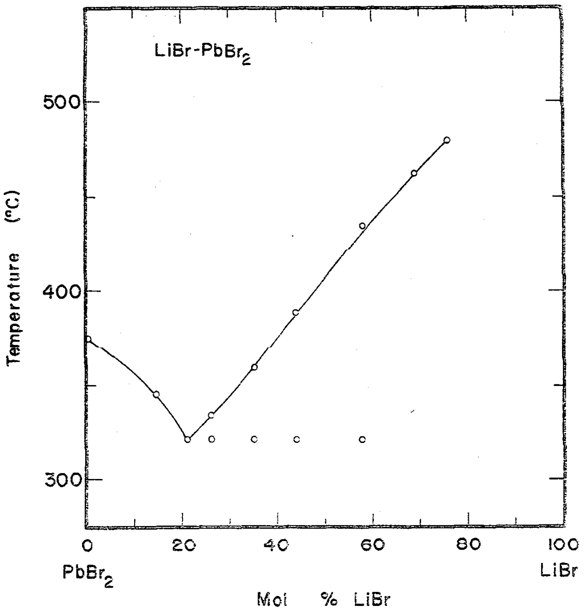

FIGURE 35. Temperature-composition phase diagram for LiBr-PbBr$_2$.

S. D. Gromov and L. M. Gromokova, Zh. Fiz. Khim., 27, 1545 (1953).

Melt Preparation and Purification

Andryushchenko and Bergman [23] recrystallized chemically pure grade salts. The melting points of the purified materials were LiBr, 550 °C; $PbBr_2$, 376 °C.

TABLE 281. Electrical conductance studies: LiBr-PbBr$_2$

Investigations critically re-examined			
Ref.	PbBr$_2$ mol %	Temp. range (T)	Comments
23	0, 40–100 (g)	653–773	Cell material: Pyrex; Pt electrodes; freq. range: 1000 Hz; calibration: molten KNO$_3$

TABLE 282. LiBr-PbBr$_2$: Specific conductance (ohm^{-1} cm^{-1})

PbBr$_2$ mol %	653 K	673 K	693 K	713 K	733 K	753 K	773 K
30						2.2	2.3
40						1.9	2.0
50				1.5	1.6	1.7	1.8
60	1.1	1.2	1.3	1.4	1.4	1.5	1.6
70	0.9	1.0	1.1	1.2	1.3	1.3	1.4
80	0.8	0.9	1.0	1.0	1.1	1.2	1.3
90	0.7	0.8	0.8	0.9	1.0	1.1	1.1
100	0.6	0.7	0.7	0.8	0.9	1.0	1.0

These values have been interpolated to two significant figures from the graphical presentation of Andryushchenko and Bergman (classical ac technique) [23].

LiBr-RbBr

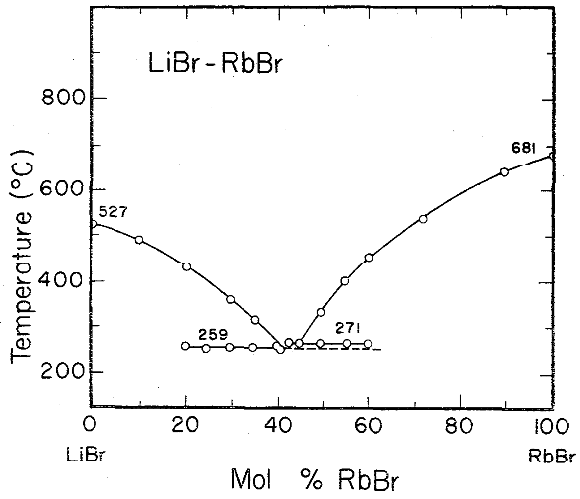

FIGURE 36. Temperature-composition phase diagram for LiBr-RbBr.

S. D. Gromov and L. M. Gromokova, Zh. Fiz. Khim., 27, 1545 (1953).

Melt Preparation and Purification

Salts used by Zuca and Olteanu [6] were Merck p.a. grade reagents dried for 24 hours at 150°C.

Berge and Holm [51] used 99.0% (M.C.B.) LiBr and Merck, Suprapure RbBr. The salts were dried at 400–500°C under moderate vacuum (0.1–0.01 torr) and then melted in a platinum crucible in an atmosphere of purified N$_2$.

TABLE 283. Electrical conductance studies: LiBr-RbBr

Investigations critically re-examined			
Ref.	RbBr mol %	Temp. range (T)	Comments
6	50	833–1033	Cell material: quartz or silica capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions

TABLE 284. LiBr-RbBr: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent RbBr				
T	100	50	T	100	50
840		1.332	970		1.689
850		1.362	980	1.160	1.713
860		1.392	990	1.177	1.737
870		1.422	1000	1.195	1.760
880		1.451	1010	1.212	1.782
890		1.479	1020	1.229	1.804
900		1.507	1040	1.262	
910		1.535	1060	1.294	
920		1.562	1080	1.326	
930		1.588	1100	1.356	
940		1.614	1120	1.386	
950		1.640	1140	1.415	
960		1.665			

Temperature-dependent equations

$$\kappa = a + bT + cT^2$$

RbBr mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
50	−3.0124	7.2689	−2.4967	0.15%
100	−1.6535	3.9678	−1.1197	0.004%

These values are based on the work of Zuca and Olteanu (classical ac technique) [6].

TABLE 285. Density studies: LiBr-RbBr

Investigations critically re-examined

Ref.	RbBr mol %	Temp. range (T)	Comments
6 [a]	50	913–1033	Cell material: Pt ball; calibration: water
39	0–100	1073	

Deviations from previous NSRDS recommendations [1, p. 15]

Ref.	RbBr mol %	Min. departure
39	100	0.40% (1073 K)

[a] Results for the equimolar mixture in reference [**6**] were expressed in the form of a linear temperature dependent equation with a standard deviation of 8.0×10^{-3} g cm^{-3}.

TABLE 286. LiBr-RbBr: Density (g cm^{-3})

	Mol percent RbBr				
T	100	50	T	100	50
920		2.6309	1040	2.624	
930		2.6214	1050	2.613	
940		2.6118	1060	2.603	
950		2.6023	1070	2.592	
960		2.5928	1080	2.581	
970		2.5833	1090	2.571	
980	2.688	2.5737	1100	2.560	
990	2.678	2.5642	1110	2.549	
1000	2.667	2.5547	1120	2.538	
1010	2.656	2.5452	1130	2.528	
1020	2.645	2.5357	1140	2.517	
1030	2.635	3.5261			

Temperature-dependent equations

$$\rho=a+bT$$

RbBr mol %	a	$b\cdot10^3$	Standard deviation
50	3.5069	−0.9522	0.0008
100	3.7373	−1.0704	

These values are based on the work of Zuca and Olteanu (Archimedean method) [**6**].

TABLE 287. Surface tension studies LiBr-RbBr

Investigations critically re-examined

Ref.	RbBr mol %	Temp. range (T)	Comments
51	40.0, 50.0, 60.0	1073	Cell material: Pt-10% Rh sinker, calibration: water

TABLE 288. LiBr-RbBr: Surface tension (dyn cm^{-1})

Mol % RbBr	1073 K
40.0	84.0
50.0	83.3
60.0	81.9

These values are taken from the work of Berge and Holm (pin detachment method) [**51**]. The experimental values are reported.

NaBr-PbBr$_2$

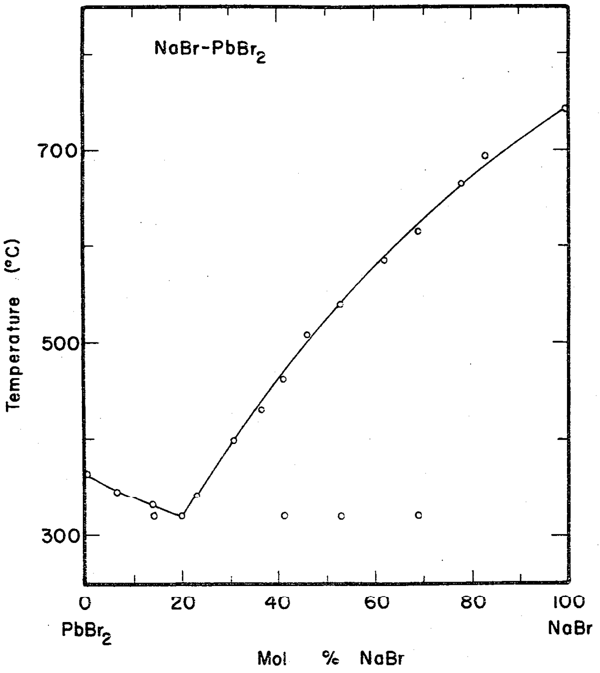

FIGURE 37. Temperature-composition phase diagram for NaBr-PbBr$_2$.

I. K. Tovmas'yan, N. M. Pokotilo, and K. I. Pokotilo, Tr. Azovo-Chernomorsk. Inst. Mekhaniz. Sel'sk. Khoz. 2, 99 (1939).

Melt Preparation and Purification

Lantratov and Moiseeva [**18**] used "chemically pure" salts which were fused and kept in a dry atmosphere until used.

TABLE 289. Electrical conductance studies: NaBr-$PbBr_2$

Investigations critically re-examined

Ref.	$PbBr_2$ mol %	Temp. range (T)	Comments
18	0–100	648–1023	Cell material: silica; Pt electrodes; freq. range: 1000–3000 Hz; calibration: molten KNO_3, $PbCl_2$, and KCl

Deviations from previous NSRDS recommendations [1, pp. 14, 18]

Ref.	$PbBr_2$ mol %	Min. departure	Max. departure
18	0	1.0% (1023 K)	
18	100	1.0% (673 K)	3.1% (773 K)

TABLE 290. NaBr-$PbBr_2$: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent $PbBr_2$											
T	100	92	85	80	75	70	65	60	55	45	35	20	0[a]
660	0.631	0.647	0.698	0.729	0.753								
680	0.703	0.720	0.769	0.798	0.818	0.856							
700	0.773	0.791	0.839	0.864	0.882	0.915	0.941						
720	0.841	0.861	0.906	0.930	0.945	0.972	1.002						
740	0.908	0.929	0.972	0.993	1.006	1.028	1.063						
760	0.974	0.996	1.035	1.054	1.066	1.084	1.122	1.134	1.145				
780	1.039	1.061	1.097	1.114	1.124	1.139	1.180	1.192	1.203				
800	1.102	1.125	1.156	1.172	1.181	1.193	1.236	1.249	1.259	1.283			
820	1.164	1.187	1.213	1.228	1.236	1.246	1.291	1.305	1.315	1.339			
840	1.224	1.248	1.269	1.283	1.290	1.298	1.345	1.359	1.368	1.394			
860	1.283	1.307	1.322	1.335	1.343	1.350	1.397	1.412	1.421	1.448			
880	1.341	1.365	1.374	1.380	1.394	1.400	1.449	1.463	1.472	1.500			
900	1.397	1.421	1.423	1.435	1.443	1.450	1.498	1.513	1.521	1.551			
920	1.452	1.476	1.470	1.483	1.492	1.499	1.547	1.561	1.570	1.601			
940			1.516	1.528	1.539	1.547	1.594	1.608	1.617	1.649	1.830		
960			1.559	1.572	1.584	1.594	1.640	1.653	1.663	1.697	1.876	2.148	
980			1.600	1.614	1.628	1.640	1.685	1.696	1.707	1.743	1.923	2.215	
1000			1.639	1.654	1.670	1.685	1.728	1.739	1.750	1.787	1.969	2.283	
1020			1.677	1.693	1.712	1.730	1.770	1.779	1.792	1.831	2.015	2.350	
1023.2													2.930

TABLE 290. NaBr-PbBr$_2$: Specific conductance (ohm^{-1} cm^{-1})—Continued

Temperature-dependent equations

$\kappa = a + bT + cT^2$

PbBr$_2$ mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
20	−1. 0929	3. 3758	0	1. 23%
35	−0. 3432	2. 3121	0	0. 33%
45	−2. 0105	5. 3926	−1. 5947	0. 40%
55	−2. 0273	5. 4315	−1. 6538	0. 55%
60	−2. 1997	5. 8031	−1. 8648	0. 47%
65	−2. 0541	5. 4361	−1. 6542	0. 44%
70	−1. 6330	4. 3885	−1. 0701	0. 76%
75	−2. 2065	5. 6630	−1. 7861	0. 46%
80	−2. 5242	6. 3865	−2. 2079	0. 29%
85	−2. 7946	6. 0555	2. 5214	0. 44%
92	−2. 5730	6. 0925	−1. 8381	0. 70%
100	−2. 4862	5. 8476	−1. 7033	1. 35%

[a] For NaBr, the only experimental value is given. These values are based on the work of Lantratov and Moiseeva (classical ac technique) [**18**].

TABLE 291. Density studies: NaBr-PbBr$_2$

Investigations critically re-examined

Ref.	PbBr$_2$ mol %	Temp. range (T)
36	30, 50, 70, 100	873

Deviations from previous NSRDS recommendations [1, p. 18]

Ref.	PbBr$_2$ mol %	Departure
36	100	−0. 99% (873 K)

TABLE 292. NaBr-PbBr$_2$: Density (g cm^{-3})

	Mol percent PbBr$_2$			
T	100	70	50	30
873. 2	5. 319	4. 737	4. 249	3. 628

The values in this table are taken from the work of Lantratov and Moiseeva (Archimedean method) [**36**]. The experimental values are reported.

NaBr-RbBr

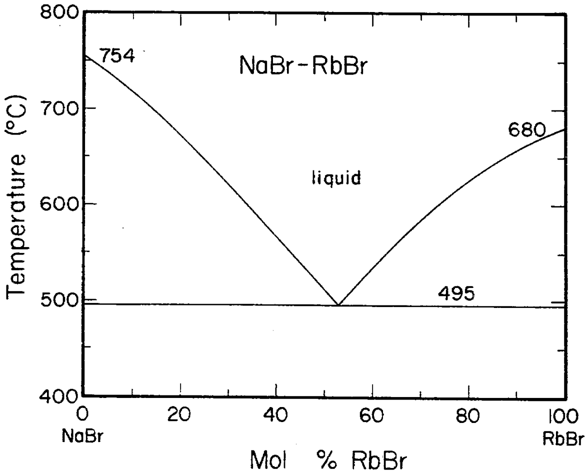

FIGURE 38. Temperature-composition phase diagram for NaBr-RbBr.

R. G. Samuseva and V. E. Plyuschev, Zh. Neorgan. Khim., **9** [10], 2436 (1964); Russ. J. Inorg. Chem. (English Transl.), 1315 (1964).

Melt Preparation and Purification

Zuca and Olteanu [**6**] used Merck p.a. grade reagents dried for 24 hours at 150 °C.

Table 293. Electrical conductance studies: NaBr-RbBr

Investigations critically re-examined

Ref.	RbBr mol %	Temp. range (T)	Comments
6[a]	50	938–1163	Cell material: quartz or silica glass capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions

[a] Zuca and Olteanu report a precision of 0.1% in their resistance measurements.

Table 294. NaBr-RbBr: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent RbBr		
T	100	50	0
960		1. 553	
970		1. 576	
980	1. 160	1. 598	
990	1. 177	1. 619	
1000	1. 195	1. 641	
1010	1. 212	1. 661	
1020	1. 229	1. 682	
1030	1. 246	1. 701	
1040	1. 262	1. 721	
1050	1. 278	1. 740	2. 946
1060	1. 294	1. 758	2. 963
1070	1. 310	1. 776	2. 981
1080	1. 326	1. 794	2. 998
1090	1. 341	1. 811	3. 015
1100	1. 356	1. 828	3. 033
1110	1. 371	1. 844	3. 050
1120	1. 386	1. 860	3. 067
1130	1. 400	1. 875	3. 085
1140	1. 415	1. 890	3. 102
1150		1. 904	3. 119
1160			3. 137
1170			3. 154
1180			3. 172
1190			3. 189
1200			3. 206
1210			3. 224
1220			3. 241

Temperature-dependent equations

$$\kappa = a + bT + cT^2$$

RbBr mol %	a	$b \cdot 10^6$	$c \cdot 10^2$	Stand. error of est.
0	1. 1218	1. 7371	0	0. 18%
50	−2. 7308	6. 6457	−2. 2743	0. 09%
100	−1. 6535	3. 9678	−1. 1197	0. 004%

These values are based on the work of Zuca and Olteanu (classical ac technique) [**6**].

Table 295. Density studies: NaBr-RbBr

Investigations critically re-examined

Ref.	RbBr mol %	Temp. range (T)	Comments
6[a]	50	963–1133	Cell material: Pt ball; calibration: water
39	40, 50, 60	1020–1122	

Deviations from NSRDS recommendations [this volume]

Ref.	RbBr mol %	Min. departure	Max. departure
39	50	−0. 29% (1120 K)	−0. 50% (1020 K)

[a] Zuca and Olteanu [**6**] reported density results of the equimolar mixture in the form of a linear temperature dependent equation with a standard deviation of 8.0×10^{-4}g cm^{-3}.

TABLE 296. NaBr-RbBr: Density (g cm^{-3})

	Mol percent RbBr		
T	100	50	0
970		2.5674	
980	2.688	2.5575	
990	2.678	2.5476	
1000	2.667	2.5377	
1010	2.656	2.5278	
1020	2.645	2.5179	
1030	2.635	2.5080	
1040	2.624	2.4982	
1050	2.613	2.4883	2.317
1060	2.603	2.4784	2.309
1070	2.592	2.4685	2.300
1080	2.581	2.4586	2.292
1090	2.571	2.4487	2.284
1100	2.560	2.4389	2.276
1110	2.549	2.4290	2.267
1120	2.538	2.4191	2.259
1130	2.528	2.4092	2.251
1140	2.517		2.243
1150			2.235
1160			2.226
1170			2.218
1180			2.210
1190			2.202
1200			2.194
1210			2.185
1220			2.177

Temperature-dependent equations

$$\rho = a + bT$$

RbBr mol %	*a*	$b \cdot 10^3$	Standard deviation
0	3.1799	−0.8220	0.0008
50	3.5262	−0.9885	
100	3.7373	−1.0704	

These values are based on the work of Zuca and Olteanu (Archimedean method) [**6**].

TABLE 297. Surface tension studies: NaBr-RbBr

Investigations critically re-examined

Ref.	RbBr mol %	Temp. range (*T*)
49 [a]	0–100	800–1173
51	40, 50, 60	1073

Deviations from previous NSRDS recommendations [2, p. 62 and this volume]

Ref.	RbBr mol %	Min. departure	Max. departure
49	0	−0.31% (1033 K)	0.81% (1133 K)
51	50	−0.76% (1073 K)	

[a] Reference [**49**] contained only graphical data in the form of surface tension-composition isotherms at 800 °C. Numerical data given here were obtained through a private communication. Bertozzi reported a reproducibility for his data of 0.5%.

Reference [**49**] is the NSRDS reference data base for the surface tension of RbBr [2].

Table 298. NaBr–RbBr: Surface tension (dyn cm^{-1})

	Mol percent RbBr										
T	100	90	80	70	60	50	40	30	20	10	0
800						105. 1					
820					102. 3	103. 7					
840					100. 9	102. 3	104. 0				
860					99. 6	100. 9	102. 6				
880				97. 0	98. 2	99. 5	101. 3				
900				95. 6	96. 8	98. 2	99. 9				
920				94. 2	95. 4	96. 8	98. 5	100. 7			
940				92. 8	94. 0	95. 4	97. 1	99. 3			
960			90. 4	91. 4	92. 6	94. 0	95. 7	97. 9			
980			88. 9	90. 0	91. 1	92. 6	94. 4	96. 6			
1000	85. 6		87. 5	88. 5	89. 7	91. 2	93. 0	95. 2	97. 9		
1020	84. 2	85. 1	86. 1	87. 1	88. 3	89. 8	91. 6	93. 8	96. 5		
1040	82. 7	83. 7	84. 7	85. 7	86. 9	88. 4	90. 2	92. 4	95. 1		102. 4
1060	81. 3	82. 3	83. 2	84. 3	85. 5	87. 0	88. 8	91. 0	93. 8		101. 8
1080	79. 9	80. 8	81. 8	82. 9	84. 1	85. 6	87. 4	89. 6	92. 4	95. 7	99. 7
1100		79. 4	80. 4	81. 4	82. 7	84. 2	86. 0	88. 2	91. 0	94. 3	98. 3
1120		78. 0	78. 9	80. 0	81. 3	82. 8	84. 6	86. 8	89. 6	92. 9	96. 9
1140			77. 5	78. 6	79. 8	81. 3	83. 2	85. 4	88. 2	91. 5	
1160				77. 2	78. 4	79. 9	81. 8	84. 0	86. 8		

Two-dimensional equation and statistical parameters

$$\gamma=a+bT+cC^2+dC^3+eTC+fCT^2$$

a	$b\cdot10^2$	$c\cdot10^4$	$d\cdot10^5$	$e\cdot10^4$	$f\cdot10^8$	Max. percent departure	Stand. error of est.
157. 84627	−7. 22154	−3. 97703	1. 38198	1. 47407	−5. 09045	0.37% (1173 K, 50 mol % RbBr)	0. 128%

These values are based on the work of Bertozzi (Wilhelmy slide plate method) [49]. C=mol % NaBr.

TABLE 299. NaBr-RbBr: Surface tension (dyn cm^{-1})

	Mol percent RbBr				
T	100	75	50	25	0
800			105. 1		
820			103. 7		
840			102. 3		
860			100. 9		
880		96. 6	99. 5		
900		95. 2	98. 2		
920		93. 7	96. 8	102. 0	
940		92. 3	95. 4	100. 6	
960		90. 9	94. 0	99. 2	
980		89. 4	92. 6	97. 8	
1000	85. 7	88. 0	91. 3	96. 4	
1020	84. 2	86. 5	89. 9	95. 0	
1040	82. 8	85. 1	88. 5	93. 6	102. 5
1060	81. 4	83. 7	87. 1	92. 2	101. 1
1080	79. 9	82. 2	85. 7	90. 8	99. 7
1100	78. 5	80. 8	84. 4	89. 4	98. 3
1120		79. 3	83. 0	88. 0	96. 9
1140		77. 9	81. 6	86. 6	
1160		76. 5	80. 2	85. 2	

Temperature-dependent equations

$$\gamma = a + bT$$

RbBr mol %	*a*	$b \cdot 10^2$
0	175. 3	−7. 0
25	166. 4	−7. 0
50	160. 3	−6. 9
75	160. 0	−7. 2
100	157. 7	−7. 2

These values are based on the work of Bertozzi (Wilhelmy slide plate method) [49].

NaBr-ScBr$_3$

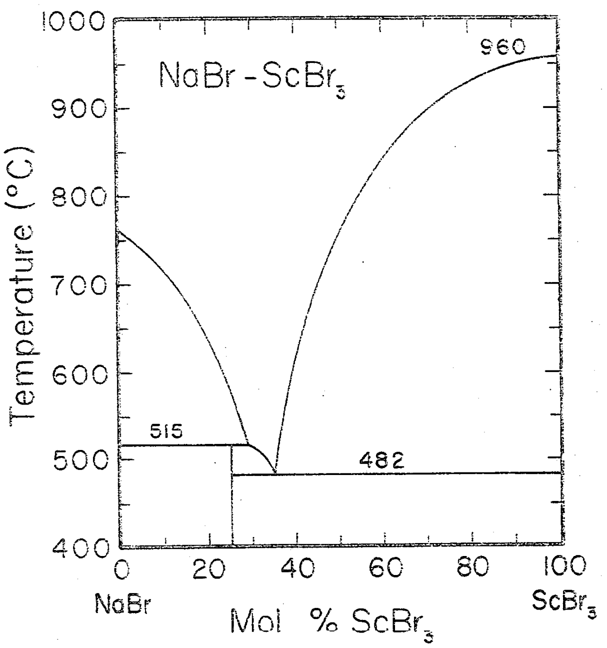

FIGURE 39. Temperature-composition phase diagram for NaBr-ScBr$_3$.

N. Ya. Federov, E. S. Petrov and L. G. Chudina, Izv. S. Oto. Akad. Nauk SSSR, Ser. Khim. Nauk, 5, 41 (1970).

Melt Preparation and Purification

Petrov et al. [33] used recrystallized chemically pure KBr which was then melted and filtered through a quartz filter.

TABLE 300. Electrical conductance studies: NaBr-ScBr$_3$

Investigations critically re-examined			
Ref.	ScBr$_3$ mol %	Temp. range (*T*)	Comments
33	0–75 (g)	873–1238	Cell material: quartz; Mo electrodes; freq. range: 1000 Hz; calibration: 1 N KCl solution

TABLE 301. NaBr-ScBr$_3$: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent ScBr$_3$							
T	0	10	20	30	40	50	60	70
873				0.9				
913			1.4	1.0				
953			1.5	1.2				
993		2.2	1.6	1.2	1.0			
1033	3.0	2.3	1.7	1.3	1.1	1.0		
1073	3.1	2.4	1.8	1.4	1.2	1.1		
1113	3.2	2.5	1.9	1.4	1.3	1.2	1.0	
1153	3.3	2.6	2.0	1.5	1.4	1.2	1.0	
1193	3.4	2.7	2.0_5	1.6	1.5	1.3	1.1	0.8
1233	3.5	2.8	2.1_5	1.7	1.6	1.4	1.2	0.9

These values have been interpolated to a maximum of two significant figures from the graphical presentation of Fedorov, Petrov, and Chudina (classical ac technique) [33].

NaBr-TlBr

Melt Preparation and Purification

Buckle and Tsaoussoglou [42] used analytical grade (B.D.H.) NaBr and Johnson-Matthey TlBr prepared from 99.9% thallium metal. Melts were prepared by mixing weighed amounts of the dried, powdered salts in silica test tubes and fusing under dry, oxygen-free argon.

TABLE 302. Density studies: NaBr-TlBr

Investigations critically re-examined

Ref.	TlBr mol %	Temp. range (*T*)	Comments
42	0–100	1023–1231.6[a]	Cell material: iridium pycnometer; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 14]

Ref.	TlBr mol %	Min. departure	Max. departure
42	0	0.31% (1055 K)	0.41% (1225 K)

[a] Mixtures were reported at 1023 and 1063 K only.

TABLE 303. NaBr-TlBr: Density (g cm^{-3})

Mol % TlBr	1023 K	1063 K
0.0	2.343	2.311
3.9		2.455
7.2		2.577
11.0		2.715
13.4	2.830	
18.1		2.960
19.3		3.005
25.4	3.260	
29.0		3.319
30.2	3.434	
37.0	3.652	
37.1		3.569
37.3	3.651	
39.1		3.633
42.2	3.704	
43.7		3.761
49.5		3.929
50.8	4.057	
55.9		4.133
100.0	5.467	5.390

These values are taken from the work of Buckle and Tsaoussoglou (pycnometric technique) [42]. The experimental values are given.

PbBr$_2$-TlBr

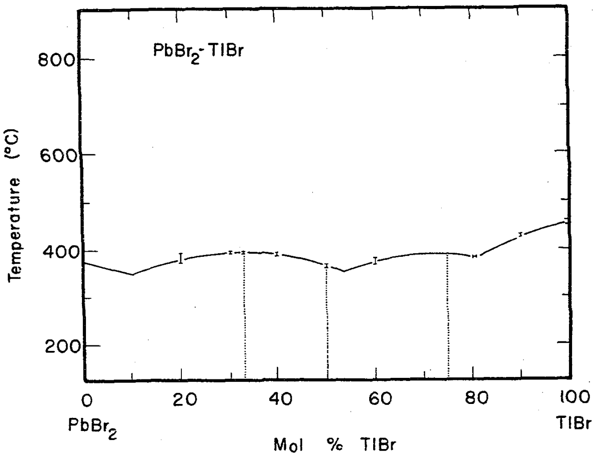

FIGURE 40. Temperature-composition phase diagram for PbBr$_2$-TlBr.

1. L. J. Pavorskii, Izv. Sekt. Fiz.-Khim. Anal., Obshch. Neorg. Khim., Akad. Nauk SSSR, **13**, 281 (1940).
2. S. D. Dionis'ev, I. I. Il'yasov and A. G. Bergman, Zh. Neorg. Khim., **5**, 1135 (1960).
3. I. I. Il'yasov, S. D. Dionis'ev and A. G. Bergman, Zh. Neorg. Khim., **6**, 1389 (1961).

Melt Preparation and Purification

The salts used by Protsenko and Shatskaya [28] were prepared by reaction of the nitrates with hydrobromic acid. They were then dried under vacuum (5 torr) at 160 °C. The melting points of the pure, dry salts were PbBr$_2$, 375 °C; TlBr, 430 °C.

TABLE 304. Electrical conductance studies: $PbBr_2$-TlBr

Investigations critically re-examined

Ref.	TlBr mol %	Temp. range (*T*)	Comments
28	0–100 (g)	653–773	Cell material: heat-resistant glass (Biltz-type vessel); Pt electrodes; freq. range: 1200 Hz; calibration: molten KNO_3.

TABLE 305. $PbBr_2$-TlBr: Specific conductance (ohm^{-1} cm^{-1})

TlBr mol %	653 K	673 K	693 K	713 K	733 K	753 K	773 K
0	0. 63	0. 72	0. 78	0. 85	0. 93	1. 0	1. 1
10	0. 59[a]	0. 65	0. 71	0. 78	0. 84	0. 91	0. 96
20	0. 54[a]	0. 61	0. 66	0. 72	0. 78	0. 84	0. 89
30	0. 52	0. 58	0. 63	0. 68	0. 74	0. 80	0. 86
40	0. 52	0. 56	0. 63	0. 67	0. 74	0. 78	0. 85
50		0. 57[a]	0. 62	0. 67	0. 72	0. 78	0. 83
60		0. 58	0. 63	0. 67	0. 73	0. 78	0. 83
70		0. 58	0. 64	0. 69	0. 74	0. 80	0. 84
80				0. 71	0. 77	0. 82	0. 88
90					0. 80	0. 85	0. 91
100					0. 83	0. 89	0. 95

These values have been interpolated to two significant figures from the graphical presentation of Protsenko and Shatskaya (classical ac technique) [28].

[a] Extrapolated value.

RbBr-TlBr

Melt Preparation and Purification

Buckle and Tsaoussoglou [47] used Johnson-Matthey (99.95%) RbBr. Their method of preparing TlBr-containing melts is described under the system (NaBr-TlBr).

TABLE 306. Density studies: RbBr-TlBr

Investigations critically re-examined

Ref.	TlBr mol %	Temp. range (*T*)	Comments
42	0–100	973–1146.2[a]	Cell material: iridium pycnometer; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 15]

Ref.	TlBr mol %	Min. departure	Max. departure
42	0	0.12% (1025 K)	0.13% (1145 K)

[a] Mixtures were reported at 973 and 1033 K only.

TABLE 307. RbBr-TlBr: Density (g cm^{-3})

Mol % TlBr	973 K	1033 K
0. 0	2. 699	2. 634
5. 3		2. 770
17. 5		3. 073
23. 0	3. 289	
24. 1	3. 314	
26. 5		3. 298
32. 0	3. 544	
34. 3	3. 577	
36. 0		3. 543
36. 7	3. 645	
39. 1	3. 702	
39. 2	3. 705	
42. 0		3. 690
43. 5	2. 832	
43. 7		3. 737
46. 5		3. 815
48. 0	3. 941	
48. 2		3. 858
48. 8	3. 961	
50. 2		3. 911
51. 3	4. 035	
52. 2		3. 963
57. 6		4. 114
58. 1	4. 240	
61. 5		4. 227
62. 0		4. 243
68. 0	4. 423	
73. 2		4. 581
74. 9	4. 743	
75. 2		4. 643
100. 0	5. 563	5. 447

These values are taken from the work of Buckle and Tsaoussoglou (pycnometric method) [42]. The experimental values are given.

6.2. Iodide-Iodide Systems

This section contains the studies tables and the numerical tables for the physical properties of iodide-iodide melts. It also includes, for each system, a summary of the methods used for melt preparation and purification and a temperature-liquidus phase diagram when available. See sections 3.3, 4.2, and 4.3 for information on the form of presentation of this material.

AgI-AlI$_3$

Melt Preparation and Purification

Izbekov and Nizhnik [**135**] prepared AlI$_3$ from chemically pure dry I$_2$ and aluminum wire. The reaction vessel consisted of four consecutively joined tube retorts of high-melting glass. The reaction took place mainly in the first retort into which I$_2$ was introduced by increments. A current of dry CO$_2$ flowed through the apparatus. The crude preparation from the first retort was distilled over metallic aluminum in the next three retorts and finally into a test tube, also under a CO$_2$ atmosphere. Since the preparation still contained free iodine, the sealed test tube (with a piece of aluminum wire) was heated in a sand bath at a temperature slightly above the melting point of AlI$_3$ until the iodine disappeared. The melting point, density and specific conductance of the pure white material was checked against literature values. The silver iodide was prepared from silver nitrate solution by precipitation with hydrogen iodide. The precipitate was filtered off, washed repeatedly, and dried to constant weight. All work was carried out in darkness.

TABLE 308. Electrical conductance studies: AgI-AlI$_3$

Investigations critically re-examined

Ref.	AlI$_3$ mol %	Temp. range (T)	Comments
135 [a]	71.22–97.86	473	Pt electrodes
	91.12	463–583	

[a] Izbekov and Nizhnik, in addition to measuring the specific conductance of this system at 200 °C while varying the composition, made a study of the temperature-dependence at the fixed composition of 91.12 mol % AlI$_3$.

TABLE 309. AgI-AlI$_3$: Specific conductance (ohm^{-1} cm^{-1})

473 K

Mol % AlI$_3$	$\kappa(\times 10^2)$	Mol % AlI$_3$	$\kappa(\times 10^2)$
71.22	2.870	82.74	1.454
71.49	2.825	89.08	0.6513
72.69	2.749	93.87	0.2286
77.96	1.906	97.86	0.03572

These values are those obtained by Izbekov and Nizhnik at a fixed temperature of 473 K and varying concentration (classical ac technique) [**135**]. See the next table for the results of an analysis of data obtained by these authors at fixed concentration and varying temperature.

TABLE 310. AgI-AlI$_3$: Specific conductance (ohm^{-1} cm^{-1})

Temperature-dependent equations

$$\kappa = -0.0103248 + 1.58260 \cdot 10^{5}\ T - 3.34059 \cdot 10^{8}\ T^2$$

91.12 Mol % AlI$_3$

Standard error of estimate: 0.38%

T	$\kappa(\times 10^3)$	T	$\kappa(\times 10^3)$
470	4.493	530	7.447
480	4.968	540	7.962
490	5.451	550	8.485
500	5.940	560	9.014
510	6.435	570	9.550
520	6.938	580	10.09

These values are based on the work of Izbekov and Nizhnik (classical ac technique) [**135**].

AgI-HgI$_2$

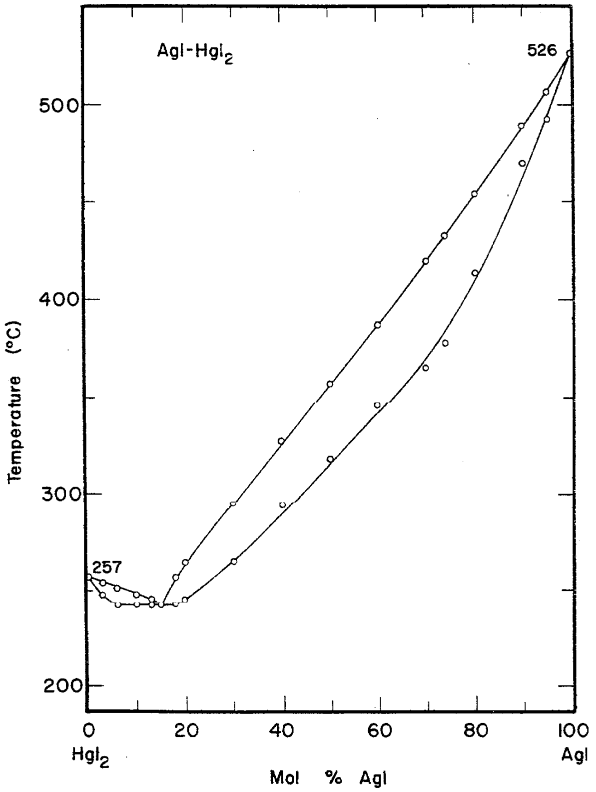

FIGURE 41. Temperature-composition phase diagram for AgI-HgI$_2$.

A. Steger, Z. Phys. Chem., **43**, 595 (1903).

Melt Preparation and Purification

Stromberg [**103**] precipitated silver iodide from silver nitrate solution with potassium iodide. The mercuric iodide was purified by sublimation.

TABLE 311. Viscosity studies: AgI-HgI$_2$

Investigations critically re-examined

Ref.	AgI mol %	Temp. range (T)	Comments
103[a]	0, 0.05, 0.2, 0.4, 0.7	536–755	Cell material: steel balls (4 mm diameter) covered with Pt (0.1–0.15 mm thickness) inside glass tube; calibration: molten KNO$_3$

Deviations from previous NSRDS recommendations [1, p. 22]

Ref.	AgI mol %	Min. departure	Max. departure
103[a]	0	3.3% (556 K)	19.3% (629 K)

[a] Compositions were reported in terms of moles of AgI per liter of melt.

TABLE 312. AgI-HgI$_2$: Viscosity (cp)

	AgI: molarity (573.2 K)				
T	0.7	0.4	0.2	0.05	0
540	4.48		3.22		2.77
550	4.12	3.53	3.01		2.59
560	3.80	3.22	2.80	2.52	2.42
570	3.51	2.94	2.62	2.37	2.28
580	3.25	2.71	2.45	2.22	2.15
590	3.02	2.51	2.30	2.10	2.05
600	2.81	2.43	2.17	1.99	1.96
610	2.63	2.20	2.05	1.89	1.88
620	2.47	2.09	1.95	1.81	1.82
630	2.34	2.00	1.87	1.74	1.77
640	2.22	1.93	1.80	1.69	1.73
650	2.12	1.87	1.76	1.65	1.70
660	2.05	1.83	1.72	1.62	1.67
670	1.98	1.80	1.71	1.61	1.65
680	1.93	1.78	1.71	1.61	1.63
690	1.90	1.76	1.73		1.62
700	1.87	1.74	1.77		1.60
710	1.86	1.72			1.58
720	1.85	1.70			1.56
730	1.85	1.67			1.53
740					1.49
750					1.45

Temperature-dependent equations

$$\eta=a+bT+cT^2+dT^3$$

AgI molarity (573.2 K)	$a\cdot 10^{-1}$	$b\cdot 10^{1}$	$c\cdot 10^{4}$	$d\cdot 10^{7}$	Stand. error of est.
0	9.4227	−4.0071	5.8038	−2.8140	1.58%
0.05	4.6250	−1.5540	1.6644	−0.5066	2.68%
0.2	4.0366	−1.1482	0.8526	0	4.01%
0.4	17.2833	−7.3532	10.5588	−5.0654	2.49%
0.7	11.4682	−4.4551	5.8500	−2.5540	3.03%

These values are based on the work of Stromberg (falling body method) [**103**].

AlI$_3$-CdI$_2$

Melt Preparation and Purification

The preparation of AlI$_3$ by Izbekov and Nizhnik [**135**] is discussed under AgI-AlI$_3$. The CdI$_2$ used by these authors was the ready-made preparation of Kalhbaum, dried to constant weight at 200° C.

Table 313. Electrical conductance studies: AlI_3-CdI_2

Investigations critically re-examined

Ref.	CdI_2, mol %	Temp. range (T)	Comments
135[a]	2.48–27.24	473	Pt electrodes
	8.04	463–583	

[a] Izbekov and Nizhnik, in addition to measuring the specific conductance of this system at 200 °C while varying the composition, made a study of the temperature-dependence at the fixed composition of 8.04 mol % CdI_2.

Table 314. AlI_3-CdI_2: Specific conductance (ohm^{-1} cm^{-1})

473 K

Mol % CdI_2	κ ($\times10^3$)	Mol % CdI_2	κ ($\times10^3$)
2.48	0.0336	16.34	6.141
3.39	0.0715	17.71	6.786
4.41	0.2048	20.97	8.119
7.01	0.9880	22.77	8.854
9.35	1.646	25.05	9.435
10.49	2.736	27.24	9.994

These values are those obtained by Izbekov and Nizhnik at a fixed temperature of 473 K and varying concentration (classical ac technique) [**135**]. See the next table for an analysis of data obtained by these authors at a fixed concentration and varying temperature.

Table 315. AlI_3-CdI_2: Specific conductance (ohm^{-1} cm^{-1})

Temperature-dependent equations

$$\kappa = -6.54562\cdot10^{-3}+1.97117\cdot10^{-5}T-5.86719\cdot10^{-9}T^2$$

8.04 mol % CdI_2

Standard error of estimate: 0.823%

T	κ($\times10^3$)	T	κ($\times10^3$)
470	1.423	530	2.253
480	1.564	540	2.388
490	1.704	550	2.521
500	1.843	560	2.653
510	1.981	570	2.784
520	2.118	580	2.913

These values are based on the work of Izbekov and Nizhnik (classical ac technique) [**135**].

AlI_3-CuI

Melt Preparation and Purification

The preparation of AlI_3 by Izbekov and Nizhnik [**135**] is discussed under AgI-AlI_3. The cuprous iodide used by these authors was obtained by treating a solution of recrystallized $CuSO_4$ with chemically pure KI. The precipitate was washed with water until it was completely white, dried to constant weight and stored in the dark.

Table 316. Electrical conductance studies: AlI_3-CuI

Investigations critically re-examined

Ref.	CuI, mol %	Temp. range (T)	Comments
135[a]	1.80–26.03	473	Pt electrodes
	26.03	463–573	

[a] Izbekov and Nizhnik, in addition to measuring the specific conductance of this sytem at 200 °C while varying composition, made a study of the temperature-dependence at the fixed composition of 26.03 mol % CuI.

Table 317. AlI_3-CuI: Specific conductance (ohm^{-1} cm^{-1})

473 K

Mol % CuI	κ ($\times10^3$)	Mol % CuI	κ ($\times10^3$)
1.80	0.1270	12.03	2.707
3.22	0.6657	14.57	4.779
6.83	2.004	26.03	5.567

These values are those obtained by Izbekov and Nizhnik at a fixed temperature of 473 K and varying concentration (classical ac technique) [**135**]. See the next table for an analysis of data obtained by these authors at fixed concentration and varying temperature.

Table 318. AlI_3-CuI: Specific conductance (ohm^{-1} cm^{-1})

Temperature-dependent equations

$$\kappa=0.191120-0.925857\cdot10^{-3}T+0.112294\cdot10^{-6}T^2$$

26.03 mol % CuI

Standard error of estimate: 1.29%

T	κ($\times10^3$)	T	κ($\times10^3$)
470	4.025	530	15.85
480	5.435	540	18.61
490	7.069	550	21.59
500	8.927	560	24.79
510	11.01	570	28.23
520	13.32		

These values are based on the work of Izbekov and Nizhnik (classical ac technique) [**135**].

AlI_3-HgI_2

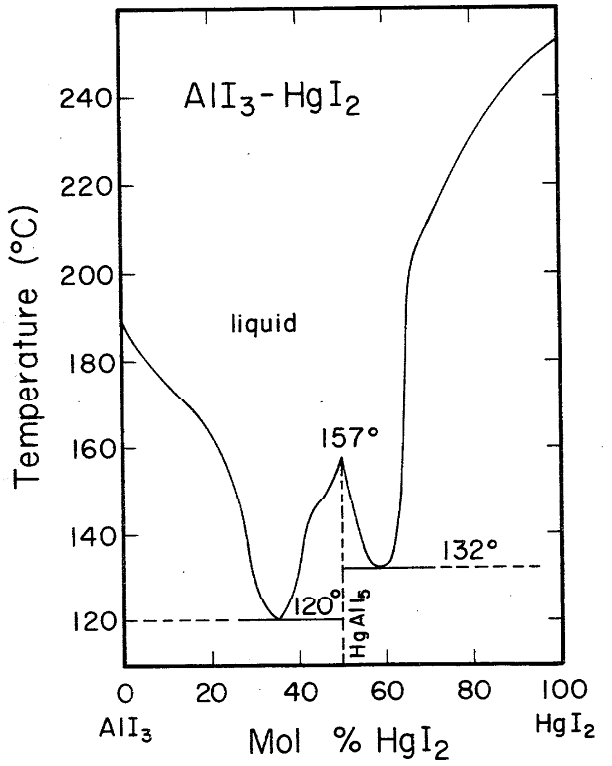

FIGURE 42. Temperature-composition phase diagram for AlI_3-HgI_2.

A. T. Nizhnik, Zh. Obshch. Khim., 7, 1942 (1937).

Melt Preparation and Purification

The preparation of AlI_3 by Izbekov and Nizhnik [**135**] is discussed under AgI-AlI_3. The mercuric iodide used by these authors was the ready-made preparation of Kalhbaum dried to constant weight at 200° C.

TABLE 319. Electrical conductance studies: AlI_3-HgI_2

Investigations critically re-examined

Ref.	HgI_2 mol %	Temp. range (T)	Comments
135[a]	0. 66–75. 20	473	Pt electrodes
	10. 46	463–583	

[a] Izbekov and Nizhnik, in addition to measuring the specific conductance of this system at 200° C while varying the composition, made a study of the temperature-dependence at the fixed composition of 10.46 mol % HgI_2.

TABLE 320. AlI_3-HgI_2: Specific conductance (ohm^{-1} cm^{-1})

473 K

Mol % HgI_2	κ ($\times 10^3$)	Mol % HgI_2	κ ($\times 10^3$)
0. 66	0. 00558	31. 35	28. 12
2. 63	0. 03133	34. 69	33. 51
5. 34	0. 2298	37. 74	39. 88
7. 27	0. 6592	47. 64	63. 46
12. 90	4. 004	48. 77	66. 06
16. 12	7. 299	53. 70	84. 52
22. 32	14. 85	62. 25	149. 0
28. 37	23. 66	75. 20	229. 0
30. 69	27. 31		

These values are those obtained by Izbekov and Nizhnik at a fixed temperature of 473 K and varying concentration (classical ac technique) [**135**]. See the next table for an analysis of data obtained by these authors at a fixed concentration and varying temperature.

TABLE 321. AlI_3-HgI_2: Specific conductance (ohm^{-1} cm^{-1})

Temperature-dependent equations

$$\kappa = -0.0167952 + 7.00838 \cdot 10^{-5} T - 6.35113 \cdot 10^{-8} T^2$$

10.46 mol % HgI_2

Standard error of estimate: 1.11%

T	κ ($\times 10^3$)	T	κ ($\times 10^3$)
470	2. 115	530	2. 509
480	2. 212	540	2. 530
490	2. 297	550	2. 539
500	2. 369	560	2. 535
510	2. 428	570	2. 518
520	2. 475	580	2. 488

These values are based on the work of Izbekov and Nizhnik (classical ac technique) [**135**].

TABLE 322. Density studies: AlI_3-HgI_2

Investigations critically re-examined

Ref.	HgI_2, mol %	Temp. range (T)
135	0. 00, 12. 21, 30. 97, 44. 80	473

Deviations from previous NSRDS recommendations [1, p. 21]

Ref.	HgI_2 mol %	Departure
135	0	1. 72% (473 K)

TABLE 323. AlI_3-HgI_2: Density (g cm^{-3})

Mol % HgI_2	473 K
0. 00	3. 256
12. 21	3. 436
30. 97	3. 820
44. 80	4. 194

Due to limited information, the values in this table are those presented by Izbekov and Nizhnik (pycnometric method) [**135**].

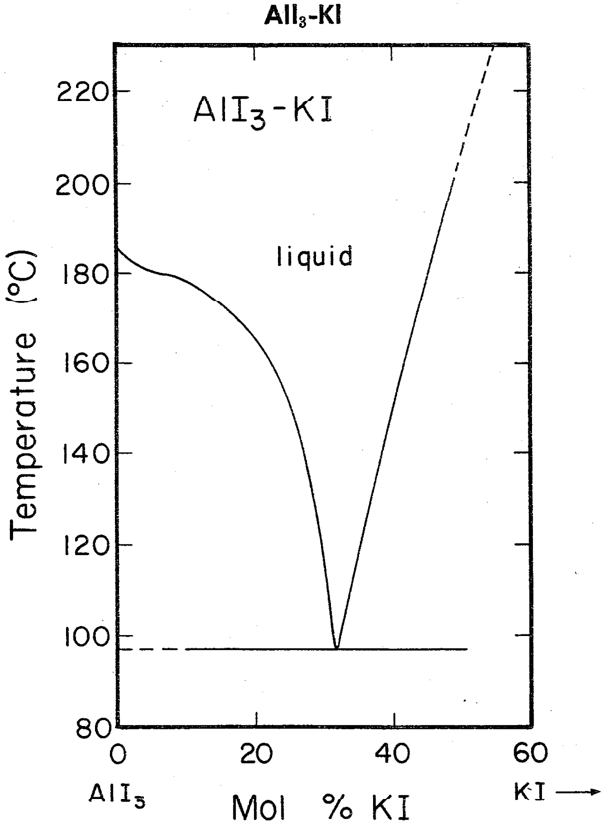

FIGURE 43. Temperature-composition phase diagram for AlI_3-KI.

A. T. Nizhnik, Zh. Obshch. Khim., 7, 1941 (1937).

Melt Preparation and Purification

The preparation of AlI_3 by Izbekov and Nizhnik [**135**] is discussed under AgI-AlI_3. The KI used by these authors was chemically pure potassium iodide recrystallized several times from alcohol and water and dried to constant weight at ~250 °C.

TABLE 324. Electrical conductance studies: AlI_3-KI

Investigations critically re-examined

Ref.	KI, mol %	Temp. range (*T*)	Comments
135[a]	0. 83–46. 50	473	Pt electrodes
	20. 01	463–583	

[a] Izbekov and Nizhnik, in addition to measuring the specific conductance of this system at 200° C while varying the composition, made a study of temperature-dependence at the fixed composition of 20.01 mol % KI.

TABLE 325. AlI_3-KI: Specific conductance (ohm^{-1} cm^{-1})

Mol % KI	473 K	Mol % KI	473 K
0. 83	0. 0002205	23. 91	0. 04303
1. 58	0. 0005516	25. 47	0. 04767
3. 11	0. 002024	27. 01	0. 05161
3. 68	0. 002677	31. 88	0. 06546
5. 12	0. 004592	37. 03	0. 07945
7. 78	0. 008421	41. 33	0. 09847
14. 78	0. 02223	44. 17	0. 11160
21. 78	0. 03907	46. 50	0. 12110

These values are those obtained by Izbekov and Nizhnik at a fixed temperature of 473 K and varying concentration (classical ac technique) [**135**]. See the next table for an analysis of data obtained by those authors at a fixed concentration and varying temperature.

TABLE 326. AlI_3-KI: Specific conductance (ohm^{-1} cm^{-1})

Temperature-dependent equations

20.01 mol % KI

$$\kappa = -0.0878627 + 1.10083 \cdot 10^{-4} T + 3.29602 \cdot 10^{-7} T^2$$

Standard error of estimate: 0.79%

T	$\kappa(\times 10^2)$	*T*	$\kappa(\times 10^2)$
470	3. 669	530	6. 307
480	4. 092	540	6. 769
490	4. 522	550	7. 239
500	4. 958	560	7. 715
510	5. 401	570	8. 197
520	5. 851	580	8. 686

These values are based on the work of Izbekov and Nizhnik (classical ac technique) [**135**].

TABLE 327. Density studies: AlI_3-KI

Investigations critically re-examined

Ref.	KI mol %	Temp. range (T)
135	0. 00, 10. 07, 22. 03, 35. 72	473

Deviations from previous NSRDS recommendations [1, p. 21]

Ref.	KI mol %	Departure
135	0	1. 72% (473 K)

TABLE 328. AlI_3-KI: Density (g cm^{-3})

Mol % KI	473 K
0. 00	3. 256
10. 07	3. 213
22. 03	3. 267
35. 72	3. 335

These values are taken from the work of Izbekov and Nizhnik (pycnometric method) [**135**]. The experimental values are given.

AlI_3-SbI_3

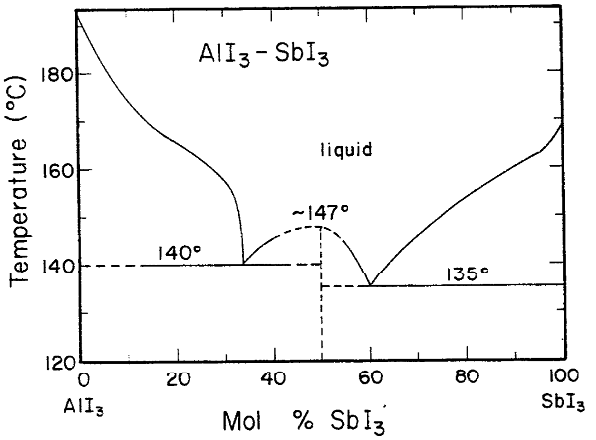

FIGURE 44. Temperature-composition phase diagram for AlI_3-SbI_3.

A. T. Nizhnik, Zh. Obshch. Khim., 7, 1943 (1937).

Melt Preparation and Purification

The preparation of AlI_3 by Izbekov and Nizhnik [**135**] is discussed under AgI-AlI_3. The antimony triiodide was obtained in a similar fashion by the action of dry iodine on chemically pure powdered antimony in a dry CO_2 atmosphere. The dark red SbI_3 was distilled 2–3 times over metallic antimony, and finally sublimed into a glass tube under CO_2. The melting point and specific conductance of the light-red crystals were checked against literature values. The preparation was stored in a sealed test tube.

TABLE 329. Electrical conductance studies: AlI_3-SbI_3

Investigations critically re-examined

Ref.	SbI_3 mol %	Temp. range (T)	Comments
135[a]	2. 35–100. 0	473	Pt electrodes
	11. 27	463–583	

[a] Izbekov and Nizhnik, in addition to measuring the specific conductance of this system at 200 °C while varying the composition, made a study of the temperature-dependence at the fixed composition of 11.27 mol % SbI_3.

TABLE 330. AlI_3-SbI_3: Specific conductance (ohm^{-1} cm^{-1})

473 K

Mol % SbI_3	$\kappa(\times 10^3)$	Mol % SbI_3	$\kappa(\times 10^3)$
2. 35	0. 0295	27. 55	10. 27
2. 99	0. 9987	41. 83	18. 37
11. 27	2. 212	47. 34	20. 47
12. 01	2. 477	55. 71	24. 27
14. 86	4. 094	59. 50	24. 83
19. 45	6. 604	72. 81	26. 31
22. 66	8. 287	92. 95	7. 524
24. 94	9. 340	100. 00	0. 2099

These values are those obtained by Izbekov and Nizhnik at a fixed temperature of 473 K and varying concentration (classical ac technique) [**135**]. See the next table for the results of an analysis of data obtained by these authors at fixed concentration and varying temperature.

TABLE 331. AlI_3-SbI_3: Specific conductance (ohm^{-1} cm^{-1})

Temperature-dependent equations

$\kappa = -0.0113589 + 5.23513 \cdot 10^{-5} T - 4.99630 \cdot 10^{-8} T^2$

11.27 mol % SbI_3

Standard error of estimate: 0.708%

T	$\kappa(\times 10^3)$	T	$\kappa(\times 10^3)$
470	2. 200	530	2. 353
480	2. 258	540	2. 342
490	2. 297	550	2. 321
500	2. 326	560	2. 289
510	2. 345	570	2. 248
520	2. 354	580	2. 197

These values are based on the work of Izbekov and Nizhnik (classical ac technique) [**135**].

TABLE 332. Density studies: AlI_3-SbI_3

Investigations critically re-examined

Ref.	SbI_3 mol %	Temp. range (T)
135	0.00, 9.47, 23.61, 58.01	473

Deviations from previous NSRDS recommendations [1, p. 21]

Ref.	SbI_3 mol %	Departure
135	0	1.72% (473 K)

TABLE 333. AlI_3-SbI_3: Density (g cm^{-3})

Mol % SbI_3	473 K
0.00	3.256
9.47	3.286
23.61	3.440
58.01	3.785

These values are taken from the work of Izbekov and Nizhnik (pycnometric method) [**135**]. The experimental values are reported.

CdI_2-CsI

Melt Preparation and Purification

Bloom et al. [**100**] recrystallized and oven-dried May and Baker cadmium iodide. Koch-Light and New Metal cesium iodide was used without further treatment except oven-drying. The purity of the dried salts was better than 99%, as determined by standard methods of analysis.

TABLE 334. Density studies: CdI_2-CsI

Investigations critically re-examined

Ref.	CsI mol %	Temp. range (T)	Comments
100[a]	0–100	744–1046	Cell material: Pt-10% Rh sinker, Pt suspension wire; calibration: water

Deviations from previous NSRDS recommendations [1, pp. 20, 22]

Ref.	CsI mol %	Min. departure	Max. departure
100	0	−0.23% (910 K)	−0.38% (770 K)
100	100	0.73% (930 K)	0.77% (1045 K)

[a] The raw density data of Bloom, et al. [**100**] were corrected for thermal expansion of the sinker, but corrections due to the surface tensions of the molten salts (~70 dyn cm^{-1}, i.e. approx. the same as water) and upthrust due to the buoyancy of the sinker (0.005%) were neglected as being too small to be significant. An accuracy of better than 0.1% was reported.

TABLE 335. CdI_2-CsI: Density (g cm^{-3})

	Mol percent CsI										
T	100	90	80	70	60	50	40	30	20	10	0
765							3. 805	3. 895			4. 264
780						3. 707	3. 787	3. 877			4. 247
795						3. 689	3. 769	3. 859	3. 964		4. 229
810					3. 598	3. 671	3. 751	3. 841	3. 946	4. 069	4. 212
825					3. 580	3. 652	3. 732	3. 823	3. 929	4. 051	4. 195
840				3. 493	3. 561	3. 634	3. 714	3. 806	3. 911	4. 034	4. 177
855			3. 406	3. 474	3. 543	3. 616	3. 696	3. 788	3. 893	4. 016	4. 160
870		3. 317	3. 388	3. 456	3. 524	3. 598	3. 678	3. 770	3. 875	3. 998	4. 142
885		3. 298	3. 369	3. 437	3. 506	3. 579	3. 660	3. 752	3. 857	3. 981	4. 125
900		3. 279	3. 350	3. 418	3. 487	3. 561	3. 642	3. 734	3. 840	3. 963	4. 107
915		3. 260	3. 331	3. 400	3. 469	3. 543	3. 624	3. 716	3. 822	3. 945	4. 090
930	3. 165	3. 241	3. 312	3. 381	3. 451	3. 524	3. 606	3. 698	3. 804	3. 928	4. 072
945	3. 145	3. 222	3. 294	3. 362	3. 432	3. 506	3. 588	3. 670	3. 786	3. 910	4. 055
960	3. 126	3. 203	3. 275	3. 344	3. 414	3. 488	3. 569	3. 662	3. 769		
975	3. 107	3. 185	3. 256	3. 325	3. 395	3. 470	3. 551	3. 664			
990	3. 088	3. 166	3. 237	3. 307	3. 377	3. 451					
1005	3. 069	3. 147	3. 219	3. 288							
1020	3. 050	3. 128	3. 200								
1035	3. 031	3. 109									

Two-dimensional equation and statistical parameters

$$\rho = a + bC + cT + dC^2 + eCT + fC^3$$

a	$b \cdot 10^2$	$c \cdot 10^3$	$d \cdot 10^4$	$e \cdot 10^6$	$f \cdot 10^7$	Max. percent departure	Stand. error of est.
5. 15460	−1. 45767	−1. 16365	1. 20465	−1. 10425	−5. 52121	0. 80% (824 K, 39.3 mol % CsI)	0. 013

These values are based on the work of Bloom, et al. (Archimedean Method) [**100**]. Here C=mol % CsI.

TABLE 336. CdI_2-CsI: Density (g cm^{-3})

	Mol percent CsI					
T	100	78.5	58.5	39.3	15.6	0
750			3. 684			
760			3. 671		4. 053	
770			3. 658		4. 040	4. 257
780			3. 646		4. 027	4. 246
790			3. 633		4. 014	4. 235
800			3. 621		4. 001	4. 225
810			3. 608		3. 988	4. 214
820			3. 598		3. 975	4. 203
830			3. 583	3. 762	3. 962	4. 193
840			3. 571	3. 748	3. 949	4. 182
850			3. 558	3. 721	3. 936	4. 171
860			3. 546	3. 708	3. 923	4. 161
870			3. 533	3. 694	3. 910	4. 150
880		3. 375	3. 521	3. 681	3. 897	4. 139
890		3. 363	3. 508	3. 667	3. 883	4. 129
900		3. 351	3. 495	3. 654	3. 870	4. 118
910		3. 339	3. 483	3. 640	3. 857	4. 107
920		3. 327	3. 470	3. 627	3. 844	4. 097
930	3. 163	3. 315	3. 458	3. 613	3. 831	4. 086
940	3. 152	3. 303	3. 445	3. 600	3. 818	4. 075
950	3. 140	3. 291	3. 433	3. 586	3. 805	4. 065
960	3. 128	3. 279	3. 420	3. 573	3. 792	
970	3. 116	3. 267	3. 408	3. 559		
980	3. 104	3. 255	3. 395			
990	3. 093	3. 243	3. 383			
1000	3. 081	3. 231	3. 370			
1010	3. 069	3. 218				
1020	3. 057	3. 206				
1030	3. 045					
1040	3. 033					

Temperature-dependent equations

$$\rho = a - bT$$

CsI mol %	a	$b \cdot 10^3$	Standard deviation
0	5. 0780	1. 0668	0. 00183
15. 6	5. 0443	1. 3043	0. 00388
39. 3	4. 8803	1. 3478	0. 00202
58. 5	4. 6243	1. 2543	0. 00228
78. 5	4. 4331	1. 2026	0. 00181
100	4. 2631	1. 1824	0. 00173

These values are based on the work of Bloom, et al. (Archimedean method) [**100**].

CdI_2-KI

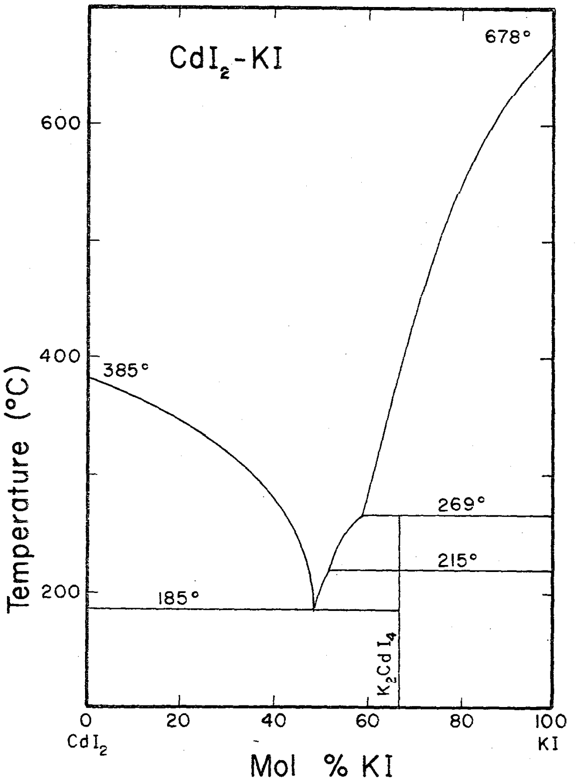

FIGURE 45. Temperature-composition phase diagram for CdI_2-KI.

H. Brand, Zentralbl. Mineral., Geol., Palaeontol., 26 (1912).

Melt Preparation and Purification

The procedure used by Bloom et al. [**13**] for the preparation of pure salts is described under the previous system.

TABLE 337. Electrical conductance studies: CdI_2-KI

Investigations critically re-examined			
Ref.	KI mol %	Temp. range (T)	Comments
13[a]	0–100	486–1073	Cell material: capillary cells of silica glass or B.T.H. #37 glass; Pt electrodes; freq. range: 100–10,000 Hz; calibration: 1 N KCl solutions.

TABLE 337. Electrical conductance studies: CdI_2-KI—Continued

Deviations from previous NSRDS recommendations [1, pp. 19, 22]

Ref.	KI mol %	Min. departure	Max. departure
13	100	0.14% (1070 K)	1.1% (1000 K)
13	0	0.35% (840 K)	5.4% (910 K)

[a] Bloom et al. [**13**] found no change in resistance over the frequency range studied and estimated their overall accuracy at ±0.5%.

TABLE 338. CdI_2-KI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent KI										
T	100	95.0	90.0	80.0	75.0	66.7	55.0	47.5	42.0	20.0	0
490								0.187			
520								0.232			
550							0.263	0.279			
580							0.310	0.331	0.323		
610							0.361	0.385	0.370		
640							0.414	0.442	0.418	0.361	
670							0.468	0.501	0.468	0.407	0.216
700						0.522	0.525	0.562	0.518	0.454	0.265
730						0.584	0.582	0.624	0.569	0.501	0.320
760						0.648	0.641	0.687	0.621	0.550	0.380
790					0.661	0.713	0.701	0.752	0.673	0.599	0.446
820					0.767	0.779	0.761	0.817	0.724	0.648	0.517
850				0.831	0.881	0.845	0.821	0.882	0.776	0.697	0.593
880				0.893	1.002	0.913	0.882	0.948	0.827	0.747	0.674
910				0.956	1.130	0.981	0.943	1.014	0.879	0.796	0.759
940			1.123	1.019	1.265	1.049	1.003	1.079	0.929	0.845	0.849
970	1.324	1.251	1.196	1.081	1.406	1.117	1.064	1.145	0.980	0.894	0.943
1000	1.384	1.322	1.269	1.144	1.552	1.185	1.124				
1030	1.443	1.392	1.342	1.206	1.705	1.253	1.183				
1060	1.501	1.461	1.414	1.267	1.862	1.320	1.243				

Temperature-dependent equations
$\kappa = A \cdot \exp(-E/RT)$

KI mol %	*A*	*E* (cal mol^{-1})
0	25.3	6340
20.0	5.19	3390
42.0	5.10	3180
47.5	7.26	3560
55.0	6.64	3530
66.7	8.02	3800
75.0	38.5	6380
80.0	7.00	3600
90.0	8.59	3800
95.0	7.81	3530
100	5.81	2850

The values in this table are based on the work of Bloom, Knaggs, Molloy, and Welch (classical ac technique) [13].

TABLE 339. Density studies: CdI_2–KI

Investigations critically re-examined

Ref.	KI mol %	Temp. range (*T*)	Comments
13[a]	0–100	486–1073	Cell material: sinker and suspension wire made from Pt–10% Rh.

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	KI mol %	Min. departure	Max. departure
13	100	0.25% (1020 K)	0.29% (1000 K)

[a] Density measurements in reference [**13**] were reported to be accurate to ±0.1%.

TABLE 340. CdI_2-KI: Density (g cm^{-3})

	Mol percent KI						
T	100	85. 0	66. 7	50. 0	33. 3	15. 0	0
490				3. 855			
510				3. 831			
530				3. 806			
550				3. 782			
570				3. 757			
590				3. 733			
610				3. 709	3. 996		
630				3. 684	3. 971		
650				3. 660	3. 945	4. 205	
670				3. 635	3. 919	4. 181	4. 385
690			3. 305	3. 611	3. 893	4. 158	4. 362
710			3. 282	3. 586	3. 867	4. 134	4. 340
730			3. 260	3. 562	3. 842	4. 111	4. 318
750			3. 238	3. 538	3. 816	4. 088	4. 295
770			3. 215	3. 513	3. 790	4. 064	4. 273
790			3. 193	3. 489	3. 764	4. 041	4. 251
810			3. 171	3. 464	3. 738	4. 017	4. 228
830			3. 149	3. 440	3. 712	3. 994	4. 206
850			3. 126	3. 415	3. 687	3. 971	4. 184
870			3. 104	3. 391	3. 661	3. 947	4. 161
890		2. 795	3. 082	3. 366	3. 635	3. 924	4. 139
910		2. 773	3. 059	3. 342	3. 609	3. 900	4. 117
930		2. 751	3. 037	3. 318	3. 583	3. 877	4. 094
950		2. 730	3. 015	3. 293	3. 558	3. 854	4. 072
970	2. 439	2. 708	2. 992	3. 269	3. 532	3. 830	4. 050
990	2. 420	2. 686	2. 970				
1010	2. 400	2. 664	2. 948				
1030	2. 381	2. 642	2. 926				
1050	2. 362	2. 620	2. 903				
1070	2. 343	2. 599	2. 881				

TABLE 340. CdI_2-KI: Density (g cm^{-3})—Continued

Temperature-dependent equations

$\rho = a + bT$

KI Mol %	a	$b \cdot 10^4$
0	3.370	−9.60
15.0	3.767	−10.92
33.3	4.074	−11.15
50.0	4.454	−12.22
66.7	4.784	−12.91
85.0	4.965	−11.70
100.0	5.133	−11.17

These values are based on the work of Bloom, Knaggs, Molloy, and Welch (Archimedean method) [**13**].

CdI_2-NaI

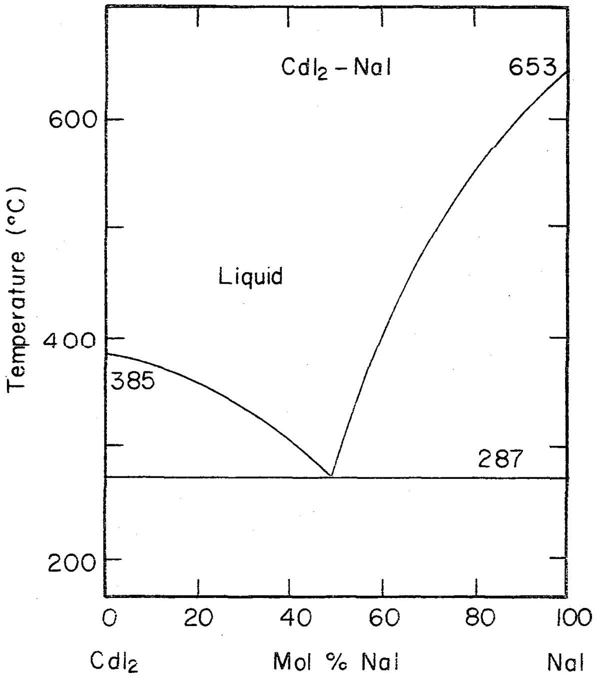

FIGURE 46. Temperature-composition phase diagram for CdI_2-NaI.

H. Brand, Zentralbl. Mineral., Geol., Palaeontol., 26 (1912).

Melt Preparation and Purification

The method used by Bloom et al. [**100**] for melt preparation and purification is given under the system (CdI_2-CsI).

TABLE 341. Density studies: CdI_2-NaI

Investigations critically re-examined

Ref.	NaI mol %	Temp. range	Comments
100[a]	0, 24.3, 58.0	660-952	Cell material: Pt-10% Rh sinker, Pt suspension wire; calibration: water

Deviations from previous NSRDS recommendations [1, p. 22]

Ref.	NaI mol %	Min. departure	Max. departure
100	0	−0.23% (910 K)	−0.38% (770 K)

[a] The raw density data of Bloom, et al. [**100**] were corrected for thermal expansion of the sinker, but corrections due to the surface tensions of the molten salts (~70 dyn cm^{-1}, i.e. approx. the same as water) and upthrust due to the buoyancy of the sinker (0.005%) were neglected as being too small to be significant. An accuracy of better than 0.1% was reported.

TABLE 342. CdI_2-NaI: Density (g cm^{-3})

	Mol percent NaI		
T	58. 0	24. 3	0. 0
660		4. 177	
670		4. 166	
680		4. 155	
690		4. 144	
700		4. 133	
710		4. 122	
720		4. 111	
730		4. 100	
740		4. 089	
750		4. 078	
760		4. 067	
770		4. 056	4. 257
780		4. 045	4. 246
790		4. 034	4. 235
800	3. 552	4. 023	4. 225
810	3. 540	4. 012	4. 214
820	3. 529	4. 001	4. 203
830	3. 517	3. 990	4. 193
840	3. 505	3. 979	4. 182
850	3. 493	3. 967	4. 171
860	3. 481		4. 161
870	3. 469		4. 150
880	3. 458		4. 139
890	3. 446		4. 129
900	3. 434		4. 118
910	3. 422		4. 107
920	3. 410		4. 097
930			4. 086
940			4. 075
950			4. 065

Temperature-dependent equations

$\rho = a - bT$

Mol % NaI	a	$b \cdot 10^3$	Standard deviation
0	5. 0780	1. 0668	0. 00183
24. 3	4. 9069	1. 1052	0. 00191
58. 0	4. 4989	1. 1834	0. 00194

These values are based on the work of Bloom, Rendall, Boyd, and Laver (Archimedean method) [**100**].

CsI-DyI$_3$

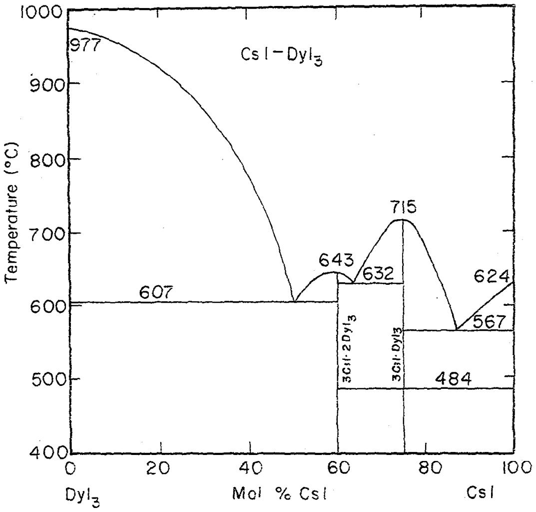

FIGURE 47. Temperature-composition phase diagram for CsI-DyI$_3$.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

Kutscher and Schneider [**109**] used Merck "Suprapur" alkali iodides fused in a quartz tube under argon to remove traces of water. The lanthanide iodides (LaI_3, DyI_4, GdI_3, and NdI_3) were prepared by dissolving the corresponding lanthanide oxide in a mixture of NH_4I and HI (both Merck "Suprapur"). After evaporation to dryness, the residue was heated under high vacuum, driving off water, ammonia and HI. The water was removed quickly to prevent the formation of the oxyiodide. Any remaining ammonium iodide was then slowly sublimed off. The product was further purified by sublimation under high vacuum (5×10^{-5} torr) over a period of 10–12 hours. The purified salts were preserved in glass ampoules under argon of greater than 99.99% purity sealed under slightly decreased pressure.

TABLE 343. Electrical conductance studies: CsI-DyI_3

Investigations critically re-examined			
Ref.	DyI_3 mol %	Temp. range (T)	Comments
109 [a]	0–100(g)	1256.7, 1295.7, 1325.2	Cell material: quartz capillary; Mo elecrodes; freq. range: 100,000–250,000 Hz; calibration: molten NaCl

[a] Highly purified argon was used as an inert gas atmosphere during all transfer operations. For the composition of the melt, CsI was determined to ±0.1 mg, while the concentration of Dy (III) was obtained using a complexometric titration with xylene orange as an indicator. The uncertainty in the measurements is judged to be ±1.0%.

TABLE 344. CsI-DyI_3: Specific conductance (ohm^{-1} cm^{-1})

DyI_3, mol %	1257.7 K	1295.7 K	1325.2 K
0	1.07	1.12	1.16
10	0.90	0.93	0.95
20	0.73	0.77	0.80
30	0.62	0.65	0.68
40	0.55	0.57	0.60
50	0.48	0.51	0.54
60	0.46	0.48	0.50
70	0.45	0.47	0.50
80	0.42	0.46	0.48
90	0.41	0.45	0.47
100	0.40	0.44	0.46

These values have been interpolated to two significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

CsI-GdI_3

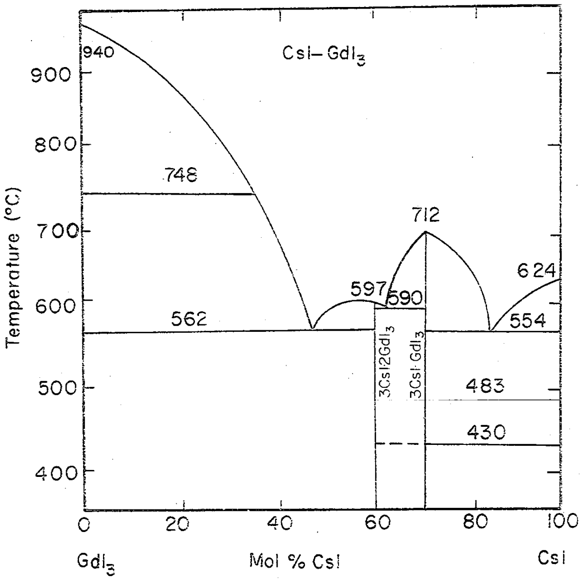

FIGURE 48. Temperature-composition phase diagram for CsI-GdI_3.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the CsI and GdI_3 used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI_3.

TABLE 345. Electrical conductance studies: CsI-GdI_3

Investigations critically re-examined		
Ref.	GdI_3 mol %	Temp. range (T)
109 [a]	0–100 (g)	1243, 1287, 1322

[a] For experimental details see CsI-DyI_3.

TABLE 346. CsI-GdI_3: Specific conductance (ohm^{-1} cm^{-1})

GdI_3 mol %	1243 K	1287.7 K	1322 K
0	1.08	1.11	1.16
10	0.90	0.93	0.98
20	0.73	0.77	0.80
30	0.61	0.65	0.68
40	0.54	0.56	0.58
50	0.49	0.52	0.55
60	0.47	0.50	0.53
70	0.46	0.50	0.52
80	0.45	0.50	0.52
90	0.45	0.48	0.51
100	0.45	0.48	0.51

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 347. Density studies: CsI-GdI_3

Investigations critically re-examined

Ref.	GdI_3 mol %	Temp. range (T)	Comments
108[a]	0–100	1004.7–1306.2	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 20]

Ref.	GdI_3 mol %	Min. departure	Max. departure
108	0	0.50% (1130 K)	0.54% (1025 K)

[a] The density data of Kutscher and Schneider [**108**] for pure GdI_3 were recommended earlier in this volume.

TABLE 348. CsI-GdI_3: Density (g cm^{-3})

	Mol percent GdI_3											
T	100	90	80	70	60	50	40	30	20	10	0	53
1010						3.775	3.676					3.804
1025					3.854	3.756	3.657	3.548	3.418	3.257	3.054	3.785
1040					3.835	3.737	3.638	3.529	3.399	3.238	3.035	3.766
1055					3.816	3.718	3.619	3.510	3.380	3.219	3.016	3.747
1070					3.797	3.698	3.600	3.491	3.361	3.200	2.997	3.728
1085					3.778	3.679	3.581	3.472	3.342	3.181	2.978	3.708
1100				3.868	3.759	3.660	3.562	3.453	3.323	3.162	2.959	3.689
1115				3.849	3.740	3.641	3.543	3.434	3.304	3.143	2.939	3.670
1130				3.830	3.721	3.622	3.524	3.415	3.285	3.123	2.920	3.651
1145				3.811	3.702	3.603	3.504	3.395	3.266	3.104	2.901	3.632
1160				3.791	3.682		3.485	3.376	3.246	3.085	2.882	3.613
1175				3.772	3.663		3.466	3.357	3.227	3.066	2.863	
1190			3.883	3.753			3.477			3.047	2.844	
1205			3.864	3.734								
1220		4.006	3.845	3.715								
1235		3.987	3.826									
1265	4.152	3.949	3.788									
1280	4.133	3.930										
1295	4.114											

Two-dimensional equation and statistical parameters

$$\rho = a + bC + cT + dC^2 + eC^3$$

a	$b \cdot 10^2$	$c \cdot 10^6$	$d \cdot 10^4$	$e \cdot 10^2$	Max. percent departure	Stand. error of est.
4.35932	2.27476	−1.27344	−2.61454	1.74377	0.56% (1011.7 K, 20.32 mol % GdI_3)	0.010

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**]. Here C=mol % GdI_3.

TABLE 349. CsI-GdI_3: Density (g cm^{-3})

	Mol percent GdI_3							
T	100	80.07	59.31	49.54	39.32	29.62	20.32	0.00
1010				3.767	3.654			
1020			3.862	3.755	3.642		3.448	
1030			3.849	3.742	3.629	3.555	3.434	3.038
1040			3.836	3.729	3.616	3.542	3.422	3.026
1050			3.823	3.716	3.603	3.529	3.408	3.014
1060			3.810	3.703	3.590	3.515	3.395	3.002
1070			3.797	3.691	3.578	3.502	3.382	2.990
1080			3.784	3.678	3.565	3.489	3.368	2.978
1090			3.770	3.665	3.552	3.475	3.355	2.966
1100			3.757	3.653	3.539	3.462	3.342	2.954
1110			3.744	3.640	3.526	3.449	3.329	2.942
1120			3.731	3.627	3.513	3.436	3.315	2.930
1130			3.718	3.614	3.501	3.422	3.302	2.918
1140			3.705	3.601	3.488	3.409	3.289	2.906
1150			3.692		3.475	3.396	3.275	2.894
1160			3.679		3.462	3.383	3.262	2.882
1170			3.665		3.449	3.369	3.249	2.870
1180			3.652		3.437	3.356	3.235	2.858
1190		3.890			3.424	3.434		
1200		3.878						
1210		3.866						
1220		3.854						
1230		3.843						
1240		3.831						
1250		3.819						
1260	4.065	3.807						
1270	4.056	3.795						
1280	4.047							
1290	4.038							
1300	4.029							

Temperature-dependent equations

$\rho = a - bT$

Mol % GdI_3	a	$b \cdot 10^3$
0.00	4.2743	1.2000
20.32	4.8040	1.3292
29.62	4.9110	1.3291
39.32	4.9487	1.2814
49.54	5.0549	1.2749
59.31	5.2011	1.3125
80.07	5.2965	1.1821
100.00	5.2097	0.9080

These values are based on the work of Kutscher and Schneider (dilatometric method) [108].

CsI-LaI$_3$

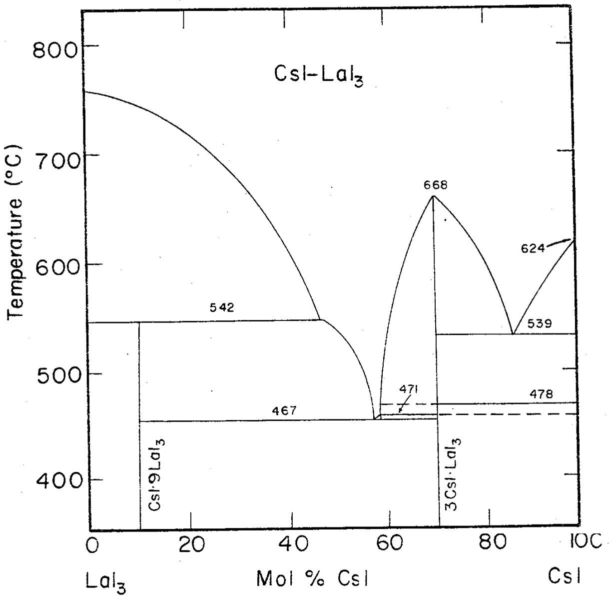

FIGURE 40. Temperature-composition phase diagram for CsI-LaI$_3$.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the CsI and LaI$_3$ used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI$_3$.

TABLE 350. Electrical conductance studies: CsI-LaI$_3$

Investigations critically re-examined		
Ref.	LaI$_3$, mol %	Temp. range (T)
109 [a]	0–100 (g)	1095, 1146, 1198

[a] For experimental details see CsI-DyI$_3$.

TABLE 351. CsI-LaI$_3$: Specific conductance (ohm^{-1} cm^{-1})

LaI$_3$, mol %	1095 K	1146 K	1198 K
0	0. 90	0. 97	1. 03
10	0. 74	0. 80	0. 85
20	0. 60	0. 67	0. 78
30	0. 52	0. 57	0. 63
40	0. 48	0. 52	0. 58
50	0. 47	0. 51	0. 55
60	0. 48	0. 52	0. 56
70	0. 50	0. 54	0. 60
80	0. 50	0. 55	0. 62
90	0. 50	0. 56	0. 64
100	0. 50	0. 57	0. 65

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 352. Density studies: CsI-LaI$_3$

Investigations critically re-examined			
Ref.	LaI$_3$ mol %	Temp. range (T)	Comments
108 [a]	0–100	992. 2–1182. 7	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 20]			
Ref.	LaI$_3$ mol %	Min. departure	Max. departure
108	0	0.50% (1130 K)	0.54% (1025 K)

[a] The density data of Kutscher and Schneider [**108**] for pure LaI$_3$ were recommended earlier in this volume.

TABLE 353. $CsI-LaI_3$: Density (g cm^{-3})

	Mol percent LaI_3										
T	100	90	80	70	60	50	40	30	20	10	0	43
1000				3. 975	3. 852	3. 730						
1010				3. 963	3. 840	3. 718	3. 595					3. 632
1020				3. 951	3. 829	3. 706	3. 583					3. 621
1030				3. 940	3. 817	3. 695	3. 572	3. 446			3. 041	3. 609
1040			4. 053	3. 928	3. 805	3. 683	3. 560	3. 435	3. 305	3. 171	3. 029	3. 597
1050			4. 041	3. 916	3. 793	3. 671	3. 548	3. 423	3. 294	3. 159	3. 017	3. 585
1060			4. 029	3. 904	3. 782	3. 660	3. 537	3. 411	3. 282	3. 147	3. 005	3. 574
1070			4. 018	3. 893	3. 770	3. 648	3. 525	3. 399	3. 270	3. 135	2. 994	3. 562
1080		4. 135	4. 006	3. 881	3. 758	3. 636	3. 513	3. 388	3. 258	3. 124	2. 982	3. 550
1090		4. 123	3. 994	3. 869	3. 746	3. 624	3. 501	3. 376	3. 247	3. 112	2. 970	3. 538
1100		4. 111	3. 982	3. 857	3. 735	3. 613	3. 490	3. 364	3. 235	3. 100	2. 958	3. 527
1110		4. 099	3. 971	3. 846	3. 723	3. 601	3. 478	3. 352	3. 223	3. 088	2. 947	3. 515
1120		4. 088	3. 959	3. 834	3. 711	3. 589	3. 466	3. 341	3. 211	3. 077	2. 935	3. 503
1130	4. 210	4. 076	3. 947	3. 822	3. 699	3. 577	3. 454	3. 329	3. 200	3. 065	2. 911	3. 491
1140	4. 198	4. 064	3. 936	3. 811	3. 688	3. 566	3. 443	3. 317	3. 188	3. 053	2. 900	3. 480
1150	4. 186	4. 052	3. 924	3. 799	3. 676	3. 554	3. 431	3. 306	3. 176	3. 041	2. 888	3. 468
1160	4. 175	4. 041	3. 912	3. 787	3. 664	3. 542	3. 419	3. 294	3. 164	3. 030	2. 876	3. 456
1170	4. 163	4. 029	3. 900	3. 775	3. 653	3. 530	3. 407	3. 282	3. 153	3. 018	2. 865	3. 445
1180	4. 151	4. 017	3. 889	3. 764	3. 641	3. 519	3. 396	3. 270				3. 433

Two-dimensional equation and statistical parameters

$$\rho = a + bC + cT + dC^2 + eC^3$$

a	$b\cdot 10^2$	$c\cdot 10^3$	$d\cdot 10^5$	$e\cdot 10^7$	Max. percent departure	Stand. error of est.
4. 24917	1. 45696	−1. 17342	−4. 24168	2. 53785	0. 68% (1175.2 K, 20.73 mol % LaI_3)	0. 009

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**]. Here C= Mol % LaI_3.

TABLE 354. CsI-LaI_3: Density (g cm^{-3})

	Mol percent LaI_3							
T	100	78. 90	60. 22	50. 33	40. 60	30. 48	20. 73	0. 00
1000			3. 866	3. 730	3. 599			
1010			3. 854	3. 719	3. 588			
1020			3. 842	3. 707	3. 576			
1030		4. 057	3. 829	3. 695	3. 565	3. 450		3. 038
1040		4. 045	3. 817	3. 683	3. 553	3. 438	3. 330	3. 026
1050		4. 033	3. 805	3. 671	3. 542	3. 427	3. 319	3. 014
1060		4. 021	3. 793	3. 660	3. 530	3. 415	3. 308	3. 002
1070		4. 009	3. 781	3. 648	3. 519	3. 403	3. 296	2. 990
1080		3. 997	3. 768	3. 636	3. 507	3. 392	3. 285	2. 978
1090		3. 985	3. 756	3. 624	3. 496	3. 380	3. 274	2. 966
1100		3. 973	3. 744	3. 612	3. 484	3. 369	3. 263	2. 954
1110		3. 961	3. 732	3. 601	3. 473	3. 357	3. 251	2. 942
1120		3. 948	3. 720	3. 589	3. 461	3. 346	3. 240	2. 930
1130	4. 203	3. 936	3. 707	3. 577	3. 450	3. 334	3. 229	2. 918
1140	4. 192	3. 924	3. 695	3. 565	3. 438	3. 322	3. 217	2. 906
1150	4. 181	3. 912	3. 683	3. 553	3. 427	3. 311	3. 206	2. 894
1160	4. 169	3. 900	3. 671	3. 542	3. 415	3. 299	3. 195	2. 882
1170	4. 158	3. 888	3. 654	3. 530	3. 404	3. 288	3. 184	2. 870
1180	4. 147	3. 876	3. 646	3. 518	3. 392	3. 276		2. 858

Temperature-dependent equations

$\rho = a - bT$

LaI_3 mol %	a	$b \cdot 10^3$
0. 00	4. 2743	1. 2000
20. 73	4. 5019	1. 1267
30. 48	4. 6412	1. 1568
40. 60	4. 7501	1. 1508
50. 33	4. 9105	1. 1801
60. 22	5. 0863	1. 2203
78. 90	5. 2945	1. 2018
100	5. 4581	1. 1109

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**].

CsI-LiI

Melt Preparation and Purification

Zuca and Olteanu [**96**] used Merck p.a. reagent grade alkali iodides twice recrystallized from distilled water, dried at 150 °C for 24 hours and then fused to remove any remaining traces of water. Due to the hygroscopicity of LiI, it was melted directly into the conductivity cell. Prior to melting, the salt was heated to 380 °C under vacuum, slowly increasing the temperature for 120 hours. Dry HI gas was then bubbled through the melt for eight hours, followed by argon to remove traces of HI. Mixtures were prepared by adding the requisite amount of alkali iodide to the weighed LiI already in the cell. To establish the composition of the melt, the mixtures were analyzed spectrophotometrically before and after each experiment. All melts were tested for neutrality with phenolphthalein before and after each run and were found to be consistently neutral.

TABLE 355. Electrical conductance studies: CsI-LiI

Investigations critically re-examined

Ref.	LiI mol %	Temp. range (T)	Comments
96	0–100	762. 2–1130. 8	Cell material: silica U-shape; Pt electrodes

Comparisons with previous NSRDS recommendations [1, pp. 19, 20]

Ref.	LiI mol %	Min. departure	Max. departure
96	0	−3. 46% (959. 2 K)	−15. 41% (1130. 8 K)
96	100	−0. 02% (871. 8 K)	−0. 46% (778. 7 K)

TABLE 356. CsI-LiI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent LiI						
T	100	94.6	78.0	53.2	28.4	24.3	0
770	4.008						
780	4.058						
790	4.106						
800	4.154						
810	4.200						
820	4.246						
830	4.291						
840	4.335						
850	4.377						
860	4.419				0.716		
870	4.460	3.013		0.977	0.750		
880	4.500	3.044	1.809	1.018	0.783	0.817	
890	4.539	3.074	1.858	1.058	0.814	0.832	
900	4.577	3.103	1.905	1.097	0.845	0.848	
910	4.614	3.133	1.950	1.135	0.875	0.863	
920		3.161	1.994	1.172	0.904	0.878	
930		3.189	2.037	1.208	0.932	0.893	
940		3.217	2.077	1.244	0.959	0.908	
950		3.245	2.117	1.278	0.985	0.922	
960		3.271	2.154	1.312	1.009	0.937	0.745
970		3.298	2.190	1.344	1.033	0.951	0.758
980		3.324	2.224	1.376	1.057	0.964	0.771
990		3.349	2.256	1.407	1.079	0.978	0.784
1000		3.374	2.287	1.436		0.992	0.796
1010		3.399	2.315	1.465		1.005	0.808
1020		3.423	2.342	1.493		1.018	0.820
1030		3.447	2.367	1.520		1.031	0.831
1040		3.470	2.389			1.044	0.843
1050		3.493	2.410			1.056	0.854
1060			2.429			1.069	0.865
1070			2.445			1.081	0.875
1080							0.885
1090							0.895
1100							0.905
1110							0.914
1120							0.923
1130							0.931

Temperature-dependent equations

$\kappa = a + bT + cT^2 + dT^3$

LiI mol %	$-a$	$b \cdot 10^3$	$-c \cdot 10^6$	$-d \cdot 10^9$	Stand. error of est.
0	1.83851	4.04370	1.40917		0.09%
24.3	1.28051	3.11914	0.759732	0.0870236	0.24%
28.4	5.77639	11.6873	4.81108		0.86%
53.2	6.10921	12.1571	4.61144		0.65%
78.0	3.99933	3.66193	−8.58547	5.96145	0.28%
94.6	1.41574	7.10128	2.31123		0.40%
100	2.68211	12.3786	4.79210		0.11%

These values are based on the work of Zuca and Olteanu (classical ac technique) [**96**].

Table 357. Density studies: CsI-LiI

Investigations critically re-examined

Ref.	LiI, mol %	Temp. range (*T*)
96	0-100	762. 2–1140. 7

Deviations from previous NSRDS recommendations [1, pp. 19, 20]

Ref.	LiI mol %	Min. departure	Max. departure
96	0	0. 36% (1130 K)	0. 74% (960 K)
96	100	0. 00% (835 K)	−0. 23% (765 K)

Table 358. CsI-LiI: Density (g cm^{-3})

	Mol percent LiI					
T	100	80. 7	78. 3	46. 6	21. 2	0. 0
770	3. 077					
780	3. 069					
790	3. 061					
800	3. 053					
810	3. 044					
820	3. 036					
830	3. 028					
840	3. 020					
850	3. 012					
860	3. 003					
870	2. 995					
880	2. 987					
890	2. 979		3. 053			
900	2. 971	3. 001	3. 043			
910	2. 963	2. 991	3. 032			
920		2. 980	3. 021		3. 084	
930		2. 970	3. 010		3. 072	
940		2. 960	2. 999		3. 059	
950		2. 949	2. 988	3. 009	3. 047	
960		2. 939	2. 977	2. 999	3. 035	3. 128
970		2. 929	2. 967	2. 988	3. 023	3. 115
980		2. 919	2. 956	2. 978	3. 010	3. 103
990		2. 908	2. 945	2. 967	2. 998	3. 090
1000		2. 898	2. 934	2. 957	2. 985	3. 078
1010		2. 888	2. 923	2. 946	2. 973	3. 065
1020		2. 877	2. 912	2. 936	2. 961	3. 053
1030		2. 867	2. 901	2. 925	2. 949	3. 040
1040		2. 857	2. 891	2. 914	2. 936	3. 027
1050		2. 847	2. 880	2. 904	2. 924	3. 015
1060		2. 836	2. 869	2. 893	2. 912	3. 002
1070		2. 826	2. 858	2. 883	2. 899	2. 990
1080		2. 816	2. 847	2. 872	2. 887	2. 977
1090		2. 805	2. 836	2. 862	2. 874	2. 965
1100		2. 795		2. 851	2. 862	2. 952
1110				2. 841	2. 850	2. 939
1120				2. 830		2. 927
1130				2. 819		2. 914
1140				2. 809		

Temperature-dependent equations

$$\rho = a - bT$$

LiI mol %	a	$b \cdot 10^3$	Stand. error of est.
0	4. 3345	1. 2568	
21. 2	4. 2166	1. 2310	0. 02%
46. 6	4. 0131	1. 0564	0. 17%
78. 3	4. 0206	1. 0867	0. 07%
80. 7	3. 9283	1. 0303	0. 07%
100	3. 7063	0. 8172	

These values are based on the work of Zuca and Olteanu (Archimedean method) [96].

CsI-NdI$_3$

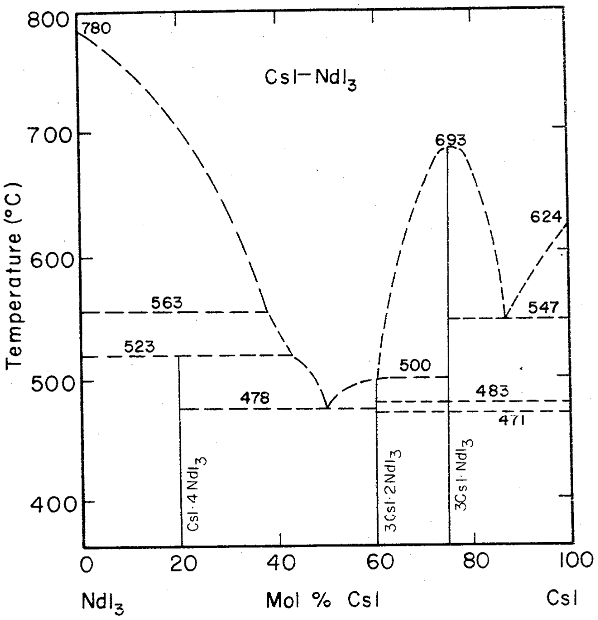

FIGURE 50. Temperature-composition phase diagram for CsI-NdI$_3$.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the CsI and NdI$_3$ used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI$_3$.

TABLE 359. Electrical conductance studies: CsI-NdI$_3$

Investigations critically re-examined

Ref.	NdI$_3$ mol %	Temp. range
109[a]	0–100 (g)	1092, 1139, 1187

[a] For experimental details, see CsI-DyI$_3$.

TABLE 360. CsI-NdI$_3$: Specific conductance (ohm^{-1}cm^{-1})

NdI$_3$ mol %	1092 K	1139 K	1187 K
0	0.90	0.95	1.03
10	0.72	0.77	0.83
20	0.57	0.63	0.69
30	0.49	0.53	0.58
40	0.43	0.48	0.52
50	0.42	0.45	0.50
60	0.42	0.45	0.50
70	0.43	0.47	0.51
80	0.44	0.48	0.53
90	0.43	0.49	0.54
100	0.42	0.48	0.54

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 361. Density studies: CsI-NdI$_3$

Investigations critically re-examined

Ref.	NdI$_3$ mol %	Temp. range (T)	Comments
108[a]	0–100	902.2–1193.2	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 20]

Ref.	NdI$_3$ mol %	Min. departure	Max. departure
108	0	0.50% (1130 K)	0.54% (1025 K)

[a] The density data of Kutscher and Schneider [**108**] for pure NdI$_3$ were recommended earlier in this volume.

TABLE 362. CsI-NdI$_3$: Density (g cm^{-3})

	Mol percent NdI$_3$										
T	100	90	80	70	60	50	40	30	20	10	0	50
910							3. 724					
925						3. 821	3. 707					3. 821
940					3. 917	3. 805	3. 691					3. 805
955					3. 900	3. 788	3. 674					3. 788
970					3. 884	3. 772	3. 657					3. 722
985					3. 867	3. 755	3. 641					3. 755
1000				3. 964	3. 850	3. 738	3. 624					3. 738
1015				3. 948	3. 834	3. 722	3. 607					3. 722
1030				3. 931	3. 817	3. 705	3. 591				3. 037	3. 705
1045				3. 914	3. 801	3. 688	3. 574	3. 454			3. 021	3. 688
1060				3. 898	3. 784	3. 672	3. 557	3. 437			3. 004	3. 672
1075				3. 881	3. 767	3. 655	3. 541	3. 421			2. 987	3. 655
1090				3. 864	3. 751	3. 639	3. 524	3. 404	3. 274		2. 971	3. 639
1105			3. 967	3. 848	3. 734	3. 622	3. 508	3. 387	3. 257	3. 114	2. 954	3. 622
1120	4. 218	4. 078	3. 950	3. 831	3. 717	3. 605	3. 491	3. 371	3. 241	3. 098	2. 937	3. 605
1135	4. 202	4. 061	3. 933	3. 814	3. 701	3. 589	3. 474	3. 354	3. 224	3. 081	2. 921	3. 589
1150	4. 185	4. 045	3. 917	3. 798	3. 684	3. 572		3. 337	3. 208	3. 064	2. 904	3. 572
1165	4. 168	3. 028	3. 900	3. 781	3. 668	3. 555		3. 321	3. 191	3. 048	2. 887	3. 555
1180	4. 152	4. 011	3. 883	3. 765							2. 871	

Two-dimensional equation and statistical parameters

$$\rho=a+bC+cT+dC^2+eC^3$$

a	$b\cdot10^2$	$c\cdot10^3$	$d\cdot10^4$	$c\cdot10^7$	Max. percent departure	Stand. error of est.
4. 17938	1. 69975	−1. 10891	−1. 03719	6. 18333	0. 76% (1086.7 K, 20.17 mol % NdI$_3$)	0. 013

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**]. Here C=mol % NdI$_3$.

TABLE 363. CsI-NdI_3: Density (g cm^{-3})

	Mol percent NdI_3							
T	100	79.71	59.19	50.00	40.07	29.94	20.17	0.00
910				3.833				
920				3.821				
930				3.809				
940				3.798				
950			3.913	3.786	3.677			
960			3.901	3.774	3.665			
970			3.889	3.763	3.654			
980			3.877	3.751	3.642			
990			3.865	3.740	3.631			
1000			3.853	3.728	3.619			
1010			3.841	3.716	3.608			
1020			3.829	3.705	3.597			
1030			3.817	3.693	3.585			3.038
1040			3.805	3.681	3.574			3.026
1050			3.793	3.670	3.562	3.464		3.014
1060			3.781	3.658	3.551	3.452		3.002
1070			3.769	3.646	3.539	3.440		2.990
1080			3.757	3.635	3.528	3.428		2.978
1090		4.004	3.745	3.623	3.517	3.417	3.301	2.966
1100		3.992	3.733	3.611	3.505	3.405	3.289	2.954
1110		3.980	3.721	3.600	3.494	3.393	3.276	2.942
1120	4.208	3.967	3.709	3.588	3.482	3.381	3.264	2.930
1130	4.198	3.955	3.697	3.577	3.471	3.369	3.256	2.918
1140	4.187	3.942	3.685	3.565	3.460	3.357	3.239	2.906
1150	4.176	3.930	3.673	3.553		3.345	3.227	2.894
1160	4.166	3.917	3.661	3.542		3.333	3.215	2.882
1170	4.155	3.905	3.649	3.530		3.321	3.202	2.870
1180	4.144	3.893	3.637	3.518		3.310		2.858
1190	4.133							

Temperature-dependent equations

$\rho = a - bT$

Mol % NdI_3	a	$b \cdot 10^3$
0.00	4.2743	1.2000
20.17	4.6451	1.2330
29.94	4.7125	1.1889
40.07	4.7615	1.1421
50.00	4.8922	1.1643
59.19	5.0529	1.1999
79.71	5.3599	1.2435
100.00	5.4069	1.0701

Thess values are based on the work of Kutscher and Schneider (dilatometric method). [**108**].

DyI_3-KI

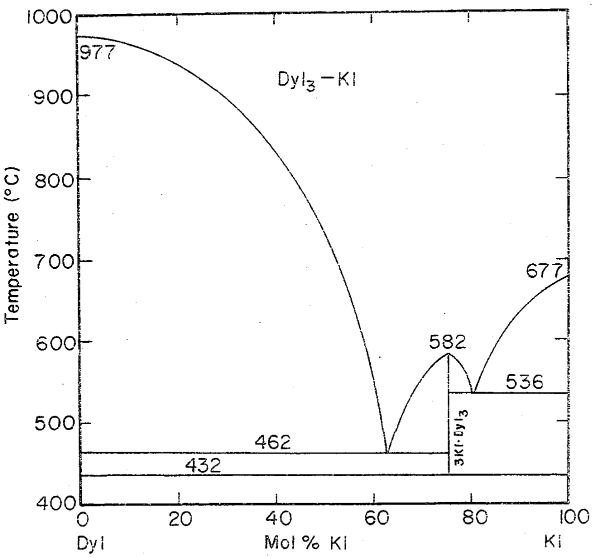

FIGURE 51. Temperature-composition phase diagram for DyI_3-KI.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the KI and DyI_3 used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI_3.

TABLE 364. Electrical conductance studies: DyI_3-KI

Investigations critically re-examined		
Ref.	KI, mol %	Temp. range (T)
109[a]	0–100 (g)	1247, 1294, 1329

[a] For experimental details, see CsI-DyI_3.

TABLE3 65. DyI_3-KI: Specific conductance (ohm^{-1} cm^{-1})

KI mol %	1247.7 K	1294 K	1329.7 K
0	0.38	0.44	0.46
10	0.45	0.50	0.55
20	0.52	0.57	0.60
30	0.58	0.65	0.68
40	0.66	0.73	0.76
50	0.76	0.82	0.85
60	0.87	0.94	0.97
70	1.01	1.10	1.14
80	1.20	1.28	1.35
90	1.47	1.55	1.61
100	1.85	1.90	1.95

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

GaI-GaI_3

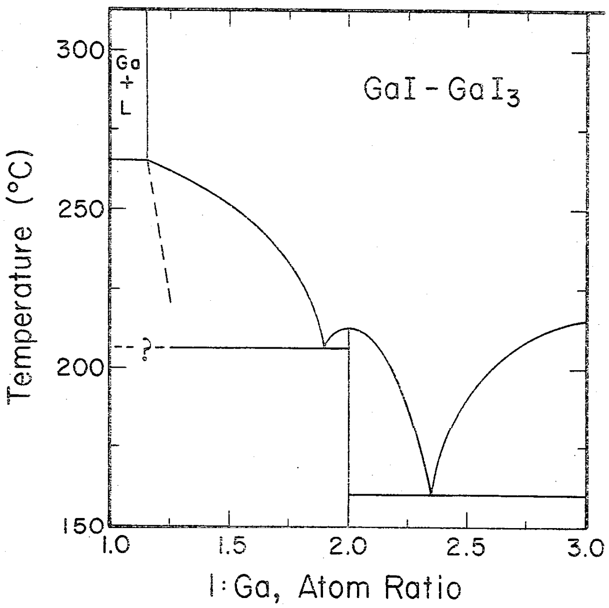

FIGURE 52. Temperature-composition phase diagram for GaI-GaI_3.

J. D. Corbett and R. K. McMullan, J. Am. Chem. Soc., **77**, 4219 (1955).

Melt Preparation and Purification

Riebling and Erickson [**104**] prepared GaI-GaI_3 mixtures by direct reaction of weighed quantities of gallium metal (ALCOA 99.99%) with iodide crystals (Matheson, Coleman, and Bell reagent grade) in a glass reaction chamber. This was placed in a furnace and heated slowly to 350–500 °C for several days at a pressure of 2.5×10^{-2} torr.

TABLE 366. Electrical conductance studies: GaI-GaI_3

Investigations critically re-examined			
Ref.	GaI_3 mol %	Temp. range (T)	Comments
104	31.5–100	417–673	Cell material: Pyrex glass; W electrodes; freq. range: 1000 Hz; calibration: KCl solutions

TABLE 367. GaI-GaI_3: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent GaI_3									
T	100.0[a]	91.5	84.5	74.0	66.5	53.0	50.0	44.0	39.0	31.5
420				0.021	0.028					
430				0.026	0.034	0.028	0.037	0.035		
440			0.016	0.031	0.041	0.039	0.049	0.048		
450			0.022	0.036	0.047	0.049	0.060	0.061	0.047	
460	0.055	0.014	0.027	0.042	0.054	0.059	0.072	0.073	0.059	
470	0.065	0.016	0.031	0.048	0.062	0.070	0.084	0.085	0.072	
480	0.073	0.019	0.036	0.054	0.069	0.081	0.096	0.098	0.085	0.064
490	0.081	0.021	0.040	0.061	0.077	0.092	0.107	0.110	0.098	0.077
500	0.089	0.023	0.044	0.068	0.086	0.103	0.119	0.121	0.111	0.090
510	0.095	0.024	0.048	0.075	0.094	0.114	0.131	0.133	0.124	0.103
520	0.101	0.026	0.051	0.082	0.103	0.126	0.143	0.144	0.137	0.117
530	0.106	0.028	0.054	0.090	0.112	0.138	0.154	0.156	0.151	0.131
540	0.111	0.030	0.057	0.098	0.122	0.149	0.166	0.167	0.165	0.146
550	0.115	0.031	0.059	0.106	0.132	0.161	0.178	0.178	0.178	
560	0.118	0.032	0.062	0.115	0.142	0.174	0.190	0.188	0.192	
570	0.120	0.034	0.064	0.124	0.152	0.186	0.201	0.199	0.206	
580	0.122	0.035	0.065	0.133	0.163	0.199	0.213	0.209	0.221	
590	0.123	0.036	0.067	0.143	0.174	0.212	0.225	0.219	0.235	
600	0.123	0.037	0.068	0.152	0.186	0.225	0.237	0.229	0.249	
610	0.123	0.038	0.069	0.162	0.197	0.238	0.248	0.239	0.264	
620	0.122	0.039	0.069	0.173	0.209	0.251	0.260	0.249	0.279	
630	0.120	0.040	0.069		0.222				0.294	
640	0.118	0.040	0.069		0.234					
650	0.115	0.041	0.069							
660	0.111	0.041	0.069							
670	0.107	0.042	0.068							

Temperature-dependent equations

$$\kappa = a + bT + cT^2$$

GaI_3, mol %	$a \cdot 10^1$	$b \cdot 10^4$	$c \cdot 10^7$	Stand. error of est.
31.5	−1.5307	−3.4497	16.6277	0.69%
39.0	−3.6989	6.0694	7.0881	1.37%
44.0	−6.8101	20.4085	−8.7236	2.06%
50.0	−4.6809	11.7460	0	2.51%
53.0	−2.3734	2.3436	8.9233	1.64%
66.5	0.5556	−7.2315	15.6677	0.56%
74.0	0.7975	−7.4727	14.4697	0.59%
84.5	−4.9093	17.6360	−13.8758	3.32%
91.5	−1.8964	6.5665	−4.6435	1.34%
100.0	−11.2310	41.5195	−34.5747	1.87%

These values are based on the work of Riebling and Erickson (classical ac technique) [**104**].

[a] For 100.0 mol percent GaI_3, the values listed are $\kappa \cdot 10^2$.

TABLE 368. Density studies: GaI-GaI_3

Investigations critically re-examined

Ref.	GaI_3 mol %	Temp. range (T)	Comments
104 [a]	30.0–100	448–538	Cell material: Pyrex glass dilatometer; calibration: Hg

[a] Riebling and Erickson [**104**] corrected their density values for thermal expansion of the dilatometer and for small composition changes in the melt due to sublimation of iodine. The authors reported that the total experimental errors were approximately ±0.1%.

TABLE 369. GaI-GaI_3: Density (g cm^{-3})

	Mol percent GaI_3						
T	100	90	80	70	60	50	40
450			3.915	3.982	4.037		
455			3.904	3.972	4.027	4.079	4.136
460	3.685		3.894	3.962	4.018	4.070	4.127
465	3.673		3.883	3.952	4.008	4.061	4.119
470	3.662	3.782	3.872	3.942	3.998	4.052	4.110
475	3.650	3.771	3.862	3.932	3.989	4.043	4.102
480	3.638	3.760	3.851	3.921	3.979	4.034	4.093
485	3.626	3.749	3.841	3.911	3.970	4.025	4.085
490	3.615	3.737	3.830	3.901	3.960	4.016	4.077
495	3.603	3.726	3.819	3.891	3.951	4.007	4.068
500	3.591	3.715		3.881	3.941	3.998	4.060
505	3.580	3.704			3.932	3.989	4.051
510	3.568	3.693			3.922	3.980	4.043
515	3.556	3.682			3.912	3.971	4.034
520	3.545	3.670			3.903	3.962	4.026
525	3.533	3.659				3.953	4.017
530						3.944	4.009
535						3.934	4.000

Two-dimensional equation and statistical parameters

$$\rho = a + bT + cC + dC^2 + eC^3 + fTC$$

a	$b \cdot 10^3$	$c \cdot 10^3$	$d \cdot 10^4$	$e \cdot 10^6$	$f \cdot 10^5$	Max. percent departure	Standard error of est.
4.76207	−2.34142	8.79063	−1.94812	1.47824	1.07593	0.36% (448.2 K, 40 mol % GaI)	0.20%

These values are based on the work of Riebling and Erickson (dilatometric method) [**104**]. Here C=mol % GaI.

Table 370. GaI-GaI_3: Density (g cm^{-3})

	Mol percent of GaI_3							
T	100	90	80	60	50	42. 5	35	31
450			3. 921	4. 022				
455			3. 911	4. 013	4. 073	4. 124	4. 182	
460	3. 685		3. 901	4. 005	4. 065	4. 155	4. 173	
465	3. 676		3. 891	3. 996	4. 056	4. 107	4. 165	4. 177
470	3. 661	3. 781	3. 881	3. 987	4. 048	4. 099	4. 156	4. 169
475	3. 649	3. 770	3. 871	3. 978	4. 039	4. 090	4. 148	4. 160
480	3. 637	3. 759	3. 861	3. 969	4. 031	4. 082	4. 139	4. 152
485	3. 625	3. 748	3. 851	3. 960	4. 022	4. 074	4. 131	4. 143
490	3. 613	3. 737	3. 841	3. 952	4. 014	4. 065	4. 122	4. 135
495	3. 601	3. 726	3. 831	3. 943	4. 005	4. 057	4. 114	4. 126
500	3. 590	3. 715		3. 934	3. 997	4. 048	4. 105	4. 117
505	3. 578	3. 705		3. 925	3. 989	4. 040	4. 096	4. 109
510	3. 566	3. 694		3. 916	3. 980	4. 032	4. 088	4. 100
515	3. 554	3. 683		3. 908	3. 972	4. 023	4. 079	4. 092
520	3. 542	3. 672		3. 899	3. 963	4. 015	4. 071	4. 083
525	3. 530	3. 661		3. 890	3. 955	4. 007	4. 062	4. 075
530					3. 946	3. 998	4. 054	4. 066
535					3. 938	3. 990	4. 045	4. 058

Temperature-dependent equations

$$\rho = a + bT$$

GaI_3, mol %	*a*	$b \cdot 10^3$
31	4. 971	−1. 707
35	4. 957	−1. 704
42. 5	4. 886	−1. 675
50	4. 841	−1. 688
60	4. 817	−1. 766
80	4. 819	−1. 996
90	4. 805	−2. 179
100	4. 778	−2. 377

These values are based on the work of Riebling and Erickson (dilatometric method) [**104**].

GdI_3-KI

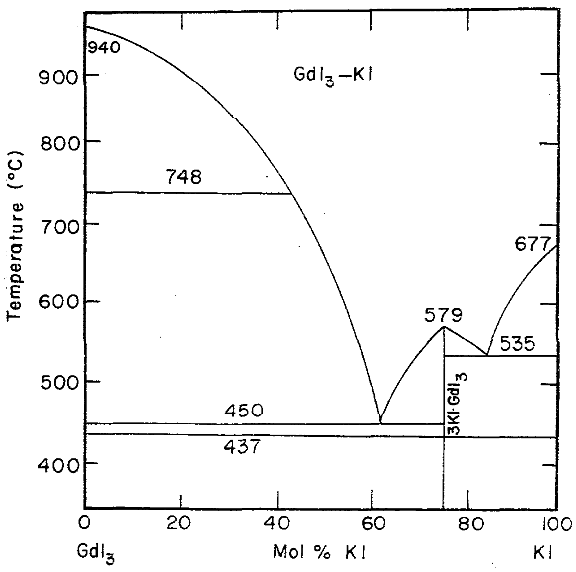

FIGURE 53. Temperature-composition phase diagram for GdI_3-KI.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the KI and GdI_3 used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI_3.

TABLE 371. Electrical conductance studies: GdI_3-KI

Investigations critically re-examined		
Ref.	KI, mol %	Temp. range (T)
109[a]	0–100 (g)	1246, 1286, 1331

[a] For experimental details, see CsI-DyI_3.

TABLE 372. GdI_3-KI: Specific conductance ($ohm^{-1}\ cm^{-1}$)

KI mol %	1246.7 K	1286 K	1331 K
0	0. 45	0. 48	0. 51
10	0. 50	0. 53	0. 58
20	0. 56	0. 60	0. 63
30	0. 62	0. 66	0. 70
40	0. 70	0. 75	0. 78
50	0. 79	0. 84	0. 88
60	0. 89	0. 94	0. 99
70	1. 02	1. 08	1. 15
80	1. 24	1. 30	1. 36
90	1. 53	1. 60	1. 67
100	1. 83	1. 90	1. 98

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 373. Density studies: GdI_3-KI

Investigations critically re-examined			
Ref.	KI mol %	Temp. range (T)	Comments
108 [a]	0–100	1022. 2–1306. 2	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 19]			
Ref.	KI mol %	Min. departure	Max. departure
108	100	0. 02% (1025 K)	0. 41% (1180 K)

[a] The density data of Kutscher and Schneider [**108**] for pure GdI_3 were recommended earlier in this volume.

TABLE 374. GdI_3-KI: Density ($g\ cm^{-3}$)

	Mol percent KI				
T	100	88. 22	59. 74	35. 37	0. 00
1030	2. 376				
1040	2. 367				
1050	2. 358	2. 964	3. 383	3. 819	
1060	2. 349	2. 954	3. 372	3. 807	
1070	2. 340	2. 944	3. 362	3. 794	
1080	2. 331	2. 934	3. 351	3. 782	
1090	2. 322	2. 924	3. 340	3. 769	
1100	2. 313	2. 914	3. 329	3. 757	
1110	2. 304	2. 903	3. 318	3. 745	
1020	2. 295	2. 893	3. 307	3. 732	
1130	2. 286	2. 883	3. 296	3. 720	
1140	2. 277	2. 873	3. 285	3. 707	
1150	2. 268	2. 863	3. 275	3. 695	
1160	2. 259	2. 853	3. 264	3. 682	
1170	2. 250	2. 842	2. 253	3. 670	
1180	2. 241	2. 832	3. 242		
1260					4. 065
1270					4. 056
1280					4. 047
1290					4. 038
1300					4. 029

Temperature-dependent equations

$\rho = a - bT$

Mol % KI	a	$b \cdot 10^3$
0. 00	5. 2007	0. 9086
35. 37	5. 1258	1. 2444
59. 74	4. 5269	1. 0890
80. 22	4. 0327	1. 0174
100. 00	3. 3027	0. 8999

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**].

GdI_3-NaI

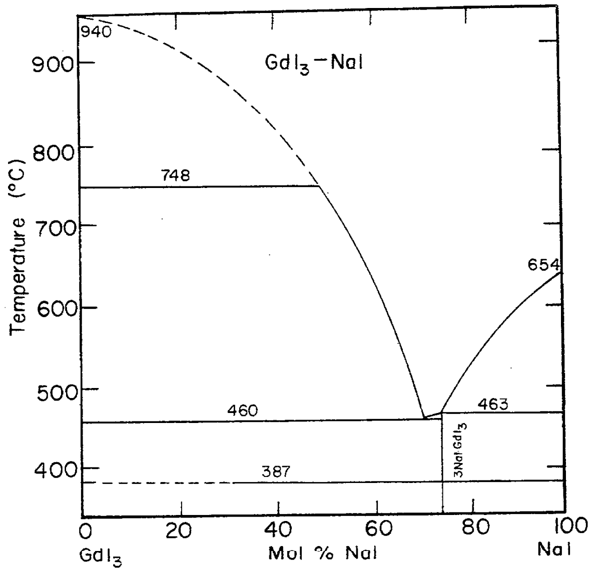

FIGURE 54. Temperature-composition phase diagram for GdI_3-NaI.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the NaI and GdI_3 used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI_3.

TABLE 375. Electrical conductance studies: GdI_3-NaI

Investigations critically re-examined		
Ref.	NaI mol %	Temp. range (*T*)
109 [a]	0–100 (g)	1232, 1278, 1324

[a] For experimental details, see CsI-DyI_3.

TABLE 376. GdI_3-NaI: Specific conductance (ohm^{-1} cm^{-1})

NaI mol %	1232.7 K	1278.7 K	1324.7 K
0	0. 43	0. 46	0. 51
10	0. 51	0. 55	0. 60
20	0. 61	0. 66	0. 72
30	0. 75	0. 80	0. 85
40	0. 90	0. 95	1. 00
50	1. 08	1. 14	1. 20
60	1. 28	1. 35	1. 40
70	1. 53	1. 60	1. 65
80	1. 84	1. 90	1. 98
90	2. 30	2. 36	2. 44
100	3. 06	3. 10	3. 19

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

Hg_2I_2-HgI_2

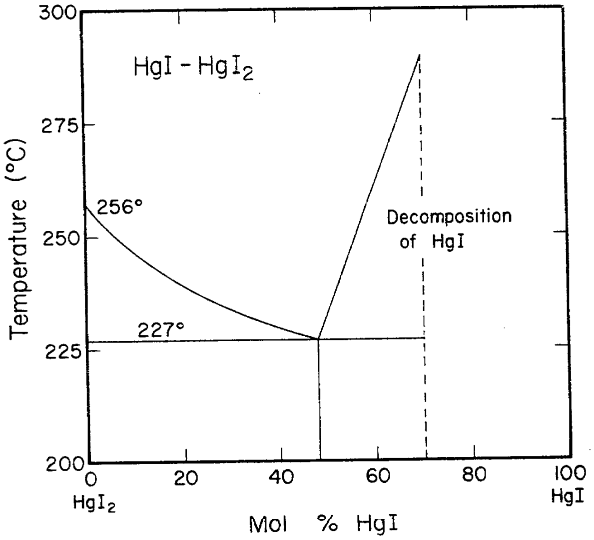

FIGURE 55. Temperature-composition phase diagram for Hg_2I_2-HgI_2.

H. Pèlabon and Laude, Bull. Soc. Chim. Fr., **45**, 488 (1929).

Melt Preparation and Purification

Grantham [**107**] purified reagent-grade HgI_2 by vacuum distillation. Triply distilled mercury was filtered and used without further purification. The HgI_2 was added to the conductivity cell in an inert-atmosphere dry-box and sufficient mercury was introduced to obtain the desired melt compositions.

TABLE 377. Electrical conductance studies: Hg_2I_2-HgI_2

Investigations critically re-examined			
Ref.	Hg_2I_2 mol %	Temp. range (*T*)	Comments
107 [a]	7. 7–94. 4	513–896	Cell material: quartz; tungsten electrodes; calibration: redistilled Hg and KCl solution

[a] A brief discussion of the work of Grantham [**107**] is given under the system $HgCl_2$-Hg_2Cl_2 [5].

TABLE 378. Hg_2I_2-HgI_2: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent HgI_2					
T	94.4	82.5	66.5	57.4	33.3	7.7
520		0. 339				
540	0. 132	0. 356	0. 452			
560	0. 127	0. 367	0. 490	0. 494		
580	0. 121	0. 373	0. 524	0. 545		
600	0. 115	0. 376	0. 552	0. 591		
620	0. 107	0. 373	0. 575	0. 630		0. 659
640	0. 993	0. 367	0. 593	0. 662		0. 705
660	0. 909	0. 358	0. 606	0. 689		0. 747
680	0. 823	0. 344	0. 614	0. 709		0. 785
700	0. 735	0. 327	0. 616	0. 723	0. 821	0. 819
720	0. 647	0. 308	0. 614	0. 731	0. 849	0. 849
740	0. 562	0. 285	0. 606	0. 732	0. 873	0. 874
760	0. 480	0. 260	0. 593	0. 727	0. 892	0. 895
780	0. 403	0. 233		0. 716	0. 906	0. 912
800	0. 322	0. 203		0. 699	0. 916	0. 925
820	0. 269	0. 171		0. 675	0. 921	0. 934
840	0. 216	0. 138		0. 645	0. 922	
860	0. 174			0. 608		
880				0. 566		

Temperature-dependent equations

$\kappa = a + bT + cT^2 + dT^3$

IgI$_2$, mol %	*a*	$b \cdot 10^3$	$c \cdot 10^6$	$d \cdot 10^9$	Stand. error of est.
7. 7	−2. 8443	8. 8824	−5. 2132	0	0. 55%
33. 3	−3. 0545	9. 5512	−5. 7349	0	0. 05%
57. 4	−3. 5028	11. 5340	−7. 8529	0	0. 80%
66. 5	−2. 5340	8. 9996	−6. 4275	0	0. 40%
82. 5	−2. 5845	11. 6269	−14. 0878	4. 8868	0. 59%
94. 4	−0. 6965	4. 2089	−6. 6838	3. 2035	1. 22%

These values are based on the work of Grantham (classical ac technique) [**107**].

HgI_2-KI

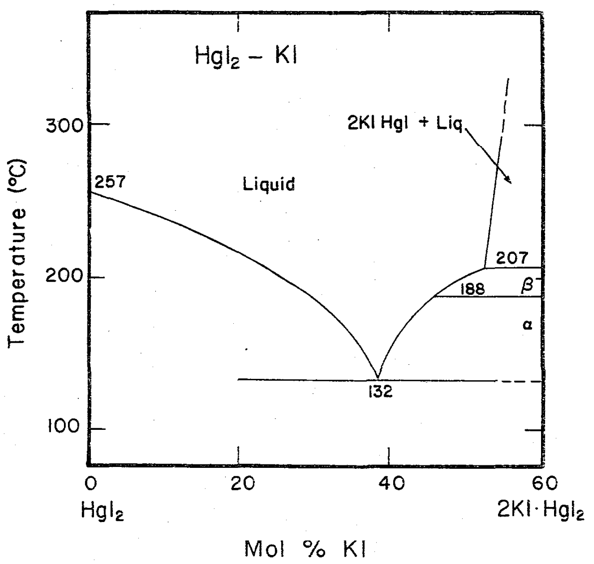

FIGURE 56. Temperature-composition phase diagram for HgI_2-KI.

I. N. Belyaev, Izv. Sektora Fiz.-Khim. Anauza, Inst. Obshch. Neorgan. Khim. Akad. Nauk SSSR, **23**, 178 (1953).

Melt Preparation and Purification

Belyaev [**105**] used chemically pure HgI_2 and KI and gave no further details on purification.

TABLE 379. Electrical conductance studies: HgI_2-KI

Investigations critically re-examined

Ref.	KI, mol %	Temp. range (T)	Comments
105	0–52. 5	543–603	Cell material: Pyrex; Pt electrodes; calibration: 0.1 N and 0.01 N NaCl solutions

Deviations from previous NSRDS recommendations [1, p 22]

Ref.	KI mol %	Min. departure	Max. departure
105	0	3. 1% (543 K)	14. 5% (573 K)

TABLE 380. HgI_2-KI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent KI										
T	52. 5	50	47. 5	45	40	35	30	25	20	10	0
545				0. 457	0. 487	0. 560	0. 633	0. 643	0. 643	0. 435	0. 0309
550				0. 476	0. 507	0. 582	0. 648	0. 657	0. 657	0. 442	0. 0306
555			0. 462	0. 495	0. 528	0. 603	0. 663	0. 671	0. 671	0. 448	0. 0303
560			0. 480	0. 514	0. 549	0. 624	0. 678	0. 685	0. 684	0. 455	0. 0300
565	0. 520	0. 510	0. 498	0. 533	0. 569	0. 646	0. 693	0. 700	0. 698	0. 462	0. 0297
570	0. 528	0. 516	0. 516	0. 552	0. 590	0. 667	0. 708	0. 715	0. 712	0. 469	0. 0294
575	0. 545	0. 532	0. 534	0. 571	0. 611	0. 689	0. 723	0. 730	0. 726		
580	0. 563	0. 548	0. 552	0. 590	0. 632	0. 710	0. 738	0. 745	0. 739		
585	0. 580	0. 564	0. 571	0. 609	0. 653						
590	0. 598	0. 580	0. 589	0. 629	0. 674						
595	0. 616	0. 596	0. 607	0. 648							
600	0. 633	0. 612	0. 625	0. 667							

Temperature-dependent equations

$$\kappa = a + bT + cT^2$$

KI, mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
0	0. 0636	−0. 0600	0	0. 0002%
10	−0. 3120	1. 3700	0	2. 09%
20	−0. 8499	2. 7400	0	0. 08%
25	0. 1895	−1. 1159	3. 5741	0. 10%
30	−1. 0016	3. 0000	0	0. 00008%
35	−1. 7725	4. 2800	0	0. 10%
40	−1. 1673	1. 9966	1. 9063	0. 08%
45	−1. 3657	2. 9005	0. 7994	0. 10%
47. 5	−1. 5388	3. 6057	0	0. 11%
50	−0. 8415	1. 6192	1. 3382	0. 04%
52. 5	−1. 4709	3. 5200	0	0. 98%

These values are based on the work of Belyaev (classical ac technique) [**105**].

HgI_2-NH_4I

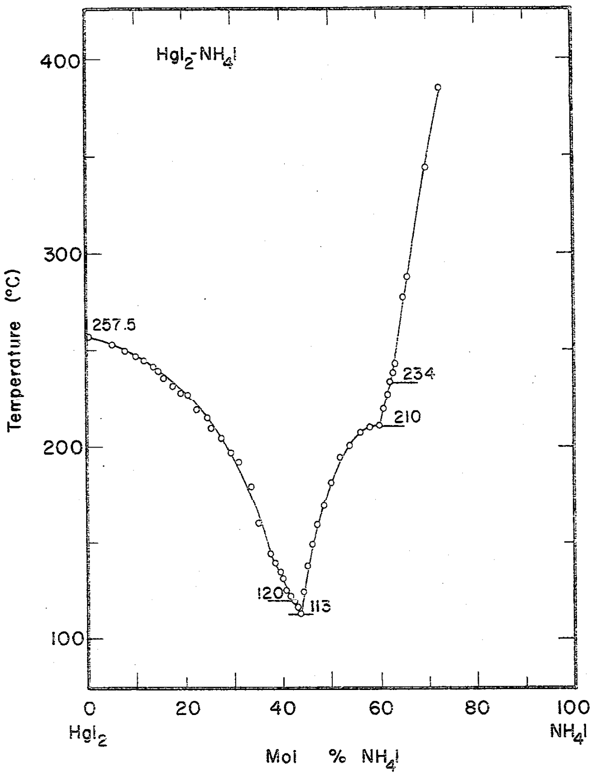

FIGURE 57. Temperature-composition phase diagram for HgI_2-NH_4I.

I. N. Belyaev and K. E. Mironov, Dokl. Akad. Nauk SSSR, 73, 1217 (1950), Zh. Obshch. Khim., 22, 1490 (1952).

Melt Preparation and Purification

Belyaev [27, 105] used chemically pure salts in his conductance studies but gave no details on purification.

TABLE 381. Electrical conductance studies: HgI_2-NH_4I

Investigations critically re-examined

Ref.	NH_4I mol %	Temp. range (T)	Comments
7	≃0–70 (g)	473–623	Cell material: Pyrex glass capillary cell; Pt electrodes; calibration: 0.1 N and 0.01 N NaCl solutions
27	0–70	473–623	As for [7]

Deviations from previous NSRDS recommendations [1, p. 22]

Ref.	NH_4I mol %	Min. departure	Max. departure
27	0	9.2% (548 K)	21.5% (623 K)

Table 382. HgI_2-NH_4I: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent NH_4I																
T	70.0	67.5	65.0	62.5	58.0	57.5	55.5	54.0	53.0	52.0	50.5	49.0	48.0	46.5	45.0	44.0	42.5	40.0
480					0.212	0.227	0.253	0.243	0.257	0.275	0.295	0.315	0.302	0.342	0.347	0.366	0.371	0.387
490					0.239	0.257	0.280	0.275	0.285	0.304	0.324	0.342	0.331	0.370	0.376	0.394	0.400	0.418
500					0.266	0.286	0.307	0.306	0.312	0.332	0.353	0.368	0.361	0.397	0.405	0.421	0.429	0.448
510					0.293	0.315	0.334	0.337	0.340	0.359	0.382	0.394	0.389	0.424	0.432	0.448	0.457	0.477
520					0.320	0.343	0.360	0.368	0.367	0.387	0.409	0.420	0.417	0.450	0.459	0.474	0.484	0.505
530	0.293	0.269	0.303	0.321	0.348	0.371	0.386	0.397	0.394	0.414	0.436	0.445	0.444	0.475	0.485	0.500	0.510	0.532
540	0.318	0.299	0.332	0.347	0.375	0.398	0.412	0.427	0.421	0.441	0.462	0.470	0.471	0.500	0.511	0.525	0.535	0.557
550	0.343	0.329	0.360	0.374	0.402	0.425	0.438	0.455	0.447	0.467	0.488	0.495	0.497	0.524	0.535	0.549	0.560	0.582
560	0.369	0.359	0.388	0.410	0.429	0.452	0.464	0.483	0.473	0.493	0.513	0.519	0.522	0.548	0.559	0.572	0.584	0.605
570	0.394	0.388	0.416	0.428	0.456	0.478	0.490	0.510	0.499	0.519	0.537	0.543	0.547	0.571	0.582	0.595	0.607	0.628
580	0.420	0.428	0.443	0.455	0.484	0.504	0.515	0.537	0.524	0.544	0.560	0.566	0.571	0.593	0.604	0.618	0.630	0.649
590	0.446	0.447	0.470	0.482	0.511	0.529	0.540	0.563	0.549	0.569	0.583	0.589	0.595	0.615	0.626	0.639	0.651	0.669
600	0.472	0.476	0.497	0.510	0.538	0.554	0.565	0.588	0.574	0.594	0.605	0.612	0.618	0.636	0.647	0.660	0.672	0.688
610	0.599	0.505	0.523	0.538	0.565	0.578	0.590	0.613	0.599	0.618	0.626	0.634	0.640	0.656	0.667	0.681	0.693	0.706
620	0.526	0.534	0.549	0.566	0.592	0.602	0 615	0 637	0.623	0.642	0.647	0.656	0.662	0.676	0.686	0.700	0.712	0.723

T	38.5	37.0	35.0	33.0	31.5	30.0	28.5	27.0	25.0	22.5	21.0	18.0	16.0	14.0	12.0	6.0	0.0
480	0.408	0.426	0.440	0.462	0.469	0.461	0.466	0.470	0.479								
490	0.437	0.452	0.467	0.487	0.493	0.486	0.491	0.494	0.501								
500	0.465	0.478	0.494	0.511	0.517	0.511	0.514	0.516	0.521	0.504	0.497						
510	0.492	0.503	0.520	0.535	0.539	0.534	0.537	0.539	0.542	0.525	0.515						
520	0.518	0.528	0.545	0.558	0.561	0.557	0.560	0.560	0.561	0.544	0.533						
530	0.544	0.552	0.569	0.580	0.583	0.580	0.518	0.580	0.580	0.563	0.549	0.519	0.495	0.449	0.413		
540	0.569	0.575	0.592	0.602	0.604	0.601	0.602	0.600	0.598	0.581	0.565	0.532	0.505	0.458	0.422		
550	0.593	0.598	0.615	0.623	0.624	0.622	0.622	0.619	0.615	0.598	0.581	0.545	0.515	0.467	0.430	0.259	0.0307
560	0.616	0.621	0.637	0.644	0.644	0.642	0.642	0.637	0.632	0.614	0.595	0.557	0.525	0.475	0.437	0.261	0.0298
570	0.638	0.642	0.657	0.664	0.663	0.661	0.661	0.655	0.648	0.629	0.609	0.569	0.534	0.482	0.444	0.263	0.0290
580	0.660	0.663	0.678	0.683	0.681	0.680	0.679	0.672	0.663	0.643	0.623	0.580	0.543	0.489	0.450	0.264	0.0283
590	0.681	0.684	0.697	0.702	0.699	0.697	0.696	0.688	0.677	0.657	0.635	0.591	0.552	0.496	0.455	0.266	0.0277
600	0.701	0.704	0.715	0.720	0.716	0.715	0.713	0.703	0.691	0.669	0.647	0.601	0.560	0.502	0.459	0.267	0.0271
610	0.720	0.723	0.733	0.738	0.733	0.731	0.729	0.718	0.704	0.681	0.659	0.611	0.568	0.507	0.462	0.268	0.0266
620	0.738	0.742	0.750	0.755	0.749	0.746	0.744	0.732	0.717	0.692	0.669	0.620	0.576	0.512	0.465	0.270	0.0262

TABLE 382. HgI_2-NH_4I: Specific conductance (ohm^{-1} cm^{-1})—Continued

Temperature-dependent equations

$\kappa = a + bT + cT^2$

NH_4I, mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
0. 0	0. 2044	−0. 5387	0. 4052	1. 13%
6. 0	0. 0419	0. 6141	−0. 3979	0. 06%
12. 0	−1. 2022	5. 1585	−3. 9831	0. 79%
14. 0	−0. 7856	3. 7241	−2. 6309	0. 25%
16. 0	−0. 5426	2. 8675	−1. 7163	0. 37%
18. 0	−0. 8627	3. 8835	−2. 4071	0. 13%
21. 0	−1. 2614	5. 1990	−3. 3633	0. 10%
22. 5	−1. 6291	6. 4479	−4. 3618	0. 18%
25. 0	−1. 3794	5. 5538	−3. 5045	0. 13%
27. 0	−1. 5365	5. 9722	−3. 7324	0. 15%
28. 5	−1. 5405	5. 8807	−3. 5421	0. 14%
30. 0	−1. 6235	6. 1253	−3. 7144	0. 08%
31. 5	−1. 4129	5. 4112	−3. 1048	0. 18%
33. 0	−1. 4408	5. 4184	−3. 0279	0. 07%
35. 0	−1. 8522	6. 7590	−4. 1334	0. 27%
37. 0	−1. 5195	5. 4431	−2. 8954	0. 19%
38. 5	−1. 9266	6. 8011	−4. 0376	0. 60%
40. 0	−2. 3634	8. 3090	−5. 3712	0. 29%
42. 5	−1. 9198	6. 5827	−3. 7707	0. 53%
44. 0	−1. 7330	5. 9092	−3. 2006	0. 44%
45. 0	−1. 9712	6. 6944	−3. 8856	0. 28%
46. 5	−1. 7445	5. 8639	−3. 1620	0. 34%
48. 0	−1. 8623	6. 0079	−3. 1239	0. 32%
49. 0	−1. 4001	4. 4505	−1. 8285	0. 44%
50. 5	−1. 9561	6. 3711	−3. 5046	0. 36%
52. 0	−1. 4825	4. 4667	−1. 6765	0. 49%
53. 0	−1. 4422	4. 2523	−1. 4861	0. 71%
54. 0	−2. 0393	6. 2530	−3. 1233	1. 07%
55. 5	−1. 2650	3. 6104	−9. 1526	0. 69%
57. 5	−1. 6996	5. 0473	−2. 1526	0. 67%
58. 0	−1. 0941	2. 7200	0	0. 20%
62. 5	−0. 7093	1. 2808	1. 2519	0. 19%
65. 0	−1. 7513	4. 8486	−1. 8358	0. 16%
67. 5	−1. 5931	4. 0024	−0. 9233	0. 15%
70. 0	−0. 7407	1. 4090	1. 0215	0. 11%

These values are based on the work of Belyaev and Mironov (classical ac technique) [27].

HgI_2-SbI_3

Melt Preparation and Purification

Mentus and Susic [**127**] used Merck HgI_2 of 99.0% purity and further purified it by distillation under a partial pressure of oxygen followed by sublimation under vacuum. SbI_3 was prepared from the elements (Sb: B.D.H. powder; I_2: B.D.H. resublimed), crystallized from carbon disulfide and twice distilled in a stream of carbon dioxide.

TABLE 383. Electrical conductance studies: HgI_2-SbI_3

Investigations critically re-examined			
Ref.	SbI_3 mol %	Temp. range (*T*)	Comments
127	0–100	~450–813 (g)	Cell material: Pyrex; Pt electrodes; calibration: molten HgI_2

TABLE 384. HgI_2-SbI_3: Specific conductance (ohm^{-1} $cm^{-1}\times 10^3$)

	Temperature (K)							
SbI_3 mol %	450	500	550	600	650	700	750	800
0			26.	20.	17.	13.	10.	7.4
9			15.	13.	10.	7.7	6.3	4.4
17			9.6	8.1	6.9	5.4	4.3	3.2
26			6.0	5.3	4.5	3.7	3.0	2.2
42		3.1	3.0	2.8	2.5	2.2	1.9	1.5
58		2.0	2.0	1.9	1.7	1.5	1.3	1.1
73	0.68	0.79	0.85	0.83	0.79	0.74	0.66	0.60
84	0.48	0.59	0.63	0.63	0.62	0.59	0.54	0.49
91	0.32	0.40	0.48	0.50	0.50	0.49	0.46	0.40
100	0.25	0.32	0.39	0.43	0.46	0.46	0.43	0.39

These values were interpolated to two significant figures from the graphical presentation of Mentus and Susic (classical ac technique) [**127**].

KI-LaI_3

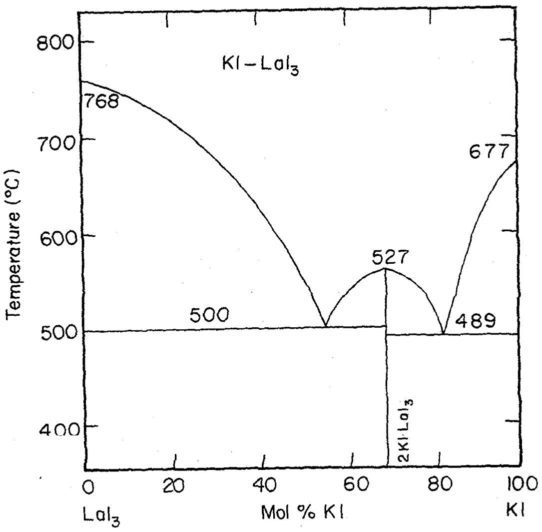

FIGURE 58. Temperature-composition phase diagram for KI-LaI_3.

*J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).*

Melt Preparation and Purification

The purification of the KI and LaI_3 used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI_3.

TABLE 385. Electrical conductance studies: KI-LaI_3

Investigations critically re-examined		
Ref.	LaI_3, mol %	Temp. range (*T*)
109[a]	0–100 (g)	1039, 1140, 1193

[a] For experimental details, see CsI-DyI_3.

TABLE 386. KI-LaI_3: Specific conductance (ohm^{-1} cm^{-1})

KI, mol %	1093 K	1140 K	1193 K
0	0.50	0.57	0.64
10	0.54	0.59	0.67
20	0.57	0.63	0.70
30	0.62	0.67	0.74
40	0.66	0.72	0.78
50	0.72	0.76	0.84
60	0.78	0.83	0.90
70	0.87	0.93	1.05
80	1.00	1.07	1.15
90	1.22	1.30	1.40
100	1.50	1.60	1.70

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 387. Density studies: KI-LaI_3

Investigations critically re-examined

Ref.	LaI_3 mol %	Temp. range (T)	Comments
108[a]	0–100	1014. 2–1182. 2	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	LaI_3 mol %	Min. departure	Max. departure
108	0	0. 02% (1025 K)	0. 41% (1180 K)

[a] The density data of Kutscher and Schneider [**108**] for pure LaI_3 were recommended earlier in this volume.

TABLE 388. KI-LaI_3: Density (g cm^{-3})

	Mol percent LaI_3										
T	100	90	80	70	60	50	40	30	20	10	0	54. 5
1020		4. 191	4. 026	3. 865	3. 702	3. 532	3. 350	3. 150	2. 926	2. 674		3. 452
1030	4. 352	4. 178	4. 014	3. 853	3. 691	3. 522	3. 340	3. 140	2. 917	2. 665	2. 378	3. 442
1040	4. 338	4. 165	4. 001	3. 842	3. 680	3. 511	3. 330	3. 131	2. 908	2. 655	2. 369	3. 432
1050	4. 324	4. 152	3. 989	3. 830	3. 669	3. 501	3. 320	3. 121	2. 898	2. 646	2. 360	3. 422
1060	4. 309	4. 138	3. 977	3. 818	3. 658	3. 491	3. 310	3. 112	2. 889	2. 637	2. 351	3. 411
1070	4. 295	4. 125	3. 964	3. 807	3. 647	3. 480	3. 300	3. 102	2. 880	2. 628	2. 342	3. 401
1080	4. 281	4. 112	3. 952	3. 795	3. 636	3. 470	3. 291	3. 093	2. 871	2. 619	2. 333	3. 391
1090	4. 267	4. 099	3. 940	3. 784	3. 626	3. 460	3. 281	3. 083	2. 861	2. 610	2. 323	3. 381
1100	4. 253	4. 086	3. 927	3. 772	3. 615	3. 449	3. 271	3. 074	2. 852	2. 601	2. 314	3. 371
1110	4. 238	4. 072	3. 915	3. 761	3. 604	3. 439	3. 261	3. 064	2. 843	2. 592	2. 305	3. 361
1120	4. 224	4. 059	3. 903	3. 749	3. 593	3. 429	3. 251	3. 055	2. 834	2. 583	2. 296	3. 351
1130	4. 210	4. 046	3. 890	3. 737	3. 582	3. 418	3. 241	3. 045	2. 824	2. 574	2. 287	3. 341
1140	4. 196	4. 033	3. 878	3. 726	3. 571	3. 408	3. 231	3. 036	2. 815	2. 564	2. 278	3. 331
1150	4. 182	4. 020	3. 866	3. 714	3. 560	3. 398	3. 222	3. 026	2. 806	2. 555	2. 269	3. 320
1160	4. 168	4. 006	3. 853	3. 703	3. 549	3. 387	3. 212	3. 017	2. 797	2. 546	2. 260	3. 310
1170	4. 153	3. 993	3. 841	3. 691	3. 538	3. 377	3. 202	3. 007	2. 787	2. 537	2. 251	3. 300
1180	4. 139	3. 980	3. 829	3. 680	3. 528	3. 367	3. 192	2. 997	2. 778	2. 528	2. 242	3. 290

Two-dimensional equation and statistical parameters

$$\rho = a + bC + cT + dC^2 + eC^3 + fTC^2$$

a	$b \cdot 10^2$	$c \cdot 10^4$	$d \cdot 10^4$	$e \cdot 10^7$	$f \cdot 10^8$	Max. percent departure	Stand. error of est.
3. 30996	3. 05830	−9. 05034	−1. 46941	9. 13031	−5. 12455	0.40% (1174.2 K, 40.36 mol % LaI_3)	0. 007

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**]. Here C = mol % LaI_3.

TABLE 389. KI-LaI$_3$: Density (g cm^{-3})

	Mol percent LaI$_3$				
T	100	60.40	40.36	20.16	0.00
1020		3.714	3.350	2.933	
1030		3.703	3.340	2.924	2.376
1040		3.592	3.330	2.916	2.367
1050		3.681	3.319	2.907	2.358
1060		3.670	3.309	2.898	2.349
1070		3.659	3.299	2.889	2.340
1080		3.648	3.289	2.880	2.331
1090		3.637	3.278	2.871	2.322
1100		3.626	3.268	2.863	2.313
1110		3.615	3.258	2.854	2.304
1120		3.604	3.247	2.845	2.295
1130	4.203	3.593	3.237	2.836	2.286
1140	4.192	3.582	3.227	2.827	2.277
1150	4.181	3.572	3.216	2.818	2.268
1160	4.169	3.561	3.206	2.810	2.259
1170	4.158	3.550	3.196	2.801	2.250
1180	4.147	3.539	3.186	2.792	2.241

Temperature-dependent equations
$\rho = a - bT$

Mol % LaI$_3$	a	$b \cdot 10^3$
0.00	3.3027	0.8999
20.16	3.8346	0.8836
40.36	4.4004	1.0295
60.40	4.8287	1.0932
100.00	5.4581	1.1109

These values are based on the work of Kutscher and Schneider (dilatometric method) [108].

KI-LiI

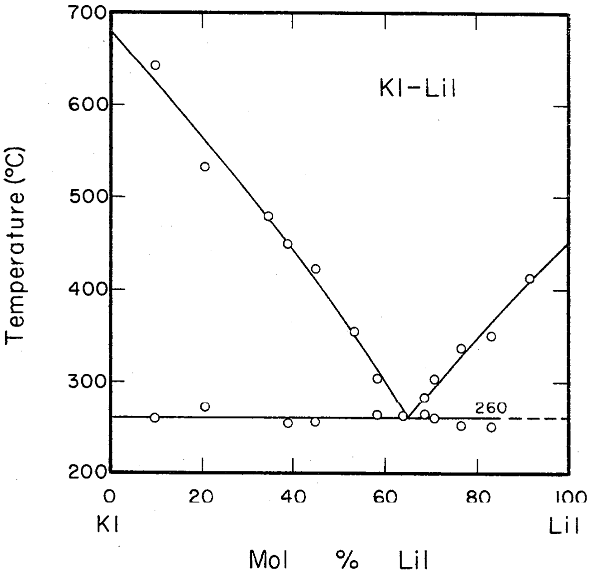

FIGURE 59. Temperature-composition phase diagram for KI-LiI.

Daniel B. Leister and O. J. Whittenmore Jr., J. Am. Ceram. Soc.—Discussion and Notes, **50**, 60 (1967).

Melt Preparation and Purification

The procedure used by Zuca and Olteanu [**96**] for the preparation of pure salts and mixtures is described under the system CsI-LiI.

Liu and Lieto [37] used reagent grade materials which were crystallized before use. The KI was dried by evacuation followed by fusion in a quartz apparatus under a hydrogen iodide atmosphere. The HI was then removed by repeated flushing with dry argon.

TABLE 390. Electrical conductance studies: KI-LiI

Investigations critically re-examined

Ref.	LiI mol %	Temp. range (T)	Comments
96	0–100	762.2–1163.2	Cell material: silica U-shape; Pt electrodes

Comparisons with previous NSRDS recommendations [1, p. 19]

Ref.	LiI mol %	Min. departure	Max. departure
96	0	0.2% (1106.8 K)	0.54% (995.2 K)
96	100	−0.02% (871.8 K)	−0.46% (778.7 K)

TABLE 391. KI-LiI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent LiI						
T	100	71.6	65.0	51.4	24.1	23.1	0.0
770	4.008						
780	4.058						
790	4.106						
800	4.154						
810	4.200						
820	4.246						
830	4.291						
840	4.335						
850	4.377						
860	4.419	2.545					
870	4.460	2.573					
880	4.500	2.601	2.223				
890	4.539	2.629	2.256				
900	4.577	2.657	2.288				
910	4.614	2.684	2.318	1.927			
920		2.712	2.347	1.955	1.490	1.411	
930		2.740	2.375	1.981	1.519	1.441	
940		2.768	2.401	2.006	1.548	1.469	
950		2.795	2.426	2.031	1.575	1.497	
960		2.823	2.450	2.055	1.600	1.523	
970		2.851	2.473	2.077	1.624	1.548	
980		2.879	2.494	2.099	1.647	1.573	
990		2.907	2.514	2.121	1.669	1.596	
1000		2.934	2.532	2.141	1.690	1.618	1.374
1010		2.962	2.550	2.161	1.709	1.639	1.397
1020			2.566	2.179	1.728	1.659	1.419
1030				2.197	1.745	1.677	1.440
1040				2.214	1.762	1.695	1.460
1050				2.231			1.480
1060				2.246			1.499
1070				2.261			1.517
1080				2.274			1.535
1090				2.287			1.552
1100							1.568
1110							1.583
1120							1.598
1130							1.612
1140							1.625
1150							1.637
1160							1.648

Temperature-dependent equations

$$\kappa = a + bT + cT^2 + dT^3$$

Mol % LiI	$-a$	$b \cdot 10^3$	$-c \cdot 10^6$	$d \cdot 10^9$	
0.0	2.68211	1.23786	4.79210		0.11%
23.0	5.96207	13.0089	5.42911		0.17%
24.1	12.1060	31.7539	24.1299	6.17181	0.26%
51.4	4.01836	10.3178	4.16032		0.14%
65.0	5.77876	14.8268	9.51570		0.16%
71.6	−0.156367	2.77792			0.48%
100.0	2.08628	2.60417	2.89501		0.16%

These values are based on the work of Zuca and Olteanu (classical ac technique) [96].

TABLE 392. Density studies: KI–LiI

Investigations critically re-examined

Ref.	LiI mol %	Temp. range (T)	Comments
37	63. 2	577–772	Cell material: Pt bob and Pt suspension wire, molten salt contained in a fused silica tube
96	0–100	762. 2–1163. 2	

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	LiI mol %	Min. departure	Max. departure
96	0	0. 04% (1000 K)	0. 23% (1160 K)
96	100	0. 00% (835 K)	−0. 23% (765 K)

TABLE 393. KI–LiI: Density (g cm^{-3})

	Mol percent LiI											
T	100	90	80	70	60	50	40	30	20	10	0	62
770	3. 072											
790	3. 059											
810	3. 046											
850	3. 020											
870	3. 007	2. 831										
890	2. 994	2. 817										
910	2. 981	2. 803	2. 681		2. 566	2. 552	2. 552					2. 572
930		2. 789	2. 666	2. 590	2. 550	2. 535	2. 534	2. 538	2. 536			2. 555
950		2. 775	2. 651	2. 574	2. 533	2. 517	2. 517	2. 520	2. 518			2. 539
970		2. 761	2. 636	2. 558	2. 517	2. 500	2. 499	2. 502	2. 500	2. 480		2. 523
990		2. 747	2. 621	2. 543	2. 500	2. 483	2. 481	2. 484	2. 481	2. 462		2. 506
1010		2. 733	2. 606	2. 527	2. 484	2. 466	2. 464	2. 466	2. 463	2. 443	2. 397	2. 490
1030		2. 719	2. 597	2. 511	2. 467	2. 449	2. 446	2. 448	2. 445	2. 425	2. 379	2. 473
1050			2. 577	2. 495	2. 450	2. 432	2. 428	2. 430	2. 426	2. 406	2. 360	2. 457
1070			2. 562	2. 479	2. 434	2. 415	2. 411	2. 412	2. 408	2. 388	2. 342	2. 441
1090							2. 393	2. 394	2. 390	2. 369	2. 323	
1100								2. 376	2. 371	2. 351	2. 304	
1130								2. 358	2. 353	2. 332	2. 286	
1150									2. 335	2. 314	2. 267	
1170										2. 295		

Two-dimensional equation and statistical parameters

$$\rho = a + bC + cT + dC^2 + eC^3 + fTC^2$$

a	$b \cdot 10^3$	$c \cdot 10^4$	$d \cdot 10^4$	$e \cdot 10^6$	$f \cdot 10^8$	Max. percent departure	Stand. error of est.
3. 33435	6. 30703	−9. 27863	−2. 14459	1. 74982	2. 80526	0.78% (1085.7 K, 50.3 mol % LiI)	0. 012

These values are based on the work of Zuca and Olteanu (Archimedean method) [**96**]. Here C=mol % LiI.

TABLE 394. KI-LiI: Density (g cm^{-3})

	Mol percent LiI					
T	100. 0	82. 73	78. 81	50. 3	32. 86	0. 0
770	3. 077					
780	3. 069					
790	3. 061					
800	3. 053					
810	3. 044					
820	3. 036					
830	3. 028					
840	3. 020					
850	3. 012					
860	3. 003					
870	2. 995					
880	2. 987					
890	2. 979					
900	2. 971	2. 737	2. 682			
910	2. 963	2. 729	2. 674	2. 534	2. 562	
920		2. 720	2. 667	2. 525	2. 553	
930		2. 711	2. 659	2. 517	2. 545	
940		2. 702	2. 651	2. 508	2. 537	
950		2. 694	2. 644	2. 499	2. 528	
960		2. 685	2. 636	2. 491	2. 520	
970		2. 676	2. 629	2. 482	2. 511	
980		2. 667	2. 621	2. 473	2. 503	
990		2. 659	2. 613	2. 465	2. 494	
1000		2. 650	2. 606	2. 456	2. 486	2. 405
1010		2. 641	2. 598	2. 448	2. 478	2. 395
1020		2. 633	2. 591	2. 439	2. 469	2. 386
1030		2. 624	2. 583	2. 431	2. 461	2. 377
1040		2. 615	2. 575	2. 422	2. 452	2. 367
1050		2. 607		2. 413	2. 444	2. 358
1060		2. 598		2. 405	2. 435	2. 349
1070		2. 589		2. 396	2. 427	2. 339
1080		2. 580		2. 387	2. 419	2. 330
1090		2. 572			2. 410	2. 321
1100					2. 402	2. 312
1110					2. 393	2. 302
1120					2. 385	2. 293
1130						2. 284
1140						2. 275
1150						2. 265
1160						2. 256

Temperature-dependent equations

$$\rho = a - bT$$

Mol % LiI	a	$b \cdot 10^3$	Stand. error of est.
0. 0	3. 3336	0. 9290	
32. 86	3. 3270	0. 8410	0. 13%
50. 3	3. 3159	0. 8595	0. 08%
78. 81	3. 3676	0. 7618	0. 06%
82. 73	3. 5211	0. 8710	0. 07%
100. 0	3. 7063	0. 8172	

These values are based on the work of Zuca and Olteanu (Archimedean method) [96].

KI-NaI

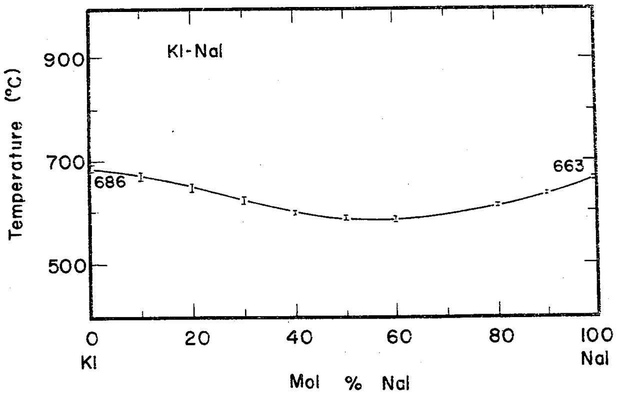

FIGURE 60. Temperature-composition phase diagram for KI-NaI.

1. N. S. Kurnakov and S. F. Zhemchuzhnuii, Z. Anorg. Chem., **52**, 186 (1907).
2. A. G. Bergman and F. P. Platonov, Izv. Sekt. Fiz. Khim. Anal. Inst. Obshch. Neorg. Khim. Akad. Nauk SSSR, **11**, 253 (1938).
3. I. I. Il'yasov and A. G. Bergman, Zh. Neorg. Khim., 4, 2083 (1959); Russ. J. Inorg. Chem., 4, 944 (1959).

Melt Preparation and Purification

Bogacz and Zuca [**106**] used reagent grade sodium iodide and potassium iodide fused under an atmosphere of HI and introduced into the measuring cell under the same conditions.

TABLE 395. Electrical conductance studies: KI-NaI

Investigations critically re-examined

Ref.	NaI mol %	Temp. range (T)	Comments
106	0–100	948–1123	Cell material: quartz capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	NaI mol %	Min. departure	Max. departure
106	100	−0. 79% (1073 K)	6. 2% (948 K)
106	0	−0. 12% (1123 K)	1. 3% (998 K)

TABLE 396. KI-NaI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent NaI					
T	100	80	60	40	20	0
950	2. 404	2. 040	1. 793	1. 577	1. 417	
960	2. 427	2. 063	1. 815	1. 598	1. 437	
970	2. 449	2. 085	1. 836	1. 619	1. 457	
980	2. 470	2. 107	1. 856	1. 639	1. 476	1. 345
990	2. 492	2. 128	1. 876	1. 659	1. 495	1. 366
1000	2. 512	2. 149	1. 896	1. 678	1. 514	1. 386
1010	2. 532	2. 169	1. 915	1. 697	1. 532	1. 406
1020	2. 552	2. 189	1. 934	1. 716	1. 550	1. 426
1030	2. 571	2. 208	1. 952	1. 734	1. 568	1. 445
1040	2. 589	2. 226	1. 970	1. 752	1. 585	1. 463
1050	2. 607	2. 245	1. 987	1. 769	1. 602	1. 481
1060	2. 625	2. 262	2. 005	1. 786	1. 619	1. 499
1070	2. 642	2. 280	2. 021	1. 802	1. 636	1. 516
1080	2. 658	2. 296	2. 037	1. 818	1. 652	1. 532
1090	2. 674	2. 312	2. 053	1. 833	1. 668	1. 548
1100	2. 690	2. 328	2. 068	1. 848	1. 683	1. 564
1110	2. 705	2. 343	2. 083	1. 863	1. 698	1. 579
1120	2. 719	2. 358	2. 098	1. 877	1. 713	1. 593

Temperature-dependent equations

$\kappa = a + bT + cT^2$

NaI mol %	*a*	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
0	−3. 1675	7. 0784	−2. 5247	0. 04%
20	−1. 9387	5. 0512	−1. 5987	0. 04%
40	−2. 4635	6. 3659	−2. 2240	0. 04%
60	−2. 1775	6. 2055	−2. 1323	0. 03%
80	−2. 4020	7. 0577	−2. 5070	0. 03%
100	−2. 0946	7. 1782	−2. 5716	0. 02%

These values are based on the work of Bogacz and Zuca (classical ac technique) [**106**].

TABLE 397. Density studies: KI-NaI

Investigations critically re-examined

Ref.	NaI mol %	Temp. range (*T*)	Comments
106	0–100	868–1198	Cell material: Pt bob; calibration: water

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	NaI mol %	Min. departure	Max. departure
106	100	−0. 09% (1080 K)	−0. 14% (960 K)
106	0	−0. 36% (1160 K)	−0. 37% (1000 K)

TABLE 398. KI–NaI: Density (g cm^{-3})

	Mol percent NaI											
T	100	90	80	70	60	50	40	30	20	10	0	42
870					2. 669							
885				2. 684	2. 655	2. 629						2. 650
900				2. 670	2. 641	2. 614	2. 589	2. 565				2. 636
915			2. 685	2. 656	2. 627	2. 600	2. 575	2. 551				2. 622
930		2. 703	2. 671	2. 641	2. 613	2. 586	2. 561	2. 537	2. 514			2. 607
945		2. 689	2. 657	2. 627	2. 599	2. 572	2. 546	2. 522	2. 500	2. 479		2. 593
960	2. 708	2. 675	2. 643	2. 613	2. 585	2. 558	2. 532	2. 508	2. 485	2. 464		2. 579
975	2. 694	2. 661	2. 629	2. 599	2. 571	2. 543	2. 518	2. 494	2. 471	2. 450	2. 430	2. 565
990	2. 680	2. 647	2. 651	2. 585	2. 556	2. 529	2. 503	2. 479	2. 457	2. 435	2. 416	2. 551
1005	2. 667	2. 633	2. 601	2. 571	2. 542	2. 515	2. 489	2. 465	2. 442	2. 421	2. 401	2. 537
1020	2. 653	2. 619	2. 587	2. 557	2. 528	2. 501	2. 475	2. 451	2. 428	2. 406	2. 387	2. 522
1035	2. 639	2. 605	2. 573	2. 543	2. 514	2. 486	2. 461	2. 436	2. 413	2. 392	2. 372	2. 508
1050	2. 625	2. 591	2. 559	2. 529	2. 500	2. 472	2. 446	2. 422	2. 399	2. 377	2. 358	2. 494
1065	2. 611	2. 577	2. 545	2. 515	2. 485	2. 458	2. 432	2. 407	2. 384	2. 363	2. 343	2. 480
1080	2. 597	2. 563	2. 531	2. 500	2. 471	2. 444	2. 418	2. 393	2. 370	2. 348	2. 328	2. 466
1095	2. 583	2. 549	2. 517	2. 486	2. 457	2. 429	2. 403	2. 379	2. 355	2. 334	2. 314	2. 451
1110	2. 569	2. 535	2. 503	2. 472	2. 443	2. 415	2. 389	2. 364	2. 341	2. 319	2. 299	2. 437
1125	2. 555	2. 521	2. 489	2. 453	2. 429	2. 410	2. 375	2. 350	2. 326	2. 290	2. 284	2. 423
1140				2. 444	2. 415	2. 387					2. 270	2. 409
1155					2. 400						2. 255	
1170											2. 240	
1185											2. 226	

Two-dimensional equation and statistical parameters

$$\rho=a+bT+cC+dC^2+eCT^2$$

a	$b\times10^4$	$c\times10^3$	$d\times10^6$	$e\times10^{10}$	Max percent departure	Standard error of estimate
3. 59783	−9. 26648	−3. 18988	7. 60336	−2. 21170	0.26% (1125.2 K, 20 mol % KI)	0. 12%

These values are based on the work of Bogacz and Zuca (Archimedean method) [**106**]. Here *C*=mol % KI.

Table 399. KI-NaI: Density (g cm^{-3})

	Mol percent NaI					
T	100	80	60	40	20	0
870			2.671			
880			2.661			
890			2.652	2.600		
900			2.642	2.590		
910		2.686	2.633	2.581		
920		2.677	2.623	2.571		
930		2.667	2.614	2.562	2.516	
940		2.658	2.604	2.552	2.506	
950		2.648	2.595	2.543	2.496	
960	2,713	2.639	2.585	2.534	2.487	
970	2.703	2.629	2.576	2.524	2.477	2.432
980	2.694	2.620	2.566	2.515	2.468	2.422
990	2.685	2.610	2.557	2.505	2.458	2.413
1000	2.675	2.601	2.547	2.496	2.449	2.403
1010	2.666	2.592	2.538	2.486	2.439	2.393
1020	2.656	2.582	2.528	2.477	2.429	2.384
1030	2.647	2.573	2.519	2.467	2.420	2.374
1040	2.638	2.563	2.509	2.458	2.410	2.365
1050	2.628	2.554	2.500	2.449	2.401	2.355
1060	2.619	2.544	2.490	2.439	2.391	2.346
1070	2.609	2.535	2.481	2.430	2.382	2.336
1080	2.600	2.525	2.471	2.420	2.372	2.327
1090	2.591	2.516	2.462	2.411	2.363	2.317
1100	2.581	2.506	2.452	2.401	2.353	2.307
1110	2.572	2.497	2.443	2.392	2.343	2.298
1120	2.562	2.487	2.433	2.383	2.334	2.288
1130	2.553	2.478	2.424	2.373	2.324	2.279
1140			2.414			2.269
1150			2.405			2.260
1160			2.395			2.250
1170						2.241
1180						2.231
1190						2.221

Temperature-dependent equations

$$\rho = a + bT$$

NoI mol %	a	$b \cdot 10^4$	Stand. dev.
0	3.3583	−9.553	0.0003
20	3.4045	−9.559	0.0003
40	3.4395	−9.437	0.00025
60	3.4977	−9.506	0.00047
80	3.5477	−9.467	0.00037
100	3.6144	−9.392	0.00025

These values are based on the work of Bogacz and Zuca (Archimedean method) [**106**].

KI-NdI$_3$

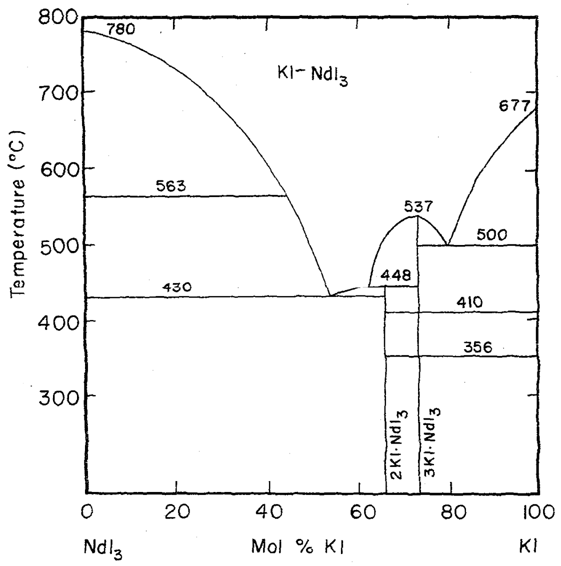

Figure 61. Temperature-composition phase diagram for KI-NdI$_3$.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the KI and NdI$_3$ used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI$_3$.

Table 400. Electrical conductivity studies: KI-NdI$_3$

Investigations critically re-examined		
Ref.	NdI$_3$, mol %	Temp. range (T)
109 [a]	0–100 (g)	1093, 1140, 1196

[a] For experimental details, see CsI-DyI$_3$.

Table 401. *KI-NdI$_3$: Specific conductance (ohm^{-1} cm^{-1})*

NdI$_3$ mol %	1093 K	1140.7 K	1196.7 K
0	1.55	1.65	1.75
10	1.25	1.32	1.42
20	1.00	1.07	1.16
30	0.84	0.90	1.00
40	0.75	0.80	0.87
50	0.67	0.72	0.80
60	0.61	0.66	0.73
70	0.57	0.62	0.68
80	0.52	0.57	0.60
90	0.47	0.53	0.58
100	0.42	0.48	0.55

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 402. Density studies: KI-NdI_3

Investigations critically re-examined

Ref.	NdI_3 mol %	Temp range (T)	Comments
108[a]	0–100	991. 7–1193. 2	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	NdI_3 mol %	Min. departure	Max. departure
108	0	0.02% (1025 K)	0.41% (1180 K)

[a] The density data of Kutscher and Schneider [**108**] for pure NdI_3 were recommended earlier in this volume.

TABLE 403. KI-NdI_3: Density (g cm^{-3})

	Mol percent NdI_3							
T	100	81. 00	61.66	49.08	31.35	29.67	20.26	0.00
1000					3. 224		2. 981	
1010					3. 214		2. 971	
1020		4. 036	3. 728		3. 204		2. 961	
1030		4. 026	3. 717	3. 523	3. 193		2. 951	2. 376
1040		4. 015	3. 706	3. 511	3. 183	3. 342	2. 942	2. 367
1050		4. 004	3. 695	3. 500	3. 173	3. 331	2. 932	2. 358
1060		3. 993	3. 684	3. 488	3. 163	3. 321	2. 922	2. 349
1070		3. 982	3. 673	3. 477	3. 152	3. 310	2. 912	2. 340
1080		3. 971	3. 662	3. 465	3. 142	3. 299	2. 902	2. 331
1090		3. 960	3. 651	3. 454	3. 132	3. 289	2. 893	2. 322
1100		3. 950	3. 640	3. 443	3. 122	3. 278	2. 883	2. 313
1110		3. 939	3. 629	3. 431	3. 111	3. 268	2. 873	2. 304
1120	4. 208	3. 928	3. 618	3. 420	3. 101	3. 257	2. 863	2. 295
1130	4. 198	3. 917	3. 607	3. 408	3. 091	3. 246	2. 853	2. 286
1140	4. 187	3. 906	3. 596	3. 397	3. 081	3. 236	2. 844	2. 277
1150	4. 176	3. 895	3. 584	3. 385	3. 071	3. 225	2. 834	2. 268
1160	4. 166	3. 884	3. 573	3. 374	3. 060	3. 214	2. 824	2. 259
1170	4. 155	3. 873	3. 562		3. 050	3. 204	2. 814	2. 250
1180	4. 144	3. 863	3. 551		3. 040	3. 193	2. 804	2. 241
1190	4. 133	3. 852	3. 540			3. 182		

Temperature-dependent equations

$$\rho=a-bT$$

Mol % NdI_3	a	$b \cdot 10^3$
0. 00	3. 3027	0. 8999
20. 26	3. 9602	0. 9795
31. 35	4. 2473	1. 0233
39. 67	4. 4489	1. 0643
49. 08	4. 7014	1. 1444
61. 66	4. 8583	1. 1077
81. 00	5. 1447	1. 0865
100. 00	5. 4069	1. 0701

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**].

KI-PbI$_2$

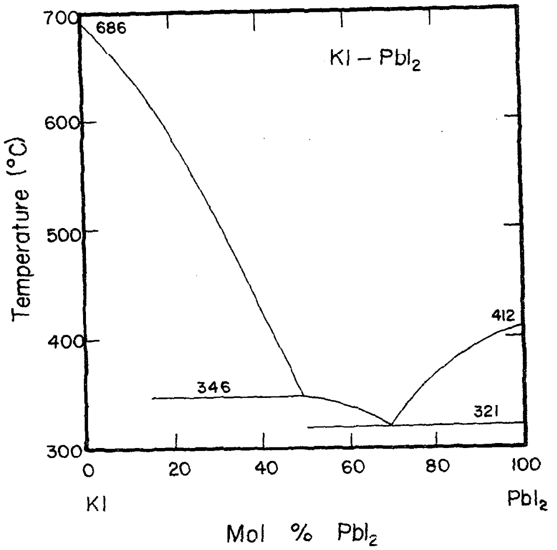

FIGURE 62. Temperature-composition phase diagram for KI-PbI$_2$.

H. S. van Klooster and E. L. Stlarns, J. Am. Chem. Soc., **55**, 4121 (1933).

Melt Preparation and Purification

Bogacz and Zuca [**106**] used reagent-grade salts dried with gaseous *HI* in the usual manner. Due to the volatility of lead iodide, weighing and fusing of the mixtures was done directly in the cell under an HI atmosphere. Measurements were made rapidly and fresh mixtures used for each determination.

TABLE 404. Electrical conductance studies: KI-PbI$_2$

Investigations critically re-examined

Ref.	PbI$_2$ mol %	Temp. range (*T*)	Comments
106	0–100	648–1123	Cell material: quartz capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions.

Deviations from previous NSRDS recommendations [1, pp. 19, 23]

Ref.	PbI$_2$ mol %	Min. departure	Max. departure
106	100	11.7% (873 K)	23.3% (723 K)
106	0	−0.12% (1123 K)	1.3% (998 K)

TABLE 405. KI-PbI_2: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent PbI_2									
T	100	90	80	70	67	60	50	40	20	0
650			0. 405	0. 386	0. 361	0. 346				
660			0. 427	0. 408	0. 384	0. 368				
670			0. 449	0. 430	0. 406	0. 390				
680		0. 488	0. 471	0. 451	0. 428	0. 412				
690		0. 511	0. 493	0. 473	0. 450	0. 433				
700		0. 533	0. 514	0. 494	0. 472	0. 454				
710		0. 556	0. 535	0. 515	0. 493	0. 475				
720		0. 578	0. 556	0. 536	0. 515	0. 496				
730	0. 617	0. 600	0. 577	0. 556	0. 536	0. 516				
740	0. 640	0. 621	0. 598	0. 577	0. 557	0. 537				
750	0. 663	0. 643	0. 618	0. 597	0. 577	0. 557				
760	0. 685	0. 664	0. 639	0. 617	0. 597	0. 577				
770	0. 708	0. 685	0. 657	0. 636	0. 618	0. 597				
780	0. 730	0. 706	0. 679	0. 656	0. 637	0. 617	0. 581			
790	0. 751	0. 726	0. 698	0. 675	0. 657	0. 636	0. 603			
800	0. 773	0. 747	0. 718	0. 694	0. 676	0. 655	0. 624			
810	0. 794	0. 767	0. 737	0. 713	0. 696	0. 674	0. 645			
820	0. 815	0. 786	0. 756	0. 731	0. 715	0. 693	0. 666			
830	0. 836	0. 806	0. 775	0. 749	0. 733	0. 712	0. 687	0. 696		
840	0. 857	0. 825	0. 794	0. 767	0. 752	0. 731	0. 707	0. 717		
850	0. 877	0. 844	0. 812	0. 785	0. 770	0. 749	0. 727	0. 739		
860	0. 897	0. 863	0. 830	0. 803	0. 788	0. 767	0. 747	0. 759		
870	0. 917	0. 882	0. 849	0. 820	0. 806	0. 785	0. 766	0. 780		
880	0. 937	0. 900	0. 867	0. 838	0. 824	0. 803	0. 786	0. 800		
890	0. 956	0. 977	0. 884	0. 854	0. 841	0. 821	0. 804	0. 820		
900	0. 975	0. 937	0. 902	0. 871	0. 858	0. 838	0. 823	0. 839		
910	0. 994	0. 954	0. 914	0. 888	0. 875	0. 856	0. 841	0. 858		
920	1. 013	0. 972	0. 937	0. 904	0. 892	0. 873	0. 859	0. 877		
930	1. 031	0. 989	0. 954	0. 920	0. 908	0. 890	0. 877	0. 895	[1. 015]	
940	1. 049	1. 006	0. 970	0. 936	0. 924	0. 906	0. 894	0. 913	[1. 034]	
950	1. 067	1. 023	0. 987	0. 951	0. 940	0. 923	0. 911	0. 931	[1. 052]	
960	1. 085	1. 040	1. 003	0. 967	0. 956	0. 939	0. 928	0. 948	[1. 071]	
970	1. 102	1. 056	1. 020	0. 982	0. 971	0. 955	0. 944	0. 965	[1. 090]	
980										1. 345
1000										1. 386
1020										1. 426
1040										1. 463
1060										1. 499
1080										1. 532
1100										1. 564
1120										1. 593

Teperature-dependent equations

$$\kappa = a + bT + cT^2$$

PbI_2 mol %	*a*	$b \times 10^3$	$c \times 10^6$	Standard error of estimate
0	−3. 1675	7. 0784	−2. 5247	0. 04%
20	[−0. 7336]	[1. 8800]	0	0. 00%
40	−2. 3443	5. 1526	−1. 7950	0. 04%
50	−2. 0560	4. 5606	−1. 5132	0. 08%
60	−1. 4721	3. 3974	−0. 9225	0. 37%
67	−1. 6038	3. 7701	−1. 1496	0. 49%
70	−1. 5329	3. 6809	−1. 1219	0. 45%
80	−1. 4496	3. 4785	−0. 9617	0. 33%
90	−1. 6068	3. 8677	−1. 1574	0. 34%
100	−1. 7307	4. 1134	−1. 2297	0. 31%

These values are based on the work of Bogacz and Zuca (classical ac technique) [**106**].

TABLE 406. Density studies: KI-PbI_2

Investigations critically re-examined			
Ref.	PbI_2 mol %	Temp. range (T)	Comments
106	0–100	605–1198	Cell material: Pt bob, calibration: water

TABLE 407. KI-PbI_2: Density (g cm^{-3})

	Mol percent PbI_2										
T	100	90	80	70	60	50	40	30	20	10	0
620				5. 018							
640				4. 987	4. 713						
660			5. 225	4. 956	4. 680						
680		5. 454	5. 193	4. 925	4. 649						
700	5. 675	5. 422	5. 162	4. 894	4. 619						
720	5. 642	5. 390	5. 131	4. 864	4. 590						
740	5. 608	5. 358	5. 100	4. 834	4. 560	4. 278					
760	5. 575	5. 326	5. 069	4. 804	4. 531	4. 249					
780	5. 542	5. 294	5. 038	4. 774	4. 501	4. 221					
800	5. 509	5. 262	5. 007	4. 744	4. 472	4. 192	3. 903				
820	5. 475	5. 230	4. 977	4. 715	4. 444	4. 164	3. 876				
840	5. 442	5. 199	4. 946	4. 685	4. 415	4. 136	3. 849				
860	5. 409	5. 167	4. 916	4. 656	4. 387	4. 109	3. 822				
880	5. 375	5. 135	4. 886	4. 627	4. 359	4. 082	3. 795	3. 499			
900	5. 342	5. 104	4. 856	4. 598	4. 331	4. 055	3. 769	3. 473			
920	5. 309	5. 072	4. 826	4. 569	4. 304	4. 028	3. 743	3. 448	3. 143		
940	5. 275	5. 040	4. 796	4. 541	4. 276	4. 002	3. 717	3. 423	3. 118	2. 804	
960	5. 242	5. 009	4. 766	4. 512	4. 249	3. 975	3. 692	3. 398	3. 094	2. 780	
980			4. 736						3. 070	2. 756	2. 432
1000									3. 047	2. 733	2. 409
1020										2. 711	2. 387
1040											2. 365
1060											2. 344
1080											2. 323
1100											2. 303
1120											2. 283
1140											2. 264
1160											2. 245
1180											2. 228

Two-dimensional equation and statistical parameters

$$\rho = a + bT + cC + dTC + eTC^2 + fCT^2$$

a	$b \cdot 10^3$	$c \cdot 10^2$	$d \cdot 10^6$	$e \cdot 10^8$	$f \cdot 10^9$	Max. percent departure	Stand. error of est.
6. 84050	−1. 66492	−2. 58152	−3. 69853	−5. 26803	7. 11857	0. 53% (968. 2 K, 100 mol % KI)	0. 17%

These values are based on the work of Bogacz and Zuca (Archimedean method) [**106**]. Here C=mol % KI.

TABLE 408. KI-PbI_2: Density (g cm^{-3})

	Mol percent PbI_2										
T	100	90	80	70	67	60	50	40	20	10	0
620				5. 029	4. 926						
640				4. 999	4. 896	4. 709					
660			5. 226	4. 968	4. 867	4. 679					
680		5. 448	5. 196	4. 938	4. 837	4. 650					
700	5. 664	5. 416	5. 166	4. 907	4. 807	4. 620					
720	5. 632	5. 385	5. 135	4. 877	4. 777	4. 591					
740	5. 600	5. 354	5. 105	4. 846	4. 748	4. 561					
760	5. 568	5. 323	5. 074	4. 816	4. 718	4. 532	4. 246				
780	5. 537	5. 292	5. 044	4. 785	4. 688	4. 502	4. 219				
800	5. 505	5. 261	5. 013	4. 754	4. 658	4. 473	4. 192	3. 912			
820	5. 473	5. 230	4. 983	4. 724	4. 629	4. 443	4. 165	3. 885			
840	5. 441	5. 199	4. 952	4. 693	4. 599	4. 414	4. 137	3. 857			
860	5. 409	5. 168	4. 922	4. 663	4. 569	4. 384	4. 110	3. 829			
880	5. 377	5. 137	4. 892	4. 632	4. 539	4. 355	4. 083	3. 802			
900	5. 345	5. 106	4. 861	4. 602	4. 510	4. 325	4. 055	3. 774			
920	5. 313	5. 075	4. 831	4. 571	4. 480	4. 296	4. 028	3. 746	3. 134		
940	5. 282	5. 044	4. 800	4. 541	4. 450	4. 267	4. 001	3. 718	3. 114	2. 794	
960	5. 250	5. 012	4. 770	4. 510	4. 420	4. 237	3. 974	3. 691	3. 094	2. 775	
980			4. 739		4. 390				3. 073	2. 755	2. 422
1000									3. 053	2. 735	2. 403
1020									3. 033	2. 715	2. 384
1040											2. 365
1060											2. 346
1080											2. 327
1100											2. 307
1120											2. 288
1140											2. 269
1160											2. 250
1180											2. 231

Temperature-dependent equations

$\rho = a + bT$

PbI_2 mol %	a	$b \cdot 10^4$	Stand. dev.
0	3. 3583	−9. 553	0. 0003
10	3. 7256	−9. 907	0. 0006
20	4. 0632	−10. 099	0. 0004
40	5. 0218	−13. 867	0. 0003
50	5. 2830	−13. 640	0. 0005
60	5. 6518	−14. 737	0. 0006
67	5. 8488	−14. 881	0. 0004
70	5. 9766	−15. 277	0. 0011
80	6. 2308	−15. 218	0. 0013
90	6. 5041	−15. 538	0. 0011
100	6. 7797	−15. 938	0. 0006

These values are based on the work of Bogacz and Zuca (Archimedean method) [**106**].

KI-RbI

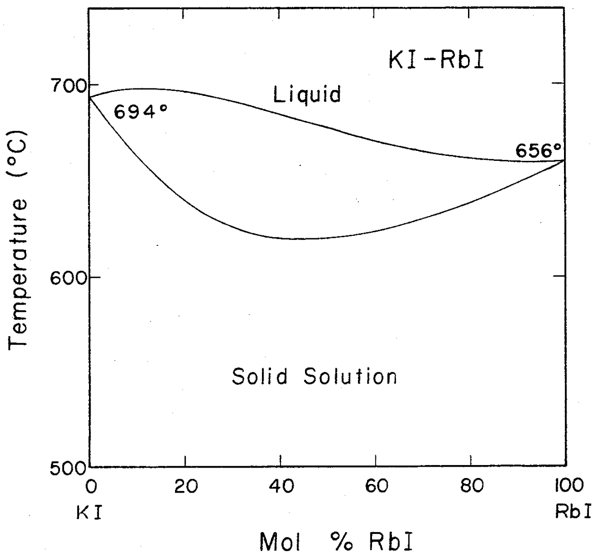

FIGURE 63. Temperature-composition phase diagram for KI-RbI.

R. G. Samuseva and V. E. Plyushclev, Zh. Neorgan. Khim., 9 [10], 2433 (1964); Russ. J. Inorg. Chem. (English Transl.), 1314 (1964).

Melt Preparation and Purification

Zuca's [6] general method of pre-treatment of alkali iodides is given under the system (CsI-LiI).

TABLE 409. Electrical conductance studies: KI-RbI

Investigations critically re-examined			
Ref.	RbI mol %	Temp. range (T)	Comments
6[a]	50	948–1124	Cell material: quartz or silica glass capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions

[a]Zuca and Olteanu [6] report a precision of ±0.1% in their resistance measurements.

TABLE 410. KI-RbI: Specific conductance ($\text{ohm}^{-1}\ \text{cm}^{-1}$)

	Mol percent RbI		
T	100	50	0
950	0. 927	1. 074	
960	0. 942	1. 091	
970	0. 958	1. 108	
980	0. 973	1. 125	
990	0. 987	1. 141	
1000	1. 002	1. 158	1. 392
1010	1. 016	1. 174	1. 408
1020	1. 030	1. 190	1. 425
1030	1. 044	1. 206	1. 442
1040	1. 058	1. 222	1. 458
1050	1. 072	1. 237	1. 475
1060	1. 085	1. 253	1. 491
1070	1. 098	1. 268	1. 508
1080	1. 111	1. 283	1. 525
1090	1. 124	1. 298	1. 541
1100	1. 137	1. 312	1. 558
1110		1. 327	1. 575
1120		1. 341	1. 591
1130			1. 608
1140			1. 624
1150			1. 641
1160			1. 658
1170			1. 674

Temperature-dependent equations

$$\kappa = a + bT + cT^2$$

RbI mol %	a	$b \cdot 10^3$	$c \cdot 10^6$	Stand. error of est.
0	−0. 2701	1. 6618	0	0. 20%
50	−1. 3559	3. 3951	−0. 8814	0. 09%
100	−1. 4231	3. 4028	−0. 9778	0. 01%

These values are based on the work of Zuca and Olteanu (classical ac technique) [6].

TABLE 411. Density studies: KI-RbI

Investigations critically re-examined			
Ref.	RbI mol %	Temp. range (T)	Comments
6[a]	50	958–1138	Pt ball; calibration: water

[a] Zuca and Olteanu [6] reported density results in the form of a linear temperature-dependent equation with a standard deviation of 9.0×10^{-4} g cm^{-3} and a precision of 0.1%.

TABLE 412. KI-RbI: Density (g cm^{-3})

	Mol percent RbI		
T	100	50	0
950	2.863		
960	2.852	2.6493	
970	2.840	2.6385	
980	2.829	2.6277	
990	2.817	2.6169	2.414
1000	2.805	2.6061	2.405
1010	2.794	2.5953	2.395
1020	2.782	2.5845	2.386
1030	2.771	2.5737	2.377
1040	2.759	2.5629	2.367
1050	2.747	2.5521	2.358
1060	2.736	2.5413	2.349
1070	2.724	2.5305	2.340
1080	2.713	2.5197	2.330
1090	2.701	2.5089	2.321
1100	2.689	2.4981	2.312
1110	2.678	2.4873	2.302
1120	2.666	2.4765	2.293
1130		2.4657	2.284
1140			2.275
1150			2.265
1160			2.256
1170			2.247

Temperature-dependent equations

$$\rho=a+bT$$

RbI mol %	a	$b\cdot 10^3$	Standard deviation
0	3.3336	−0.9290	0.0009
50	3.6862	−1.0801	
100	3.9667	−1.1613	

These values are based on the work of Zuca and Olteanu (Archimedean method) [6].

KI-TlI

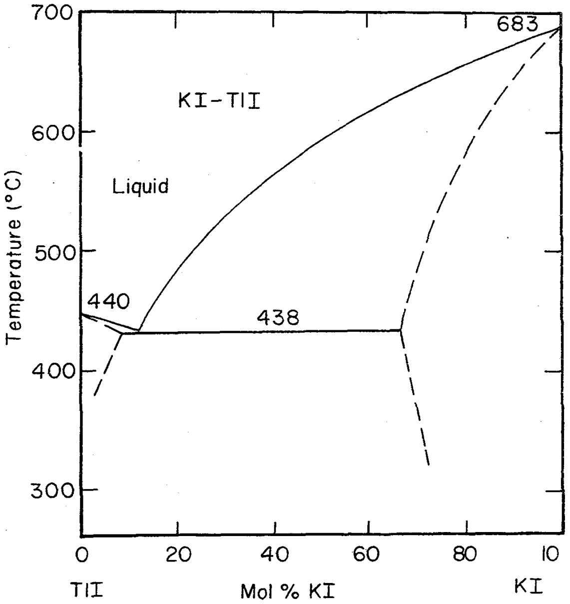

FIGURE 64. Temperature-composition phase diagram for KI-TlI.

E. M. Chernotordik, Zh. Obshch. Khim., 4, 459 (1934).

Melt Preparation and Purification

Buckle and Tsaoussoglou [**110**, **53**] used TlI (Johnson-Matthey) prepared from metal of 99.9% purity. The other salts were of analytical grade (Johnson-Matthey). Mixtures were prepared by taking weighed amounts of the dry powdered salts and melting in a silica test tube under anhydrous nitrogen or argon.

TABLE 413. Electrical conductance studies: KI-TlI

Investigations critically re-examined		
Ref.	TlI, mol %	Temp. range (T)
110[a]	0–100(g)	913, 970

[a] For details on cell materials, calibration and melt preparation, see under system KBr-TlBr.

TABLE 414. KI-TlI: Specific conductance ($ohm^{-1}\ cm^{-1}$)

TlI mol %	913 K	970K
0	1.17[a]	1.31
10	1.12[a]	1.25
20	1.09[a]	1.20
30	1.06	1.16
40	1.03	1.13
50	0.98	1.12
60	0.93	1.06
70	0.89	1.00
80	0.87	0.96
90	0.86	0.95
100	0.87	0.96

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Buckle and Tsaoussoglou (classical ac technique) [**110**].

[a] Extrapolated value.

TABLE 415. Density studies: KI-TlI

Investigations critically re-examined

Ref.	TlI mol %	Temp. range (T)	Comments
53	0–100	813, 970	Cell material: iridium pycnometer; calibration: triply-distilled mercury

Deviations from previous NSRDS recommendations [1, p. 19 and this volume]

Ref.	TlI	Min. departure	Max. departure
53	0	outside temperature	range of data base
53	100	−2.33% (970 K)	−4.69 % (813 K)

TABLE 416. KI–TlI: Density [a] ($g\ cm^{-3}$)

813 K		970 K	
TlI, mol %	ρ	TlI mol %	ρ
0.0	2.500	0.0	2.444
24.2	3.247	7.7	2.660
27.8	3.360	15.9	2.894
29.8	3.426	18.5	2.971
32.4	3.501	19.8	3.001
33.0	3.518	24.2	3.140
33.8	3.537	29.1	3.290
34.5	3.559	33.9	3.435
39.2	3.698	36.7	3.522
39.7	3.713	40.6	3.642
43.5	3.824	41.3	3.663
45.0	3.871	42.9	3.711
45.1	3.870	44.5	3.764
49.0	4.001	50.0	3.934
49.1	3.997	51.5	3.977
50.5	4.049	56.4	4.151
55.4	4.208	61.7	4.313
56.3	4.240	66.6	4.478
58.1	4.298	66.7	4.484
61.7	4.443	76.8	4.823
63.2	4.406	86.5	5.141
66.6	4.635	100.0	5.570
68.0	4.684		
69.7	4.737		
72.7	4.847		
76.8	4.991		
82.0	5.157		
83.7	5.207		
100.0	5.683		

[a] The data, reported as molar volumes at two-temperatures, were converted to densities ($g\ cm^{-3}$). These values are based on the work of Buckle and Tsaoussoglou (pycnometric method) [**53**].

LaI_3-NaI

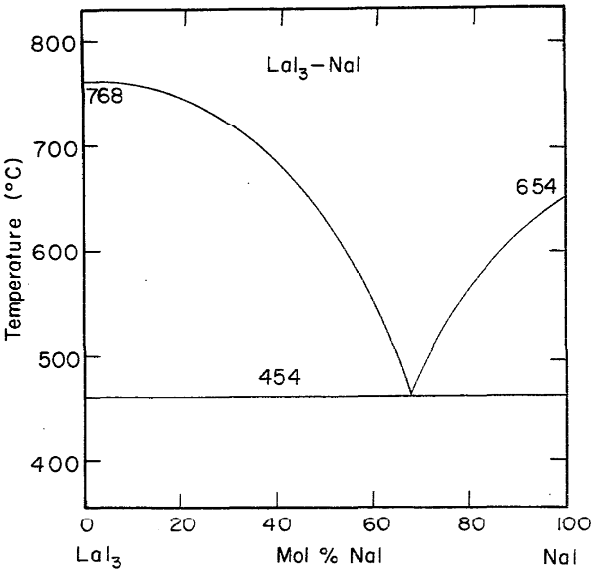

FIGURE 65. Temperature-composition phase diagram for LaI_3-NaI.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the NaI and LaI_3 used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI_3.

TABLE 417. Electrical conductance studies: LaI_3-NaI

Investigations critically re-examined

Ref.	NaI, mol %	Temp. range (*T*)
109[a]	0–100 (g)	1092, 1150, 1227

[a] For experimental details, see CsI-DyI_3.

TABLE 418. LaI_3-NaI: Specific conductance (ohm^{-1} cm^{-1})

NaI, mol %	1092 K	1150.7 K	1227 K
0	0. 50	0. 57	0. 67
10	0. 55	0. 65	0. 75
20	0. 65	0. 75	0. 85
30	0. 77	0. 85	0. 95
40	0. 90	1. 00	1. 10
50	1. 05	1. 15	1. 25
60	1. 22	1. 32	1. 42
70	1. 45	1. 55	1. 65
80	1. 75	1. 85	1. 95
90	2. 10	2. 20	2. 32
100	2. 75	2. 85	3. 00

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

LiI-NaI

Melt Preparation and Purification

The procedure used by Zuca and Olteanu [**96**] for the preparation of pure salts and mixtures is described under the system CsI-LiI.

TABLE 419. Electrical conductance studies: LiI-NaI

Investigations critically re-examined

Ref.	NaI mol %	Temp. range (*T*)	Comments
96	0–100	762. 2–1122. 9	Cell material: silica U-shape; Pt electrodes

Comparisons with previous NSRDS recommendations [1, p. 19]

Ref.	NaI mol %	Min. departure	Max. departure
96	0	−0. 02% (871. 8 K)	−0. 46% (778. 7 K)
96	100	−0. 04% (1053. 2 K)	4. 79% (945. 2 K)

TABLE 420. LiI-NaI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent NaI						
T	100	70.2	49.6	45.4	44.8	24.3	0.0
770							4.008
780							4.058
790							4.106
800							4.154
810							4.200
820							4.246
830							4.291
840							4.335
850					2.973		4.377
860				2.877	2.993	3.384	4.419
870				2.911	3.012	3.417	4.460
880		2.564		2.944	3.032	3.449	4.500
890		2.592	2.962	2.976	3.052	3.480	4.539
900		2.620	2.989	3.007	3.073	3.510	4.577
910		2.647	3.016	3.037	3.093	3.540	4.614
920		2.673	3.042	3.066	3.114	3.569	
930		2.700	3.068	3.095	3.135	3.598	
940		2.723	3.094	3.122	3.157	3.626	
950	2.398	2.747	3.118	3.149	3.178	3.653	
960	2.421	2.770	3.143	3.174	3.200	3.679	
970	2.444	2.793	3.167	3.199	3.222	3.705	
980	2.467	2.814	3.190	3.223	3.245	3.729	
990	2.489	2.835	3.212	3.246	3.267	3.754	
1000	2.510	2.855	3.234	3.268	3.290	3.777	
1010	2.531	2.874	3.256	3.289	3.313	3.800	
1020	2.551	2.892	3.276	3.310	3.337	3.822	
1030	2.570	2.910	3.296	3.329		3.843	
1040	2.589	2.927	3.316	3.348		3.863	
1050	2.607			3.365		3.883	
1060	2.624			3.382			
1070	2.641			3.398			
1080	2.658						
1090	2.673						
1100	2.688						
1110	2.703						
1120	2.717						

Temperature-dependent equations

$$\kappa = a + bT + cT^2 + dT^3$$

Mol % NaI	a	$b \cdot 10^3$	$c \cdot 10^6$	$d \cdot 10^9$	Stand. error of est.
0.0	−2.68211	12.3786	−4.79210		0.11%
24.3	−2.12299	9.49368	−3.59368		0.07%
44.8	2.25465	−2.30890	1.26631		0.16%
45.4	−3.33037	11.0268	−4.42840		0.21%
49.6	1.02148	−0.829250	6.12865	−3.08661	0.12%
70.2	−3.04491	9.84786	−3.94822		0.10%
100.0	−2.68970	8.30510	−3.10545		0.05%

These values are based on the work of Zuca and Olteanu (classical ac technique) [**96**].

TABLE 421. Density studies: LiI-NaI

Investigations critically re-examined

Ref.	NaI mol %	Temp. range (*T*)
96	0–100	762. 2–1133. 9

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	NaI mol %	Min. departure	Max. departure
96	0	0. 00% (835 K)	−0. 23% (765 K)
96	100	−0. 07% (1120 K)	−0. 13% (945 K)

TABLE 422. LiI-NaI: Density (g cm^{-3})

	Mol percent NaI					
T	100	79. 7	61. 9	32. 9	19. 3	0. 0
770						3. 077
780						3. 069
790						3. 061
800						3. 053
810						3. 044
820						3. 036
830						3. 028
840						3. 020
850						3. 012
860						3. 003
870						2. 995
880						2. 987
890						2. 979
900					2. 835	2. 971
910		2. 744			2. 827	2. 963
920		2. 735	2. 753		2. 820	
930		2. 726	2. 744		2. 813	
940		2. 717	2. 735		2. 806	
950	2. 722	2. 709	2. 725	2. 777	2. 799	
960	2. 713	2. 700	2. 716	2. 760	2. 702	

Temperature-dependent equations

$$\rho = a - bT$$

NaI	*a*	$b \cdot 10^3$	Stand. error of est.
0	3. 7063	0. 8172	
19. 3	3. 4719	0. 7081	0. 19%
32. 9	3. 5593	0. 8233	0. 08%
61. 9	3. 5936	0. 9139	0. 05%
79. 7	3. 5489	0. 8845	0. 01%
100. 0	3. 6144	0. 9392	

These values are based on the work of Zuca and Olteanu (Archimedean method) [**96**].

LiI-RbI

Melt Preparation and Purification

The procedure used by Zuca and Olteanu [**96**] for the preparation of the pure salts and mixtures is described under the system CsI-LiI.

TABLE 423. Electrical conductance studies: LiI-RbI

Investigations critically re-examined

Ref.	RbI mol %	Temp. range (*T*)	Comments
96	0–100	762. 2–1099. 7	Cell material: silica U-shape; Pt electrodes

Comparisons with previous NSRDS recommendations [1, pp. 19, 20]

Ref.	RbI mol %	Min. departure	Max. departure
96	0	−0. 02% (871. 8 K)	−0. 46% (778. 7 K)
96	100	0. 03% (933. 7 K)	−3. 63% (1093. 6 K)

TABLE 424. LiI-RbI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent RbI				
T	100	72. 9	44. 8	9. 0	0. 0
770					4. 008
780					4. 058
890					4. 106
800					4. 154
810					4. 200
820					4. 246
830					4. 291
840					4. 335
850					4. 377
860			1. 463	3. 243	4. 419
870			1. 488	3. 277	4. 460
880		0. 987	1. 513	3. 311	4. 500
890		1. 006	1. 537	3. 345	4. 539
900		1. 025	1. 561	3. 378	4. 577
910		1. 044	1. 585	3. 410	4. 614
920		1. 063	1. 608	3. 441	
930		1. 082	1. 630	3. 472	
940		1. 100	1. 653	3. 502	
950		1. 118	1. 674	3. 531	
960		1. 136	1. 695	3. 560	
970		1. 153	1. 716	3. 588	
980		1. 171	1. 736	3. 615	
990		1. 188	1. 756	3. 642	
1000		1. 205	1. 776	3. 668	
1010		1. 221	1. 795	3. 693	
1020		1. 238	1. 813	3. 718	
1030		1. 254	1. 831	3. 742	
1040		1. 270			
1050		1. 285			

Temperature-dependent equations

$\kappa = a + bT + cT^2$

RbI mol %	$-a$	$b \cdot 10^3$	$-c \cdot 10^6$	Stand. error of est.
0. 0	2. 68211	12. 3786	4. 79210	0. 11%
9. 0	2. 24901	9. 26623	3. 34943	0. 15%
44. 8	2. 37040	6. 30132	2. 23620	0. 27%
72. 9	1. 66545	4. 06771	1. 19761	0. 23%
100. 0	2. 17357	4. 88620	1. 72329	0. 17%

These values are based on the work of Zuca and Olteanu (classical ac technique) [**96**].

TABLE 425. Density studies: LiI-RbI

Investigations critically re-examined

Ref.	RbI, mol %	Temp. range (T)
96	0–100	762. 2–1138. 2

Deviations from previous NSRDS recommendations [1, pp. 19, 20]

Ref.	RbI mol %	Min. departure	Max. departure
96	0	0. 00% (835 K)	−0. 24% (765 K)
96	100	0. 00% (945 K)	−0. 10% (1095 K)

TABLE 426. LiI-RbI: Density (g cm^{-3})

	Mol percent RbI										
T	100	90	80	70	60	50	40	30	20	10	0
785											3.063
800											3.055
815											3.045
830											3.034
845											3.022
860											3.009
875											2.995
890											2.980
905					2.833					2.920	2.964
920				2.831	2.822	2.823				2.906	2.948
935	2.888			2.818	2.811	2.811				2.891	
950	2.870			2.806	2.799	2.800	2.808			2.876	
965	2.851			2.793	2.787	2.788	2.796			2.860	
980	2.832		2.791	2.779	2.774	2.776	2.783	2.797	2.818	2.845	
995	2.814		2.776	2.766	2.762	2.763	2.771	2.784	2.803	2.829	
1010	2.795		2.761	2.752	2.749	2.751	2.758	2.771	2.789	2.812	
1025	2.776	2.759	2.746	2.739		2.739	2.746	2.758	2.775	2.796	
1040	2.757	2.742	2.732	2.726			2.733	2.745	2.760	2.781	
1055	2.739	2.726	2.717	2.713			2.721	2.732	2.747	2.765	
1070	2.721	2.710	2.703				2.710	2.720	2.733		

Two-dimensional equation and statistical parameters

$$\rho=a+bC+cT+dC^2+eT^2+fTC+gTC^2+hT^3$$

a	$b\cdot10^2$	$c\cdot10^2$	$d\cdot10^4$	$e\cdot10^5$	$f\cdot10^5$	$g\cdot10^7$	$h\cdot10^9$	Max. percent departure	Stand. error of est.
−1.13344	−1.93993	1.43833	1.94016	−1.55896	1.60923	−1.65556	5.19317	0.42% (1070.2 K, 43.8 mol % RbI)	0.001

These values are based on the work of Zuca and Olteanu (Archimedean method) [96]. Here C=mol % RbI.

TABLE 427. LiI-RbI: Density (g cm^{-3})

	Mol percent RbI					
T	100	75.9	43.8	28.1	12.8	0.0
770						3.077
780						3.069
790						3.061
800						3.053
810						3.044
820						3.036
830						3.028
840						3.020
850						3.012
860						3.003
870						2.995
880						2.987
890						2.979
900						2.971
910						2.963
920						
930						
940	2.875					
950	2.863	2.823		2.837		
960	2.852	2.813	2.791	2.827	2.854	
970	2.840	2.803	2.782	2.818	2.844	
980	2.829	2.792	2.773	2.808	2.835	
990	2.817	2.782	2.765	2.799	2.825	
1000	2.805	2.772	2.756	2.789	2.815	
1010	2.794	2.762	2.747	2.779	2.806	
1020	2.782	2.752	2.739	2.770	2.796	
1030	2.771	2.741	2.730	2.760	2.787	
1040	2.759	2.731	2.721	2.751	2.777	
1050	2.747	2.721	2.713	2.741	2.768	
1060	2.736	2.701	2.704	2.731	2.758	
1070	2.724	2.691	2.696	2.722	2.749	
1080	2.712	2.681	2.687	2.712	2.739	
1090	2.701	2.670		2.703	2.730	
1100		2.660			2.720	
1110					2.711	
1120					2.701	
1130					2.691	

Temperature-dependent equations

$\rho = a - bT$

RbI mol %	a	$b \cdot 10^3$	Stand. error of est.
0.0	3.7063	0.8172	
12.8	3.7703	0.9548	0.07%
28.1	3.7499	0.9608	0.04%
43.8	3.6212	0.8651	0.03%
75.9	3.7890	1.0170	0.03%
100.0	3.9667	1.1613	

These values are based on the work of Zuca and Olteanu (Archimedean method) [96].

NaI-NdI$_3$

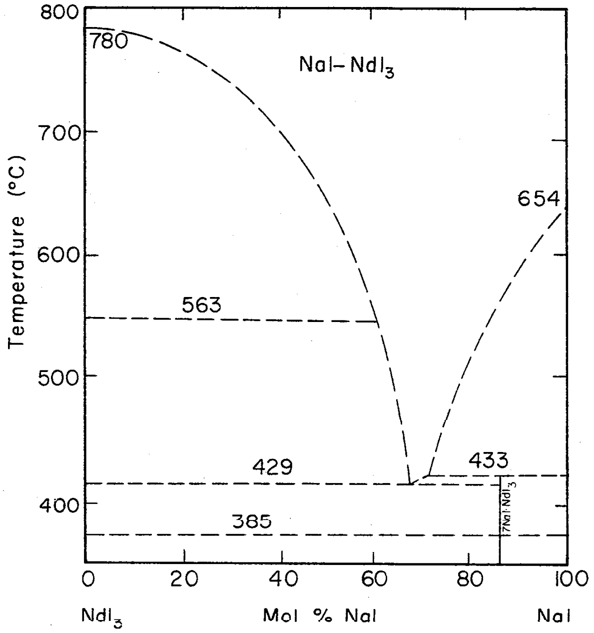

FIGURE 66. Temperature-composition phase diagram for NaI-NdI$_3$.

J. Kutscher and A. Schneider, Z. Anorg. Allg. Chem., **386**, 38 (1971).

Melt Preparation and Purification

The purification of the NaI and NdI$_3$ used by Kutscher and Schneider [**109**] is discussed under the system CsI-DyI$_3$.

TABLE 428. Electrical conductance studies: NaI-NdI$_3$

Investigations critically re-examined		
Ref.	NdI$_3$, mol %	Temp. range (T)
109[a]	0–100 (g)	1193, 1141, 1195

[a] For experimental details, see CsI-DyI$_3$.

TABLE 429. NaI-NdI_3: Specific conductance (ohm^{-1} cm^{-1})

NdI_3 mol %	1093 K	1141.7 K	1195.7 K
0	2. 67	2. 82	2. 95
10	2. 04	2. 15	2. 26
20	1. 65	1. 74	1. 84
30	1. 39	1. 45	1. 56
40	1. 16	1. 23	1. 32
50	0. 99	1. 06	1. 15
60	0. 85	0. 90	0. 99
70	0. 71	0. 77	0. 85
80	0. 60	0. 65	0. 74
90	0. 50	0. 56	0. 62
100	0. 40	0. 48	0. 55

These values have been interpolated to a maximum of three significant figures from the graphical presentation of Kutscher and Schneider (classical ac technique) [**109**].

TABLE 430. Density studies: NaI-NdI_3

Investigations critically re-examined

Ref.	NdI_3 mol %	Temp. range (T)	Comments
108[a]	0–100	1022. 2–1193. 2	Cell material: quartz; calibration: Hg

Deviations from previous NSRDS recommendations [1, p. 19]

Ref.	NdI_3 mol %	Min. departure	Max. departure
108	0	0. 08% (1025 K)	0. 42% (1180 K)

[a] The density data of Kutscher and Schneider [**108**] for pure NdI_3 were recommended earlier in this volume.

TABLE 431. NaI-NdI_3: Density (g cm^{-3})

	Mol percent NdI_3											
T	100	90	80	70	60	50	40	30	20	10	0	32. 5
1030											2. 656	
1040					3. 848	3. 717					2. 646	
1050				3. 956	3. 839	3. 708	3. 557			2. 926	2. 637	
1060				3. 946	3. 829	3. 698	3. 547	3. 371	3. 162	2. 917	2. 627	3. 418
1070			4. 044	3. 935	3. 819	3. 688	3. 537	3. 361	3. 153	2. 907	2. 618	3. 408
1080			4. 034	3. 925	3. 809	3. 678	3. 528	3. 351	3. 143	2. 897	2. 608	3. 398
1090			4. 024	3. 915	3. 799	3. 669	3. 518	3. 342	3. 134	2. 888	2. 598	3. 389
1100		4. 120	4. 014	3. 905	3. 789	3. 659	3. 508	3. 332	3. 124	2. 878	2. 589	3. 379
1110		4. 109	4. 004	3. 895	3. 779	3. 649	3. 499	3. 322	3. 114	2. 869	2. 579	3. 369
1120	4. 208	4. 099	3. 993	3. 885	3. 769	3. 639	3. 489	3. 313	3. 105	2. 859	2. 570	3. 360
1130	4. 198	4. 089	3. 983	3. 875	3. 759	3. 629	3. 479	3. 303	3. 095	2. 850	2. 560	3. 350
1140	4. 187	4. 078	3. 973	3. 865	3. 750	3. 620	3. 470	3. 294	3. 086	2. 840	2. 551	3. 340
1150	4. 177	4. 068	3. 963	3. 855	3. 740	3. 610	3. 460	3. 284	3. 076	2. 830	2. 541	3. 331
1160	4. 166	4. 058	3. 953	3. 845	3. 730	3. 600	3. 450	3. 274	3. 067	2. 821	2. 532	3. 321
1170	4. 156	4. 047			3. 720	3. 590	3. 440	3. 265	3. 057	2. 811	2. 522	3. 311
1180	4. 145					3. 580	3. 431	3. 255			2. 512	3. 302
1190	4. 135											

Two-dimensional equation and statistical parameters

$$\rho = a + bC + cT + dC^2 + eC^3 + fTC^2$$

a	$b\cdot10^2$	$c\cdot10^4$	$d\cdot10^4$	$e\cdot10^7$	$f\cdot10^9$	Max. percent departure	Stand. error of est.
3. 64037	3. 13209	−9. 55882	−2. 37566	9. 86706	−9. 32877	0. 38% (1057. 2 K, 27. 68 mol % NdI_3)	0. 006

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**]. Here C = mol % NdI_3.

TABLE 432. NaI-NdI_3: Density (g cm^{-3})

	Mol percent NdI_3						
T	100	77. 38	57. 61	37. 80	27. 68	19. 59	0. 00
1030							2. 652
1040			3. 819	3. 522			2. 643
1050			3. 808	3. 522			2. 634
1060		4. 027	3. 798	3. 512	3. 338	3. 143	2. 625
1070		4. 018	3. 787	3. 502	3. 328	3. 133	2. 617
1080		4. 008	3. 777	3. 492	3. 318	3. 124	2. 608
1090		3. 998	3. 766	3. 482	3. 308	3. 115	2. 599
1100		3. 989	3. 756	3. 472	3. 298	3. 105	2. 590
1110		3. 979	3. 745	3. 462	3. 288	3. 086	2. 572
1120	4. 208	3. 969	3. 735	3. 452	3. 279	3. 086	2. 572
1130	4. 198	3. 960	3. 724	3. 442	3. 269	3. 077	2. 563
1140	4. 187	3. 950	3. 714	3. 432	3. 259	3. 068	2. 554
1150	4. 176	3. 940	3. 703	3. 422	3. 249	3. 058	2. 545
1160	4. 166	3. 930	3. 693	3. 412	3. 239	3. 049	2. 536
1170	4. 155		3. 682	3. 402	3. 229	3. 039	2. 527
1180	4. 144		3. 672		3. 219	3. 030	2. 518
1190	4. 133						

Temperature-dependent equations

$\rho - a - bT$

Mol % NdI_3	a	$b \cdot 10^3$
0. 00	3. 5743	0. 8951
19. 59	4. 1388	0. 9397
27. 68	4. 3886	0. 9911
37. 80	4. 5668	0. 9952
57. 61	4. 9113	1. 0503
77. 38	5. 0558	0. 9701
100. 00	5. 4069	1. 0701

These values are based on the work of Kutscher and Schneider (dilatometric method) [**108**].

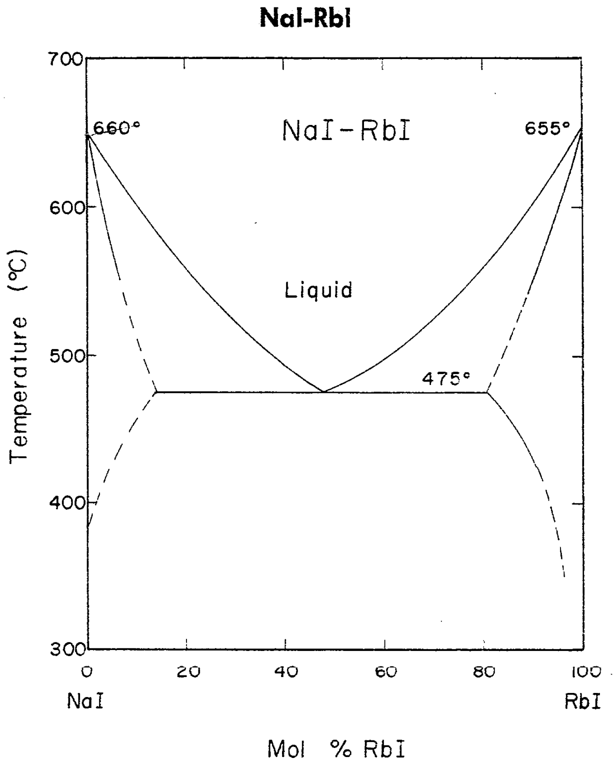

FIGURE 67. Temperature-composition phase diagram for NaI-RbI.

R. G. Samuseva and V. E. Olyashchev, Zh. Neorg. Khim., **9** [10], 2436 (1964); Russ. J. Inorg. Chem. (English Transl.), 1315 (1964).

Melt Preparation and Purification

A summary of the purification method used by Zuca and Olteanu [6] is given under the system CsI-LiI.

TABLE 433. Electrical conductance studies: NaI-RbI

Investigations critically re-examined			
Ref.	RbI mol %	Temp. range (T)	Comments
6	50	928–1125	Cell material: quartz or silica glass capillary cell; Pt electrodes; freq. range: 1000–7000 Hz; calibration: 0.1 M and 1.0 M KCl solutions

TABLE 434. NaI-RbI: Specific conductance (ohm^{-1} cm^{-1})

	Mol percent RbI		
T	100	50	0
930		1. 315	
940		1. 333	
950	0 927	1. 350	
960	0. 943	1. 367	2. 425
970	0. 958	1. 384	2. 446
980	0. 973	1. 400	2. 466
990	0. 987	1. 416	2. 486
1000	1. 002	1. 432	2. 506
1010	1. 016	1. 447	2. 525
1020	1. 030	1. 463	2. 545
1030	1. 044	1. 478	2. 563
1040	1. 058	1. 493	2. 582
1050	1. 072	1. 507	2. 600
1060	1. 085	1. 521	2. 619
1070	1. 098	1. 535	2. 636
1080	1. 111	1. 549	2. 654
1090	1. 124	1. 562	2. 671
1100	1. 137	1. 575	2. 688
1110		1. 588	2. 705
1120		1. 601	2. 721

Temperature-dependent equations

$$\kappa=a+bT+cT^2$$

RbI mol %	0	$b\cdot10^3$	$c\cdot10^6$	Stand. error of est.
0	−0. 8315	4. 7141	−1. 3768	0. 07%
50	−1. 4894	4. 2732	−1. 3519	0. 12%
100	−1. 4231	3. 4028	−0. 9778	0. 01%

These values are based on the work of Zuca and Olteanu (classical ac technique) [6].

TABLE 435. Density studies: NaI-RbI

Investigations critically re-examined			
Ref.	RbI mol %	Temp. range (T)	Comments
6	50	963–1133	Platinum bob; calibration: water, 25 ° C.

[a] The density results in reference [6] were reported in the form of a linear temperature dependent equation with a standard deviation of 1.0×10^{-3} g cm^{-3}. The stated precision was 0.1%.

TABLE 436. NaI-RbI: Density (g cm^{-3})

	Mol percent RbI		
T	100	50	0
950	2. 863		
960	2. 852		2. 713
970	2. 840	2. 761	2. 703
980	2. 829	2. 750	2. 694
990	2. 817	2. 740	2. 685
1000	2. 805	2. 729	2. 675
1010	2. 694	2. 718	2. 666
1020	2. 782	2. 708	2. 656
1030	2. 771	2. 697	2. 647
1040	2. 759	2. 686	2. 638
1050	2. 747	2. 675	2. 628
1060	2. 736	2. 665	2. 619
1070	2. 724	2. 654	2. 609
1080	2. 713	2. 643	2. 600
1090	2. 701	2. 633	2. 591
1100	2. 689	2. 622	2. 581
1110	2. 678	2. 611	2. 572
1120	2. 666	2. 601	2. 563
1130		2. 590	

Temperature-dependent equations

$$\rho = a + bT$$

RbI, mol %	a	$b \cdot 10^3$	Standard deviation
0	3. 6144	−0. 9392	
50	3. 7984	−1. 0695	0. 0010
100	3. 9667	−1. 1613	

These values are based on the work of Zuca and Olteanu (Archimedean method) [6].

6.3. General Study Tables

The following series of tables presents, first, for each of the four properties κ, ρ, η, γ, the binary systems for which a recommendation has been advanced in this study, together with the re-examined references, the technique used in the recommended reference and the authors of the recommended reference, and, second, an over-view of the recommendations advanced in this study for binary melts.

TABLE 437. Specific conductance

A: Classical ac technique
B: Modified potentiometric technique

System	Investigations critically re-examined	Total	Technique of recommended reference	Authors of recommended reference
AgBr-CsBr	**40**	1	B	Poillerat
AgBr-$HgBr_2$	**9**	1	A	Jander and Brodersen
AgBr-KBr	**14**, 40	2	A	Harrap and Heymann
AgBr-NaBr	**40**	1	B	Poillerat
AgBr-RbBr	**40**	1	B	Poillerat
$AlBr_3$-$CoBr_2$	**31**	1	A	Izbekov and Plotnikov
$AlBr_3$-$FeBr_3$	**31**	1	A	Izbekov and Plotnikov
$AlBr_3$-$HgBr_2$	**21**, 31	2	A	Gorenbein
$AlBr_3$-KBr	10, **11**, 12 31	4	A	Gorenbein and Kriss
$AlBr_3$-$MnBr_2$	**31**	1	A	Izbekov and Plotnikov
$AlBr_3$-NaBr	10, 11, **30**	3	A	Boston
$AlBr_3$-NH_4Br	10, **21**	2	A	Gorenbein
$AlBr_3$-$SbBr_3$	**10, 12,** 29, 59	4	A	Gorenbein
$AlBr_3$-$ZnBr_2$	**10, 12,** 16	3	A	Gorenbein
$BaBr_2$-KBr	**13**	1	A	Bloom et al.
$CdBr_2$-KBr	**26**, 41	2	A	Moiseeva
$CdBr_2$-NaBr	**26**	1	A	Moiseeva
CuBr-$HgBr_2$	**9**	1	A	Jander and Brodersen
$HgBr_2$-KBr	**9**	1	A	Jander and Brodersen
$HgBr_2$-NaBr	**9**	1	A	Jander and Brodersen
$HgBr_2$-NH_4Br	**9**	1	A	Jander and Brodersen
$HgBr_2$-$PbBr_2$	**9**	1	A	Jander and Brodersen
$HgBr_2$-TlBr	**9**	1	A	Jander and Brodersen
$InBr_3$-KBr	**45**	1	A	Dudareva, Lovetskaya and Gladis
$InBr_3$-LiBr	**45**	1	A	Dudareva, Lovetskaya and Gladis
KBr-LiBr	6, 23, **25**, 137	4	A	Mehta, Lantelme and Chemla
KBr-NaBr	**6**	1	A	Zuca and Olteanu
KBr-$PbBr_2$	18, 23, **43**	3	A	Easteal and Khoo
KBr-RbBr	**6**	1	A	Zuca and Olteanu
KBr-$ScBr_3$	**33**	1	A	Fedorov, Petrov and Chudina
KBr-TlBr	**19**	1	A	Buckle and Tsaoussoglou
LiBr-NaBr	**6**	1	A	Zuca and Olteanu
LiBr-$PbBr_2$	**23**	1	A	Andryushchenko and Bergman
LiBr-RbBr	**6**	1	A	Zuca and Olteanu
NaBr-$PbBr_2$	**18**	1	A	Lantratov and Moiseeva
NaBr-RbBr	**6**	1	A	Zuca and Olteanu
NaBr-$ScBr_3$	**33**	1	A	Fedorov, Petrov and Chudina
$PbBr_2$-TlBr	**28**	1	A	Protsenko and Shatskaya
AgI-AlI_3	**135**	1	A	Izbekov and Nizhnik
AlI_3-CdI_2	**135**	1	A	Izbekov and Nizhnik
AlI_3-CuI	**135**	1	A	Izbekov and Nizhnik
AlI_3-HgI_2	**135**	1	A	Izbekov and Nizhnik
AlI_3-KI	**135**	1	A	Izbekov and Nizhnik
AlI_3-SbI_3	**135**	1	A	Izbekov and Nizhnik
CdI_2-KI	**13**	1	A	Bloom et al.
CsI-DyI_3	**109**	1	A	Kutscher and Schneider
CsI-GdI_3	**109**	1	A	Kutscher and Schneider
CsI-LaI_3	**109**	1	A	Kutscher and Schneider
CsI-LiI	**96**	1	A	Zuca and Olteanu
CsI-NdI_3	**109**	1	A	Kutscher and Schneider
DyI_3-KI	**109**	1	A	Kutscher and Schneider
GaI-GaI_3	**104**	1	A	Riebling and Erickson
GdI_3-KI	**109**	1	A	Kutscher and Schneider

TABLE 437. Specific conductance—Contunued

A: Classical ac technique
B: Modified potentiometric technique

System	Investigations critically re-examined	Total	Technique of recommended reference	Authors of recommended reference
GdI_3-NaI	**109**	1	A	Kutscher and Schneider
Hg_2I_2-HgI_2	**107**	1	A	Grantham
HgI_2-KI	**105**	1	A	Belyaev
HgI_2-NH_4I	**7,27**	2	A	Belyaev and Mironov
HgI_2-SbI_3	**127**	1	A	Mentus and Susic
KI-LaI_3	**109**	1	A	Kutscher and Schneider
KI-LiI	**96**	1	A	Zuca and Olteanu
KI-NaI	**106**	1	A	Bogacz and Zuca
KI-NdI_3	**109**	1	A	Kutscher and Schneider
KI-PbI_2	**106**	1	A	Bogacz and Zuca
KI-RbI	**6**	1	A	Zuca and Olteanu
KI-TlI	**110**	1	A	Buckle and Tsaoussoglou
LaI_3-NaI	**109**	1	A	Kutscher and Schneider
LiI-NaI	**96**	1	A	Zuca and Olteanu
LiI-RbI	**96**	1	A	Zuca and Olteanu
NaI-NdI_3	**109**	1	A	Kutscher and Schneider
NaI-RbI	**6**	1	A	Zuca and Olteanu

TABLE 438. Density

A: Archimedean method
B: Pycnometric method
C: Dilatometric method
D. Maximum bubble pressure method
E: Flotation technique
F: Method of hydrostatic weighing

System	Investigations critically re-examined	Total	Technique of recommended reference	Authors of recommended reference
AgBr-CsBr	**44**, **46**	2	A	Brooks and Paul
AgBr-KBr	8, **44**, 46	3	C	Boardman, Dorman, and Heymann
AgBr-LiBr	**44**, **46**	2	A	Brooks and Paul
AgBr-NaBr	**44**, **46**	2	A	Brooks and Paul
AgBr-RbBr	**44**, **46**	2	A	Brooks and Paul
AgBr-HgBr$_2$	**21**, 31	2	B	Gorenbein
AlBr$_3$-KBr	10, **11**, **12**, **31**	4	B	Gorenbein and Kriss
AlBr$_3$-NaBr	10, 11, **32**	3	E	Boston and Ewing
AlBr$_3$-NH$_4$Br	10, **21**	2	B	Gorenbein
AlBr$_3$-SbBr$_3$	10, **12**, 31, 59	4	B	Gorenbein
AlBr$_3$-ZnBr$_2$	10, **12**, 16	3	B	Gorenbein
BaBr$_2$-KBr	**13**	1	A	Bloom, Knaggs, Molloy, and Welch
CdBr$_2$-KBr	22, **34**, **35**, 36	4	D	Ellis
CdBr$_2$-NaBr	**36**	1	A	Lantratov and Shevlyakova
CdBr$_2$-TlBr	**38**	1	A	Il'yasov and Barsegov
CdBr$_2$-ZnBr$_2$	**24**	1	A	Markov, Prisyazhnyii, and Prikhodko
CsBr-KBr	**44**, **46**	2	A	Brooks and Paul
CsBr-LiBr	**39**	1	F	Holm
KBr-LiBr	**6**, **37**, 39	3	A	Zuca and Olteanu
KBr-NaBr	**6**, 39, 44, **46**	4	A	Zuca and Olteanu
KBr-PbBr$_2$	**17**, 36, 140	3	A	Murgulescu and Zuca
KBr-RbBr	**6**, 39	2	A	Zuca and Olteanu
KBr-TlBr	**20**	1	B	Buckle, Tsaoussoglou, and Ubbelohde
KBr-ZnBr$_2$	**100**	1	A	Bloom, Bendall, Boyd, and Laver
LiBr-NaBr	**6**, 39	2	A	Zuca and Olteanu
LiBr-RbBr	**6**, 39	2	A	Zuca and Olteanu
NaBr-PbBr$_2$	**36**	1	A	Lantratov and Moiseeva
NaBr-RbBr	**6**, 39	2	A	Zuca and Olteanu
NaBr-TlBr	**42**	1	B	Buckle and Tsaoussoglou
RbBr-TlBr	**42**	1	B	Buckle and Tsaoussoglou
AlI$_3$-HgI$_2$	**135**	1	B	Izbekov and Nizhnik
AlI$_3$-KI	**135**	1	B	Izbekov and Nizhnik
AlI$_3$-SbI$_3$	**135**	1	B	Izbekov and Nizhnik
CdI$_2$-CsI	**100**	1	A	Bloom, Bendall, Boyd, and Laver
CdI$_2$-KI	**13**	1	A	Bloom, Knaggs, Molloy, and Welch
CdI$_2$-NaI	**100**	1	A	Bloom, Bendall, Boyd, and Laver
CsI-GdI$_3$	**108**	1	C	Kutscher and Schneider
CsI-LaI$_3$	**108**	1	C	Kutscher and Schneider
CsI-LiI	**96**	1	A	Zuca and Olteanu
CsI-NdI$_3$	**108**	1	C	Kutscher and Schneider
GaI-GaI$_3$	**104**	1	C	Riebling and Erikson
GdI$_3$-KI	**108**	1	C	Kutscher and Schneider
KI-LaI$_3$	**108**	1	C	Kutscher and Schneider
KI-LiI	37, **96**	2	A	Zuca and Olteanu
KI-NaI	**106**	1	A	Bogacz and Zuca
KI-NdI$_3$	**108**	1	C	Kutscher and Schneider
KI-PdI$_2$	**106**	1	A	Bogacz and Zuca
KI-RbI	**6**	1	A	Zuca and Olteanu
KI-TlI	**53**	1	B	Buckle and Tsaoussolgou
LiI-NaI	**96**	1	A	Zuca and Olteanu
LiI-RbI	**96**	1	A	Zuca and Olteanu
NaI-NdI$_3$	**108**	1	C	Kutscher and Schneider
NaI-RbI	**6**	1	A	Zuca and Olteanu

TABLE 439. Viscosity

A: Capillary method
B: Oscillating sphere method
C: Falling body method

System	Investigations critically re-examined	Total	Technique of recommended reference	Authors of recommended reference
$AgBr$-$HgBr_2$	**9**	1	A	Jander and Brodersen
$AgBr$-KBr	**14**	1	A	Harrap and Heymann
$AlBr_3$-$HgBr_2$	**21**	1	A	Gorenbein
$AlBr_3$-KBr	10, **11**, 12	3	A	Gorenbein and Kriss
$AlBr_3$-$NaBr$	10, **11**	2	A	Gorenbein and Kriss
$AlBr_3$-NH_4Br	10, **21**	2	A	Gorenbein
$AlBr_3$-$SbBr_3$	**10**, **12**, 29	3	A	Gorenbein
$AlBr_3$-$ZnBr_2$	**10**, **12**, 16	3	A	Gorenbein
$HgBr_2$-KBr	**9**	1	A	Jander and Brodersen
$HgBr_2$-$NaBr$	**9**	1	A	Jander and Brodersen
KBr-$PbBr_2$	**17**	1	B	Murgulescu and Zuca
AgI-HgI_2	**103**	1	C	Stromberg

TABLE 440. Surface tension

A: Wilhelmy slide plate method
B: Pin detachment method
C: Maximum bubble pressure method

System	Investigations critically re-examined	Total	Technique of recommended reference	Authors of recommended reference
$AgBr$-KBr	**47**	1	C	Boardman, Palmer, and Heymann
$AgBr$-$NaBr$	**48**	1	B	Sternberg and Terzi
$BaBr_2$-$CsBr$	**15**	1	A	Bertozzi and Soldani
$BaBr_2$-KBr	**15**	1	A	Bertozzi and Soldani
$BaBr_2$-$NaBr$	**15**	1	A	Bertozzi and Soldani
$BaBr_2$-$RbBr$	**15**	1	A	Bertozzi and Soldani
$CdBr_2$-KBr	22, **34**, **35**, 50	4	C	Ellis
$CsBr$-KBr	**49**	1	A	Bertozzi
$CsBr$-$LiBr$	**51**	1	B	Berge and Holm
$CsBr$-$NaBr$	**15**	1	A	Bertozzi and Soldani
KBr-$LiBr$	**51**	1	B	Berge and Holm
KBr-$NaBr$	47, **49**, 51	3	A	Bertozzi
KBr-$RbBr$	**49**, 51	2	A	Bertozzi
$LiBr$-$NaBr$	**51**	1	B	Berge and Holm
$LiBr$-$RbBr$	**51**	1	B	Berge and Holm
$NaBr$-$RbBr$	**49**, 51	2	A	Bertozzi

No information on the surface tension of any binary iodide melt was available at the time of publication of this table.

Table 441. Recommendations

System	Recommended reference				System	Recommended reference			
	κ	ρ	η	γ		κ	ρ	η	γ
AgBr-CsBr	40	44, 46			LiBr-RbBr	6	6		51
AgBr-$HgBr_2$	9		9		NaBr-$PbBr_2$	18	36		
AgBr-KBr	14	8	14	47	NaBr-RbBr	6	6		51
AgBr-LiBr		44, 46			NaBr-$ScBr_3$	33			
AgBr-NaBr	40	44, 46		48	NaBr-TlBr		42		
AgBr-RbBr	40	44, 46			$PbBr_2$-TlBr	28			
$AlBr_3$-$CoBr_2$	31				RbBr-TlBr		42		
$AlBr_3$-$FeBr_3$	31				AgI-AlI_3	135			
$AlBr_3$-$HgBr_2$	21	21	21		AgI-HgI_2			103	
$AlBr_3$-KBr	11	11	11		AlI_3-CdI_2	135			
$AlBr_3$-$MnBr_2$	31				AlI_3-CuI	135			
$AlBr_3$-NaBr	30	32	11		AlI_3-HgI_2	135	135		
$AlBr_3$-NH_4Br	21	21	21		AlI_3-KI	135	135		
$AlBr_3$-$SbBr_3$	10, 12	12	10, 12		AlI_3-SbI_3	135	135		
$AlBr_3$-$ZnBr_2$	10, 12	12	10, 12		CdI_2-CsI		100		
$BaBr_2$-CsBr				15	CdI_2-KI	13	13		
$BaBr_2$-KBr	13	13		15	CdI_2-NaI		100		
$BaBr_2$-NaBr				15	CsI-DyI_3	109			
$BaBr_2$-RbBr				15	CsI-GdI_3	109	108		
$CdBr_2$-KBr	26	34, 35		34, 35	CsI-LaI_3	109	108		
$CdBr_2$-NaBr	26	36			CsI-LiI	96	96		
$CdBr_2$-TlBr		38			CsI-NdI_3	109	108		
$CdBr_2$-$ZnBr_2$		24			DyI_3-KI	109			
CsBr-KBr		44, 46		49	GaI-GaI_3	104	104		
CsBr-LiBr		39		51	GdI_3-KI	109	108		
CsBr-NaBr				15	GdI_3-NaI	109			
CuBr-$HgBr_2$	9				HgI_2-Hg_2I_2	107			
$HgBr_2$-KBr	9				HgI_2-KI	105			
$HgBr_2$-NaBr	9		9		HgI_2-NH_4I	27			
$HgBr_2$-NH_4Br	9				HgI_2-SbI_3	127			
$HgBr_2$-$PbBr_2$	9				KI-LaI_3	109	108		
$HgBr_2$-TlBr	9		9		KI-LiI	96	96		
$InBr_3$-KBr	45				KI-NaI	106	106		
$InBr_3$-LiBr	45				KI-NdI_3	109	108		
KBr-LiBr	25	6, 37		51	KI-PbI_2	106	106		
KBr-NaBr	6	6		49	KI-RbI	6	6		
KBr-$PbBr_2$	43	17	17		KI-TlI	110	53		
KBr-RbBr	6	6		49	LaI_3-NaI	109	96		
KBr-$ScBr_3$	33				LiI-NaI	96	96		
KBr-TlBr	19	20			LiI-RbI	96			
KBr-$ZnBr_2$		100			NaI-NdI_3	109	108		
LiBr-NaBr	6	6		51	NaI-RbI	6	6		
LiBr-$PbBr_2$	23								

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7. References

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