NATIONAL BUREAU OF STANDARDS REPORT

6484

Preliminary Report on the Thermodynamic Properties of Lithium, Beryllium, Magnesium, Aluminum and Their Compounds With Hydrogen, Oxygen, Nitrogen, Fluorine, and Chlorine

(Supplement to NBS Report 6297)

July 1, 1959

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

THE NATIONAL BUREAU OF STANDARDS

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NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT

0302-11-03419
0509-11-05513
0903-11-19430
0305-11-03496

July 1, 1959

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(Supplement to NBS Report 6297)

**Second Technical Summary Report
to the Advanced Research Projects Agency
on the Thermodynamic Properties
of Light-Element Compounds**

Reference: ARPA Order No. 20-59

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

PREFACE

The National Bureau of Standards is undertaking an experimental and theoretical investigation of the thermodynamic properties of light-element compounds. This research program presently comprises the chemical elements lithium, beryllium, magnesium, and aluminum, free and in combination with hydrogen, oxygen, nitrogen, fluorine, and/or chlorine. It has as its objective the securing of the basic information which is necessary to determine, with an accuracy of one per cent where possible, the energies and equilibrium proportions of these substances in the solid, liquid, and gaseous states in the temperature range from 0° to 6000°K and the pressure range from 0 to 100 atmospheres.

The first year's program at NBS involves nine groups -- namely, those in fluorine calorimetry, low-temperatue calorimetry, high-temperature calorimetry, statistical thermodynamics, high-temperature high-pressure phenomena, spectra, chemical preparation, thermochemistry, and thermodynamics of refractory substances. This program is a part of a broader program at the National Bureau of Standards on properties of materials at high temperatures now required in many technical and scientific fields.

The present report is divided into two parts. Part A summarizes the present status of the research program of each of the above nine groups, in terms of the accomplishments during the first nine months of the program and the plans for future work during the next fifteen months. The tentative nature of these future plans should be emphasized. Although it is likely that most of the various experimental approaches will continue as outlined, with perhaps some shifts of emphasis, there may be major changes in and additions to the actual substances on which work will be done, owing to subsequent reevaluations of where data are most urgently needed. As our program progresses, some modifications in its plans can be expected at intervals of six months or so. We feel that insofar as different laboratories in this field indicate their tentative plans, the areas where specific data will be forthcoming can be better predicted and all laboratories can better mesh their efforts.

Part B of the report is a revision and extension of our earlier report (NBS Report 6297) issued under date of last January 1. As

the table of contents suggests, some of the properties treated in that report have been modified in the light of more recently published data, whereas the treatment of other properties has been considerably expanded. This part of the present report also describes in considerable detail some of the experimental apparatus being developed at the Bureau.

The thermodynamic tables contained in this and in earlier reports will be revised periodically as new information becomes available. Since many deficiencies in the available data exist, current tables are necessarily tentative. The reader should also note the paragraph on the title page of this report concerning NBS editorial policies.

Chas W Beckett

Charles W. Beckett, Chief
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Heat Division

ABSTRACT

A second comprehensive report is presented on an extensive experimental and theoretical investigation, at the National Bureau of Standards, of the thermodynamic properties of light-element compounds. This supplements and brings up-to-date the first report (dated January 1, 1959), with further data analysis and in addition a summary for each working group of research accomplishments and tentative plans for future work.

Published data on heats of formation have been further reviewed, and values have been selected also for light-metal nitrides and carbides. The available low-temperature enthalpy data on solids and liquids have been carefully analyzed and joined smoothly to the corresponding high-temperature data. Equilibrium data for the vaporization of Al_2O_3, AlF_3, LiF, and other light-metal fluorides and chlorides are examined critically for thermodynamic consistency. Molecular constants of some aluminum-oxygen molecules are estimated from semiempirical rules. High-speed computer programs were written for solids, liquids, and gases (including polyatomic molecules), and tables of thermodynamic functions are given for almost 30 solid and liquid substances and for 65 gas species.

Experimental measurements, methods selected, and design and construction of apparatus are described in some detail. Attempts were made to prepare the hydrides of beryllium and aluminum, in preparation for measuring their heats of formation and other properties. Preliminary measurements were made of the vapor pressures of a compound between aluminum hydride and trimethylamine. Measurement of the heat of formation of $KClO_4$ was completed, and those of AlF_3, $BeCl_2$, and $LiClO_4$ are in progress. A transpiration apparatus being built to study the vaporization of halides is described, and plans to study the vaporization of the oxides of aluminum and other light metals (using an arc image furnace, a rhenium effusion cell, a Langmuir apparatus, and a mass spectrometer) are outlined. The structure of the N_2F_4 molecule was deduced from its microwave spectrum, and a new microwave spectrometer designed to operate up to 1500°K is being built. There is described in considerable detail the present design of an exploding-wire apparatus for high-temperature high-pressure measurements on light metals evaporated into atmospheres of oxygen and other gases.

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APPENDIX 2. THERMODYNAMIC FUNCTIONS OF SOLIDS AND LIQUIDS (Continued)

Table	Formula	Name	Phases	Temperature Range (°K)
2-1	Al		s & l	0-2500
2-2	Al_2O_3		s(alpha)	0-2300
2-3	$Al_2O_3 \cdot H_2O$	Boehmite	s	0-300
2-4	$Al_2O_3 \cdot 3H_2O$	Gibbsite	s	0-300
2-5	AlF_3		s(alpha & beta)	0-1550
2-6	$AlCl_3$		s & l	298.15 - 1550
2-7	Be		s & l	0-2500
2-8	BeO		s	0-2800
2-9	Mg		s & l	0-2500
2-10	MgO		s (macro)	0-3000
2-11	MgO		s (micro)	0-500
2-12	MgH_2		s	0-300
2-13	$Mg(OH)_2$		s	0-400
2-14	MgF_2		s & l	0-2500
2-15	$MgCl_2$		s & l	0-2500
2-16	$MgCl_2 \cdot H_2O$		s	0-300
2-17	$MgCl_2 \cdot 2H_2O$		s	0-300
2-18	$MgCl_2 \cdot 4H_2O$		s	0-300
2-19	$MgCl_2 \cdot 6H_2O$		s	0-300
2-20	$Mg(AlO_2)_2$		s	0-2000
2-21	Li		s & l	0-1200
2-22	Li_2O		s	0-2000
2-23	LiOH		s & l	0-2000
2-24	$LiOH \cdot H_2O$		s	0-300
2-25	LiF		s & l	0-2500
2-26	LiCl		s & l	0-2500
2-27	$LiAlO_2$		s	0-300

PART A

SUMMARY OF RESEARCH ACCOMPLISHMENTS AND PLANS FOR FUTURE WORK

INTRODUCTION

The National Bureau of Standards is undertaking an experimental and theoretical investigation of the thermodynamic properties of light-element compounds. This research program presently comprises the chemical elements lithium, beryllium, magnesium, and aluminum, free and in combination with hydrogen, oxygen, nitrogen, fluorine, and/or chlorine. It has as its objective the securing of the basic information which is necessary to determine, with an accuracy of one per cent where possible, the energies and equilibrium proportions of these substances in the solid, liquid, and gaseous states in the temperature range from 0° to 6000°K and the pressure range from 0 to 100 atmospheres.

The first year's program at NBS involves nine research groups--namely, those in fluorine calorimetry, low-temperature calorimetry, high-temperature calorimetry and vaporization of halides, statistical thermodynamics, high-temperature high-pressure phenomena, spectra, chemical preparation and purification, thermochemistry, and thermodynamics of refractory substances. This program is a part of a broader program at the National Bureau of Standards on properties of materials at high temperatures now required in many technical and scientific fields.

This NBS program of research on light-element compounds is of such a scope that maximum fruition can be expected only after a period of perhaps three years. At the present stage the status of the program can be described conveniently in terms of three periods of time:

1. Accomplishments during the first nine months (October 1, 1958, to July 1, 1959).

2. Plans for the remainder of the first year (July 1, 1959 to October 1, 1959).

3. Plans for the second year (October 1, 1959, to October 1, 1960).

The phases of research planned were (a) a literature survey to assemble and assess the data already existing, (b) the calculation of preliminary tables of thermodynamic functions, (c) an experimental program to obtain accurate new thermal data where needed, (d) a program to obtain heats of formation and relative abundances of high-temperature gaseous species through theoretical estimates and specially devised experimental studies, and (e) revisions and extensions of thermodynamic tables in the light of more recent data.

During the first three months of work almost all the research groups concentrated on the above phases (a) and (b). The results of this critical work are given in the 150-page comprehensive First Technical Summary Report (NBS Report 6297), which includes critical discussions, tables of summarized experimental and estimated values for the most important thermodynamic properties, and tables of thermodynamic functions -- comprising altogether approximately 100 chemical substances.

During the subsequent six months of work the previous lines of activity were continued on a reduced basis. One group continued the theoretical and semi-empirical estimation of experimentally elusive molecular constants, the computation of additional tables, and the development of computer codes to facilitate future data treatment. In realizing that the most serious gaps in existing data lie in the region of the highest temperatures, further treatment of existing lower-temperature thermal data was given general priority over immediate efforts to obtain new experimental data in this temperature region (phase (c)). The greatest change in activity, however, was a shift of most of the groups to a concentrated development of suitable experimental methods and the design and construction of the new apparatus, described above as phase (d) of the program. Nine months after the program began, these developments stand at various stages of completion, but owing to the time required for experimental preparations which can hope to resolve the often-serious discrepancies in the literature, new data have not yet been obtained with the exception of a microwave spectrum of one compound reported herein.

More specific information is given in the following two sections, which are entitled "The First Year of the NBS Program" and "The Second Year of the NBS Program." The varying amounts of detail with which the individual groups there describe their accomplishments and plans should not be construed as measures of their extent of participation in the overall program. In some cases, it did not seem appropriate to discuss development of techniques which are either still highly tentative or else already well-known. In other cases technical details, critical discussions and computed results are deferred to Part B of this report.

THE FIRST YEAR OF THE NBS PROGRAM

(Accomplishments October 1, 1958, to July 1, 1959;
Program Plans for July 1, 1959, to October 1, 1959)

1. Fluorine Calorimetry

The primary objective of this group is the determination of the heat of formation of aluminum fluoride by bomb calorimetry. To carry out the task requires the adaptation of well-known calorimetric methods to the combustion of metals in fluorine gas. The development of such a new technique will in itself be a significant advance in combustion calorimetry. Aside from this, the heat of formation of aluminum fluoride is at present subject to an uncertainty of about 30 kilocalories per mole. The experimental program for the measurement got underway in January, with the setting up of apparatus for electrical calibration of the calorimeter. Some preliminary calibration experiments have been made and show satisfactory performance of most components. Two bombs have been procured. One bomb of monel body, teflon gaskets and alundum insulators has materials adequate for handling fluorine and may give satisfactory performance. To rectify certain difficulties foreseen with this bomb, another bomb has been ordered, of pure nickel (A nickel, 99.4% Ni) to reduce possible difficulties from the presence of several elements in the bomb material; and having inverted construction to remove the sensitive parts of the bomb - the valves, gaskets, etc. - from the direct blast of the fluorine flame. A bomb-loading facility has been constructed, and it and the bomb are at present undergoing seasoning and other preliminary tests with fluorine. Aluminum has been obtained for the experiment in the form of notch bars of 99.99 per cent purity.

Between July 1 and October 1 it is expected that heat measurements will be made on the combustion of aluminum in fluorine. If the reaction is complete, the products homogeneous and of definite composition, and corrosion of the bomb not serious, then a rapid completion of the work on aluminum may be expected. On the other hand, it is more probable that difficulties will be encountered in one or more of the above areas of the experiment. In that event, the completion of the work on aluminum in a definitive way may require much time and will extend past October 1. A rotating bomb calorimeter is under construction and is scheduled for completion of shopwork by July.

2. Low-Temperature Calorimetry

The work during the period from October 1, 1958 to July 1, 1959 involved primarily literature survey in order to examine the status of thermodynamic data on lithium, beryllium, magnesium, aluminum, and their compounds with oxygen, hydrogen, fluorine, and chlorine. Where data were lacking, sources

of samples were investigated and samples obtained wherever available. The samples that have been obtained for possible heat-capacity measurements include BeO, $Be(OH)_2$, BeF_2, $BeCl_2$, NH_4ClO_4, $LiClO_4$, and LiH. Arrangements have been made to have $AlCl_3$ and $LiAlH_4$ specially prepared. For handling the hygroscopic materials, a special dry inert atmosphere box was ordered, the delivery of which is expected in July 1959.

Parts for assembling of a platinum container for investigating corrosive substances, such as $AlCl_3$, BeF_2, and $BeCl_2$, have been ordered. Preparations are being made to determine the heat capacity of an empty copper container for investigating non-corrosive substances.

Examination of the literature has shown that, although in many instances smoothed heat capacities and the derived thermal functions are tabulated, it is desirable to analyze the original data and obtain smoothed heat capacities at closely spaced temperature intervals for the calculation of thermal functions. In many instances it has been found that the investigators' smoothed values are not smooth to the desired degree. Much of the data contain relatively large percentage uncertainty in the heat capacity at temperatures below 100°K, as much as ± 5 per cent or more. Fortunately, these uncertainties become relatively smaller at the higher temperatures where the values of the thermal functions are larger. Detailed analyses have been made using the IBM 704 computer on the following substances: Al, Al_2O_3, $Al_2O_3 \cdot H_2O$, $Al_2O_3 \cdot 3H_2O$, AlF_3, Be, BeO, Mg, MgH_2, MgO (powder and crystals), $Mg(OH)_2$, MgF_2, $MgCl_2$, $MgCl_2 \cdot H_2O$, $MgCl_2 \cdot 2H_2O$, $MgCl_2 \cdot 4H_2O$, $MgCl_2 \cdot 6H_2O$, $MgO \cdot Al_2O_3$, Li, Li_2O, LiOH, $LiOH \cdot H_2O$, LiF, LiCl, and $Li_2O \cdot Al_2O_3$. The analyses have been so performed to join smoothly the values of heat capacity expressed by the high-temperature equations. Thermodynamic functions were derived from the smoothed heat capacities.

Between July 1 and October 1 measurements of the heat capacity of an empty container will be made and measurements on NH_4ClO_4 and BeO are planned. The platinum container and accessory parts for investigating $AlCl_3$ will be assembled.

3. High-Temperature Calorimetry and Vaporization of Halides

The vapor pressures of Al, Mg, AlF_3, MgF_2, $MgCl_2$, and LiF were examined for "Third-Law" consistency by the use of thermal functions and the best attainable estimates of degrees of vapor association. A critical analysis of all existing heat-content data on $Al_2O_3(c)$ led to a reasonable extrapolation to the melting point. Several improvements were made in the design of a new furnace for measuring heat contents of solids up to 1800°K in order to achieve greater temperature uniformity and to facilitate temperature recording. A proportional temperature control was built and tested satisfactorily. After promising feasibility studies, apparatus was designed, and is presently being constructed, for measuring by a flow method the equilibrium

between solid (or liquid) with gaseous halides up to above 1300°K. Since this experimental phase of the group's activities has not been previously described, the background and plans are outlined in considerable detail in the following paragraphs.

Elsewhere in this and in the preceding Technical Summary Report (NBS Report 6297), thermodynamic analyses of existing vapor, condensed-phase equilibrium data are presented for certain systems, such as aluminum-oxygen and aluminum-fluorine under "neutral" conditions (i.e., corresponding to ratios of the two elements equivalent to Al_2O_3 and AlF_3, respectively.) Also, estimated molecular constants are presented not only for observed simple gaseous species of these systems but also for hypothecated "mixed" molecules such as AlOF and AlF_2Cl, which contain three chemical elements. The halides and mixed halides of aluminum are expected to be important gaseous species at temperatures above approximately 1000°K, but no data of any kind appear to exist for the mixed halides, and the data on the vapor pressure of aluminum fluoride, as noted elsewhere in this report, were found to be discordant and lacking in precision.

With the goal of obtaining such data, experimental plans were made to carry out measurements of vapor, condensed-phase equilibria in the temperature range 1000° to 1500°K, with initial efforts directed to the well-known flow or "transpiration" method. The plan is to pass purified argon (with or without an additional, chemically reacting gas) over a solid or liquid compound and to determine the composition of the resulting gas mixture. A furnace has been designed and is being built, inside which vaporization equilibrium is to be established in a tube containing constrictions carefully designed to block radiation losses and minimize diffusion of condensable vapor. This tube is to be of platinum-rhodium, which would react with free metals but should be completely inert to dry halides of the light metals. The center of the tube is to be surrounded with a long thick-wall pipe of pure copper (in an inert atmosphere), with copper end guards. The very high thermal conductivity of copper will make it possible to minimize the temperature gradients and thus to reduce the uncertainty of temperature measurement and control, toward which vapor pressure is very sensitive. If measurements are later attempted at temperatures above the melting point of copper, the latter would naturally have to be replaced by a higher-melting metal such as nickel.

The sequence of materials on which measurements of effective vapor pressure are planned includes first some substance easy to handle and whose values can be readily examined for thermodynamic consistency, in order to test the apparatus. Pure aluminum fluoride and possibly also pure lithium fluoride are scheduled to be measured afterwards. If these results seem satisfactory, measurements are planned on two-component systems.

The two-component system presently planned for later study is AlF_3—$AlCl_3$. Thermodynamic calculations show that near 1300°K and up to one atmosphere pressure pure aluminum chloride vapor is very largely monomeric,

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and aluminum fluoride vapor may be also. If $AlCl_3$ vapor is passed over solid AlF_3, one can postulate the following two independent reactions in the gas phase:

$$2AlF_3 + AlCl_3 = 3AlF_2Cl$$

$$AlF_3 + 2AlCl_3 = 3AlFCl_2$$

The widely different volatilities and molal volumes of solid AlF_3 and solid $AlCl_3$ suggest that very little if any chloride may dissolve in the former; if this is so, the extent of the above reactions will strongly determine how much "extra" fluoride will evaporate in the presence of $AlCl_3$ vapor at a given temperature. In fact, it can be shown that, in principle, measurement at two different partial pressures of $AlCl_3$ vapor, with chemical analysis for any two of the three chemical elements in the resulting vapor, is sufficient to evaluate the individual equilibrium constants of both the above reactions.

Several possible major experimental difficulties can be foreseen in the above proposed scheme to obtain basic thermodynamic results:

(a) All anhydrous aluminum halides readily hydrolyze to decompose traces of moisture. A minute layer of contamination thus produced might inhibit evaporation of the halide seriously.

(b) Vapor association to any considerable extent would complicate the above simple equilibria.

(c) Appreciable solution of chloride in the solid fluoride would, if it occurred, reduce the thermodynamic activity of the latter to an extent needing evaluation.

(d) Evaporating solids, unless very compact, notoriously present difficulties in supplying to the surface of the solid the needed heat of sublimation fast enough to prevent appreciable cooling below the ambient temperature, unless the rate of evaporation is low. However, at high temperatures, heat transfer by radiation tends to compensate for poor thermal conductivity. In the present case, quantitative feasibility calculations of this effect were found favorable.

In studying some heterogeneous systems, complications such as those above present many parameters needing evaluation--so many that the unambiguous establishment of the equilibrium constant of no well-defined chemical reaction or physical process is practically feasible by conventional methods of the type discussed above. However, from a practical standpoint, even empirical data alone on the stoichiometric volatility of aluminum fluoride in the presence of varying proportions of aluminum chloride should in itself be useful information.

Projected activities of this group between July 1 and October 1 are as follows. It is planned to construct and test the new furnace for vapor-pressure measurements described above. Several temperature controls will be built and tested, and adapted to this furnace and to the existing heat-capacity furnaces. Power circuits for the new "vapor pressure" furnace also will be designed and constructed. In the heat-capacity furnace operable up to 1800°K the crucial thermocouples for measuring the sample temperature will be calibrated in place in the approximate temperature range 1100° - 1300°K. It is planned to measure then the heat capacity of crystalline aluminum oxide in this temperature range. If the results seem satisfactory, the heat capacity of magnesium oxide will be measured from 1200° to 1800°K.

4. Statistical Thermodynamics

Advances have been made since the inception of the project on the mechanized computation of thermodynamic properties of liquids, gases and solids. Computation programs for the IBM 704 have been written for:

(a) ideal gas thermal functions for atoms;

(b) ideal gas thermal functions for diatomic molecules including first and second order anharmonicity corrections;

(c) ideal gas thermal functions for the rigid rotor-harmonic oscillator approximation;

(d) thermodynamic properties of liquids and solids fitted to an empirical formula.

Tables of thermal functions have been newly computed for approximately 55 gaseous species, and for various modifications and phases of approximately 17 molecules in the condensed phase.

An expansion of the NBS Equilibrium Calculation Program for Homogeneous Phases has been outlined to permit calculations with 10 or more elements, and the inclusion of non-ideality corrections in the dense regime.

Another activity of this group prior to July 1 has been the study of spectroscopic and structural molecular constants and dissociation energies of molecules important to the program, with specific attention to the gases AlO_2H, AlOH, Al_2O, AlO, Al_2O_2, and Al_2O_3. Some attention has been given to theoretical aspects of thermodynamic property representation in terms of clusters. The application of simple models of chemical binding to empirical use has also been examined. This has included covalent and ionic binding.

Between July 1 and October 1 efforts will be directed toward the extension of computing techniques to include vapor-pressure fitting and table generation, third-law checks, etc. Tables of ideal gas thermal functions will be prepared in final form for the Third Technical Summary Report. This will include approximately 75 molecules and atoms. A special report will be written giving in full detail the new NBS Partition Function Codes to be used on the IBM 704. Instructions will be given so that these programs may be used by any group having access to an IBM 704. The survey of molecular constants and parameters is to be extended to compounds involving additional atoms progressively added in the list: N, C, P, S, Si, and Na, including their compounds with atoms already in the list in the preceding section. Empirical estimates for unobserved molecular quantities will also be made. Empirical rules for bond energy and molecular constant prediction will be studied further.

5. High-Temperature High-Pressure Phenomena

This group has had as its objective the determination, by dynamic methods, of equilibrium thermodynamic properties of selected light metal elements and their compounds at temperatures in the range 2000°- 6000°K and pressures to 100 atmospheres. No clear-cut experimental approach to a problem of this general nature has been developed. Because of its adaptability to studies of metals and its relative economy, the exploding wire method was considered to offer promise as a basic experimental technique for this research. This method involves the explosion and vaporization of a thin metal wire by a sudden discharge of electrical energy through the wire. However, to apply this method to the present problem, it is necessary to have complete mixing of the metal vapor with the surroundings after the explosion has occurred. The primary aim of the initial phase of this work, therefore, is two-fold: (1) to determine the feasibility of this method as a means for producing a homogeneous vapor of the metal or its compounds in an equilibrium, or quasi-equilibrium, state; and (2) to develop appropriate measurement techniques. The basic electrical discharge apparatus was designed, and its individual components -- consisting of condenser bank, storage cabinet, test vessel, opening for pressure transducer, electrodes, triggering circuits, etc., were either ordered commercially or submitted to the shops for construction. Part of the equipment is now being set up in the laboratory for use in preliminary experiments with aluminum wires. An intensive study has been made of a variety of high-speed optical and pulsed x-ray techniques. The Beckman and Whitley Company and the Field Emission Corporation have been retained as consultants, and the former submitted a preliminary report on June 1.

For the period from July 1 to October 1 the plans include the following: (1) completion and assembly of experimental apparatus now under construction, (2) preliminary measurement of current and voltage during the process of explosion, (3) preliminary measurement of pressure in the test vessel, (4) initiation of design and construction of spectroscopic and other optical and x-ray instrumentation for the measurement of density distribution and molecular composition in the test vessel.

6. Spectra

An investigation of the microwave spectrum of N_2F_4 has been undertaken. The spectrum has been analyzed satisfactorily and accurate moments of inertia have been obtained. The geometric structure has been established and the interatomic distances and angles have been fixed within fairly close limits. (A more detailed discussion is given in Part B, Chapter 2, of this report).

The application of microwave-spectroscopic techniques to the study of high temperature species has been considered in some detail. There appear to be many species of interest which have sufficient vapor pressure in the 800° - 1200°C range to permit microwave studies. Tests have been carried out on various waveguide designs. One design has been found which combines good microwave performance with several features which are desirable in a high temperature spectrometer. The necessary microwave equipment has been ordered, but some details remain to be worked out concerning the materials of construction and the furnace arrangement.

Between July 1 and October 1 it is hoped that the design of the high temperature microwave spectrometer can be crystallized. Orders will be placed for the remaining components and construction of the furnace and waveguide will be started.

7. Chemical Preparation and Purification

The activities of this group during the current reporting period (October 1, 1958 - July 1, 1959) can be roughly subdivided into three phases:

1. Literature survey
2. Preparation and measurements of commercially unavailable materials
3. Purification of available compounds

The activities of phase 1 had been nearly completed by January 1, 1959 and the findings were reported in the First Semi-annual Report. However, the literature survey is continuing with particular emphasis on current publications, and pertinent data are filed for appropriate use. Some of the more recent data will be incorporated elsewhere in this report.

Phase 2 deals primarily with the preparation of hydrides, particularly those of beryllium and aluminum. In keeping with the main objective of this project, viz., the accumulation of reliable thermodynamic data, it is of great importance to obtain pure samples of the materials to be measured. The two above mentioned hydrides have not as yet been prepared in sufficient

purity to make accurate measurements feasible. It will, therefore, be necessary to either develop better synthetic methods or to study systems related to the hydrides from which thermodynamic data for the pure hydrides can be estimated.

a. Beryllium hydride

At the beginning of the project, consideration was given to the idea that beryllium hydride could be synthesized by direct union of the elements under high pressures. At the same time the system Be-H_2-BeH_2 could be studied at various temperatures and pressures in a manner similar to the Mg-H_2-MgH_2 system studied at the Los Alamos Laboratory [1]. The apparatus was assembled and several trial runs were made on the magnesium hydrogen system. However, on the basis of theoretical work done at Catholic University [2] and experimental work performed at Los Alamos [3], it became apparent that, unlike magnesium hydride, the synthesis of beryllium hydride from the elements was most unlikely.

An alternate approach to the synthesis of beryllium hydride is the pyrolysis of a dialkylberyllium compound. The best results were reported for di-t-butylberyllium [4,5]. The apparatus for this synthesis has been assembled and the work will be performed as soon as adequate safety devices can be installed. The material expected from this preparation is not completely pure but preparations containing as high as 97 mole per cent BeH_2 have been reported.

b. Aluminum hydride

The simplest synthesis of aluminum hydride is by the reaction of lithium aluminum hydride and aluminum chloride [6], $3LiAlH_4 + AlCl_3 \xrightarrow{\text{ether}} 4AlH_3 + 3LiCl$. The aluminum hydride formed in this fashion precipitates out of the ether solution as a polymer. Prolonged vacuum drying of this polymer failed to remove a substantial amount of ether and the resulting material still contained about 25 per cent ether. An attempt was made to perform the above synthesis in tetrahydrofuran, which has been reported to form stable solutions of aluminum hydride [7]. This synthesis failed because lithium chloride is soluble in tetrahydrofuran and therefore cannot be separated. As it appears that the preparation of solvent-free aluminum hydride may be very difficult, an alternate approach was chosen based on the known ability of AlH_3 to form addition complexes with a number of compounds, notably amines and ethers. Among those reported the complexes with trimethylamine [8] appeared to be the most suitable because of their relatively high thermal stability. The objective of this scheme is to determine the dissociation equilibria of the complexes from which heats of dissociation can be calculated. This together with direct determination of the heat of formation of the complex would give results for the heat of formation of the AlH_3 monomer.

The synthesis of $AlH_3 \cdot 2N(CH_3)_3$ was performed essentially by the procedure described in the literature [8]. Ether solutions of $LiAlH_4$ + $AlCl_3$ were mixed in a dry box. The precipate was filtered and the ether solution transferred to a flask. This flask was removed from the box, attached to a vacuum line and frozen in liquid nitrogen. After evacuating, an excess of trimethylamine was distilled into the flask from a storage bulb. The mixture was then allowed to warm up until a clear solution resulted, subsequently cooled to -80° and the excess solvent pumped off. Later the bath was allowed to warm up to about -20° and pumping continued. Higher temperatures were avoided because of the tendency of the complexes to sublime into the vacuum line. The sample was purified by vacuum sublimation after transferring it in a dry box to a small sublimation apparatus. The sublimation proceeded readily at room temperature, the condenser being cooled with dry ice. The melting point of this material checked with that reported, 95°C.

A sample of this material was distilled into an apparatus for vapor pressure measurements which was designed according to Stock [9]. The apparatus was sealed off and immersed in a constant temperature bath. Pressure readings were taken at 5° intervals between 15° and 75°C. Actual data will not be presented at this time because they are not considered sufficiently reliable, but the preliminary results indicated that dissociation occurs and that the upper limit of the measurement may have to be about 75° because some evolution of hydrogen occurred at that temperature. It is also apparent that the scheme outlined above is greatly oversimplified because it may be impossible to attain measurements for complete dissociation into AlH_3 and NMe_3. However, it appears possible that a thorough study of the solid-vapor and perhaps solid-liquid equilibria may be performed over a limited range of temperatures and some thermodynamic data ought to be obtainable.

Phase 3 was rather inactive so far. The only attempted purification was that of aluminum chloride. The method chosen was vacuum sublimation, and analyses performed on the sublimed samples indicate that high purity can be attained.

Plans for period July 1 - October 1, 1959.

a. Beryllium hydride

It is expected that the synthesis of this material can be performed and completed. Subsequently, experiments will be conducted to study the decomposition pressure of this hydride and the beryllium hydrogen system. Samples will be subjected to various conditions of temperature and pressure and the products of the decomposition will be analyzed. A suitable high pressure apparatus is available. Analytical techniques for the $Be-H_2-BeH_2$ system are being studied.

b. Aluminum hydride

A thorough study of the system AlH_3—$N(CH_3)_3$ will be undertaken. It is hoped that isotherms for the vapor pressure vs. composition can be constructed. Also phase studies of the solid-liquid equilibria will be performed whenever feasible.

c. Purification

The purification of other materials, probably lithium aluminum hydride, may be undertaken.

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8. Thermochemistry

This group participated actively in the completion of IBM 704 computer codes for the calculation of thermodynamic properties of gaseous atoms and diatomic molecules with corrections for anharmonicity, rotational stretching, and rotation-vibration interaction. In addition similar codes correcting also for Fermi interaction were developed for the linear polyatomic molecules, and had been completed except for the elimination of minor imperfections. After a data analysis the thermodynamic functions of graphite were revised.

In the experimental calorimetry program, measurements of the heat of decomposition of $KClO_4$ were completed. Work to determine indirectly (by

solution calorimetry) the heat of formation of $LiClO_4$ was started with the construction of a calorimeter heater. Preliminary work was completed on determining the heat of formation of $BeCl_2$ by direct combination of the elements using a flow system.

Between July 1 and October 1 this group expects to perfect the computer code for polyatomic gases and to use it to compute thermal functions for compounds for which the necessary molecular data will be available. Present tables of thermal functions and heats of formation of simple gases will be revised to extend up to 6000°K and to cover more closely spaced temperatures. In addition, the group expects to complete the solution-calorimetric apparatus as well as measurements on $LiClO_4$ and $BeCl_2$ and to start measurements on the heat of formation of BeO.

9. Thermodynamics of Refractory Substances

Owing to personnel shortage this group's active participation in the program did not begin till January 1. The initial survey work was devoted primarily to a review of experimental data on the vaporization and heat of fusion of Al_2O_3, as well as additional data on MgO, BeO, and Li_2O. The aim of the initial experimental activity has been to attempt to devise new experimental techniques that would permit greater control of the chemistry of the vaporization process of alumina (Al_2O_3). Attempts to heat sapphire single crystals directly in an inductive field of up to 6-7 megacycles did not prove successful, even with extensive preheating of the sapphire. A transpiration technique has been used with a solar furnace, and has shown promise; however, the experimental variables, such as temperature and weight loss, are difficult to measure and control with precision. The use of an arc or incandescent image furnace should permit greater control, and the apparatus for such an approach has been designed. Discussions are being held with the A. D. Little Company with a view to adapting their recently available arc-image furnace for vaporization studies.

Vapor pressure data on alumina has been obtained in the past by the Knudsen method using a tungsten cell. The extent to which tungsten produces a reducing condition at high temperatures is not clearly established. Rhenium may permit the use of the method under more neutral conditions, and an apparatus for undertaking such an investigation is being constructed.

During the period from July 1 to October 1 this group's activity will be devoted towards the development of apparatus for undertaking three specific tasks:

(a) A Knudsen cell apparatus for measuring the vapor pressure of alumina,

(b) an image furnace for studying the Al_2O_3-H_2O reaction,

(c) a Langmuir-type apparatus for extending vaporization studies to temperatures well below the melting point of alumina.

THE SECOND YEAR OF THE NBS PROGRAM

(Program Plans for October 1, 1959, to October 1, 1960)

Plans for this period also are discussed group by group as above.

1. Fluorine Calorimetry

It is presently estimated that the measurement of the heat of combustion of aluminum in fluorine will be completed satisfactorily by January 1, 1960. The same type of measurements will be continued with other elements. It is considered that the decision as to the next material to be studied should partly be based upon the nature of the difficulties encountered in the combustion of aluminum. In making the decision a contributory factor will be the availability of the rotating bomb calorimeter which has been under construction. Only estimates presently exist for the heat of formation of $BeF_2(c)$. In the absence of unforeseen difficulties, the heat of formation of BeF_2 may be measured.

2. Low-Temperature Calorimetry

Heat-capacity measurements on about 5 to 6 compounds are planned. The substances that are considered include $AlCl_3$, LiCl, BeF_2, $BeCl_2$, $Be(OH)_2$, $LiAlH_4$, LiH, Li, Li_3AlF_6, and $LiClO_4$.

3. High-Temperature Calorimetry and Vaporization of Halides

Using the existing heat-capacity apparatus operable for solids and liquids up to 1800°C, it is planned to complete measurements on aluminum oxide, probably covering the temperature range 1300° - 1800°K. These measurements are planned to be followed by similar ones on one or two other solids of interest to the program, such as magnesium oxide and beryllium oxide, over the temperature range 1000° to 1800°K. It is planned also to construct a gas-flow system for the new apparatus for studying the equilibrium between vapor and condensed phases of fluorides and chlorides of the light metals by the inert-gas-flow method, then to follow the completion and testing of the apparatus with the measurement of the apparent vapor pressures of two or three substances such as aluminum and lithium fluorides, as time permits.

4. Statistical Thermodynamics

The (IBM 704) program for including the non-ideality corrections in the equilibrium calculations which was formulated in the previous year will be carried through during this year. Additional computing service and consultation will be provided to the project during the year as required.

In this group's pursuance of theoretical estimates of molecular and other thermodynamic properties of interest to the program, further revision of estimates of energies of formation and molecular constants will be made according to such newer data as will become available. Estimates of equation of state quantities and corresponding effects on thermodynamic properties for various reaction products will also be considered. Also, various special problems, some of which were examined in a preliminary way during the first year of the program, are to be considered. Such problems are:

(1) A cluster formulation of vapor pressure, including polymer molecule formation, might be carried through for various substances of interest for this project.

(2) General formulations of high temperature thermodynamic functions for diatomic molecules could be carried through in a more exact or more complete theoretical representation.

(3) Methods of approximately evaluating cluster integrals may be explored.

(4) Semi-theoretical studies of intramolecular potential functions and of relations between electronegativity and details of bond type might be made.

5. High-Temperature High-Pressure Phenomena

The program plans for the exploding wire experiment during the second contract year are directed toward a more detailed exploration of the exploding wire method as a means for obtaining equilibrium or near-equilibrium thermodynamic data of state of light elements and their compounds in the ranges of interest. The specific tasks are as follows: (1) Refinement of the techniques for making measurements of voltage and current, and of pressure and perhaps shock velocity in the test vessel. (2) Initiation of preliminary time-resolved spectroscopic and other optical measurements for the purpose of obtaining data on the thermodynamic state of the system in the test vessel. (3) Determination of the equation of state for the aluminum-oxygen system in the experimental ranges referred to previously, if the results up to item (2) above should be promising.

6. Spectra

The high temperature microwave spectrograph will be assembled, and sensitivity and resolution tests will be run at room temperature. The performance at high temperature will be tested on compounds whose spectra are known, such as the alkali halides. If the performance is satisfactory, the

first problems to be undertaken will probably involve the aluminum halides. An effort will be made to observe the spectra of AlF and AlCl. Mixed systems will also be studied in the hope of detecting species such as AlF_2Cl and $AlFCl_2$. If these experiments are successful, they will be extended to the analogous Be and Mg compounds.

7. Chemical Preparation and Purification

Plans for the next project year are difficult to outline at this time because an increasing amount of this group's activities may be in the nature of service to other groups, such as purification of samples for thermodynamic measurements. Such activities will be greatly governed by current needs. However, it is anticipated that independent phase and decomposition studies will be continued and may be extended to other systems of pertinent interest.

8. Thermochemistry

The calculation program will be devoted mainly to the computation of thermal functions for various gaseous compounds of the N-H-O system, as N_2O, NO_2, NH_3, etc. Revisions will also be made in the tables of data on heats of formation previously issued as new data warrant. The experimental program will be directed to measurements of the heats of formation of BeO and Be_3N_2 -- by direct combination if possible -- and the heats and free energies of dehydration of $Be(OH)_2$. Measurement of the heats of formation of AlH_3 or its addition compounds will also be made. Heat of combustion techniques will be employed when possible, but other procedures may have to be used, depending on the chemical nature of the materials to be studied.

9. Thermodynamics of Refractory Substances

Present plans for the period envisage a continuation of present activity to study the vaporization of Al_2O_3 under neutral and aqueous conditions. The major problem in undertaking these investigations is the development of the experimental technique. It is anticipated that with the solution of this problem extension of the activities to consider the vaporization of BeO, MgO, and Li_2O will be feasible during the period.

PART B

THERMODYNAMIC PROPERTIES OF LIGHT-ELEMENT COMPOUNDS

Chapter 1

THERMAL PROPERTIES OF SOLIDS AND LIQUIDS

Analysis of Low-Temperature Data: George T. Furukawa, Martin L. Reilly, and Jeanette M. Henning

High-Temperature Data: Thomas B. Douglas, Andrew C. Victor, and Adrienne R. Beaudoin

The preliminary report (National Bureau of Standards Report No. 6297) on the low-temperature heat-capacity phase of the survey of literature data contained values of heat capacity, entropy, and enthalpy function at 298.15°K taken in general from a single experimental work considered to be best. The selection was based on the analysis of a large scale plot of the heat-capacity data in the range 0° to about 400°K. In those instances where the investigator did not evaluate the thermal properties from his heat-capacity data, the values of the entropy were taken from the compilations given in the Bureau of Mines Bulletin 477 (K. K. Kelley, Contributions to the Data on Theoretical Metallurgy. XI. Entropies of Inorganic Substances. Revision (1948) of Data and Methods of Calculation, 1950) or in the National Bureau of Standards Circular 500 (F. D. Rossini, D. D. Wagman, W. H. Evans, S. Levine, and I. Jaffe; Selected Values of Chemical Thermodynamic Properties, February, 1952).

The evaluation of the enthalpy function relative to absolute zero of temperature involves the time-consuming task of obtaining smoothed heat capacities at equally and closely spaced intervals. Therefore, the preliminary report did not contain the enthalpy function whenever this property was not given in the original work or the substance was not yet reported in the Series III of the National Bureau of Standards' Selected Values of Chemical Thermodynamic Properties which are available at present in loose-leaf form.

This report contains the results of a rather extensive and critical analysis of the heat capacity and enthalpy data, as prepared with the aid of the IBM 704 computer. Selected heat-capacity and relative enthalpy data from about 10° to 500°K were examined and fitted to several overlapping polynomials by the method of least squares. The analysis included the observed experimental values as well as the author's smoothed values whenever both were available. The polynomials were evaluated at one- or five-degree intervals, depending upon the curvature of the heat capacity, then matched and joined at temperatures at which the heat capacities and their first and second derivatives were in best agreement.

These values were then smoothed by multiple-point least square methods along with extrapolated values below 10 or 50°K which had been computed on a desk calculator. Smoothed values of heat capacity were assembled at five-degree intervals and applied to the standard thermodynamic relations to obtain enthalpy, enthalpy function, entropy, Gibbs free energy, and Gibbs free energy function by numerical integration on the IBM 704 computer using four-point Lagrangian integration coefficients.

In the integration process, the values of heat capacity at one-degree intervals were obtained by fitting a cubic equation to the values of Einstein Θ corresponding to the four values of smoothed heat capacity at 5°, 10°, 15° and 20°K. The cubic equation was used in turn to evaluate Einstein Θ's and subsequently the values of heat capacity at one-degree intervals from 0° to 22°K. These were then used in the numerical integration between 0° and 20°K. Above 20°K, the integrations were done at five-degree intervals.

Analysis of the values of heat capacity included, whenever available, those values up to 500°K derived from the high-temperature enthalpy measurements. This facilitated smooth joining of low-temperature with high-temperature values expressed in equation form. In this compilation, the high-temperature enthalpy equations used were those given in the National Bureau of Standards Report No. 6297.

In the process of analysis the results from the upper end of the low-temperature measurements and the lower end of the high-temperature measurements were altered in an amount dependent upon the discrepancy of the two measurements. The evaluation of the high-temperature thermodynamic properties from the enthalpy equation was begun at a temperature at which the low-temperature analysis joined smoothly. The temperatures of "smooth joining" were not the same for all substances treated. Wherever applicable, this temperature of "smooth joining" is given along with the high-temperature heat-capacity equation derived from the enthalpy equation in the discussion dealing with each substance.

The entropies at 298.15°K obtained by means of the method described are collated in table 1 with those values obtained by other compilers. Except in the cases of the magnesium chloride hydrates, wherever the compilation is based on low-temperature heat-capacity data, the results obtained by different compilers do not vary significantly from each other. The relatively higher values of entropy obtained in this compilation for the magnesium chloride hydrates arise from the difference in methods of extrapolation below 50°K. In this compilation, the ratio of the sum of the heat capacities of anhydrous magnesium chloride and crystalline water to that of the magnesium chloride hydrate below the experimental range was taken to be the same as that in the lower experimental range. Earlier compilers have based their extrapolation on the relation: $C_p = (A + BT)\ C_p^o$, where C_p is the heat capacity of the magnesium chloride hydrate under consideration and C_p^o is the heat capacity of the anhydrous magnesium chloride. The constants A and B were determined from two experimentally

observed heat capacities. The large difference in entropy obtained in the two methods of analysis suggests that measurements should be made to lower temperatures, especially where large values of entropy are involved.

The values of entropy based on the heat and free energy of formation as given by earlier compilers are in general higher than the values of this compilation based on low-temperature heat-capacity data. The latter data were not available at the time of the earlier compilations.

The discussions concerning the low-temperature heat-capacity data have been separated into four groups--those containing aluminum, beryllium, magnesium, and lithium. Substances containing two of these metallic elements have been placed in the more basic group. The substances within each group are discussed separately. Included are listings of chronologically-ordered low-temperature heat measurements with their respective references and temperature ranges. The chemical and physical nature of the material, wherever known, is given. The estimate of uncertainty in the results of the low-temperature phase of compilation is given in table 1 in terms of the uncertainty in the entropy at 298.15°K. The insignificant zero is given in the estimate of uncertainty to comply with the number of figures given in the tables in the Appendix at the end of this report. Included in the discussions of each substance are any revisions of statements or values that are to be made in the high-temperature enthalpy chapter of NBS Report 6297.

TABLE 1. Comparison of the Entropy at 298.15°K obtained by Different Compilers of Substances in the Crystalline State (Units: cal/deg mole = e. u.)

Substance	Kelley [29]	NBS C-500 [49]	Sinke [59]	This Work
Al	6.77 ± 0.02	6.769	6.77	6.777 ± 0.020
α - Al_2O_3	12.5 ± 0.15	12.186	12.16	12.174 ± 0.020
α - $Al_2O_3 \cdot H_2O$	23.15 ± 0.10	23.15	---	23.281 ± 0.200
α - $Al_2O_3 \cdot 3H_2O$	33.5 ± 0.2	33.51	---	33.712 ± 0.200
AlF_3	---	23.	15.89	15.881 ± 0.100[a]
$AlCl_3$	---	40.	---	---
Be	2.28 ± 0.02	2.28	2.28	2.282 ± 0.020
BeO	3.37 ± 0.02	3.37	3.37	3.376 ± 0.050
Mg	7.77 ± 0.05	7.77	7.81	7.800 ± 0.050
MgH_2	---	---	---	7.498 ± 0.100[b]
MgO (Microcrystals)	6.55 ± 0.15 (Average of micro - and macrocrystals)	6.66	6.55 (Probably an average of micro - and macrocrystals)	6.669 ± 0.050
MgO (Macrocrystals)		6.4		6.439 ± 0.020
$Mg(OH)_2$	15.09 ± 0.05	15.09	---	15.097 ± 0.050

TABLE 1 (continued). Comparison of the Entropy at 298.15°K by Different Compilers of Substances in the Crystalline State(Units: cal/deg mole = e. u.)

Substance	Kelley [29]	NBS C-500 [49]	Sinke [59]	This Work
MgF_2	13.68 ± 0.07	13.68	13.68	13.687 ± 0.070
$MgCl_2$	21.4 ± 0.2	21.4	21.40	21.409 ± 0.200
$MgCl_2 \cdot H_2O$	32.8 ± 0.5	32.8	---	33.111 ± 0.600
$MgCl_2 \cdot 2H_2O$	43.0 ± 0.5	43.0	---	43.599 ± 0.800
$MgCl_2 \cdot 4H_2O$	63.1 ± 0.7	63.1	---	64.094 ± 1.300
$MgCl_2 \cdot 6H_2O$	87.5 ± 1.0	87.5	---	88.825 ± 1.800
Mg(OH)Cl	---	19.8	---	---
$MgO \cdot Al_2O_3$	---	---	---	19.268 ± 0.100[c]

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TABLE 1 (Continued). Comparison of the Entropy at 298.15°K by Different Compilers of Substances in the Crystalline State (Units: cal/deg mole = e. u.)

Substance	Kelley [29]	NBS C-500 [49]	Sinke [59]	This Work
Li	6.70 ± 0.06	6.70	6.75	6.777 ± 0.070[d]
LiH	5.9 ± 0.5	5.9	---	---
Li_2O	---	---	9.06	8.978 ± 0.080[e]
LiOH	12.8 ± 1.0	12.	---	10.232 ± 0.050[f]
$LiOH \cdot H_2O$	---	22.	---	17.020 ± 0.070[f]
LiF	8.32 ± 0.08	8.57	8.52	8.517 ± 0.080
LiCl	13.9 ± 0.5	---	13.90	12.322 ± 0.500
$LiCl \cdot H_2O$	---	24.8	---	---
$LiAlO_2$	---	---	---	12.742 ± 0.100[g]

[a] King [35] gives 15.89 ± 0.08 e. u. for AlF_3.
[b] Stull and colleagues [58] give 7.49 ± 0.10 e. u. for MgH_2.
[c] King [33] gives 19.26 ± 0.10 e. u. for $MgO \cdot Al_2O_3$.
[d] Evans et al [15] give 6.753 e. u. for Li.
[e] Johnston and Bauer [26] give 9.056 e. u. for Li_2O.
[f] Bauer et al [2] give 10.231 e. u. for LiOH and 17.073 e. u. for $LiOH \cdot H_2O$.
[g] King [34] gives 12.7 ± 0.1 e. u. for $LiAlO_2$.

As stated earlier, in the case of nearly every substance for which thermodynamic functions are given at the end of this report at both "low" and "high" temperatures, a temperature was chosen at which the "low-temperature" and "high-temperature" functions join smoothly. In every such case the functions in the higher temperature region were derived analytically from empirical equations representing the relative enthalpy. With a few exceptions noted in the present chapter under the discussion of specific substances, the enthalpy equations in table 1, Chapter III, of the earlier NBS Report 6297 were used. In addition, for Li(c), Li(l), and LiF(c) enthalpy equations were taken from the respective NBS papers referenced in the earlier report. For these two substances that report gave only abbreviated tables of thermodynamic functions, which, however, had originally been computed from these same equations.

All high-temperature relative-enthalpy equations used are represented by the general equation (T = °K)

$$H^\circ - H^\circ_{298.15} = AT + BT^2 + CT^{-1} + D \log_{10} T + E + FT^3 + GT^4. \qquad (1)$$

In the temperature region in which equation (1) can be considered applicable, any one of the six thermodynamic functions tabulated in the present report can then be represented by a general equation of the form

$$X = A'T^{-2} + B'T^{-1} + C' + D'T + E'T^2 + F'T^3 + K'T^4 + G'T^{-1} \log_{10} T + H' \log_{10} T + P'T \log_{10} T, \qquad (2)$$

where X represents the function in question. An IBM 704 computer code had been written to evaluate equation (2) at designated temperatures. For each thermodynamic function of each phase of each substance so computed, the coefficients of equation (2) were first evaluated from those of equation (1) and the two additional constants required to give the proper continuity in entropy (or Gibbs free energy) and enthalpy with the table at lower temperatures.

It may be noted that for many substances the tables of condensed-phase functions at the end of this report are not exactly consistent with the relative-enthalpy equations to as low temperatures as the respective lower limits of applicability tabulated in Chapter III of NBS Report 6297. In causing these discrepancies the more recent data-analysis and smoothing discussed above have led to what are believed to be more reliable thermodynamic functions in the region near room temperature.

Various facts were taken into consideration in deciding on how high a temperature to tabulate the thermodynamic functions of each condensed phase. In some cases the tables extend to much higher temperatures than the available measurements on which they are based. In most such cases the extrapolated heat capacities seem to vary with temperature in a plausible fashion, though no effort was made to make adjustments in line with theoretical or semi-empirical expectations. It was felt that in the absence of actual data such extrapolated portions of tables would be useful for thermodynamic estimation of properties depending on other parameters introducing greater uncertainties than the heat capacity, though it should be duly recognized that an extrapolation by 1000 degrees or so must lead to very considerable uncertainties.

It was aimed not to tabulate functions of a solid above its melting point, even though this may have occurred in a few cases such as Li_2O where no reliable melting point seems available. In one case (liquid lithium) the table was terminated near the highest temperature of measurement because the multi-term empirical equation which had been derived to fit the data does not extrapolate to a heat capacity, temperature relation which behaves in a plausible fashion. In three cases (solid $Al_2O_3 \cdot H_2O$, $Al_2O_3 \cdot 3H_2O$, and $Mg(OH)_2$) the heat capacity has been measured at several hundred degrees above room temperature, but the tables were carried to no higher temperatures than covered by the low-temperature heat-capacity measurements. In these latter three cases the heat capacities measured by high-temperature methods disagreed considerably from the low-temperature results, and, in view of the strong possibility that the high-temperature data were invalidated by chemical decomposition, they were ignored.

The unit of energy used in this compilation is the defined calorie (4.1840 abs j = 1 cal). All temperatures are in degrees Kelvin unless otherwise indicated.

Aluminum, Al, 26.98

Low-temperature measurements of the heat capacity of aluminum have been published by Nernst [44] (32° to 88°), Nernst and Schwers [45] (19° to 79°), Griffiths and Griffiths [21, 22] (158° to 371°), Maier and Anderson [39] (54° to 296°), Kok and Keesom [36] (1° to 20°), and Giauque and Meads [18] (15° to 302°). The data reported by Kok and Keesom [36] on a sample of 99.7 percent purity and Giauque and Meads [18] on a single-crystal sample of 99.944 percent purity were selected for analysis. The values of heat capacity in the range below about 20°K were evaluated using the Debye heat-capacity function in which the Θ's were calculated from an equation fitted to the Θ's obtained from experimental values. The heat-capacity values from Kelley's high-temperature equation $C_p = 4.94 + 2.96 \times 10^{-3}T$ cal/deg mole [28], were included in the analysis and joined smoothly at 450°K with the lower-temperature values.

Aluminum Oxide, Al_2O_3, 101.96

Parks and Kelley [47] (91° to 291°); Simon and Swain [55] (30° to 280°); Kerr, Johnston, and Hallett [32] (20° to 295°); Furukawa, Douglas, McCoskey, and Ginnings [16] (13° to 1170°); and Morrison and Patterson [42] (78° to 270°) have published measurements on sapphire (α-Al_2O_3). The measurements by Parks and Kelley were on natural sapphire, while those by others were on synthetic materials. The results reported by Furukawa, Douglas, McCoskey, and Ginnings were selected for the analysis, equation 5 of NBS Report 6297 (p. 26) being used up to 2300°K.

Measurements of the enthalpy of α-Al_2O_3 from 100° to 2600°K by L. Terebesi (Helv. Chim. Acta 17, 804 (1934)) were found since the issuance of the NBS Report No. 6297. The melting point is given as 2320°K, with a heat of fusion of 6000 cal/mole. The values of enthalpy reported agree generally within ±3 percent of the values up to 1800°K that were accepted and they may retain the same accuracy up to the melting point. There is, however, some question whether his values of the melting point, the heat of fusion, and the heat capacity of the liquid are based on experimental measurements.

Aluminum Oxide Monohydrate, $Al_2O_3 \cdot H_2O$ (Böhmite?), 119.976

Shomate and Cook [53] (52° to 296°) (See also analysis on $Al_2O_3 \cdot 3H_2O$) determined the heat capacity of a sample prepared by heating α-alumina trihydrate, $Al_2O_3 \cdot 3H_2O$, at 220°C for three days. They found the sample to contain 100.12 percent of the theoretical Al_2O_3 and, from the X-ray examinations, to be similar in structure to Bayerite (β-$Al_2O_3 \cdot 3H_2O$). The values below about 50°K, the lower limit of their measurements, were evaluated from the Debye heat-capacity function in which the Θ's were obtained by graphical extrapolation of experimental values of Θ.

Shomate and Cook [53] (298.15° to 520°) reported high-temperature enthalpy measurements in the same paper as their low-temperature measurements. The results deviate considerably from each other because of the loss of water during the high-temperature measurements. The two measurements could not be successfully joined without excessive alteration of the original values. For this compilation, the two measurements were not joined.

Aluminum Oxide Trihydrate, $Al_2O_3 \cdot 3H_2O$ (Gibbsite), 156.008

Shomate and Cook [53] (52° to 297°) (See also analysis on $Al_2O_3 \cdot H_2O$) measured the heat capacity of a sample prepared by dissolving aluminum wire in potassium hydroxide. They found the material to have 100.41 per cent of the theoretical Al_2O_3 and, from X-ray examinations, to have the structure of Gibbsite (α-$Al_2O_3 \cdot 3H_2O$). The values below about 50°K, the lower limit of their measurements, were calculated using the Debye heat-capacity function in which the Θ's were obtained by graphical extrapolation of experimental values of Θ.

Shomate and Cook [53] (298.15° to 425°) reported high-temperature enthalpy measurements on $Al_2O_3 \cdot 3H_2O$ in the same paper as their low-temperature measurements. The results are not in agreement because of the loss of water during the high-temperature measurements. The two measurements were not joined in this compilation.

Aluminum Fluoride, AlF_3, 83.98

King [35] (53° to 296°) reported measurements on a sample prepared by vacuum sublimation and analyzed to have 99.97 percent of the theoretical aluminum. The heat-capacity values below about 50°K were calculated using the sums of Debye and Einstein heat-capacity functions given by King [35]. The low-temperature heat-capacity values were joined smoothly with those values derived from the high-temperature enthalpy measurements reported by O'Brien and Kelley [46] (300° to 1400°). The high-temperature heat-capacity equation $C_p = 17.27 + 10.96 \times 10^{-3}T - 2.30 \times 10^{-5}/T^2$ cal./deg mole. joins smoothly with the lower temperature values at 475°K.

Beryllium, Be, 9.013

Measurements have been reported by Simon and Ruhemann [54] (71° to 79°); Lewis [37] (97° to 463°); Cristescu and Simon [9] (10° to 300°); Ginnings, Douglas, and Ball [20] (0° to 900°C); and Hill and Smith [25] (4° to 300°). The values reported by the latter two groups of investigators were combined and analyzed. Hill and Smith [25] studied a beryllium sample of 99.5 percent purity, while Ginnings, Douglas and Ball [20] studied two samples both 99.5 percent pure. One contained 0.3 percent oxygen, 0.1 percent water, and 0.3 percent of various metallic impurities. The second sample contained 0.4 percent of magnesium and 0.1 percent of other metallic impurities. The first sample was essentially free of magnesium.

The heat-capacity values below about 20°K were obtained from the relation: $C_V = C_p = 5.4 \times 10^{-5} T + 464 (T/1160)^3$ cal/deg mole, given by Hill and Smith [25]. Results of the analysis showed that the values of heat capacity in the range 550° to 1150°K are almost linear with the slope 0.002 or 0.003 cal/deg mole/deg. Values of heat capacity up to the melting point (1556°K) were obtained by extrapolating linearly using the slope at 1150°K.

Beryllium Oxide, BeO, 25.013

Measurements by Günther [23] (76° to 85°) and Kelley [27] (55° to 292°) differ widely. Victor and Douglas [61] (0° to 900°C) made measurements of the enthalpy relative to 0°C up to 900°C. The data obtained by Kelley [27] and Victor and Douglas [61] were analyzed. The values of heat capacity below about 50°K, the lower limit of Kelley's measurements, were obtained

by means of the relation $C_V = C_P = 7.87 \times 10^{-7} T^3$ cal/deg mole given by Kelley [27]. The low temperature values join smoothly at 400°K with the high-temperature heat-capacity values given by the equations $C_P = 14.088 + 9.756 \times 10^{-5} T - 2409.8/T - 0.4235 T \exp(-0.01842T) + 138.7 \exp(-0.01842T)$ cal/deg mole derived from the enthalpy equation obtained by Victor and Douglas [61].

Magnesium, Mg, 24.32

Measurements have been reported by Nernst and Schwers [45] (27° to 94°); Eastman and Rodebush [13] (75° to 289°); Clusius and Vaughen [7] (11° to 228°); Estermann, Friedberg, and Goldman [14] (1.8° to 4.2°); Craig, Krier, Coffer, Bates, and Wallace [8] (12° to 320°); Smith [57] (1° to 20°); Logan, Clement, and Jeffers [38] (3° to 13°); and Saba, Sterrett, Craig, and Wallace [50] (20° to 270°C). The analysis was based primarily on the data reported since Clusius and Vaughen [7]. The low-temperature values were combined and joined smoothly at 475°K with the values given by the high-temperature heat-capacity equation $C_P = 4.689 + 3.436 \times 10^{-3} T + 2.0776 \times 10^{4}/T^2$ cal/deg mole derived from the enthalpy equation 18 given in NBS Report No. 6297.

Enthalpy equations 18 and 19 of NBS Report No. 6297 give 2127 cal/mole instead of 2140 cal/mole given for the heat of fusion at the melting point of 923°K.

Magnesium Hydride, MgH_2, 26.336

Stull and colleagues [58] (25° to 300°) determined the heat capacity of a sample containing approximately seven percent free magnesium metal. Since the entropies of magnesium metal and magnesium hydride are closely the same, Stull and colleagues did not correct for the free metal. Their smoothed values of heat capacity were fitted directly to polynomial equations. The values below the experimental range were obtained by extrapolation using a $C_V = C_P = AT + BT^3$ type equation fitted to the experimental values between 25° and 40°K.

Magnesium Oxide, MgO, 40.32

Günther [23] (21° to 83°), Parks and Kelley [47] (94° to 291°), Giauque and Archibald [17] (20° to 301°), and Barron, Berg, and Morrison [1] (10° to 270°) measured the heat capacity. Giauque and Archibald [17] investigated finely divided MgO prepared by dehydrating $Mg(OH)_2$. The other investigators measured fused samples. Values of the heat capacity of the substance in the two physical states are significantly different. The data were analyzed separately and thermal properties were obtained for micro- and macrocrystalline states of MgO. Values of the heat capacity of MgO powder below 20°K and above 300°K were obtained by extrapolating polynomials fitted to experimental values. For the MgO crystal, the values below 10°K were obtained graphically by extrapolating a C/T^3 versus T plot; the values above 300°K were obtained by analyzing the measurements by Victor and Douglas [62] (0° to 900°C) in which the derived heat-capacity equation is

given by $C_P = 13.7146 - 4.494 \times 10^{-5} T - 1418.9/T$ cal/deg mole. The equation joins smoothly with the values of the analysis at 450°K.

The enthalpy equation 21 of NBS Report No. 6297 from which the above heat-capacity equation was derived may be extended from 1200° to 2100°K with an uncertainty of ±2%.

Magnesium Hydroxide, $Mg(OH)_2$, 58.336

Giauque and Archibald [17] (22° to 321°) measured the heat capacity of $Mg(OH)_2$ crystals (average diameter of 0.2 mm) prepared by treating magnesium chloride solution with potassium hydroxide. Values of the heat capacity below their experimental range were obtained by extrapolating a polynomial fitted to the experimental values. Since the dissociation pressure of water is known to be about 20 mm at 463°K [17], no attempt was made to join the results of low-temperature measurements with those of high-temperature heat-content measurements.

Magnesium Fluoride, MgF_2, 62.32

Todd [60] (54° to 297°) measured the heat capacity of a sample prepared by treating MgO with hydrofluoric acid (48% HF) and drying at 400°C. The material was found to contain 99.87 percent of theoretical magnesium. From about 50°K to 15°K the Debye and Einstein combined heat-capacity function given by Todd [60] was used to extrapolate below the experimental range. Below 15°K, a $C = AT^3$ type equation was fitted to the values at higher temperatures for extrapolation. The results of the enthalpy measurements reported by Naylor [43] (300° to 1760°) were combined with the low-temperature data and analyzed. The values from the analysis join smoothly at 450°K with the high-temperature heat-capacity equation $C_P = 17.125 + 2.378 \times 10^{-3} T - 2.7996 \times 10^{-5}/T^2$ cal/deg mole derived from the enthalpy equation 23 given in NBS Report No. 6297.

In NBS Report No. 6297, the enthalpy equation 23 is indicated to have been reported by Naylor [43]. The equation given was derived after modifying Naylor's equation to obtain better fit with the low-temperature data. Equation 25, however, was reported by Naylor. Equations 23 and 25 yield for the heat of fusion of MgF_2 at the melting point of 1536°K, the value 13.98 ±0.1 kcal/mole.

Magnesium Chloride, $MgCl_2$, 95.234

Kelley and Moore [30] (53° to 295°) measured the heat capacity of a sample prepared by treating magnesium-ammonium chloride hexahydrate with dry HCl up to temperatures of 600°C. The analysis of the product was 100.78 and 99.72 percent of the theoretical magnesium and chlorine, respectively.

MgO was estimated to be present to the extent of 0.2 percent and corrections were applied for this impurity in the heat-capacity results. The values of heat capacity reported by Kelley and Moore [30] were analyzed along with those derived from high-temperature enthalpy measurements obtained by Moore [41] (298.15° to 1430°) in which the heat capacity is given by $C_p = 18.90 + 1.42 \times 10^{-3} T - 2.06 \times 10^5/T^2$ cal/deg mole. The equation joins smoothly with the values of the analysis at 475°K.

Magnesium Chloride Monohydrate, $MgCl_2 \cdot H_2O$, 113.250

Kelley and Moore [31] (53° to 298°) measured the heat capacity of the monohydrate of $MgCl_2$ prepared by heating for 16 hours at 120° to 140°C a degassed and sealed stoichiometric mixture of dihydrated and anhydrous magnesium chloride. The material contained 100.47 and 99.71 percent of the theoretical Mg and Cl, respectively. The estimate of the MgO content was reported to be 0.14 percent. In the range 50° to 120°K, the ratios of the combined heat capacity of $MgCl_2$ and crystalline water [19] to the observed heat capacity of $MgCl_2 \cdot H_2O$ were found to be fairly constant. The values below 50°K were extrapolated by combining the heat capacity of $MgCl_2$ and crystalline water and multiplying by the average ratio obtained from the experimental values in the range 50° to 120°K.

Magnesium Chloride Dihydrate, $MgCl_2 \cdot 2H_2O$, 131.266

Kelley and Moore [31] (54° to 295°) determined the heat capacity of magnesium chloride-dihydrate prepared by dehydrating a previously prepared sample of tetrahydrate in a stream of dry HCl at 170° to 220°C. When the sample was analyzed to be slightly deficient in water, it was degassed and sealed with a necessary amount of water and "aged" by heating at about 103°C for seven hours. The product was found to have 100.49 and 100.02 percent of the theoretical Mg and Cl, respectively. The values of heat capacity below about 50°K were obtained by a combination of the heat capacities of $MgCl_2$ and crystalline water described in the section on $MgCl_2 \cdot H_2O$.

Magnesium Chloride Tetrahydrate, $MgCl_2 \cdot 4H_2O$, 167.298

Kelley and Moore [31] (54° to 296°) measured the heat capacity of the tetrahydrate of $MgCl_2$ prepared by heating the hexahydrate in air in an oven at 100° to 103°C for six days. The product was found to be 100.48 and 100.00 percent of the theoretical Mg and Cl, respectively. The values of heat capacity below about 50°K were obtained by a combination of the heat capacities of $MgCl_2$ and crystalline water described in the section on $MgCl_2 \cdot H_2O$.

Magnesium Chloride Hexahydrate, $MgCl_2 \cdot 6H_2O$, 203.330

Kelley and Moore [31] (54° to 296°) measured the heat capacity of the hexahydrate of $MgCl_2$ prepared from a reagent-grade material. The excess water that was present was removed by storing over 80 percent sulfuric acid at room temperature for seven days. The product was found to contain 100.75 and 99.80 percent of the theoretical Mg and Cl, respectively. The values of the heat capacity below about 50°K were obtained by a combination of the heat capacities of $MgCl_2$ and crystalline water described in the section on $MgCl_2 \cdot H_2O$. In the hexahydrate of $MgCl_2$ a small transition was observed at about 136°K which was not observed with the other hydrates of $MgCl_2$.

Magnesium Aluminate, $MgO \cdot Al_2O_3$, 142.280

King [33] (53° to 296°) measured the heat capacity of $MgO \cdot Al_2O_3$ prepared by heating for periods totaling 15 hours at 1480° to 1500°C a stoichiometric mixture of reagent-grade magnesia and pure hydrated alumina. The analysis of the product showed 99.96 and 99.94 percent theoretical MgO and Al_2O_3, respectively. Values of heat capacity reported by King [33] were analyzed along with the high-temperature enthalpy measurements reported by Bonnickson [3] (298.15° to 1800°) on the same sample.

Lithium, Li, 6.940

Measurements of the low-temperature heat capacity have been published by Simon and Swain [55] (15° to 300°) and Roberts [48] (1.5° to 20°). The results obtained by Simon and Swain [55] do not show continuity with the more recent heat-capacity values derived from the enthalpy measurements in the range 0° to 900°C by Douglas, Epstein, Dever, and Howland [11]. The values of Al_2O_3 given in the same paper by Simon and Swain [55] deviate in a similar manner from the values on Al_2O_3 reported by Furukawa, Douglas, McCoskey, and Ginnings [16]. In view of the lack of any other data, the values at the corresponding temperatures of heat capacity of lithium reported by Simon and Swain [55] were converted by the ratio of their values of heat capacity of Al_2O_3 to values reported by Furukawa, Douglas, McCoskey, and Ginnings [16]. These converted values were analyzed along with the results obtained by Douglas, Epstein, Dever, and Howland [11] and joined smoothly at 350°K.

Lithium Oxide, Li_2O, 29.880

Measurements of the low-temperature heat capacity have been reported by Johnston and Bauer [26] (17° to 299°) on a sample prepared by heating purified crystals of $LiOH \cdot H_2O$ up to temperatures as high as 1300°C. On the bases of titration with hydrochloric acid and of spectroscopic analysis, the sample was reported to be 99.74 percent Li_2O and 0.26 percent CaO.

The values of the heat capacity obtained by Johnston and Bauer [26] were found to be continuous with those derived from the enthalpy measurements reported by Shomate and Cohen [52] (300° to 1045°). The low-temperature heat-capacity values were joined smoothly at 450°K with the high-temperature heat-capacity equation:
$C_p = 14.939 + 0.00608\ T - 3.38 \times 10^5/T^2$ cal/deg mole derived from the enthalpy equation 32.

Lithium Hydroxide, LiOH, 23.948

Bauer, Johnston, and Kerr [2] (15° to 303°) measured the heat capacity of LiOH prepared by heating purified crystals of $LiOH \cdot H_2O$ at 150°C in a stream of CO_2- free air. Titration with hydrochloric acid showed the purity to be 99.9 ±0.2 percent. Shomate and Cohen [52] (300° to 880°) made enthalpy measurements on a sample of LiOH prepared by dissolving pure lithium metal in distilled water and treating the $LiOH \cdot H_2O$ crystals, obtained through removal of water by pumping, in a manner similar to Bauer, Johnston, and Kerr [2]. The results from both groups of investigators were combined and analyzed and the values at the lower temperatures were joined smoothly at 450°K with the high-temperature values given by the equation $C_p = 11.988 + 0.00824\ T - 2.267 \times 10^5/T^2$ cal/deg mole derived from the enthalpy measurements [52]. The values below about 15°K were obtained by extrapolating a C/T versus T^2 plot of the observed values.

Enthalpy equations 33 and 35 of NBS Report No. 6297 yield 4991 cal/mole instead of 5010 cal/mole given for the heat of fusion at the melting point of 744.3°K.

Lithium Hydroxide Monohydrate, $LiOH \cdot H_2O$, 41.964

Low temperature measurements of the heat capacity were reported by Bauer, Johnston, and Kerr [2] (15° to 302°) on a sample purified by crystallization from water. The excess water was removed by desiccating over anhydrous LiOH. Titration with hydrochloric acid showed the sample to have Li to H_2O ratio of 0.9993 ±0.0027. Values below the experimental range were obtained by extrapolating a C/T versus T^2 plot. Below 200°K, the smoothed values of heat capacity tabulated by Bauer, Johnston, and Kerr [2] were found to be, in general, higher than the polynomial equation obtained by the method of least squares using the authors' observed data and smoothed values.

Lithium Fluoride, LiF, 25.940

Measurements of the low-temperature heat capacity of lithium fluoride have been reported by Clusius [4] (18° to 273°); Clusius, Goldmann, and Perlick [6] (18° to 272°); Martin [40] (2° to 30°); Clusius and Eichenauer [5] (10° to 111°); and Scales [51] (2° to 7°). The results of all of the above measurements, where tabulated values or equations of heat capacity are available, were combined with the heat-capacity values derived from the enthalpy

measurements obtained by Douglas and Dever [10] in the range 0° to 900°C. The values from the analysis join smoothly at 400°K with the high-temperature heat-capacity values given by the equation

$$C_p = 13.5517 + 30.3453 \times 10^{-4} T - 5.3077 \times 10^{-6} T^2 + 4.1774 \times 10^{-9} T^3 - 1216.62/T \text{ cal/deg mole},$$

derived from the enthalpy equation given by Douglas and Dever [10].

Lithium Chloride, LiCl, 42.397

Slonim and Hüttig [56] have published measurements of the mean heat capacity (-188° to -77°C, -77° to -3°C, and 4° to 96°C). The three observed mean heat capacities were combined with the seven interpolated values given by Slonim and Hüttig [56] and analyzed along with the high-temperature values obtained by Douglas, Harman, and Dever [12] (0° to 900°C). The values below the experimental range were obtained by extrapolation using a Debye heat-capacity function fitted to values in the experimental range. The results of the analysis join smoothly at 400°K with the heat-capacity equation $C_p = 10.9036 + 4.5888 \times 10^{-3} T - 210.585/T$ cal/deg mole derived from the enthalpy measurements of Douglas, Harman, and Dever [12].

Lithium Aluminate, $LiAlO_2$, 65.920

King [34] (52° to 296°) measured the heat capacity of lithium aluminate prepared by heating a stoichiometric mixture of reagent-grade lithium carbonate and pure hydrated alumina for periods totaling 50 hours at 900° to 1000°C. Chemical analysis of the product showed 100.03 percent of the theoretical Al_2O_3 to be present. The values of heat capacity from about 50° down to 15°K were obtained by extrapolation using the Debye-Einstein combined heat-capacity functions given by King [34]. Below about 15°K, a $C = AT^3$ type equation was used for extrapolation.

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Chapter 2

MICROWAVE SPECTRUM AND STRUCTURE OF N_2F_4

David R. Lide, Jr., and D. E. Mann

The microwave spectrum of N_2F_4 has been investigated in an effort to establish the correct molecular structure. Ten $\Delta J = 1$ lines with $J \leq 4$ have been assigned. The observed frequencies are compared with calculated rigid-rotor frequencies in Table I. The small deviations can probably be removed by a centrifugal distortion correction; however, the rotational constants are unlikely to change by more than 0.1 Mc from the values in Table I. A number of Q-branch transitions of higher J have also been identified; some of these are listed in Table II. The number of transitions of this type which can be observed is sharply limited by the Stark effect. In fact, the Q-branch lines would be undetectable if it were not for a somewhat accidental confluence of high line strengths and relatively fast Stark effects. Although some lines remain to be assigned, it appears that the majority of the spectrum can be explained by the single rigid-rotor species.

No clear evidence of hyperfine structure from the N^{14} nuclei has been obtained. Preliminary measurements of the Stark effect indicate a dipole moment of about 0.26 D.

The observed rotational constants are consistent with a hydrazine-like model (point group C_2) for N_2F_4. Calculations on this model show that the asymmetry parameter κ is very sensitive to the dihedral angle between NF_2 groups; in fact κ varies from + 0.2 to - 1.0 and back to - 0.2 as this angle goes from 0 to 180°. The observed value of $\kappa = - 0.72757$, combined with the fact that the spectrum follows a c - type selection rule, places the dihedral angle in the range 60° - 70°.

A complete structure determination would require measurements on at least one isotopic species. However, the angles may be calculated for assumed values of the NN and NF distances. With $r_{NN} = 1.47$ A (as in N_2H_4) and $r_{NF} = 1.37$ A (as in NF_3), one obtains $\measuredangle$ FNF = 108°, $\measuredangle$ NNF = 104°, and a dihedral angle of 65°. Since the dihedral and FNF angles are rather insensitive to the assumed distances, their values are probably correct within 2° or 3°. However, various combinations of a longer NN distance and smaller $\measuredangle$ NNF (or vice versa) will fit the observed moments equally well.

A few Q-branch lines from an excited vibrational state have also been identified. Rough intensity measurements indicate a vibrational frequency in the neighborhood of 100 - 150 cm^{-1}. Since the bending and stretching modes are expected to have higher frequencies, the observed state probably corresponds to the torsional motion around the N - N bond. If this assignment is correct, it suggests that internal rotation of the NF_2 groups is hindered by a barrier greater than 3 kcal/mole.

There is no assurance, of course, that the species observed here represents the ground state of N_2F_4. A <u>trans</u> configuration of the NF_2 groups might be more stable but would not contribute to the microwave spectrum. From intensity considerations it seems improbable that the concentration of the observed species is less than 10% (at 200°K). Further experiments are planned in order to establish this concentration more precisely.

Table I. Assigned $\Delta J = 1$ transitions and rotational constants of N_2F_4.

Transition	Obs. freq. (Mc)	Calc. freq.
$1_{10} \longrightarrow 2_{20}$	19582.6 ± 0.3	19582.7
$1_{11} \longrightarrow 2_{21}$	19917.9 ± 0.2	19918.0
$2_{02} \longrightarrow 3_{12}$	21725.0 ± 0.2	21725.0
$2_{11} \longrightarrow 3_{21}$	25370.14 ± 0.05	25369.8
$2_{12} \longrightarrow 3_{22}$	26297. ± 1[a]	26296.7
$3_{03} \longrightarrow 4_{13}$	28549.9 ± 0.3	28550.1
$2_{20} \longrightarrow 3_{30}$	30868.47 ± 0.05	30868.4
$2_{21} \longrightarrow 3_{31}$	30906.52 ± 0.05	30906.6
$3_{12} \longrightarrow 4_{22}$	31187.4 ± 0.1	31187.7
$3_{13} \longrightarrow 4_{23}$	32856. ± 1[a]	32855.9

a = 5576.21 Mc
b = 3189.35
c = 2812.95

[a] Two partially resolved lines observed.

Table II. Q-branch transitions in N_2F_4 (in Mc)

	$J_{4,J-3} \longrightarrow J_{5,J-5}$		$J_{5,J-4} \longrightarrow J_{6,J-6}$	
J	Obs. ν[a]	Calc. ν[b]	Obs. ν	Calc. ν
9	22866.9	22868.6		
10	805.9	807.8		
11	788.3	791.2		
12	865.6	870.1		
13	23110.	23118.0		
14	620.1	633.2	27526.5	27529.5
15	24512.5	24534.7	27461.3	27466.2
16			501.8	509.8
17			723.1	737.3
18			28226.0	28250.9
19			29131.5	29173.4
20			30572.0	30638.9
21			32669.0	32769.9

[a]Observed frequencies are accurate to ± 0.3 Mc.

[b]Calculated with constants from Table I.

Chapter 3

ESTIMATES OF SOME MOLECULAR CONSTANTS FROM SEMIEMPIRICAL RULES

Harold W. Woolley

The general usefulness of estimated molecular constants has led to a short study of empirical rules for their prediction. In view of the preliminary nature of the study up to this point, no firm conclusions from it may be given at the present time. Becuase of current interest, however, we mention the empirical rules recently discussed by Lippincott and Dayhoff [1] for estimation of bond lengths, bond energies and vibrational constants. Table 1 shows a comparison between some of their estimated diatomic dissociation energies and other values, principally as listed in NBS Report 6297, [2,3]. Rather poor estimates are given by the empirical rules for several well known molecules. The most notable failure is probably F_2. In the case of Al_2, for which they estimate a D_e of 37.4 kcal/mole, one may admit that the value 50 ± 30 kcal/mole for D_o from NBS Report 6297 may quite possibly be high. An estimate of 39 kcal/mole was made by Drowart and Honig, as mentioned in Report 6297.

A detail worth noting is that the method makes separate predictions for bonds of various types even when they are nominally of like order. The method has been used in a somewhat provisional and tentative way in some preliminary speculations that we have made on some bonds of interest to us. A few selected and presumably representative general magnitudes thus estimated for various orders of bonds, after rejecting some of the bond types first postulated, are included in Table 2.

The vibrational frequency estimates listed are of a pseudo-diatomic type in that they neglect the special cooperative inertial and force constant combination effects arising within polyatomic molecules. The values in Table 2 ignore partial ionic character and so should not be used unchanged if large polar effects are present. An empirical formula of Pauling [4] suggests that there should be about 90 kcal/mole additional per single AlO bond due to polar effects while another electronegativity scale of a Mulliken type [5,6] suggests only about 55 kcal/mole.

In summarizing the application of the covalent values of Table 2 to the selection of molecular constants, we note that without the polar contributions we obtain estimates far (50%) below the experimentally indicated binding energies for the polyatomic aluminum oxides. With the polar contributions estimated from Pauling's formula, the calculated binding energies of the linear Al_2O_2 model and the V-form Al_2O_3 are much greater than appear indicated experimentally.

Even though an accurate method of prediction is not at hand, a considerable excess of calculated partially ionic binding energy for these forms over some similarly estimated alternative models - even when their steric strain was ignored - would appear to lend some support to the models selected for the present calculations. For Al_2O, a V or bent form would allow the estimated binding energy to agree well with experimental indications, using Al-O single bonds of 40 kcal/mole covalent energy from Table 2, augmented by ionic energy contributions between the three atoms consistent with the 55 kcal/mole for an isolated Al-O bond, now noting that in absolute magnitude the charge on the O atom is double that on the Al atom. For the present tables, however, a triangle form with a double between Al atoms has been postulated on the ground that it should be expected to have even greater binding energy. On the other hand, similar calculations for Al_2O_2 are now found to suggest that a "square" form with alternating atoms should have greater binding energy than the linear form included in the present tables.

Table 3 gives some very tentative estimated pure covalent binding energies for some gaseous aluminum oxides based on covalent bond estimates listed in the preceding table. These may be compared with experimentally indicated values also listed. The experimental binding energy given for Al_2O_3 is an estimated upper limit based largely though not exclusively on the non-observance of an Al_2O_3 peak in mass spectrometer work. Variously estimated or assumed molecular constants for the calculation of thermodynamic functions for these molecules make up the remainder of the table. The single bond AlO distance arbitrarily taken is the least such length in crystalline boehmite; it is acknowledged that there are good arguments for using a smaller value. Empirical estimates of change of bond length due to ionic character suggest in fact that the proper value may be closer to the diatomic AlO distance used for Al_2O by Sinke [8].

Table 1. Comparison of Diatomic Dissociation Energies as Estimated by Lippincott and Dayhoff and by Others.

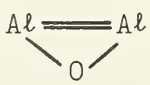
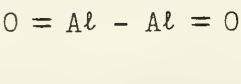
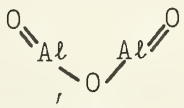
Substance	D_e, calc.	D_o, calc.	D_o (kcal/mole)	Ref.
H_2	131	124.8	103.242	[2]
F_2	64.5	63.2	36.714	"
Cl_2	57.6	56.8	57.08	"
O_2	124.8	122.6	117.96	"
Al_2	37.4		50 ± 30	"
Be_2	10.5		16 ± 10	"
Mg_2	6.3		7.2	"
Li_2	25.2	24.9	25.76 ± 0.10	"
AlH	69.9	67.7	70.53	"
BeH	66.2	63.3	51 ± 7	"
MgH	54.4	52.3	46 ± 10	"
LiH	53.8	51.7	56.01 ± 10	"
HF	132.3	126.0	135.12 ± 0.3	[3]
HCl	98.8	93.7	102.1	[1]

Table 2. Tentative Estimates of Polyatomic Bond Lengths, Bond Energies and Bond Stretching Frequencies

Bond	Re	D kcal/mole	cm^{-1}
=Al-Al=	2.2	35	250
-Al=Al-	2.0	65	430
=Al-O-	1.8*	40*	490*
-Al=O	1.7*	80*	790*
-O-O-	1.4	50	750

*These values are not intended for use except after correction for the effects of ionic forces.

Table 3. Assumed Molecular Constants for Some Aluminum Compounds

Molecule	Al_2O	Al_2O_2	Al_2O_3
Model			
	Triangle	Linear	V-form
Estimated Covalent Binding Energy (Table 2) (kcal/mole)	145	195	240
Binding energy estimated from experimental observation (kcal/mole)	254 ±5	376 ±30	510 ±30
R(Al-Al)		2.2	
R(Al=Al)	2.0		
R(Al-O)	1.87		1.87
R(Al=O)		1.62	1.62
Angle			120°
$I_a x10^{39}$, g cm^2	5.1	0	5.61
$I_b x10^{39}$, g cm^2	9.0		72.02
$I_c x10^{39}$, g cm^2	14.1	50.1	77.63
Symmetry Number	2	2	2
Vibrational frequencies and degeneracies	1000 1000 450	1200 1200 500 (2) 340 300 (2)	1200 (2) 900 (2) 600 (2) 500 (2) 220

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BOND LENGTHS AND BOND ANGLES OF MOLECULES

Harold W. Woolley, David R. Lide, Jr., and William H. Evans

In the earlier NBS Report 6297 (Chapter IV) spectroscopic or estimated molecular constants were tabulated for the ground states of 16 diatomic and 19 polyatomic molecules. On the basis of these constants, tables of thermodynamic functions were computed for all these molecules and are given in the Appendix of the present report. It was thought desirable to list the bond lengths (internuclear distances) and bond angles which were assumed in calculating the corresponding moments of inertia, to permit ready comparison with newer data or the estimates of others and thereby to enable an easier assessment of the effects such differences would have on the thermodynamic properties. These basic constants are given below in Table 4 for the diatomic molecules and in Table 5 for the polyatomic molecules.

Table 4. Bond Lengths of Diatomic Molecules

Molecule	Ground State Species	Bond Length (Å)	Molecule	Ground State Species	Bond Length (Å)
Li_2	$^1\Sigma_g^+$	2.672	MgO	$^1\Sigma$(?)	1.749
LiF	$^1\Sigma$	1.545[a]	AlF	$^1\Sigma$	1.655
LiCl	$^1\Sigma$	2.022	AlCl	$^1\Sigma$	2.138
BeF	$^2\Sigma$	1.361	AlO	$^2\Sigma^+$	1.618
BeCl	$^2\Sigma$	1.750	F_2	$^1\Sigma_g^+$	1.412
BeO	$^1\Sigma^+$	1.331	Cl_2	$^1\Sigma_g^+$	1.989
MgF	$^2\Sigma$	1.750	ClF	$^1\Sigma$	1.628
MgCl	$^2\Sigma$	2.18	ClO	$^2\Pi$	1.54

[a] The thermodynamic functions of LiF(g) tabulated in the present report differ somewhat from those in the earlier NBS Report 6297, and were computed from the molecular constants resulting from recent observations (Vidale, G.L., "The Infrared Spectrum of the Gaseous LiF Molecule," Aerophysics Research Memo. No. 32, Technical Information Series No. R59SD359, General Electric Co., Philadelphia, Pa., May 14, 1959). The latter report gives as "best" values (with probable errors): ω_e, 906.2 ± 1.5 cm^{-1}; $\omega_e x_e$, 7.900 ± 0.010 cm^{-1}; α_e, 0.01971 ± 0.00016 cm^{-1}; B_e, 1.378 ± 0.010 cm^{-1}; r_e, 1.545 ± 0.006 Å.

Table 5. Bond Lengths and Bond Angles

of Polyatomic Molecules

Molecule	Structure[a]	Bond Length				Bond Angle			
		Bond	Å	Bond	Å	Bond	Angle	Bond	Angle
$(LiF)_2$	P	LiF	1.70			FLiF	105.2°	LiFLi	74.8°
$(LiCl)_2$	P	LiCl	2.19			ClLiCl	113.6°	LiClLi	66.4°
BeF_2	L	BeF	1.40			FBeF	180°		
$BeCl_2$	L	BeCl	1.75			ClBeCl	180°		
BeFCl	L	BeF	1.40	BeCl	1.75	FBeCl	180°		
MgF_2	L	MgF	1.77			FMgF	180°		
$MgCl_2$	L	MgCl	2.18			ClMgCl	180°		
MgFCl	L	MgF	1.77	MgCl	2.18	FMgCl	180°		
AlF_3	P	AlF	1.70			FAlF	120°		
$AlCl_3$[c]	P	AlCl	2.10			ClAlCl	120°		
AlF_2	B	AlF	1.70			FAlF	120°		
$AlCl_2$	B	AlCl	2.10			ClAlCl	120°		
AlF_2Cl	P	AlF	1.70	AlCl	2.10	FAlF	120°	FAlCl	120°
$AlFCl_2$	P	AlF	1.70	AlCl	2.10	FAlCl	120°	ClAlCl	120°
O=AlF	L	O=Al	1.62	AlF	1.65	OAlF	180°		
O=AlCl	L	O=Al	1.62	AlCl	2.14	OAlCl	180°		
O=AlOH	P	AlO	[b]	OH	0.94	OAlO	180°	AlOH	105°
O=AlH	L	O=Al	1.62	AlH	1.64	OAlH	180°		
AlOH	B	Al-O	1.87	OH	0.94	AlOH	105°		

[a] B=Bent, L=Linear, P=Planar. [b] O=Al, 1.62Å; Al-O, 1.87Å.

[c] See table of thermodynamic functions of $AlCl_3$ (g) near end of this report for the frequencies assumed, which are slightly different from those tabulated in NBS Report 6297, p. 44.

A table of ideal-gas thermodynamic functions of Al_2Cl_6 also was computed, and is given in the Appendix. The moments of inertia are from Palmer, K. J., and Elliott, N., J. Am. Chem. Soc. 60, 1852 (1938); the fundamental frequencies are from Klemperer, W. A., J. Chem. Phys. 24, 353 (1956), and from Bell, R. P., and Longuet-Higgins, H. C., Proc. Royal Soc. London A183, 357 (1945).

Chapter 4

AN EXPLODING-WIRE APPARATUS FOR HIGH-TEMPERATURE HIGH-PRESSURE MEASUREMENTS

Donald H. Tsai and Lawrence M. Brown

Introduction

The lack of data on the properties of the light metals and their compounds has been emphasized in the First Technical Summary Report (NBS Report 6297). This is especially true in the regions of higher temperatures and pressures (2000-6000°K, 1-100 atmospheres). Computed properties based on available data at lower temperatures and pressures, and extrapolated to these higher regions, are of uncertain accuracy because of the lack of confirming experimental measurements. In fact, under these extreme conditions, even qualitative observations on the more complicated systems are scarce in the open literature.

To remedy this situation, and to aid the over-all objectives of the project, it was decided early in the program that some effort should be given to the exploration of various methods for producing an environment of high-temperature and high-pressure under carefully controlled conditions, and to develop the more promising methods, together with applicable techniques of measurement, so that accurate thermodynamic data may be obtained experimentally. As a first step, the objective will be limited to the determination of the equation of state of the aluminum-oxygen system in the stated regions of higher temperature and pressure. This chapter reports the activities (since October 1, 1958) and future plans related to this part of the work.

The Experimental Problem

The ideal experimental method for the present problem should satisfy the following requirements.

(1) Production of temperature up to 6000°K or higher.

(2) Containment of pressure up to 100 atmospheres.

(3) Achievement of equilibrium or quasi-equilibrium conditions in the test vessel.

(4) Freedom from contamination.

(5) Adaptability to precision methods of measurement.

These requirements are not compatible with one another. In the first place, the temperature range rules out the use of a furnace or other similar indirect heating devices, because the furnace would melt and vaporize first, long before the sample is heated to 6000°K. Even if the heating energy could be applied directly to the test sample, by using such methods as placing the sample in a high temperature flame, electric arc, plasma jet, or the like, it would still be very difficult to carry out a steady-state experiment inside a test vessel, again because of the loss of strength of the vessel materials. Yet a vessel is necessary for the containment of high pressures. Forced cooling of the vessel on the outside would make the problem of establishing equilibrium inside more difficult, and the task of cooling would in itself be rather formidable. Also, under steady-state conditions in a test vessel, contamination from the material of the wall would become a difficult problem which would not only affect adversely the accuracy of the data, but also complicate the problem of measurement. This is true, for example, in spectroscopic measurements in which even a small amount of contaminant may mask other spectral lines so completely as to make it impossible to observe the system under investigation.

With a transient method of heating, such as the method of shock compression (in a shock tube) or electrical discharge, the loss of strength of the test vessel and perhaps also the problem of contaimination become less serious. However, the problem of making high-speed measurements and that of establishing equilibrium in the test section are more difficult. The latter problem is made worse in systems which contain Al_2O_3 or similar compounds with high melting points, because additional time is required to vaporize and distribute the sample uniformly in the test section.

The foregoing considerations indicate that there is no clear-cut experimental method which is best suited to the present problem. In all probability, a variety of experiments and a variety of measurements will be needed to determine all the properties of interest. Nevertheless, to make a start in this direction, it was decided to investigate the exploding wire method as a possible experimental technique for the limited purpose of obtaining the P-V-T data for the aluminum-oxygen system. The literature cites various other likely methods. Some of these have been mentioned in the above discussion. For the various reasons also given above, these methods were considered to be somewhat less promising for the present purpose.

The exploding wire method has been used in various studies of metals. The method involves the explosion and evaporation of a thin metal wire by a sudden discharge of electrical energy through the wire. The temperature reached in the metal has been estimated to lie in the range 8,000-30,000°K[1][1],

[1]Numbers in brackets refer to references at the end of this chapter.

and evaporation is completed within a few microseconds. As applied to the present problem, this method is relatively simple and inexpensive, and promises to be a suitable high-temperature source. However, in addition to the problems noted earlier in connection with transient heating methods, the process of equilibration is further complicated by the need for mixing and chemical reaction between the metal vapor and the surrounding gas. On the other hand, the boundary between the expanding aluminum vapor and the surrounding oxygen would be hydrodynamically unstable, and this instability would aid the process of mixing and diffusion. Also, as the aluminum reacts with oxygen, the chemical energy released would further raise the temperature, and thus reduce the temperature gradient within the system. These considerations favor a fuller exploration of the exploding wire method. The major effort in the past six months, therefore, has been devoted to the design and construction of an apparatus for exploratory studies. This is discussed in the next section. The primary aim of the initial phase of this work is two-fold: (1) to determine the feasibility of the exploding wire method as a means for producing a homogeneous vapor of a metal or its compounds in a quasi-equilibrium state; and (2) to develop appropriate measurement techniques.

Activity Summary

The experiments to be conducted initially will include measurements of current through and voltage across aluminum wires, and of the pressure due to the explosion of the wire in an inert or oxygen-containing atmosphere. The electrical measurements, which will give data on the total energy input to the wire, will be made during the explosion process (a few microseconds in duration). The pressure will be monitored after the explosion over an interval of 1/2 to 1 millisecond. In this interval the initial gradients will be decaying rapidly and the system will perhaps be approaching a state suitable for making thermodynamic measurements.

The experimental apparatus needed in this initial phase of the work has been designed and placed under construction. Parts of it have been completed and are now being assembled in the laboratory.

The apparatus consists of a discharge circuit and a trigger circuit, as shown schematically in Figure 1. The discharge circuit includes, (1) a 20,000 joule condenser bank (400 μ f at 10,000V maximum), (2) two parallel spark gaps, (3) the wire and test vessel, and (4) a coaxial shunt (for current measurements) and voltage divider (for voltage measurements). Each of the primary spark gaps is connected to half the condenser bank by a copper bus bar to form two parallel current paths. These paths are arranged symmetrically about the voltage divider and wire. The leads between the condensers and bus bars are relatively thin wires which will act as fuses in the event of a short circuit in any one of the condensers.

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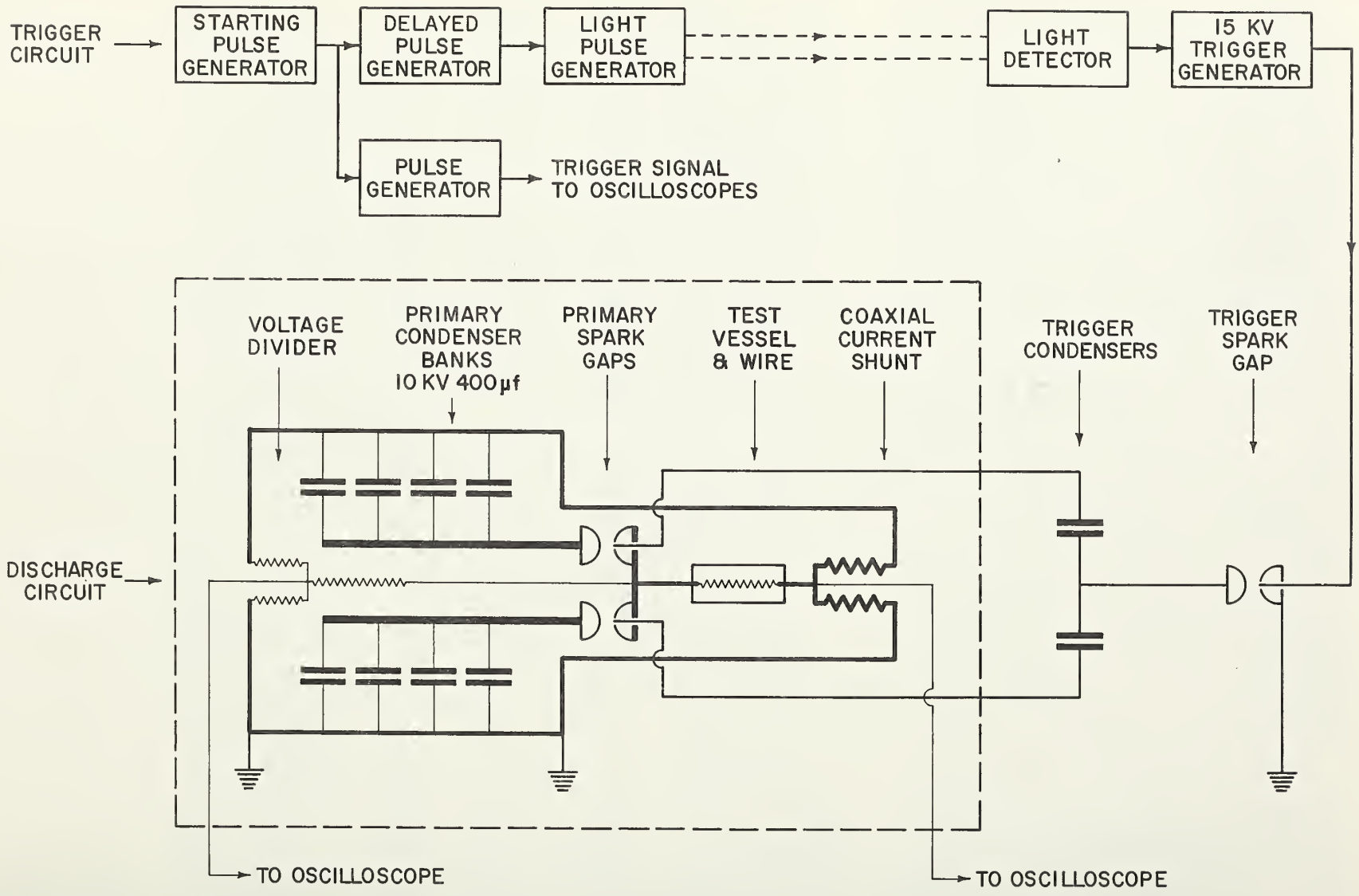


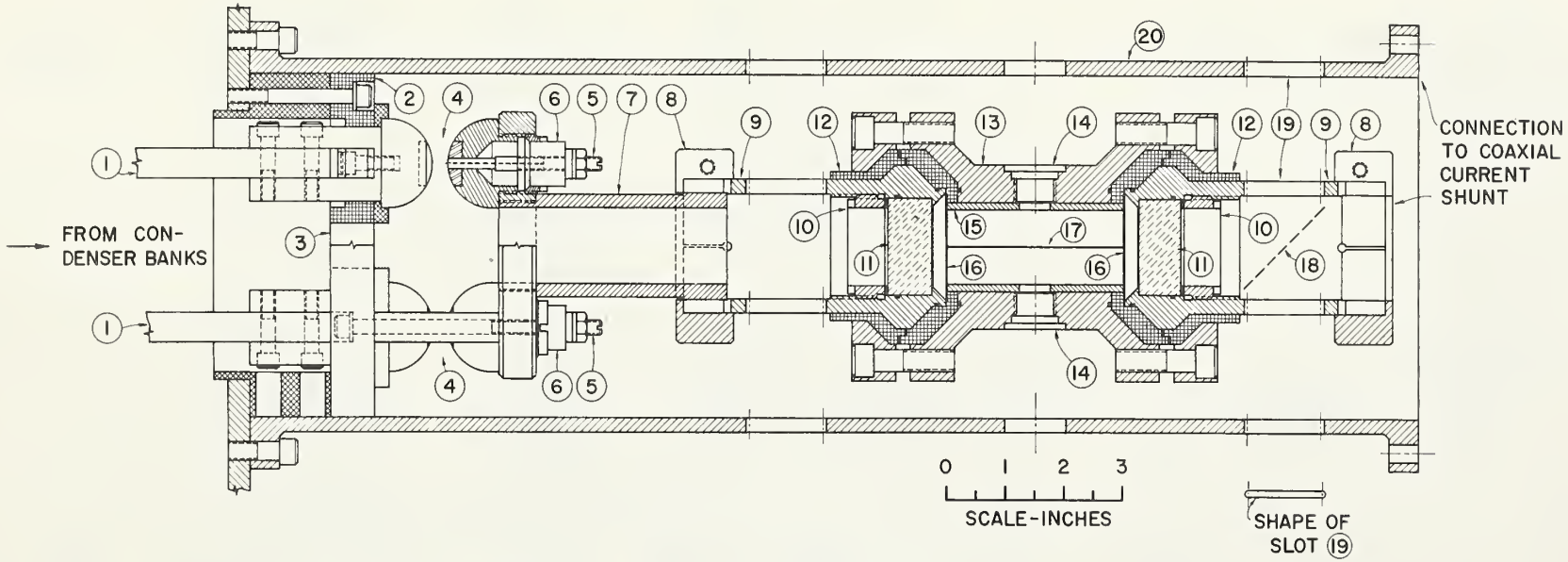
FIG. 1 SCHEMATIC DIAGRAM OF THE EXPLODING WIRE APPARATUS

The coaxial shunt is a precision instrument of known resistance designed for the accurate measurement of large, transient currents (I ~ several hundred kiloamperes, $\frac{dI}{dt} \sim 10^{10}$ amperes/sec.). It is very insensitive to stray magnetic fields. A thorough study of coaxial shunt design problems has been made by Park [2]. Mr. Park, of the Electrical Instruments Section of this Bureau, has kindly consented to lend us one of his shunts for preliminary measurements of current. Although the measurement of current should be more or less straightforward, the situation in regard to the measurement of voltage, however, is apparently not the same. Previous attempts to make accurate voltage measurements in exploding wire experiments were not satisfactory [3]. The difficulty arises mainly from the effects of magnetic fields on the voltage measuring system. In order to overcome this difficulty, an arrangement of the apparatus in which the magnetic fields may be canceled out has been devised. The main features of the circuit are the two parallel current paths to the wire, the inductive effects of which are in opposite directions in the vicinity of the voltage divider.

Inherent in this arrangement of the apparatus is the problem of effecting the simultaneous breakdown of the primary spark gaps and discharge of the condenser bank through the wire. To facilitate this, a spark gap and two condensers (10 μ f each, 10,000V), one for each primary gap, have been included in the trigger circuit, shown in block form in Figure 1. A 15 kv trigger generator provides a high-energy pulse for breaking down the trigger gap. After the firing of the trigger gap, the trigger condensers discharge and effect the simultaneous breakdown of the primary spark gaps which causes the primary condenser bank to discharge through the wire. This series of events is initiated by a manually controlled sawtooth signal from the starting pulse generator. The sawtooth signal triggers two pulse generators, one of which transmits a delayed pulse to the 15 kv source. The other pulse generator provides an undelayed signal for triggering oscilloscopes and other apparatus.

The light pulse generator and light detector were included in the trigger circuit so that there will be only one electrical path between the wire and measuring system. This technique has been found useful in other exploding wire measurements [3]. The light pulse generator consists of a strobotron tube wired for single pulse operation. A photomultiplier tube, in a standard circuit, serves as the light detector.

A detailed drawing of the test vessel and the electrodes for the primary spark gaps is given in Figure 2. The test vessel is an aluminum cylinder whose inner dimensions are, 1-1/4" in diameter (with insert as shown) and 3" in length (60.4 cc. volume). Its sides contain openings for optical windows, a pressure transducer, and connectors to gas-filling and vacuum systems. Two aluminum clamps are provided for securing the wire in the test vessel. Openings are included in the clamp to permit observations along the axis of the vessel from the surface of the wire to the wall.



1 COPPER BUS BAR
2 BAKELITE ELECTRODE SUPPORT
3 OPENING FOR VIEWING
4 PRIMARY SPARK GAP WITH TUNGSTEN-TIPPED ELECTRODES
5 TRIGGER ELECTRODE
6 INSULATOR
7 COPPER ELECTRODE SUPPORT
8 CLAMP
9 WINDOW HOLDER
10 WINDOW CLAMP
11 OPTICAL WINDOW
12 BAKELITE INSULATOR
13 TEST VESSEL
14 OPENING FOR PRESSURE PICK-UP OR WINDOW
15 ALUMINUM-OXIDE INSERT
16 WIRE CLAMP
17 WIRE
18 MIRROR OR PRISM
19 SLOTS FOR VIEWING
20 ALUMINUM SHIELD AND CURRENT RETURN

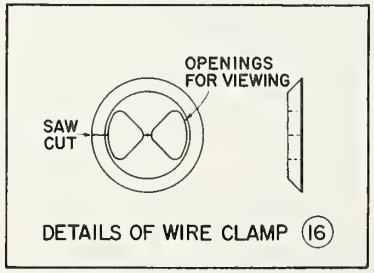


FIG. 2 DETAILS OF PRIMARY SPARK GAPS AND TEST VESSEL

The above tentative dimensions and volume of the test vessel were made sufficiently small so that high pressures may be developed therein at the temperatures of interest, but large enough to permit the installation of windows and the transducer. The volume of the vessel may, however, be decreased by increasing the thickness of the insert. The insert was made from a non-conducting material, aluminum oxide, to preclude arcing between the wire clamps and the wall and to reduce the heat loss at the wall.

The primary spark gap electrodes are similar in basic detail to the Lovotron [4], a low-voltage trigger gap switch designed for single pulse operation with very low time jitter (delay). They are made of copper and provided with tungsten tips to minimize erosion by the arc. The trigger electrode is a 0.050" diameter tungsten wire soldered to a copper connector and insulated from the main electrode by teflon. The connector is insulated from the main electrode by bakelite.

The primary condenser bank is enclosed in a mobile cabinet 54" long x 30" wide x 42" high, fabricated from 1/4-inch thick aluminum plate. The spark gaps and test vessel are attached to one end of the cabinet and enclosed by a cylindrical, aluminum container with viewing slots. Openings are provided in either end of the cabinet for making the necessary electrical connections. For reasons of economy and lightness aluminum, rather than copper, was selected as the shielding material.

Determinations of variables other than total energy and pressure are also planned for the exploratory phase of the work. These variables include the density, composition and temperature. In anticipation of this, an intensive study of high-speed optical and pulsed X-ray techniques that may be employed in these measurements was initiated. Also, the Beckman and Whitley Company was retained on contract (NBS Purchase Order No. S-13439-59) as a consultant on the relevant applications of streak spectrographs, framing cameras and streak cameras. The first progress report on its study of the problem was submitted on June 1, 1959, by Mr. T. E. Holland. The report includes a discussion of tentative optical arrangements for preliminary measurements of shock velocity and time-resolved spectral intensities. Plans were also made to have discussions with Dr. W. P. Dyke of the Field Emission Corporation on the use of pulsed X-ray equipment.

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CHAPTER 5

VAPORIZATION OF LIGHT-METAL OXIDES

Raymond F. Walker and John Efimenko

The following discussion presents further information pertinent to vaporization in the Al-O and Be-O systems, and summarizes some of the information available on the Mg-O and Li-O systems. This information will be combined and evaluated with the material presented in Chapter V of NBS Report No. 6297 and supplements thereto in subsequent reports.

Al-O system.

Although there appears to be general recognition of the existence of only one solid phase (i.e. Al_2O_3) in the Al-O system, it should be mentioned that several investigators have presented evidence in support of the existence in the solid state of one or more lower oxides. Baur and Brunner /1/ attributed a maximum in the liquidus curve of Al_2O_3-Al mixtures to a compound Al_8O_9. Beletskii and Rapoport /2/ reported a hexagonal Al_2O phase after heating similar mixtures in a vacuum, but in the presence of carbon, and condensing the vapor. Hoch and Johnston /3/ reported the formation of two cubic phases, Al_2O and AlO, after heating mixtures of Al_2O_3 and Al in helium. These phases were stable between 1050 and 1600°C, and above 1500°C respectively. More recently, Filonenko et al /4/ heated Al_2O_3 with solid carbon and found a new isotropic, octahedral, spinel-type phase to which he gave the composition $AlO.Al_2O_3$. While these reports do not confirm one another, and some of the observations may be attributable to the formation of oxy-carbides rather than lower oxides, the evidence for the possible existence of lower oxides of Al in the solid state is worthy of consideration.

The recommended melting point for Al_2O_3 is 2030 ± 20°C. All known determinations fall within these limits.

The difficulty in evaluating the vaporization data for alumina is due to the lack of laboratory data for checking purposes. Only one laboratory has published its experimental data for alumina at high temperatures, against which all others compare their results. The mass spectrometric data on alumina by the University of Chicago group under Prof. M. G. Inghram may be available soon. This group has recently published some mass spectrometric data /5/ which confirms the importance of gaseous species of higher oxidation state than Al_2O. A tungsten Knudsen cell with an alumina liner was employed; hence the data obtained may refer to the vaporization of a composition on the metal rich side of its homogeneity range. The AlO species was detected in equilibrium with Al_2O_3 (S) in the range 2125-2265°K, and both AlO and Al_2O_2 were detected over Al_2O_3 (l) at 2475°K. These species were

in addition to the Al_2O, Al, O, and tungsten oxide species previously observed or suspected.

For $AlO\ (g) = Al\ (g) + O\ (g)$; $\Delta H_o^o = 120 \pm 5$ kcal

$Al_2O\ (g) = 2Al\ (g) + O\ (g)$; $\Delta H_o^o = 256 \pm 5$ kcal

$2AlO\ (g) = Al_2O\ (g) + O\ (g)$; $\Delta H_o^o = -15 \pm 3$ kcal

$Al_2O_2\ (g) = 2AlO\ (g)$ $\Delta H_o^o = 138 \pm 15$ kcals.

The heat of the first reaction is in very good agreement with the value of 119 ± 8 kcals. tabled in Chapter VI of NBS Report 6297. The heat of the second reaction is in good agreement with the value of 260 kcals obtainable from the slope of a plot of log K_p vs. 1/T from the data given by Brewer (p. 51, NBS Report 6297). Although the reaction, $Al_2O\ (g) = 2Al\ (g) + O\ (g)$, has not been investigated directly, a few equilibrium constants for it have been computed, showing agreement of the sources of thermodynamic tables. The equilibrium constant will be independent of any other species present in the system.

	log K		
	(a)	(b)	(c)
2000°K	-15.2	-14.5	-14.5
2500°K	- 9.4	- 8.9	- 8.6
2750°K	- 7.5	- 6.9	- 6.7
ΔH (reaction)	260 kcal	258 kcal	263.5 kcal

(a) NBS Report 6297, p. 51, Data of Brewer.
(b) NBS Circular 564 "Tables of Thermal Properties of Gases" and recent NBS thermodynamic tables on Al_2O (g) and Al (g).
(c) Thermodynamic Properties of Combustion Products, Dow Chemical Co. (1959).

The equilibrium constants in columns (b) and (c) were computed from $\ln K = \frac{-\Delta H_o^o}{RT} - \frac{1}{R}\frac{\Delta(F^o - H_o^o)}{T}$

From observations of the rate of evaporation of Al_2O_3 in the presence of, but out of contact with tungsten, Sears and Navias /6/ conclude that at 1900°C the rate is 4000 times less than the rate predictable from the data of Brewer and Searcy. These observations may indicate that the evaporation is a kinetically-determined process, or that the coefficient of evaporation is considerably less than unity.

Be-O system.

The melting point of BeO, the only known solid phase in this system, is variously given in the literature. The most recently published /7/ value of 2540 ± 30°C was selected for NBS Circular 500, and is the "best" value recommended here. Earlier determinations gave 2520 ± 30°C /8/ and 2530 ± 30°C /9/; the value of 2570°C is given in many handbooks, but this value has not been substantiated by the more recent determinations.

The heat of fusion of BeO has not been determined. A heat of fusion of about 17 kcals is obtainable by assuming an entropy of fusion of 6 cals/degree, by analogy with the entropies of fusion of MgO and FeO. Approximate phase diagrams of binary systems involving BeO have been published in recent years, and these are being used to obtain estimates of the heat of fusion. This approach does not, however, yield very reliable values.

Reference is made to the determination of equilibrium vapor pressure of BeO by Erway and Seifert /10/. Neither the technique employed nor the precision of the data permitted an unequivocal statement concerning the vapor species, but the data were not inconsistent with the view that the vaporization of BeO proceeds predominantly by dissociation to the elements. However, the heat of vaporization is too low to be attributed solely to dissociation to the elements, and the data is not, therefore, in conflict with the data of Chupka, Berkowitz, and Giese, which was discussed in NBS Report 6297 and has now been published /11/.

A solid-gas reaction between BeO and water vapor is readily detectable even at 1200°C. For the reaction:

$$BeO\ (c) + H_2O\ (g) = Be(OH)_2\ (g)$$

Grossweiner and Seifert /12/ give $\Delta H^\circ_{1673} = 41.5$ kcals and $\Delta F^\circ_{1673} = 29$ kcals. Using the value of $\Delta H^\circ_{298} = -216.8$ kcal for $Be(OH)_2$ (c) yields a heat of formation of $\Delta H^\circ_{298} = -162.4$ kcals for $Be(OH)_2$ (g), which is the value tabulated in NBS Report No. 6297. This value is in fair agreement with the value of -157 kcals for the heat of formation of $Be(OH)_2$ (g) calculated by von Wartenburg /13/ from the data of Hutcheson and Malm /14/.

Mg-O system.

The melting point of MgO, the only solid phase in this system known to be stable at high temperature, is given as 2800°C in NBS Circular 500, quoting the data of Kanolt /15/. However, Ebert and Cohn /16/ determined a melting point of 2640°C for MgO during studies of the MgO-ZrO_2 system, and Kelley /17/ used their liquidus curve to estimate a value of 18.5 kcals for the heat of fusion of MgO.

Brewer and Porter /18/ studied the sublimation of MgO and concluded that it vaporizes mainly to MgO (g). However, the mass spectrometric study of Porter, Chupka, and Inghram /19/ showed the vapor to be predominantly Mg (g) and O_2 (g) with the MgO pressure less than 0.001 of Mg pressure. For the reaction:

$$MgO\ (g) = Mg\ (g) + O\ (g),$$

the latter authors give $\Delta H_o < 90$ kcals, and this is the value tabled in NBS Report 6297. A discussion of further, spectrometric measurements of the dissociation energy of MgO (g) is given on page 69 of that report.

Hutcheson and Malm /14/ found no enhanced volatility of MgO in the presence of water vapor at 1500°C.

Li-O system.

A recent mass spectrometric study of the vaporization of Li_2O (s) indicates that the vapor species are Li, O_2, Li_2O with a small amount of LiO /20/.

For	$Li_2O\ (s) = Li_2O\ (g)$	$\Delta H_o^o = 106 \pm 5$ kcals
	$LiO\ (g) = Li\ (g) + O\ (g)$	$D_o^o \leq 82$ kcals
	$Li_2O\ (g) = 2Li\ (g) + O\ (g)$	$\Delta H_o^o = 172 \pm 5$ kcals
	$LiO\ (g) = Li\ (g) + 1/2\ O_2\ (g)$	$\Delta H_o^o = 23 \pm 5$ kcals.

The composition of the vapor in equilibrium with Li_2O at 1400°C is given as:

Species	Partial Pressure (10^{-6} atmos.)
Li	0.236
O_2	0.0589
Li_2O	0.031
LiO	0.00095

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Chapter 6

VAPOR PRESSURE AND HEAT OF VAPORIZATION OF LIGHT-METAL FLUORIDES AND CHLORIDES

Thomas B. Douglas, Andrew C. Victor and Adrienne R. Beaudoin

The present discussion will be limited to the fluorides and chlorides of aluminum, beryllium, magnesium and lithium in which the metals exhibit their "normal" valences of 3,2,2, and 1 respectively. (No treatment of the available data on the lower halides is attempted here). Where there is evidence of vapor association, the monomer, dimer, trimer, etc., will be considered ideal-gas species, the total vapor pressure P being given by the sum of the partial pressures:

$$P = \sum_i p_n \qquad (1)$$

The heat of sublimation of the crystalline form ("c") stable at 298.15°K to form one mole of monomer ("1") at this temperature, $\Delta H_1^\circ(298)$, is then given by

$$\Delta H_1^\circ(298)/RT = \left[-(F^\circ - H_{298}^\circ)/RT\right]_1 - \left[-(F^\circ - H_{298}^\circ)/RT\right]_c - \ln p_1(\text{atm.}), \qquad (2)$$

the so-called "Third-Law" method. Unless the values of $\Delta H_1^\circ(298)$ given by equation (2) are nearly independent of p_1(and T), the alternative but less accurate "Second-Law" method,

$$d \ln p_1/dT = \left[\Delta H_1^\circ(298) + (H^\circ - H_{298}^\circ)_1 - (H^\circ - H_{298}^\circ)_c\right]/RT^2, \qquad (3)$$

may give widely different (and quite erroneous) values of $\Delta H_1^\circ(298)$, and is consequently never used to evaluate this quantity when the free-energy functions of equation (2) are known.

When the degree of association of the vapor is not known, the use of equation (2) necessitates the assumption of some relationship between p_1 and P. The simplest assumption, which is sometimes valid, is that $p_1 = P$, and to distinguish the value of $\Delta H_1^\circ(298)$ so calculated from equation (2), it will be designated by $\Delta h_1(298)$. It is obvious that in all cases where the data used are otherwise correct

$$\Delta H_1^\circ(298) \geq \Delta h_1(298). \qquad (4)$$

Free-energy functions of the condensed phases and monomer gases of the halides treated below are given in the tables at the end of this report.

However, it was often convenient to use equations (2) and (3) in simple analytical form by using a gaseous heat capacity equivalent to a contribution by each vibrational mode of

$$C/R = 1 - (1/12)\ (h\ c\ \omega/kT)^2 \qquad (5)$$

This is a very good approximation for a harmonic rigid-rotor down to a temperature of about $h\ c\ \omega/2k$. It permits ready application of estimated frequencies for the polymer gas species, and is compatible in accuracy with the available vapor data in the present cases.

Aluminum Fluoride. Vapor-pressure data have been reported by Olbrich [1], Ruff and Le Boucher [2], and Naryshkin [3]. The data and consequent Third-Law results are given in Table 1.

Table 1. Observed Vapor Pressure and Calculated Heat of Sublimation of Aluminum Fluoride

T(°K)	P_{obs}(mm)	Reference	$\Delta h_1(298)$(kcal/mole)	Obs.-Calcd. P (%) *
1108	0.093	3	71.82	-14.
1188	1.366	3	70.36	+62.
1273	3.066	3	73.01	-45.
1367	31	2	71.74	- 8.5
1371	16.4	1	73.67	-55.
1391	49.5	2	71.61	- 4.0
1396	33.4	1	72.94	-40.
1409	81	2	71.08	+16.
1417	115	2	70.47	+44.
1417	60.3	1	72.29	-24.
1447	160	2	70.89	+24.
1454	130.7	1	71.79	- 9.5
1460	200	2	70.83	+26.
1472	298	2	70.19	+57.
1491	254.7	1	71.48	+ 0.6
1492	416.5	2	70.06	+62.
1519	365.6	1	71.61	- 3.5
1524	614	2	70.25	+51.
1548	553.9	1	71.57	- 2.2
1556	657.3	1	71.38	+ 4.1
1567	767.0	1	71.34	+ 5.1

* % of calculated pressure, which is based on the assumption that $\Delta h_1(298) = 71.5$ kcal/mole.

When examined by the Second-Law method only, the vapor pressures of Ruff and LeBoucher show the best interconsistency, and lead to a heat of sublimation of approximately $\Delta h_1(298)$ = 87.7 kcal; it is for these reasons that a comparably high heat of sublimation of aluminum fluoride has usually been quoted in the past. The free-energy functions of crystal and gas are subject to some uncertainty, which, however, is believed great enough to explain no more than a small fraction of the discrepancy of some 16 kcal/mole between the Second- and Third-Law values of $\Delta h_1(298)$; and on the basis of Ruff and LeBoucher's work alone, one would be tempted to assume that the saturated vapor is highly associated at these temperatures.

However, Olbrich's vapor pressures are consistently lower. His five highest values show little trend by the Third Law, and, with the tentative assumption that the vapor is monomeric, were averaged to give the adopted value, $\Delta H_1^\circ(298) = 71.5$ kcal. (This agrees fortuitously with the mean from Naryshkin's less precise results). The conclusion is that the data of Ruff and LeBoucher and those of Olbrich are probably subject to systematic experimental errors giving too low pressures at the lower temperatures.

In view of the uncertainty as to whether saturated aluminum fluoride vapor is appreciably associated in the temperature range of Table 1, the matter was considered from another standpoint. Bauer, Diner and Porter [4] have presented evidence that near 1000°K the entropy of monomerization is nearly the same (31 ± 1.5 e.u.)for the eight alkali-halide dimers examined, and further confirmation is afforded by the more recent work of Eisenstadt, Rothberg and Kusch [5]. For a given alkali metal, however, the heat of dissociation of the fluoride dimer to monomer is somewhat greater (by amounts up to 8 kcal/mole) than that of the chloride dimer to its monomer. From vapor-density measurements (see below) it was calculated that for $Al_2Cl_6(g) = 2AlCl_3(g)$ ΔS°_{1300} = 30.8 e.u. and ΔH°_{1300} = 26.4 kcal. The following assumptions were made: (a) Saturated aluminum fluoride vapor contains only monomer and dimer, (b) for $Al_2F_6(g) = 2AlF_3(g)$ ΔS°_{1300} = 30.8 e.u. but the value of ΔH°_{1300} is allowed to vary, and (c) the total vapor pressure at 1550°K remains such that this value leads to $\Delta h_1(298)$ = 71.50 kcal. Table 2 gives the results.

Table 2. Effect of Heat of Monomerization of Al_2F_6 on the Saturated-Vapor Composition

ΔH°_{1300} (dimer to monomer) (kcal)	$\Delta H_1(298)$ (kcal)	$\Delta h_1(298)$ (kcal) calcd. from P at 1300°K	$\Delta h_1(298)$ (kcal) calcd. from P at 1550°K	Mol Fraction of Dimer at 1300°K	Mol Fraction of Dimer at 1550°K
22.1	71.50	71.50	71.50	0.00001	0.0002
28.1	71.50	71.50		0.0001	0.001
34.1	71.53	71.53		0.001	0.009
40.5	71.72	71.68		0.014	0.07
57.6	76.44	73.89		0.63	0.80
69.7	82.21	74.36		0.95	0.97

According to Table 2 the heat of dissociation of the dimer must exceed approximately 40 kcal/mole if this species is to constitute an appreciable fraction of the vapor in this temperature range, or if the Third-Law values of $\Delta h_1(298)$ are to show an easily recognizable drift with temperature. It is doubtful whether increased electrostatic attraction and decreased ionic repulsion are sufficiently marked in Al_2F_6 to stabilize it (relative to the monomer) by some 15 kcal/mole in excess of that in the case of the molecules Al_2Cl_6, Al_2Br_6, and Al_2I_6, which have approximately identical monomerization energies.

Aluminum Chloride. The density of the vapor was measured by Fischer and Rahlfs (605°-944°K)[6] and by Smits and Meijering (669°-816°K)[7]. Interpreting the vapor density as a measure of the ideal-gas equilibrium

$$Al_2Cl_6(g) = 2AlCl_3(g), \qquad (6)$$

the thermal functions of these gases given in Appendix 1 were applied in a Third-Law treatment of the data. The unsmoothed values of the monomer pressure p_1, the total pressure P, and $\Delta H^\circ_{298.15}$ of reaction (6) are given in Table 3.

Table 3. Monomer-Dimer Equilibrium in Aluminum Chloride Vapor

T(°K)	p_1(obs)(mm)	P(obs)(mm)	Reference	$\Delta H^\circ_{298.15}$ of Reaction (6) (kcal)
605	12.5	222.2	6	33.57
647	25.7	281.4	6	34.22
667	28.7	182.4	6	34.27
669	29.4	138	7	33.85
670	34.2	255.8	6	34.44
688	52.9	278.5	6	34.17
692	58.5	316.0	6	34.25
692	39.4	157.5	7	34.28
695	51.3	262	6	34.50
698	54.6	278.3	6	34.55
701	58.2	277	6	34.47
711	51.8	157	7	34.24
731	66.9	179	7	34.51
734	91.8	208.9	6	33.79
734	92.5	307.2	6	34.65
748	103.2	306	6	34.86
750	110.9	323.3	6	34.81
753	94.3	229.7	6	34.75
761	92.3	186.5	7	34.62
776	156.0	356.0	6	34.81
779	175.6	401.0	6	34.75
787	167.5	354	6	34.95
805	175.7	266.1	6	34.40
816	161.6	244	7	34.96
845	217.1	304.7	6	35.24
869	334.7	474.2	6	35.49
881	296.3	342.5	6	34.44
938	373.1	393.0	6	34.09
944	365.1	390.7	6	34.78

The last column of Table 3 shows some drift with temperature which may reflect substantial systematic errors in the PVT data, the gas free-energy functions, or the simplifying assumptions made. However, it should be noted that the equilibrium constants calculated for the lowest and highest temperatures investigated would be the most sensitive to given errors in pressure measurement. The last column was averaged to give the presently adopted value for reaction (6),

$$\Delta H^\circ_{298.15} = 34.5 \text{ kcal.} \qquad (7)$$

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The vapor pressure of aluminum chloride has been measured by Fischer, Rahlfs, and Benze (395°-450°K)[23], Smits, Meijering, and Kamermans (401°-491°K)[24,25], Treadwell and Terebesi (389°-476°K)[26], Friedel and Crafts (441°-486°K)[27], Maier (342°-454°K)[28], and recently by Dunne and Gregory (294°-322°K)[29]. Kelley[8] considered the results of the first five sets of workers, and found those of the first three to be in substantial agreement on the solid. At the melting point (465.6°K) and lower temperatures, the saturated vapor is over 99.9 mole % dimer (Al_2Cl_6) according to the above results on reaction (6).

No low-temperature heat-capacity data on solid aluminum chloride were found, so no Third-Law treatment of the vapor pressures is possible at present. However, a "sigma" plot was made using the unsmoothed vapor pressures below the melting point reported by the first three sets of observers named above, and in addition the values calculated for 300°, 311°, and 322°K from the equation given by Dunne and Gregory[29], who list no unsmoothed values. This amounted to plotting $\Delta H_2^\circ(298)/T + 2S_c^\circ(298)$ vs. $1/T$, where $\Delta H_2^\circ(298)$ applies at 298.15°K to the reaction

$$2AlCl_3(c) = Al_2Cl_6(g) \qquad (8)$$

and $S_c^\circ(298)$ is the molal entropy of $AlCl_3(c)$ at the same temperature. The straight line chosen corresponds to

$$\Delta H_2^\circ(298) = 28.38 \text{ kcal} \qquad (9)$$

and

$$S_c^\circ(298) = 22.43 \text{ e.u./mole.} \qquad (10)$$

The "observed" vapor pressures are given in Table 4, and the last column indicates the agreement with the values calculated from the free-energy functions with the use of equations (9) and (10).

Table 4. Observed Vapor Pressure of Solid Aluminum Chloride

T(°K)	P_{obs}(mm)	Reference	Obs.-Calcd. P (%)*
300.0	$9.62(10^{-5})$	29	-11
311.0	$5.67(10^{-4})$	29	+ 0.4
322.0	$2.96(10^{-3})$	29	+10
388.6	5	26	+ 2.0
395.0	8.5	23	- 2.5
398.0	12	26	- 0.8
401.1	17	24	+14
403.6	18.9	23	+ 2.2
403.8	18.9	23	0.0
409.1	32	26	+ 8.8
409.5	30	24	- 2.0
416.3	51	24	- 4.0
417.0	55.4	23	- 1.1
417.3	56	26	- 2.4
417.8	60.6	23	+ 2.0
418.5	63.7	23	+ 0.5
420.8	79	25	+ 3.1
421.2	82	24	+ 5.1
422.8	84.4	23	- 5.0
425.4	108	24	+ 0.9
427.4	127.5	26	+ 1.2
428.4	136	24	0.0
433.5	186	25	- 6.1
434.0	201	23	- 2.0
434.0	198	23	- 3.4
434.5	207	24	- 2.4
436.0	229	23	- 3.8
436.4	251	26	+ 2.4
436.7	239	23	- 4.0
437.0	244	24	- 3.9

Table 4. (Continued) Observed Vapor Pressure of Solid Aluminum Chloride

T(°K)	P_{obs}(mm)	Reference	Obs.-Calcd. P (%)*
439.5	316	24	+ 3.6
441.1	351	23	+ 2.9
443.4	383	23	- 4.5
443.7	433	26	+ 5.6
443.9	403	24	- 3.4
444.7	420	25	- 3.9
445.1	435	25	- 3.5
448.5	553	24	- 2.5
449.5	588	25	- 3.0
450.1	679	26	+ 6.8
450.2	626	23	- 2.0
450.6	636	25	- 3.0
451.5	669	25	- 3.9
451.6	724.5	26	+ 3.1
453.1	796	24	+ 2.6
454.3	932	26	+11
458.0	1445	24	+35
458.2	1027	24	- 5.3
459.5	1118	24	- 4.9
460.7	1215	24	- 4.4
461.0	1538	24	+19
461.2	1286	25	- 2.0
461.6	1452	26	+ 7.3
462.4	1601	25	+13
462.7	1384	24	- 4.0
464.0	1647	24	+ 4.6
464.1	1552	25	- 2.0
464.6	1586	25	- 2.9
464.7	1600	24	- 2.5
465.0	1676	24	+ 0.5
465.3	1689	24	- 1.0
465.4	1692	25	- 1.5

* % of pressure calculated assuming equations (9) and (10).

The last column of Table 4 demonstrates the general agreement of the vapor-pressure data with the required linearity of the "sigma" plot. In particular, it is of interest to note the agreement (within the experimental precision) of the three lowest pressures with the several sets of pressures at higher temperatures. The first three pressures tabulated are smooth values from a series of effusion measurements, whereas the pressures at higher temperatures were measured by static methods. It is still possible, however, that appreciable systematic errors from various sources, such as the entropy of the gas (Al_2Cl_6), may contribute an appreciable error in the intercept of the sigma plot without essentially destroying its approximate linearity. When the entropy of the solid is accurately measured by low-temperature calorimetry (see pages 4 and 14 regarding plans for doing so), a more accurate value than that presently adopted (equation 10)) should be available, and thermodynamic inconsistencies on aluminum chloride can then be reexamined. Meanwhile the other thermodynamic values for this substance given in this report have been made consistent with the results discussed above.

Beryllium Fluoride. The vapor pressure was measured by Sense, Snyder and Clegg from 1019° to 1298°K [10,11]. However, no heat-content data on the solid were found, so no Third-Law treatment of the vapor-pressure data is possible.

Beryllium Chloride. Rahlfs and Fischer [12] measured the vapor pressure from 613° to 732°K and the vapor density at 835°K, where the equilibrium constant K_p of the reaction

$$Be_2Cl_4(g) = 2BeCl_2(g) \qquad (11)$$

was found to be 1.66 atm. However, no heat-content data on the condensed phases were found, so no Third-Law treatment of the vapor data is possible.

Magnesium Fluoride. The vapor pressure was measured by Ruff and LeBoucher [2]. The data and consequent Third-Law results are given in Table 5.

Table 5. Observed Vapor Pressure and Calculated Heat of Vaporization of Magnesium Fluoride

T(°K)	P_{obs}(mm)	$\Delta h_1(298)$(kcal/mole)	Obs. - Calcd. P (%) *
1934	10.6	86.2	-23
2026	24	85.9	-16
2035	26.6	85.8	-14
2065	46	84.4	+22
2078	42.2	85.2	0.0
2129	61	85.1	+ 2.4

* % of calculated pressures, which is based on the assumption that $\Delta h_1(298) = 85.2$ kcal/mole.

Though there is some drift of $\Delta h_1(298)$ with temperature, the precision is poor and also there is probably little reason to suspect that the saturated vapor is not monomeric at these temperatures, and for the heat of vaporization a weighted mean is adopted: $\Delta H_1(298) = 85.2$ kcal/mole.

Magnesium Chloride. Maier's [13] measurements of the vapor pressure are the only reliable data which were found. The data and consequent Third-Law results are given in Table 6.

Table 6. Observed Vapor Pressure and Calculated Heat of Vaporization of Magnesium Chloride

T(°K)	P_{obs}(mm)	$\Delta h_1(298)$(kcal/mole)	Obs. - Calcd. P (%) *
1056.0	1.0	52.88	-13
1111.8	3.5	52.15	+21
1172.9	8.7	52.10	+23
1225.4	15.7	52.30	+12
1273.8	24.9	52.59	- 0.4
1313.8	39.8	52.52	+ 2.3
1338.8	50.2	52.60	- 0.8
1357.9	61.7	52.55	+ 1.1
1376.6	74.2	52.56	+ 0.7
1388.6	81.4	52.61	- 1.1
1400.5	90.4	52.64	- 2.1

* % of calculated pressure, which is based on the assumption that $\Delta h_1(298) = 52.58$ kcal/mole.

There is little reason to suspect that the saturated vapor is not highly monomeric at these temperatures. The seven highest pressures are quite concordant, and the corresponding values of $\Delta h_1(298)$ were averaged to give the adopted value: $\Delta H_1(298) = 52.58$ kcal/mole.

Lithium Fluoride. The vapor pressure of the solid has been measured recently by Pugh and Barrow [14] by a torsion-effusion method (1001°-1126°K) giving pressures independent of assumed vapor molecular weight, by Porter and Schoonmaker [15] by a combination of effusion and mass-spectrometric experiments (at 1073°K), and by Eisenstadt, Rothberg and Kusch [5] by the analysis of molecular beams (1072°-1158°K). In the liquid range earlier vapor-pressure measurements were reported by von Wartenberg and Schultz (1626°-1820°K) [16] and by Ruff, Schmidt and Mugdan (1671°-1939°K) [17]. The normal boiling point is approximately 1940°K.

A number of workers have used various methods to demonstrate and evaluate the complex nature of the saturated vapor. Using their own vapor pressures only, Pugh and Barrow [14] found that approximate agreement between the Second-Law and Third-Law methods could not be obtained on the basis of monomer vapor only, but they achieved agreement by postulating proportions of monomer and dimer calculated with the assumption of molecular constants of the dimer which included one low frequency of 64 cm^{-1}. Proportions of monomer, dimer, and trimer near saturation pressures and 1100°K were evaluated by Porter and Schoonmaker [15] and by Berkowitz and Chupka [18] using mass-spectrometric techniques, and by Eisenstadt, Rothberg, and Kusch [5] from molecular beams. In addition, Berkowitz and Chupka detected an ion attributable to a tetramer, but its intensity indicates the mol fraction of this species to be only about one part per million under the conditions of their observations. The heats of the following reactions were evaluated by various authors from their own data and calculations,

$$LiF(c) = LiF(g) \qquad \Delta H_1 \qquad (12)$$

$$Li_2F_2(g) = 2LiF(g) \qquad \Delta H_D \qquad (13)$$

and after conversion to 298°K are shown in Table 7.

Table 7. Reported Heat of Vaporization and Monomerization of Lithium Fluoride

$\Delta H_1(298)$(kcal)	$\Delta H_D(298)$(kcal)	Reference
66.3	55.7	14
68.9	67.2[a]	15
66.8	62.2[b]	15
65.1	61.7 ± 2.1	5

[a] Assuming dimer: monomer ionization cross section ratio = 2.

[b] Assuming cross-section ratio = 8. They suggested a heat of monomerization equivalent to $\Delta H_D(298) = 64.7 \pm 3$ kcal.

The present authors treated systematically all the available total-vapor-pressure data by the Third-Law method in an effort to determine what values of the vapor-species parameters were thermodynamically consistent with the available data. The thermodynamic functions of LiF(g) given at the end of this report resulted from a recomputation on the basis of recent accurate measurements of the infrared spectrum by Vidale [19]*. The corresponding table for $Li_2F_2(g)$ is discussed below. The table for the condensed phases is based on accurate thermal data to well above the melting point (1121°K). The parameters chosen for attempted evaluation include $\Delta H_1(298)$ and $\Delta H_D(298)$, defined above.

In order to take into account the appreciable concentrations of trimer, it was decided to assume as additional data the equilibrium constant and heat of the reaction

$$2Li_2F_2(g) = LiF(g) + Li_3F_3(g). \qquad (14)$$

Since this reaction is isomolecular, the equilibrium constant as evaluated from reported data would be expected to be relatively independent of errors in total pressure and ionization cross-sections, and the heat of this reaction is no doubt reasonably independent of temperature. Two equations giving the equilibrium constant of the above reaction were alternatively used. The first is

$$K_{eq} = 0.1032 \exp [-2.7 \text{ kcal}/RT], \qquad (15)$$

and was derived from the data of Porter and Schoonmaker [15] over the temperature range 991° - 1113°K. The second is

$$K_{eq} = 2639 \exp [(-20.6 \pm 3.1 \text{ kcal})/RT], \qquad (16)$$

and follows directly from equations given by Eisenstadt, Rothberg and Kusch [5] based on their data in the range 1072° - 1158°K. Both equations indicate little trimer in the saturated vapor near 1000°K, but differ widely at much higher temperatures. Equation (16) is based on more precise data than equation (15).

The total vapor pressures of Eisenstadt, Rothberg and Kusch [5], which they stated to be uncertain by a large percentage, disagree from those of Pugh and Barrow [14] by a factor of 3, and were eliminated from further consideration, since the remaining sets [14,16,17] gave subsequent sigma plots which seemed to show interconsistency within the apparent experimental errors. Of the remaining values, the eight shown in

*Table 8 is actually based on the thermodynamic functions for LiF(g) in NBS Report 6297, but the resulting errors are small and probably within experimental error.

Table 8 below are representative and were selected for further treatment. Of these eight, the pressures at 1699° and 1738°K would show the largest positive and negative deviations, respectively, from a smoothed vapor-pressure curve. As a result, the average thermodynamic consistency would have appeared somewhat better if all the individual vapor-pressures had been treated.

To obtain values of the partial pressures of monomer, dimer and trimer at each temperature (as well as the other thermodynamic relations such as heat of reaction), the third item of information needed was provided by assigning the arbitrary values 65.8, 66.3, 69.1 and 73.0 kcal to $\Delta H_1(298)$ to cover the range of experimental values given in Table 7. (The vapor-pressure data are inconsistent with any value below about 65 kcal). Using alternatively equations (15) and (16), the results obtained as explained below are shown in Table 8.

Table 8. Required Relation of Lithium-Fluoride Gas-Species Parameters

K_{eq}, Assumed	Equation (15)				Equation (16)			
$\Delta H_1(298)$, Assumed (kcal)	65.8	66.3	69.1	73.0	65.8	66.3	69.1	73.0
$\Delta H_D(298)$, Calculated (kcal)	54.6	56.0	63.0	69.4	58.2	61.8	69.0	76.4
$\Delta H_2(298)$, Calculated (kcal)	77.0	76.6	75.2	76.6	73.4	70.8	69.2	69.6
ω_3 of Li_2F_2, Calculated (cm^{-1})	12	11	12	8	100	225	400	550

Temp. (°K)	Total Obs. Vapor Pressure(mm.)	Reference	$\Delta H_2(298)$, Calculated from Observed Vapor Pressure (kcal)							
1000	$7.41(10^{-4})$	14	76.8	76.0	74.8	76.0	73.1	70.5	68.9	69.4
1060	$5.03(10^{-3})$	14	76.5	76.1	75.0	76.2	72.6	70.5	69.0	69.6
1120	0.0278	14	76.3	76.0	75.1	76.6	72.1	70.3	69.1	69.8
1626	49.4	16	77.6	77.1	75.6	76.9	73.7	71.0	69.4	69.9
1699	112	17	76.7	76.5	75.2	76.6	73.3	70.6	69.2	69.6
1738	129.1	16	78.4	78.0	76.0	77.1	74.4	71.4	69.6	69.9
1813	272	17	77.3	76.9	75.4	76.7	73.9	70.9	69.2	69.6
1939	761	17	76.3	76.2	74.8	76.3	73.6	70.5	68.9	69.2

For each of the eight sets of assumed parameters shown in the table, a value of $\Delta H_D(298)$ was found from a sigma plot involving log K for the monomerization reaction (equation (13)), and is given in the third row. Using $\Delta H_2(298)$ to designate the ΔH at 298°K of the reaction

$$2LiF(c) = Li_2F_2(g), \tag{17}$$

the value required by the thermochemical relation

$$\Delta H_2(298) = 2\Delta H_1(298) - \Delta H_D(298) \tag{18}$$

is shown in the fourth row.

Each set of assumed parameters in conjunction with the observed total vapor pressures determined at each temperature a partial pressure of the dimer from which an unsmoothed value of $\Delta H_2(298)$ was first calculated using free-energy functions of $Li_2F_2(g)$ calculated on the basis of the estimated molecular constants given in the earlier NBS Report 6297 (Chapter IV). However, most of these values of $\Delta H_2(298)$ not only disagreed by several kcal with the respective values in the fourth row of Table 8, but also showed a marked trend with temperature (by up to 8 kcal over the 939° temperature range). Of the four lowest fundamental frequencies that had been assumed for the molecule, which are close to 537 cm^{-1}, that of the out-of-plane bending mode has been the subject of considerable controversy. One of the frequency values was varied until the resulting individual unsmoothed values of $\Delta H_2(298)$ in each column of Table 8 averaged the required value in the fourth row. These new values of $\Delta H_2(298)$ are given in the table, and show no trend with temperature. The new frequency is tabulated in the fifth row. (In this range of temperature and frequency, approximately the same result would have been achieved by varying more than one of the frequencies such that their geometric mean had the same final value).

Although the observed vapor pressures set a lower limit to $\Delta H_1(298)$, it appears from Table 8 that no unique selection of parameters is possible without considerations of molecular structure. The results using equation (15) are eliminated on the basis of requiring so low an adjusted frequency as to be unlikely; in addition, the entropy of dissociation of the dimer would depart considerably from the approximately constant value advocated by Bauer, Diner and Porter [4] for all the alkali halides.

Assuming equation (16) to hold, a value of $\Delta H_D(298)$ = 64.0 kcal was selected, being intermediate between the second and fourth values in Table 7. By interpolation in Table 8, the following additional values are found: $\Delta H_1(298)$ = 67.0 kcal; $\Delta H_2(298)$ = 70.0 kcal; ω_3 = 300 cm^{-1}. Other tables in this report have been made consistent with these adopted values.

Although the computed composition of the saturated vapor is quite sensitive to these parameters, the values of the latter which were selected above would indicate that near 1000°K the vapor is about 50 mole % dimer, with more monomer than trimer, but that at the normal boiling point (1940°K) it is approximately 50 mole % trimer, with more monomer than dimer.

Lithium Chloride. The vapor pressure has been measured by Ruff and Mugdan (1318° - 1598°K) [20], von Wartenberg and Schultz (1442° - 1657°K) [16], Maier [13], Beusman (1195° - 1378°K) [21], and Niwa (1939). Miller and Kusch [22] analyzed their molecular-beam data (915° - 971°K) and found the saturated vapor at these temperatures to contain, in addition to the monomer, considerable dimer and some trimer; while Berkowitz and Chupka [18] found mass-spectrometrically also a small proportion of tetramer. However, no accurate values for the absolute entropy of the crystal are yet available from low-temperature thermal data, so no Third-Law treatment of this substance was attempted.

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CHAPTER 7

HEAT OF FORMATION AND DISSOCIATION ENERGY

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The heats of formation of the elements considered in this report are listed in table 1. In this table are shown the heats of formation in the standard states at 0°K and 298.15°K and the energy of dissociation to atoms at 0°K and 298.15°K. Values are expressed in terms of the defined calorie: 1 calorie = 4.1840 absolute joules. All values in table 1 are from Stull and Sinke [1]* except those for fluorine which are based on the correlation by Stamper and Barrow [2], nitrogen, which are given in the review by Brewer and Searcy [94], and carbon. The value for gaseous carbon is obtained by combining the dissociation energy of CO(g) reported by Douglas [147] with the heat of formation from [28] and the dissociation energy of O_2. As Brewer and Searcy [94] have pointed out, there is an uncertainty in this value because the exact dissociation products are not known. We have assumed them to be the atoms in their ground states, $^3P_0$ for C and $^3P_2$ for O. If other configurations such as $^3P_2$ and $^3P_0$ are assumed to be the products, the heat of sublimation of carbon would be lowered by up to 0.7 kcal.

Heats of formation and dissociation energies at the same temperature for the compounds and molecular species of the elements are shown in table 2. In this table the value for a given element or compound with the smaller number of significant figures indicates the accuracy of the value. Derived quantities are shown with larger numbers of significant figures in some cases, to show differences. The various values listed for a given substance are consistent with values for $(H_{298} - H_0)$ given in Chapter I. In many cases a justification of the selected value is given in the following text. All values are subject to further revision on the basis of additional information or further analysis of existing data. In some cases recent data have been published which lead to values agreeing with those reported in NBS Report 6297, within the limits of uncertainty stated. In general, such values are mentioned, but the values in table 2 have not been changed. An extensive discussion of the aluminum oxide-oxyhydrate system, found in NBS Report 6297, is not repeated here.

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*Numbers in brackets refer to references at the end of this chapter.

Discussion of Substances in Table 2

A. Aluminum and its compounds:

1. $Al_2(g)$ $D_0 \approx 50. \pm 30$ kcal/mole or 2.2 e.v.

The dissociation energy for Al_2 is very uncertain. Sharma [4] reported spectra attributed tentatively to this molecule. If taken to apply to the ground state, a linear Birge-Sponer extrapolation gives a dissociation energy of 83 kcal/mole. An examination of the behavior of vapor pressure data suggests that a value roughly of the magnitude of 65 kcal/mole might help some in accounting for the results. As a rough interpolation between their mass spectroscopic value for Si_2 and a value for Mg_2 (see Mg reference), Drowart and Honig [3] have suggested a value of 1.7 e.v. which is about 39 kcal/mole. The value of 50 kcal/mole has been selected arbitrarily, presuming that the Birge-Sponer extrapolation may be high in view of the existence of the lower estimates.

2. $Al_2O(c)$

Gattow [5] estimated ΔHf°_{298} on the basis of a Born-Haber cycle and recent literature, but his value of -25 kcal/mole must be disregarded because it leads to a negative heat of sublimation. No evidence for the existence of this solid has been presented.

3. $Al_2O(g)$ $\Delta Hf^{\circ}_{298} = -39.4 \pm 5$ kcal/mole.

For the reaction $4/3\ Al(l) + 1/3\ Al_2O_3(c) = Al_2O(g)$ $\Delta H^{\circ}_{1500} = 85 \pm 5$ Kcal/mole. This value was obtained by Brewer [6] on the basis of an analysis of the data of Porter, Schissel, and Inghram [7] and of Brewer and Searcy [8], giving greater weight to the former. This leads to a value for $\Delta Hf^{\circ}_{298}(Al_2O) = -39.4$. Gattow [5] estimated $\Delta Hf^{\circ}_{298} = -40$ kcal/mole on the basis of a Born-Haber cycle. See also recent work by DeMaria, Drowart, and Inghram [93] and by Sears and Navias [97].

4. AlO(c) $\Delta Hf^{\circ}_{298} = -88. \pm 10$ kcal/mole.

Gattow [5] estimated the heat of formation of the solid on the basis of a Born-Haber cycle and recent literature. The existence of the compound in the solid phase is not established.

5. AlO (g) $D_0 = 119. \pm 8$ kcal/mole.

In still accepting Brewer's estimate [5] of 119 kcal/mole, we note that this value can be obtained as an arithmetic mean between the recent value of 133.5 ±3 kcal/mole of Veits and Gurvitch [11], based on the coefficient of the dissociation reaction in an oxy-acetylene flame, and a value < 104 kcal/mole more recently reported by Inghram,

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Chupka, and Berkowitz [12], based on mass spectrometer observations. The value given above is in remarkably good agreement with the recently published value of 120 kcal/mole reported by DeMaria, Drowart, and Inghram [93].

6. $Al_2O_2(g)$ $D_0 = 376. \pm 30$ kcal/mole.

This molecule has recently been observed and ΔH_0° for the reaction $Al_2O_2(g) = 2AlO(g)$ has been estimated to be 138 ±15 kcal/mole by DeMaria, Drowart and Inghram [93].

7. AlO_2^- Aluminate ion. $\Delta Hf^\circ_{298} = -221. \pm 3$ kcal/mole.

Kelley, et al. [13] determined the heat of solution of aluminum in potassium hydroxide (2N). The heat of formation of aluminate ion in a solution of 2N $KAlO_2$, 356.6 KOH • 9845 H_2O was calculated, using -114.7 for the heat of formation of KOH(aq 2M) and assuming the K^+ ion to be in its standard state. No corrections for hydrolysis were applied.

8. Al_2O_3-α (c). Corundum. $\Delta Hf^\circ_{298} = -400.4 \pm 0.3$ kcal/mole.

There appears to be little doubt as to the value of ΔHf_{298}. The following values have been recently reported on the basis of direct combustion of highly pure aluminum in oxygen.

Snyder and Seitz (1945) [14]	-399.09 ±0.06
Holley and Huber (1951) [15]	-400.29 ±0.3
Schneider and Gattow (1954) [16]	-400.6 ±2 (-402 ±2)
Mah (1957) [17]	-400.4 ±0.3

The only important possible error appears to be that suggested by Schneider and Gattow, that up to 0.5 percent error may be introduced by formation of some χ - Al_2O_3 in the reaction. The value in parentheses reflects a suggested correction for this crystalline form by Schneider and Gattow. However, the possibility that any such large correction is required was largely dispelled by the work of Mah [17] who found only a small quantity of product which was not corundum. The occurrence of the undesired phase principally in the dust collected from the bomb walls suggested that this oxide might be most troublesome in regions where the gaseous products are quickly cooled. The possible effect of a large surface energy due to fineness of subdivision of the product has not been investigated directly. Information about the heat of formation of Al_2O_3 at 1120 - 1380°K may be obtained from the work of Treadwell and Terebesi [18] on the oxygen-aluminum - aluminum oxide electrode.

Further experimental work on the heat of formation of Al_2O_3 -α is described in references [19-29].

9. Al_2O_3 - γ (c) $\Delta Hf^\circ_{298} = -384.8 \pm 3$ kcal/mole.

Kelley et al. [13] determined the heats of solution of aluminum and of Al_2O_3 - γ in aqueous KOH. They adjusted their solution to give the same final concentrations in each reaction, and itemized corrections for impurities and side effects. From their data, $\Delta Hf^\circ(Al_2O_3 - \gamma) = -384.8$ kcal/mole, Büchner [30] carried out a similar pair of reactions in which the solvent was aqueous HF. His work leads to a value of -377.4 kcal for $\Delta Hf^\circ(Al_2O_3 - \gamma)$, which is significantly different from the work of Kelley. Büchner's value for the heat of solution of Al in HF was confirmed by Wartenberg [31]. Neuvonen [95] dissolved Al_2O_3 - γ in a 5 per cent HF - 20 per cent HCl solution at 75°C. Correcting his heat of solution to 25°, neglecting the effect of the HF in solution, and using values from reference [28] for the heat of formation of $AlCl_3$ solutions leads to $\Delta Hf(Al_2O_3 - \gamma) = -384.0$ kcal, in good agreement with the value found by Kelley. Kelley's value is therefore adopted. It should be realized that aluminum forms a series of complex ions with hydroxides, with fluorides, and with chlorides, which may introduce significant heat effects.

10. Al_2O_3 - ρ (c) $\Delta Hf^\circ_{298} = -394. \pm 4$ kcal/mole.

This little-known phase of alumina is formed by vacuum dehydration of alpha- or beta-alumina trihydrate. Michel [33] measured the heat of dehydration of alpha alumina trihydrate at 210-230°C and adjusted it to 25°C. Combining this with the heat of formation of alpha alumina trihydrate (see below), one obtains $\Delta Hf(Al_2O_3 - \rho) = -394.$ kcal/mole. Földvári-Vogl and Kliburszky recently determined the heat of dehydration of alpha alumina trihydrate to Al_2O_3 - ρ. Their heat of dehydration leads to $\Delta Hf = -396.4$, which is within the limits stated above. Shevtsov and Gevorkyan [98] have reported some information on amorphous Al_2O_3.

11. $Al_2O_3(g)$

The existence of this species has not been demonstrated. Wartenberg [31] has estimated the heat of sublimation to be at least 150 kcal/mole, and disagrees with the interpretation by Brewer and Searcy of the vaporization processes. The paucity of data upon which he bases his argument has caused it to be disregarded in the face of detailed mass spectrometric data obtained by other workers. DeMaria, Drowart, and Inghram [93] estimate the heat of atomization to be 500 kcal/mole, a value which requires a much greater heat of vaporization than that estimated by Wartenberg. See also a recent letter by Sears and Navias [97]. It must be conceded that the vapor pressure and vapor species present over Al_2O_3 are still open questions.

12. $Al_2O_3 \cdot H_2O$-α (c) Boehmite $\Delta Hf^\circ_{298} = -463.4 \pm 3$ kcal/mole.

Roth [32] determined the heat of dehydration of alpha alumina monohydrate by reaction calorimetry. His value for this process is confirmed within 0.2 kcal by a direct determination of the heat of dehydration in vacuum by Michel [34]. See also Földvari-Vogl and Kliburszky [96].

13. $Al_2O_3 \cdot H_2O$-β (c) Diaspore $\Delta Hf^\circ_{298} = -478. \pm 4$ kcal/mole.

The data on this compound are inconsistent. The most useful piece of information for relating it to other compounds is the finding by Hüttig and Wittgenstein [35] that the heat of dehydration of beta alumina monohydrate to alpha alumina is the same as the heat of dehydration of alpha alumina monohydrate to gamma alumina. Their estimate is based on measurements of the vapor pressure of water over the hydrate. Földvári-Vogl and Kliburszky [96] found about 0.5 kcal for this difference.

14. $Al_2O_3 \cdot 3H_2O$-α (c) Hydrargillite $\Delta Hf^\circ_{298} = -615.4 \pm 5$ kcal/mole.

The heat of dehydration of alpha alumina trihydrate to alpha alumina monohydrate was determined from vapor pressure measurements by Fricke and Severin [36]. The value is consistent with a value determined from the heat of solution of alpha alumina trihydrate in aqueous sodium hydroxide directly measured by Roth, Wirths, and Berendt [27]. The latter value is confirmed within 3 kcal by Russell, Edwards, and Taylor [37] who evaluated the heat of solution on the basis of a difficult experiment on the solubility equilibrium as a function of temperature. Recent work on the dehydration of hydrargillite has been reported by Schwiete and Ziegler [99] whose work yields 235 kcal/mole for the difference in heats of formation of gamma alumina and alpha alumina trihydrate, as compared to 230.6 found in table 2. Földvári-Vogl and Kliburszky [96] also studied the dehydration of the trihydrate.

15. $Al_2O_3 \cdot 3H_2O$-β (c) Bayerite $\Delta Hf^\circ_{298} = -612.6 \pm 6$ kcal/mole.

Michel [33] found 1.50 kcal for the difference in the heat of dehydration of alpha- and beta-alumina trihydrates both yielding Al_2O_3-ρ. Fricke and Wullhorst [38] determined the heats of solution of the same compounds in aqueous HF and found a difference of 2.50 kcal. Russell, Edwards, and Taylor [37] calculated the heats of solution from solubility measurements in aqueous NaOH and found a difference of 4.20 kcal. An average of 2.8 kcal was selected.

16. AlH(g) $D_0 = 71. \pm 20$ kcal/mole.

This value is taken from Herzberg [8].

17. $AlH_3(g)$ $\Delta Hf^\circ_{298} = 18. \pm 10$ kcal/mole.

The data for $(AlH_3)_x$ (see below) when combined with estimated heats of polymerization and sublimation give $\Delta Hf = 9$ kcal and $\Delta Hf = 26$ kcal. From the Al-H bond energy of 70 kcal, $\Delta Hf = 23$ kcal.

18. $(AlH_3)_x(c)$ $\Delta Hf^\circ_{298} = -3. \pm 10$ kcal/mole.

Recently Marsel [100] and Foster [101] have reported for the heat of formation of this polymeric substance preliminary values of -12 kcal and 5 kcal per monomeric unit, respectively. It is not certain that these two values refer to the same compound. Lacking further information we have taken the average.

19. $Al(OH)_3$ amorphous $\Delta Hf^\circ_{298} = -304. \pm 4$ kcal/mole.

No recent work has been done on this substance, which is not well defined. The value reported was found from the heat of formation of $Al(OH)_3$ precipitate by bases acting on solutions of aluminum salts, and is reported in NBS Circular 500.

20. AlF(c) $\Delta Hf^\circ_{298} = -102. \pm 10$ kcal/mole.

No measurements have been made on solid AlF, and the occurrence of this compound has not been demonstrated. Irmann [39] has estimated the heat of formation to be -103 kcal per mole, and Brewer et al. [40] estimated it to be -102 kcal/mole.

21. AlF(g) $\Delta Hf^\circ_{298} = -60. \pm 10$ kcal/mole.

While a spectroscopic value of 167 kcal/mole for the dissociation energy was obtained by Barrow, Johns, and Smith [41], they thought it likely that the excited state studied for this estimate had a potential maximum, so that a thermochemical value was preferable. With the heat of formation here accepted, $\Delta Hf_{298} = -60$ kcal/mole, the dissociation energy is taken as 155.3 kcal/mole. Gaydon [42] has used 154 kcal/mole, 155 kcal/mole was given by Gross, Hayman, and Levi [43], and Barrow, Johns, and Smith give 158.4 kcal/mole as their thermochemical value.

22. AlF_2(c) $\Delta Hf^\circ_{298} = -184. \pm 10$ kcal/mole.

This substance is not known. The heat of formation is estimated by Irmann [39].

23. AlF_2(g) $\Delta Hf^\circ_{298} = -114. \pm 5$ kcal/mole.

The substance is not known; the heat of formation is estimated by Irmann [39].

24. AlF_3(c) $\Delta Hf^\circ_{298.16} = -356.3$ kcal/mole.

This value, reported by Gross, Hayman, and Levi [102], and a slight revision of an earlier value [43], is the only direct experimental determination and is based on the reaction of Al with PbF_2 in the dry state. Brewer et al. [40] derived a value of -323 ±5 on the basis of heat of hydration and heat of solution estimates. In NBS Circular 500 is reported a value of -311. obtained by a similar method of estimation, using different solution data. Work with hydrates and solutions is indicated to be very difficult by the experiments of Ehret and Frere [42], who found in some cases up to a year was required for achievement of equilibrium; and therefore, the direct dry heat determination by Gross, Hayman, and Levi is preferred.

25. $AlF_3(g)$ $\Delta Hf^\circ_{298} = -284.8$ kcal/mole.

The heat of vaporization is 71.5 kcal/mole on the basis of a third law treatment of the vaporization data (see chapter 6). Together with the heat of formation of $AlF_3(c)$ given above this leads to $\Delta Hf_{298} = -284.8$ kcal/mole.

26. AlF_3(hydrates)

No values are reported here for the heats of formation of AlF_3 hydrates. There are several, not all clearly differentiated nor well defined. See for example Emeléus [103], and Seidell and Linke [104]. The system of hydrates, acid salts, and basic salts of AlF_3 is complex and only fragmentary heat data are available (see NBS Circular 500).

27. AlCl(c) $\Delta Hf^\circ_{298} = -50. \pm 10$ kcal/mole.

The heat of formation was estimated by Gattow [5].

28. AlCl(g) $D_0 = 116.8$ kcal/mole or 5.06 e.v.

A thermochemical value by Gross, Campbell, Kent, and Levi [44] of $\Delta Hf_{298} = -11.3$ kcal/mole is accepted for AlCl, giving $D_0 =$ 116.8 kcal/mole. For AlCl, as for AlF, the value obtained for D_0 is considerably above the result of a linear Birge-Sponer extrapolation, a situation typical for strongly ionic bonding.

29. $AlCl_2(c)$

The heat of formation was estimated by Gattow [5] as -80 kcal/mole. This leads, however, to much too small a heat of sublimation.

30. $AlCl_2(g)$ $\Delta Hf^\circ_{298} = -78. \pm 5$ kcal/mole.

Heimgartner [105] studied the equilibrium in the reaction between AlCl and $AlCl_3$.

31. $AlCl_3(g)$ $\Delta Hf^\circ_{298} = -137.1 \pm 1.5$ kcal/mole.

This value is from the heat of formation of $Al_2Cl_6(g)$ and dissociation equilibrium measurements by Smits and Maijering [49] and Fischer and Rahlfs [50]. (See Chapter 6.)

32. $AlCl_3 \cdot 6H_2O(c)$ $\Delta Hf^\circ_{298} = -643.6 \pm 0.5$ kcal/mole.

Coughlin determined the heat of solution of aluminum [148] and $AlCl_3 \cdot 6H_2O(c)$ [51] in 4.360 molal HCl.

33. $Al_2Cl_6(c)$ $\Delta Hf^\circ_{298} = -337.14 \pm 0.5$ kcal/mole.

Coughlin determined the heat of solution of aluminum [148] and of $Al_2Cl_6(c)$ [51] in 4.360 molal HCl.

34. $Al_2Cl_6(g)$ $\Delta Hf^\circ_{298} = -308.76 \pm 0.8$ kcal/mole.

ΔH vaporization is calculated from the vapor pressure data reported in references [48, 158-161]. (See Chapter 6.)

35. $AlN(c)$ $\Delta Hf^\circ_{298} = -76.5 \pm 1$ kcal/mole.

The heat of formation by nitriding aluminum directly in a bomb calorimeter was determined by Neugebauer and Margrave [106], whose value is listed above. Other determinations have been made by Neumann, Kroger, and Haebler [107], who found -57.4 kcal/mole, using the same method; by Fichter and Jenny [108], who found -71.5 kcal/mole from the heat of combustion of AlN; by Schissel and Williams [109] who found -63 kcal/mole in a mass spectrometric study of the vaporization from a Knudson cell. Prescott and Hincke [110] studied the equilibrium between AlN and C. The heat of formation of AlN calculated from their study is dependent upon the heat of formation of Al_4C_3, which is not well known.

36. $Al_2C_2(g)$ $\Delta Hf^\circ_{298} = -33$, kcal/mole.

Chupka, Berkowitz, Giese, and Inghram [111] determined the heat of formation of Al_2C_2 by mass spectrometer study of the vapor. Existence of other aluminum carbide gas species was not demonstrated.

37. $Al_4C_3(c)$ $\Delta Hf^\circ_{298} = -48.6 \pm 10$ kcal/mole.

The heat of combustion of Al_4C_3 has been determined by Berthelot [112], by Wohler and Hober [113], by Meichsner and Roth [114], and by Kameyama and Yoshida [115], using not very pure material. The measurements of Meichsner and Roth appear to have been done most carefully, using the purest material, and have been adopted for this work. Their calculations have been redone, using -400.4 kcal/mole for the heat of formation of Al_2O_3, to obtain the value listed above. This assumes that α-Al_2O_3 was the principal aluminum oxide formed. Meichsner and Roth made no examination of the crystalline form of the product Al_2O_3. However, Foster, Long, and Hunter [116] suggest that a delta-like phase of Al_2O_3 is stabilized in the presence of a carbonaceous promoter. The formation of such a phase, if it formed a principal part of the combustion product, could cause a rather large error in the heat of formation of Al_4C_3.

A number of other values have been reported for the heat of formation of Al_4C_3, based on equilibrium gas pressures in the systems Al_4C_3-N_2 and Al_2O_3-C. Kelley [117] reviewed the work of Prescott and Hincke [118], and of Brunner [119], and calculated a value, which when adjusted to more recent values for the heat of formation of Al_2O_3 gives -117.1 kcal/mole for the heat of formation of Al_4C_3. More recent work

has been reported informally by Hilmer and colleagues [120] and by Gross [121]. Because of the difficulty of the measurements, the results obtained in the equilibrium studies have not been used here.

B. Beryllium and its compounds:

1. $Be_2(g)$ $D_0 = 16. \pm 10$ kcal/mole.

For Be_2, Drowart and Honig [3] have estimated that D_0 is about 0.7 e.v., based on a graphical interpolation between elements for which literature values exist. It would seem that such an estimate must be very uncertain.

2. BeO(c) $\Delta Hf^\circ_{298} = -143.1 \pm 4$ kcal/mole.

A determination by Cosgrove and Snyder [52] gave a value $\Delta Hf(BeO) = -143.1 \pm 0.1$. The small standard deviation will probably cause this value to be generally accepted. The principal criticism which can be made of this work is the failure to determine the completeness of reaction. In a heterogeneous system of refractory materials incomplete combustion is sometimes a serious problem (viz. boron oxides). It should be noted that the two most recent determinations for $\Delta Hf^\circ(BeO)$; -147.3 ±0.6 (Roth, Börger, and Siemonsen [53]), and -143.1 ±0.1, differ from one another by considerably more than the uncertainty estimated by the authors, a fact which suggests systematic errors in one or both experiments.

3. BeO(g) $D_0 = 106. \pm 5$ kcal/mole.

A dissociation energy of 106 kcal/mole has been accepted for the present report based on mass spectrometric studies of Chupka, Berkowitz, and Giere [54] showing vapor species including oxide polymers. See chapter 6 of NBS Report 6297. Some thermochemical data had appeared earlier to indicate a value near the 124 kcal/mole accepted by Gaydon [42]. It appears that the uncertainty of the value accepted could well be increased to 5 kcal/mole to take account of the possible correctness of 111 kcal/mole or 4.82 e.v. obtained spectroscopically by Lagerqvist [55].

4. BeH(g) $D_0 = 51. \pm 7$ kcal/mole.

This value is taken from Herzberg [8].

5. $Be(OH)_2(c)$ $\Delta Hf^\circ_{298} = -213.9 \pm 5$ kcal/mole.

The value in [28] is based upon the heats of solution of BeO and $Be(OH)_2$ in aqueous HF reported by Fricke and Wullhorst [38] and Matignon and Marchal [149].

6. $Be(OH)_2(g)$ $\Delta Hf^\circ_{298} = -162.4 \pm 6$ kcal/mole.

The data of Grossweiner and Seifert [56] on the volatility of BeO as a function of the water vapor pressure were used to calculate the heat of formation of $Be(OH)_2(g)$

7. BeF(g) $D_0 = 92. \pm 30$ kcal/mole.

For BeF and BeCl, two opposing effects are thought to occur relevant to the magnitude obtained by a linear Birge-Sponer extrapolation. On the one hand, the bond is partially ionic so the true value might be expected to be above the extrapolated value. On the other hand, one of the atoms (Be) has a $^1S_0$ ground state, in which case an opposite deviation is found. The view might be taken that either effect might be the larger so that the simple extrapolated value should be used as listed by Herzberg [9], with a large uncertainty. Gaydon [42] gives values indicating that he considers the reducing effect to be the larger. A comparison of heats of formation for an extensive group of fluorine compounds has led to a preference for Gaydon's value for BeF, viz., $D_0 = 92 \pm 30$ kcal/mole. His indicated uncertainties are increased somewhat in the present listing.

8. $BeF_2(c)$ $\Delta Hf^\circ_{298} = -241.1 \pm 5$ kcal/mole.

Kolesov and Skuratov [122] informally report measuring the heats of solution of BeO and BeF_2 (β-crystoballite) in $HF \cdot 3.8H_2O$ at 21°C, to be -24.17 ±0.12 and -8.04 ±0.07 kcal/mole respectively, from which they derive -241.08 kcal/mole for the heat of formation of BeF_2. The estimate of the heat of solution previously made [40] appears to have been seriously in error.

9. $BeF_2(g)$ $\Delta Hf^\circ_{298} = -192.1 \pm 5$ kcal/mole.

Sense, Snyder, and Clegg [57] have measured the heat of vaporization of $BeF_2(g)$ to 1000°C. See also Sense and Stone [58]. With the heat of formation of solid BeF_2, 3 kcal for reduction to 298°K and an estimated heat of melting of 6 kcal, this leads to $\Delta Hf = -192.1$ kcal/mole.

10. BeCl(g) $D_0 = 69. \pm 30$ kcal/mole.

See BeF.

11. $BeCl_2(c)$ $\Delta Hf^\circ_{298} = -109.2 \pm 5$ kcal/mole.

The direct determination of the heat of chlorination by Siemonsen [59] is adopted. The older value obtained by Mielenz and Wartenberg [150], -112.6 kcal, is in good agreement.

12. $BeCl_2(g)$ $\Delta Hf^\circ_{298} = -84. \pm 6$ kcal/mole.

Using Siemonsen's [59] value for the heat of formation of $BeCl_2(c)$ and sublimation data from NBS Circular 500, the heat of formation of $BeCl_2(g)$ is found to be -84 kcal/mole.

13. $Be_2Cl_4(g)$ $\Delta Hf^\circ_{298} = -188. \pm 10$ kcal/mole.

Using the heat of sublimation of the dimer from NBS Circular 500 and the heat of formation of $BeCl_2(c)$ from Siemonsen [59], the heat of formation of the dimer is calculated to be -188 kcal/mole.

14. $Be_3N_2(c)$ $\Delta Hf^\circ_{298} = -132. \pm 3$ kcal/mole.

Neumann, Kroger, and Haebler [107] measured the heat of formation of Be_3N_2 to be -133.4 ±0.6 kcal/mole by nitriding Be (99.5 percent pure) directly in a high temperature bomb calorimeter. Neumann, Kroger, and Kunz [123] measured the heat of combustion of Be_3N_2 (91.2 percent pure). Their value, corrected for impurities and using -143.1 kcal/mole for the heat of formation of BeO gives -129.0 kcal/mole for the heat of formation of Be_3N_2. Because of the strong dependence of the combustion experiment upon the value accepted for the heat of formation of BeO, greater weight is given to the nitriding experiment.

15. $BeC_2(g)$ $\Delta Hf^\circ_0 = 134.3 \pm 10$ kcal/mole.

Chupka, Berkowitz, Giese, and Inghram [111] studied the vaporization of BeC_2. No vapor species was observed at temperatures up to 1900°K. The above estimate is made by analogy to BeO.

16. $Be_2C(c)$ $\Delta Hf^\circ_{298} = -22.2 \pm 5$ kcal/mole.

Pollock [124] measured the vapor pressure of beryllium over beryllium carbide by an effusion process. From his equilibrium vapor pressure and an estimated correction for ΔCp we calculate -22.2 ±5 for the heat of formation of $Be_2C(c)$.

C. Magnesium and its compounds

1. $Mg_2(g)$ $D_0 = 7.2$ kcal/mole or 0.31 e.v.

The dissociation energy for Mg_2 has been reported as estimated from the band spectrum as 0.31 e.v. or 7.2 kcal/mole by Soulen, Sthapitanonda, and Margrave (1955)[60] and also so reported by Margrave (1957) [61]. It had also been reported as 0.30 e.v. by Hamada (1931) [62] from the interval between the vapor resonance line and its short wave cut-off.

2. $MgO(c)$ $\Delta Hf^\circ_{298} = -143.7 \pm 0.3$ kcal/mole.

The above value for ΔHf°_{298} was determined by direct combustion of Mg by Holley and Huber [15]. It is in good agreement with a previous value (-143.84) which Shomate and Huffman [63] obtained from the heat of solution in HCl, and with a recently reported value (-143.92 ±0.26) found by Vorob'ev and Skuratov [125] by direct combination. An older value (-146.1 ±0.3) found by Moose and Parr [23] by direct combustion differs significantly.

3. $MgO(g)$ $D_0 = 90.$ kcal/mole or 3.9 e.v.

The dissociation energy for MgO is taken as 90 kcal/mole, reported as an upper limit for D_0 by Porter, Chupka, and Inghram [64] on the basis of observations on electron bombarded vapor. On the basis of flame studies, Huldt and Lagerqvist [65] had proposed 120 kcal/mole, and Veits and Gurvich [66] more recently have obtained 100 kcal/mole. Brewer and Porter [67] had obtained 109 kcal/mole on the basis of vapor pressure and spectroscopic measurement. A spectroscopic value of 85 kcal/mole was reported earlier by Lagerqvist and Uhler [68], based on visible band systems, but is presumed to be irrelevant if the proposal is correct that the ground state for the molecule is not the observed $^1\Sigma$ state but an unobserved $^3\Sigma$ state. The question of the ground state was mentioned by Brewer [69], by Porter [70], and by Brewer and Porter [67]. Gaydon [42] has suggested that a triplet state may have been observed by Barrow and Crawford [71].

4. $MgO_2(c)$ $\Delta Hf^\circ_{298} = -148.9 \pm 4$ kcal/mole.

Only one value has been reported for the heat of formation $\Delta Hf = -148.9$ by Blumenthal [72].

5. $MgH(g)$ $D_0 = 46. \pm 10$ kcal/mole.

These values are from Gaydon [42].

6. $MgH_2(c)$ $\Delta Hf^\circ_{298} = 18. \pm 5$ kcal/mole.

The heat of formation was determined by Ellinger [133]

7. $Mg(OH)_2(c)$ (brucite) $\Delta Hf^\circ_{298} = -221.0 \pm 0.7$ kcal/mole.

Zhabrova and Kadenatsi [126] and Berg and Rassonskaya [127] have studied the dehydration equilibrium $Mg(OH)_2(c) = MgO(c) + H_2O(g)$. Their data lead to a ΔHf $Mg(OH)_2(c)$ of -219.0 kcal and -222.0 kcal/mole, respectively. Roth and Chall [128], Taylor and Wells [129], and Giauque and Archibald [130] measured the heat of solution of MgO and $Mg(OH)_2$ in aqueous HCl. Their data lead to ΔHf $Mg(OH)_2(c)$ of -220.3 kcal, -220.9 kcal, and -221.76 kcal/mole, respectively. Shomate and Huffman [63] measured the heat of solution of MgO in aqueous HCl

and Torgeson and Sahama [132] dissolved $Mg(OH)_2$ in the same acid. Their data give $\Delta Hf\ Mg(OH)_2(c) = -220.87$ kcal/mole. The heat of formation of $Mg(OH)_2$ depends upon the method of preparation, as is shown by the work of Taylor and Wells.

8. $MgF(g)$ $D_0 = 74. \pm 20$ kcal/mole.

The MgF molecule is thought to bear a resemblance to BeF in combining opposing effects related to deviations from the linear Birge-Sponer extrapolation. Similarly, MgCl bears a resemblance to BeCl. Gaydon's [42] values have been accepted for this report. Thus we have $D_0 = 74 \pm 20$ kcal/mole for MgF and 62 ± 20 kcal/mole for MgCl.

9. $MgF_2(c)$ $\Delta Hf^\circ_{298} = -268.0$ kcal/mole.

The heat of formation was calculated from the heat of reaction of Mg with PbF_2 as reported by Gross, Hayman, and Levi [43].

10. $MgF_2(g)$ $\Delta Hf^\circ_{298} = -182.8$ kcal/mole.

Correlation of the vapor pressure data of MgF_2 by the third law of thermodynamics gives 85.2 kcal/mole for the heat of vaporization, which can be combined with the heat of formation of $MgF_2(c)$. See chapter 6.

11. $MgCl(g)$ $D_0 = 62. \pm 20$ kcal/mole.

See MgF.

12. $MgCl_2(c)$ $\Delta Hf^\circ_{298} = -153.40 \pm 0.2$ kcal/mole.

Recent work by Gunn and Cunningham [134] and by Westrum and Eyring [135] on the heat of solution of Mg in HCl(aq) lead to essentially the same values as those in Circular 500, which are based on the work of Shomate and Huffman [63].

13. $MgCl_2(g)$ $\Delta Hf^\circ_{298} = -100.8 \pm 0.6$ kcal/mole.

A third law treatment of the vapor pressure of $MgCl_2$ leads to 52.58 for the heat of vaporization. Combined with the heat of formation of the crystal, this leads to -100.8 kcal/mole for the heat of formation of the gas. See chapter 6.

14. $MgCl_2 \cdot H_2O(c)$ $\Delta Hf^\circ_{298} = -231.15 \pm 0.2$ kcal/mole.

The value in NBS Circular 500 [28], which is based upon the heat of solution data of Shomate and Huffman [63], was adopted.

15. $MgCl_2 \cdot 2H_2O(c)$ $\Delta Hf^\circ_{298} = -305.99 \pm 0.2$ kcal/mole.

See $MgCl_2 \cdot H_2O(c)$.

16. $MgCl_2 \cdot 4H_2O(c)$ $\Delta Hf^\circ = -454.00 \pm 0.25$ kcal/mole.

The value [28] obtained from the heat of solution data of Shomate and Huffman [63] is confirmed by the decomposition pressure studies of Konduirev and Berezovskii [154], Derby and Yngve [55], and Sano [156,157].

17. $MgCl_2 \cdot 6H_2O(c)$ $\Delta Hf = -597.42 \pm 0.30$ kcal/mole.

See $MgCl_2 \cdot H_2O(c)$.

18. $Mg_3N_2(c)$ $\Delta Hf^\circ_{298} = -110.2 \pm 1$ kcal/mole.

Mitchell [136] in 1949 dissolved Mg_3N_2 in a 1N HCl solution and found -287.9 kcal/mole for the heat of solution, which leads to -110.2 kcal/mole for the heat of formation of Mg_3N_2. Other determinations have been -113.9 kcal/mole by Neuman, Kroger, and Kunz [123], from the heat of solution in HCl, -114.9 kcal/mole by Brunner [119] from the heat of solution of Mg_3N_2 in water, with the evolution of ammonia, and a less reliable value, -134.3 kcal/mole found by Matignon [137] from the solution of Mg_3N_2 in aqueous sulfuric acid. Neumann, Kroger, and Haebler [107] by nitriding Mg directly in a high temperature bomb calorimeter found the heat of formation to be -116 ±2 kcal/mole.

19. $MgC_2(c)$ $\Delta Hf^\circ_{298} = 21. \pm 5$ kcal/mole.

Irmann [138] determined the heat of solution of MgC_2 in HCl solution. The purity of the material used was 56.8-66.8%.

20. $Mg_2C_3(c)$ $\Delta Hf^\circ_{298} = 19. \pm 8$ kcal/mole.

Irmann [138] measured the heat of solution of $Mg_2C_3(c)$ (67-82 percent pure) in aqueous HCl.

D. Lithium and its compounds

1. $Li_2(g)$ $\Delta Hf^\circ_{298} = 50.47$ kcal/mole.

Spectroscopic and vapor pressure data were reviewed by Evans, Jacobson, Munson, and Wagman [73]. While the present report involves slightly modified basic tables for solid and vapor, including isotope shift for the spectroscopic constants, the previous results for ΔHf_{298} for Li_2 would apparently not be affected to the number of figures reported and are hence retained.

2. LiO(g) $D_0 \leq 83. \pm 5$ kcal/mole.

A limiting value for D_0 (LiO) of 83 kcal/mole has been reported by Blue, Berkowitz, and Chupka [74] based on a mass spectrometric study of the sublimation of lithium oxide.

3. $Li_2O(c)$ $\Delta Hf^\circ_{298} = -142.4 \pm 0.5$ kcal/mole.

The above value listed in NBS Circular 500 is further substantiated by recent work reported informally by Kolesov, Skuratov, and Zaikin [139] who give -142.8 ±0.3 kcal/mole.

4. $Li_2O_2(c)$ $\Delta Hf^\circ_{298} = -151.5 \pm 4$ kcal/mole.

The decomposition pressures measured by Centnerszwer and Blumenthal [140] have been recalculated to give -146.5. The heats of solution and reaction with aqueous HCl measured by de Forcrand [151] give -151.7 kcal.

5. LiH(c) $\Delta Hf^\circ_{298} = -21.64$ kcal/mole.

The heat of formation has been determined by measurement of the heats of solution of Li(c) and LiH(c) by Gunn and Green [75], Messer, Fasolino, and Thalmayer [76], and Gibb [152].

6. LiH(g) $D_0 = 56.0 \pm 10$ kcal/mole.

The dissociation energy $D_0 = 56.01$ kcal/mole obtained by Velasco [77] from spectroscopic data is accepted as the best value at present.

7. LiOH(c) $\Delta Hf^\circ_{298} = -116.4 \pm 0.2$ kcal/mole.

The heat of formation is obtained using the data of Gregory and Mohr [78] for the decomposition pressure. Fair agreement as to heats is obtained using data of Ditmars and Johnston [79] although there is disagreement as to the magnitude of the pressure. Solution data by Ueda [141] and by deForcrand [131,142] give values in excellent agreement.

8. $LiOH \cdot H_2O(c)$ $\Delta Hf^\circ_{298} = -188.77 \pm 0.2$ kcal/mole.

The value in NBS Circular 500 [28] is based on the heat of solution data of Ueda [141] and de Forcrand [131].

9. LiF(c) $\Delta Hf^\circ_{298} = -146.3 \pm 2.0$ kcal/mole.

The solubility data of Payne [153] were used to calculate the heat of solution.

10. LiF(g) $\Delta Hf^{\circ}_{298} = -79.3 \pm 3$ kcal/mole.

For the reaction LiF(c) = LiF(g), Pugh and Barrow [80] give $\Delta H_{1060} = 62.7$ kcal/mole and Porter and Schoonmaker [81] give as an average value $\Delta H_{1073} = 64.6$ kcal/mole. Taking the mean and assuming that ΔHf°_{298} of LiF(c) is -146.3 kcal/mole [28], a thermochemical cycle gives for D_0 of LiF(g) 136.2 kcal. Theoretical calculation from an ionic model which gave excellent agreement with thermochemical values for ten other alkali halide diatomic molecules gave for LiF(g) $D_0 =$ 131.0 kcal/mole. From photochemical dissociation Desai [82] calculated $D_0 = 132.4$ kcal/mole. See chapter 6 for a complete discussion of the vapor pressure data which give 67.0 kcal for the heat of sublimation.

11. $(LiF)_2(g)$ $\Delta Hf^{\circ}_{298} = -222.6 \pm 5$ kcal/mole.

For the reaction $(LiF)_2(g) = 2LiF(g)$ Pugh and Barrow [80] calculated from their vapor-pressure data $\Delta E_{1060} = 53$ kcal; this is equivalent to $\Delta H_{1060} = 55.1$ kcal. This value depends to some extent on their assumption of a value below 100 cm^{-1} for one vibrational fundamental of the dimer. For the same reaction Porter and Schoonmaker [81] recommended $\Delta H_{1073} =$ 64.1 ±3 kcal on the basis of their mass spectrometric free energies and a dimer entropy calculated by the method of Bauer, Diner, and Porter [83]. Further work has been done by Eisenstadt, Rothberg, and Kusch [143]. See chapter 6 for a complete discussion leading to a value at 298.15°K of 70.0 kcal for the reaction $2LiF(c) = (LiF)_2(g)$.

12. $(LiF)_3(g)$ $\Delta Hf^{\circ}_{298} = -345.3 \pm 8$ kcal/mole.

Porter and Schoonmaker [81] and Berkowitz and Chupka [84] have reported ion intensities attributed to $(LiF)_3$. Though the temperatures and total pressures are not clearly defined, it seems logical to apply their data to the isomolecular reaction $2(LiF)_2(g) = LiF(g) + (LiF)_3(g)$, which would be expected to be relatively independent of temperature, total pressure, and ionization cross-sections. The two investigations correspond to equilibrium constants for this reaction (calculated to be 0.03 ±0.01 at 1000°K) which differ by a factor of 2. The temperature dependence reported by Porter and Schoonmaker is subject to a very large percentage uncertainty, but seems to correspond on the average to $\Delta H = 3$ kcal, which is consistent with their estimate of 50 kcal$< \Delta H_{1073}$ < 65 kcal. for the reaction $(LiF)_3(g) = (LiF)_2(g) + LiF(g)$. Further work has been done by Eisenstadt, Rothberg, and Kusch [143]. See chapter 6 for a complete discussion of the data, leading to a value of 93.6 kcal for the reaction $3LiF(c) \rightarrow (LiF)_3(g)$.

13. $(LiF)_4(g)$

Berkowitz and Chupka [84] report a very low ion intensity attributed to this molecule. This result seems surprising in view of the relative stability which this molecule might be expected to have in a cubic configuration, not to mention other configurations which may also be important in a comprehensive statistical treatment [85]. Apparently no heat of dissociation of this molecule has been estimated, and none is recommended here.

14. $LiHF_2$ $\Delta Hf^\circ_{298} = -224.2 \pm 1$ kcal/mole.

Decomposition pressure of the bifluoride to give LiF and HF was measured by Burney [144]. Calculation from his data gives the above value.

15. LiCl(c) $\Delta Hf^\circ_{298} = -97.70 \pm 2$ kcal/mole.

A recent measurement by Siemonsen and Siemonsen [88] by direct combination of the elements is in disagreement by about 3 kcal with measurements in aqueous solution [28]. Because of the weight of evidence for the latter, no change is recommended until the reason for the difference is clarified.

16. LiCl(g) $D_0 = 111.8 \pm 4$ kcal/mole.

The dissociation energy assumed was calculated to be $D_0 = 110.4 \pm 4$ kcal/mole, using the same type of thermochemical cycle as for LiF(g). In this calculation the apparent "Second-Law" heat of evaporation of LiCl(l) [28, p.792] was increased by 4.2 kcal/mole to correct for the presence of dimer and trimer in the vapor according to the results of Miller and Kusch [86,87]; in addition ΔHf°_{298} of LiCl(c), was assumed to be the average of the two values -97.70 kcal/mole [28, p.433] resulting from a thermochemical cycle and -94.8 kcal/mole found [88] by direct combination of the elements. From the photochemical absorption limit Desai [82] obtained $D_0 = 118.0$ kcal/mole, but the thermochemical value is considered to be more reliable because the thermal data seem more accurate.

17. $(LiCl)_2(g)$, $(LiCl)_3(g)$ $D_0 = 276.4, 424.2$ kcal/mole.

From an analysis of their molecular-beam data at a total pressure of 10^{-2}mm Miller and Kusch [86] reported for the two reactions $(LiCl)_2(g) = 2LiCl(g)$ and $(LiCl)_3(g) = (LiCl)_2(g) + LiCl(g)$ the respective values $\Delta E_{870} = 51.1 \pm 0.3$ kcal and $\Delta E_{870} = 34.2 \pm 1.8$ kcal. They calculated also the equilibrium constants for these reactions; under these conditions they found lithium chloride vapor to contain more dimer than monomer, and a few percent of trimer. Their detection was subject to more uncertainty than in the case of alkali halides other than lithium salts, and their statements of precision have been criticized as being much too small indications of the true uncertainty by Bauer, Diner, and Porter [83], who however arrived at a value of ΔE for the first reaction above which differs fortuitously by only 0.2 kcal. Miller and Kusch's values have been assumed.

18. $Li_2FCl(g)$ $D_0 = 305.2$ kcal/mole.

It appears that no evidence of the existence of this molecule has been reported, but its importance can be predicted on theoretical grounds. It may be noted that for the reaction $(LiF)_2(g) + (NaF)_2$

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= $2NaLiF_2$, in which a somewhat analogous molecule is formed, Porter and Schoonmaker [81] found approximately $\Delta S = 4$ eu and $\Delta H° = -0.2$ kcal, which compare favorably with the respective values Rln 4 and zero roughly predicted from symmetry considerations. The tabulated dissociation energy of $Li_2FCl(g)$ is based on the assumption that for the reaction $(LiF)_2(g) + (LiCl)_2(g) = 2Li_2FCl(g)$, $\Delta H_0 = 0$.

19. $Li_3N(c)$ $\Delta Hf°_{298} = -47.5 \pm 2$ kcal/mole.

Guntz [145] measured the heat of solution of Li_3N in water, giving a solution of lithium hydroxide and aqueous ammonia. The heat of solution, -131.1 kcal/mole, leads to a heat of formation for Li_3N of -47.8 kcal/mole. Neumann, Kroger, and Haebler [107) determined the heat of formation of Li_3N by direct nitridation of lithium in a high temperature bomb calorimeter. The result of this measurement is -47.166 kcal/mole.

20. $Li_2C_2(c)$ $\Delta Hf°_{298} = -14.2 \pm 2$ kcal/mole.

This value, reported in NBS Circular 500 is based on a single study of the heat of reaction of lithium carbide with water, by Guntz [146], but is probably not in serious error, because the carbide, an acetylide, is well defined.

Table 1

Standard Heats of Formation and Dissociation Energies of the Elements

Substance	State	$\Delta Hf°$		ΔH to gaseous atoms	
		at 0°K kcal/mole	at 298.15°K kcal/mole	at 0°K kcal/mole	at 298.15°K kcal/mole
H	g	51.621	52.090	0	0
H_2	g	0	0	103.242	104.180
O	g	58.980	59.550	0	0
O_2	g	0	0	117.960	119.100
F	g	18.357	18.860	0	0
F_2	g	0	0	36.714	37.720
Cl	g	28.540	28.942	0	0
Cl_2	g	0	0	57.080	57.884
Al	c	0	0	76.940	77.500
Al	g	76.940	77.5	0	0
Be	c	0	0	76.887	77.900
Be	g	76.887	77.9	0	0
Mg	c	0	0	35.313	35.600
Mg	g	35.313	35.6	0	0
Li	c	0	0	38.050	38.439
Li	g	38.05	38.439	0	0
N	g	112.52	112.96	0	0
N_2	g	0	0	225.04	225.93
C	c, graphite	0	0	169.988	171.299
C	g	169.988	171.299	0	0

Table 2. Standard Heat of Formation and Dissociation Energy of Compounds and Gaseous Metals.

Substance	State	ΔHf at 0°K kcal/mole	ΔHf at 298.16°K kcal/mole	ΔH to gaseous atoms at 0°K kcal/mole	ΔH to gaseous atoms at 298.15°K kcal/mole
		Aluminum Compounds			
Al_2	g	103.88		50. ±30	
Al_2O	g	-38.76	-39.4 ±5	251.62	253.95
AlO	c		(-88. ±10)		(225.05)
	g	16.92	16.89	119. ±8	120.16
Al_2O_2	g	-104.16	-105.28	376. ±30	379.38
AlO_2^-	(aq, a=1)		-221. ±3		
Al_2O_3-α	c	-397.5	-400.4 ±3	728.32	734.05
-γ	c		-384.8 ±3		718.45
-ρ	c		-394.0 ±4		727.65
$Al_2O_3 \cdot H_2O$-α	c	-459.26	-463.4 ±3	952.30	960.78
-β	c		-478. ±4		975.38
$Al_2O_3 \cdot 3H_2O$-α	c	-607.02	-615.4 ±5	1424.51	1440.24
-β	c		-612.6 ±6		1437.44
AlH	g	57.56		71. ±20	
AlH_3	g		18. ±10		215.77
$(AlH_3)_x$	c		-3. ±10		236.77
$Al(OH)_3$	amorph		-304. ±4		716.42
AlF	c		(-102. ±10)		(198.36)
	g	-59.98	-60. ±10	155.27	156.36
AlF_2	c		(-184. ±10)		(299.22)
	g	(-113.54)	(-114. ±5)	(227.19)	(229.22)
AlF_3	c	-354.82	-356.3 ±5	486.83	490.38
	g	-283.77	-284.8 ±6	415.78	418.88
AlCl	c		(-50. ±10)		(156.44)
	g	-11.34	-11.3 ±1	116.82	117.74
$AlCl_2$	g	-77.81	-78. ±5	211.83	213.38

Table 2. - Continued

Substance	State	ΔHf at 0°K kcal/mole	ΔHf at 298.15°K kcal/mole	ΔH to gaseous atoms at 0°K kcal/mole	ΔH to gaseous atoms at 298.15°K kcal/mole
$AlCl_3$	g	-136.68	-137.1 ±1.5	299.24	301.43
$AlCl_3 \cdot 6H_2O$	c		-643.6 ±0.5		1790.31
Al_2Cl_6	c		-337.14 ±0.5		665.79
	g	-307.85	-308.76 ±0.8	632.96	637.41
AlN	c		-76.5 ±1		266.96
Al_2C_2	g		-33. ±12		530.60
Al_4C_3	c		-48.6 ±5		872.50
		Beryllium Compounds			
Be_2	g	137.77		16. ±10	
BeO	c	-142.28	-143.1 ±4	278.15	280.55
	g	29.87	30.44	106.±5	107.01
BeH	g	77.51		51. ±7	
$Be(OH)_2$	c		-213.9 ±5		515.08
	g		-162.4		463.58
BeF	g	3.24	3.80	92. ±30	92.96
BeF_2	c		-241.1 ±5		356.72
	g	-191.75	-192.1 ±6	305.35	307.72
BeCl	g	36.43	36.98	69. ±30	69.86
$BeCl_2$	c		-109.2 ±5		244.98
	g	-83.85	-84. ±6	217.81	219.78
Be_2Cl_4	g		-188. ±10		459.57
Be_3N_2	c		-132. ±3		591.62
BeC_2	g	134.3 ±10		282.56	
Be_2C	c		-22.2 ±5		349.3
		Magnesium Compounds			
Mg_2	g	63.43		7.2 ±2	
MgO	c	-142.70	-143.7 ±0.3	236.99	238.85
	g	4.29	4.19	90. ±5	90.96

Table 2. - Continued

Subsistance	State	ΔHf		ΔH to gaseous atoms	
		at 0°K kcal/mole	at 298.16°K kcal/mole	at 0°K kcal/mole	at 298.15°K kcal/mole
MgO_2	c		-148.9 ±4		303.60
MgH	g	40.93		46. ±10	
MgH_2	c	19.94	18. ±5	118.62	121.78
$Mg(OH)_2$	c	-218.43	-221.0 ±0.7	474.95	479.88
MgF	g	-20.33	-20.44	74. ±20	74.90
MgF_2	c	-267.07	-268.0 ±5	339.10	341.32
	g	-182.09	-182.8 ±6	254.12	256.12
MgCl	g	1.85	1.80	62. ±20	62.74
$MgCl_2$	c	-153.30	-153.40 ±0.2	245.69	246.88
	g	-107.23	-107.64 ±0.6	199.62	201.12
$MgCl_2 \cdot H_2O$	c	-229.79	-231.15 ±0.2	484.41	488.36
$MgCl_2 \cdot 2H_2O$	c	-303.20	-305.99 ±0.2	720.04	726.93
$MgCl_2 \cdot 4H_2O$	c	-448.25	-454.00 ±0.25	1189.53	1202.40
$MgCl_2 \cdot 6H_2O$	c	-588.79	-597.42 ±0.30	1654.52	1673.28
Mg_3N_2	c		-110.2 ±1		442.92
MgC_2	c		21. ±5		357.20
Mg_2C_3	c		19. ±8		566.10
		Lithium Compounds			
Li_2	g	50.35	50.47	25.76 ±0.10	26.41
LiO	g	14.03		83. ±5	
Li_2O	c	-140.91	-142.4 ±0.5	275.99	278.83
Li_2O_2	c		-151.5 ±5		347.48
LiH	c		-21.64 ±1.5		112.17
	g	33.67		56.0 ±10	

Table 2. - Continued

Substance	State	ΔHf at 0°K kcal/mole	ΔHf at 298.16°K kcal/mole	ΔH to gaseous atoms at 0°K kcal/mole	ΔH to gaseous atoms at 298.15°K kcal/mole
LiOH	c	-115.03	-116.4 ±0.2	263.68	266.48
LiF	c	-145.70	-146.3 ±2	202.11	203.60
	g	-79.26	-79.3 ±3	135.67	136.60
$(LiF)_2$	g	-221.24	-222.6 ±5	334.05	337.20
$(LiF)_3$	g		-345.3 ±8		517.20
$LiHF_2$	c		-224.2 ±1		352.45
LiCl	c	-97.51	-97.70 ±2	164.10	165.09
	g	-45.21	-45.24	111.8 ±4	112.62
$(LiCl)_2$	g	-143.22	-144.12	276.4 ±3	278.88
$(LiCl)_3$	g	-224.4	-226.	424.2 ±5	428.34
Li_2FCl	g	-182.2	-183.3	305.2	307.98
Li_3N	c		-47.5 ±2		275.78
Li_2C_2	c		-14.2 ±2		433.68

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APPENDIX 1

IDEAL GAS THERMODYNAMIC FUNCTIONS

by

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The thermodynamic functions for 65 gaseous species are given from 50°K to 7000°K in units of calories (4.184 abs. joules), gram moles, and °K. These tables are newly computed using the molecular data given in NBS Report 6297 as modified in the body of this report. Thus with a few exceptions, discussed below, the tables for the diatomic molecules contained herein are consistent with those in Report 6297 which were given in dimensionless form. The computations were performed on the IBM 704 using the fundamental constants of Cohen, Crowe, and Dumond [1] and the molecular data indicated at the bottom of the first page of each table. The second page of the tables includes conversion factors to other units.

The functions for the atoms were computed by a summation of the energy levels given in Volume I (and as corrected in Volume III) of Atomic Energy Levels [2]. The functions for the polyatomic molecules were computed on the harmonic oscillator-rigid rotator approximation using the molecular data listed with the tables. The molecular constants are for the ground state and have been adjusted for the naturally occurring isotopic abundances. As is customary, the effects of nuclear spin and isotopic mixing have not been included.

The functions for the diatomic molecules have been computed from formulas (See NBS Report 6297 pp 103-104) based on the Mayer and Mayer treatment and include first order corrections to the harmonic oscillator for vibrational anharmonicity, rotational stretching, and rotation-vibration interaction. The data used for these calculations are listed on each table.

The reader's attention is directed to the fact that the tables in this appendix for LiF(g), ClO(g) are slightly different from the dimensionless version contained in the earlier report (6297). Since the earlier report was prepared, spectroscopic measurements of G. L. Vidale on the LiF molecule have provided better molecular data. These are discussed briefly on page 50 of this report. The tables for ClO(g) have been corrected for the multiplicity, 4, corresponding to a $^2\pi$ ground state.

The computation program for linear polyatomic molecules, which is provisional, does not provide for a dimensional calculation, hence the 10 tables for the linear molecules are in dimensionless form. Conversion factors are, however, provided with each table.

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The arrangement of the tables for the gaseous species is as follows:

a. Tables for the atomic elements in order of atomic number.

b. Tables for diatomic molecules of Lithium, Beryllium, Magnesium, Aluminum, Fluorine, and Chlorine, the within-group arrangement being in accord with the scheme of NBS Circular 500, page 4. (See Reference 49 on page 34 of this report).

c. Tables for polyatomic molecules of Li, Be, Mg, Aℓ, F, and Cℓ arranged within groups in accord with the scheme of NBS Circular 500.

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Table 1-1 Thermodynamic Functions for H (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	13.553	4.968	18.521	248.41	4.968
75.	15.568	4.968	20.536	372.61	4.968
100.	16.997	4.968	21.965	496.81	4.968
125.	18.105	4.968	23.074	621.02	4.968
150.	19.011	4.968	23.979	745.22	4.968
175.	19.777	4.968	24.745	869.43	4.968
200.	20.441	4.968	25.409	993.63	4.968
225.	21.026	4.968	25.994	1117.83	4.968
250.	21.549	4.968	26.517	1242.04	4.968
275.	22.023	4.968	26.991	1366.24	4.968
300.	22.455	4.968	27.423	1490.44	4.968
325.	22.853	4.968	27.821	1614.65	4.968
350.	23.221	4.968	28.189	1738.85	4.968
375.	23.564	4.968	28.532	1863.06	4.968
400.	23.884	4.968	28.852	1987.26	4.968
425.	24.185	4.968	29.154	2111.46	4.968
450.	24.469	4.968	29.438	2235.67	4.968
475.	24.738	4.968	29.706	2359.87	4.968
500.	24.993	4.968	29.961	2484.07	4.968
550.	25.466	4.968	30.434	2732.48	4.968
600.	25.899	4.968	30.867	2980.89	4.968
650.	26.296	4.968	31.264	3229.30	4.968
700.	26.664	4.968	31.633	3477.70	4.968
750.	27.007	4.968	31.975	3726.11	4.968
800.	27.328	4.968	32.296	3974.52	4.968
850.	27.629	4.968	32.597	4222.93	4.968
900.	27.913	4.968	32.881	4471.33	4.968
950.	28.182	4.968	33.150	4719.74	4.968
1000.	28.436	4.968	33.405	4968.15	4.968
1050.	28.679	4.968	33.647	5216.56	4.968
1100.	28.910	4.968	33.878	5464.96	4.968
1150.	29.131	4.968	34.099	5713.37	4.968
1200.	29.342	4.968	34.310	5961.78	4.968
1250.	29.545	4.968	34.513	6210.19	4.968
1300.	29.740	4.968	34.708	6458.59	4.968
1350.	29.927	4.968	34.896	6707.00	4.968
1400.	30.108	4.968	35.076	6955.41	4.968
1450.	30.282	4.968	35.251	7203.82	4.968
1500.	30.451	4.968	35.419	7452.22	4.968
1550.	30.614	4.968	35.582	7700.63	4.968
1600.	30.772	4.968	35.740	7949.04	4.968
1650.	30.924	4.968	35.893	8197.45	4.968
1700.	31.073	4.968	36.041	8445.85	4.968
1750.	31.217	4.968	36.185	8694.26	4.968
1800.	31.357	4.968	36.325	8942.67	4.968
1850.	31.493	4.968	36.461	9191.08	4.968
1900.	31.625	4.968	36.593	9439.48	4.968
1950.	31.754	4.968	36.722	9687.89	4.968
2000.	31.880	4.968	36.848	9936.30	4.968
2050.	32.003	4.968	36.971	10184.71	4.968
273.15	21.989	4.968	26.957	1357.05	4.968
298.15	22.424	4.968	27.392	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 1.008.

Table 1-1 Thermodynamic Functions for H (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	32.123	4.968	37.091	10433.11	4.968
2150.	32.239	4.968	37.208	10681.52	4.968
2200.	32.354	4.968	37.322	10929.93	4.968
2250.	32.465	4.968	37.433	11178.34	4.968
2300.	32.574	4.968	37.543	11426.74	4.968
2350.	32.681	4.968	37.649	11675.15	4.968
2400.	32.786	4.968	37.754	11923.56	4.968
2450.	32.888	4.968	37.857	12171.97	4.968
2500.	32.989	4.968	37.957	12420.37	4.968
2600.	33.184	4.968	38.152	12917.19	4.968
2700.	33.371	4.968	38.339	13414.00	4.968
2800.	33.552	4.968	38.520	13910.82	4.968
2900.	33.726	4.968	38.694	14407.63	4.968
3000.	33.895	4.968	38.863	14904.45	4.968
3100.	34.057	4.968	39.026	15401.26	4.968
3200.	34.215	4.968	39.183	15898.08	4.968
3300.	34.368	4.968	39.336	16394.89	4.968
3400.	34.516	4.968	39.485	16891.71	4.968
3500.	34.660	4.968	39.629	17388.52	4.968
3600.	34.800	4.968	39.768	17885.34	4.968
3700.	34.936	4.968	39.905	18382.15	4.968
3800.	35.069	4.968	40.037	18878.97	4.968
3900.	35.198	4.968	40.166	19375.78	4.968
4000.	35.324	4.968	40.292	19872.60	4.968
4100.	35.446	4.968	40.415	20369.41	4.968
4200.	35.566	4.968	40.534	20866.23	4.968
4300.	35.683	4.968	40.651	21363.04	4.968
4400.	35.797	4.968	40.765	21859.86	4.968
4500.	35.909	4.968	40.877	22356.67	4.968
4600.	36.018	4.968	40.986	22853.49	4.968
4700.	36.125	4.968	41.093	23350.30	4.968
4800.	36.230	4.968	41.198	23847.12	4.968
4900.	36.332	4.968	41.300	24343.93	4.968
5000.	36.432	4.968	41.401	24840.75	4.968
5100.	36.531	4.968	41.499	25337.56	4.968
5200.	36.627	4.968	41.595	25834.38	4.968
5300.	36.722	4.968	41.690	26331.19	4.968
5400.	36.815	4.968	41.783	26828.01	4.968
5500.	36.906	4.968	41.874	27324.82	4.968
5600.	36.995	4.968	41.964	27821.64	4.968
5700.	37.083	4.968	42.052	28318.46	4.968
5800.	37.170	4.968	42.138	28815.27	4.968
5900.	37.255	4.968	42.223	29312.09	4.968
6000.	37.338	4.968	42.306	29808.90	4.968
6100.	37.420	4.968	42.388	30305.72	4.968
6200.	37.501	4.968	42.469	30802.53	4.968
6300.	37.581	4.968	42.549	31299.35	4.968
6400.	37.659	4.968	42.627	31796.17	4.968
6500.	37.736	4.968	42.704	32292.99	4.968
6600.	37.812	4.968	42.780	32789.80	4.968
6700.	37.886	4.968	42.855	33286.62	4.968
6800.	37.960	4.968	42.928	33783.45	4.968
6900.	38.033	4.968	43.001	34280.27	4.968
7000.	38.104	4.968	43.072	34777.09	4.968

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.99206
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	4.1508
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.99141

Table 1-2 Thermodynamic Functions for He (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	16.287	4.968	21.255	248.41	4.968
75.	18.301	4.968	23.269	372.61	4.968
100.	19.730	4.968	24.698	496.81	4.968
125.	20.839	4.968	25.807	621.02	4.968
150.	21.745	4.968	26.713	745.22	4.968
175.	22.511	4.968	27.479	869.43	4.968
200.	23.174	4.968	28.142	993.63	4.968
225.	23.759	4.968	28.727	1117.83	4.968
250.	24.283	4.968	29.251	1242.04	4.968
275.	24.756	4.968	29.724	1366.24	4.968
300.	25.188	4.968	30.156	1490.44	4.968
325.	25.586	4.968	30.554	1614.65	4.968
350.	25.954	4.968	30.922	1738.85	4.968
375.	26.297	4.968	31.265	1863.06	4.968
400.	26.618	4.968	31.586	1987.26	4.968
425.	26.919	4.968	31.887	2111.46	4.968
450.	27.203	4.968	32.171	2235.67	4.968
475.	27.471	4.968	32.440	2359.87	4.968
500.	27.726	4.968	32.694	2484.07	4.968
550.	28.200	4.968	33.168	2732.48	4.968
600.	28.632	4.968	33.600	2980.89	4.968
650.	29.030	4.968	33.998	3229.30	4.968
700.	29.398	4.968	34.366	3477.70	4.968
750.	29.741	4.968	34.709	3726.11	4.968
800.	30.061	4.968	35.029	3974.52	4.968
850.	30.362	4.968	35.331	4222.93	4.968
900.	30.646	4.968	35.615	4471.33	4.968
950.	30.915	4.968	35.883	4719.74	4.968
1000.	31.170	4.968	36.138	4968.15	4.968
1050.	31.412	4.968	36.380	5216.56	4.968
1100.	31.643	4.968	36.612	5464.96	4.968
1150.	31.864	4.968	36.832	5713.37	4.968
1200.	32.076	4.968	37.044	5961.78	4.968
1250.	32.278	4.968	37.247	6210.19	4.968
1300.	32.473	4.968	37.441	6458.59	4.968
1350.	32.661	4.968	37.629	6707.00	4.968
1400.	32.842	4.968	37.810	6955.41	4.968
1450.	33.016	4.968	37.984	7203.82	4.968
1500.	33.184	4.968	38.152	7452.22	4.968
1550.	33.347	4.968	38.315	7700.63	4.968
1600.	33.505	4.968	38.473	7949.04	4.968
1650.	33.658	4.968	38.626	8197.45	4.968
1700.	33.806	4.968	38.774	8445.85	4.968
1750.	33.950	4.968	38.918	8694.26	4.968
1800.	34.090	4.968	39.058	8942.67	4.968
1850.	34.226	4.968	39.194	9191.08	4.968
1900.	34.359	4.968	39.327	9439.48	4.968
1950.	34.488	4.968	39.456	9687.89	4.968
2000.	34.614	4.968	39.582	9936.30	4.968
2050.	34.736	4.968	39.704	10184.71	4.968
273.15	24.723	4.968	29.691	1357.05	4.968
298.15	25.158	4.968	30.126	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 4.003.

Table 1-2 Thermodynamic Functions for He (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	34.856	4.968	39.824	10433.11	4.968
2150.	34.973	4.968	39.941	10681.52	4.968
2200.	35.087	4.968	40.055	10929.93	4.968
2250.	35.199	4.968	40.167	11178.34	4.968
2300.	35.308	4.968	40.276	11426.74	4.968
2350.	35.415	4.968	40.383	11675.15	4.968
2400.	35.519	4.968	40.487	11923.56	4.968
2450.	35.622	4.968	40.590	12171.97	4.968
2500.	35.722	4.968	40.690	12420.37	4.968
2600.	35.917	4.968	40.885	12917.19	4.968
2700.	36.104	4.968	41.073	13414.00	4.968
2800.	36.285	4.968	41.253	13910.82	4.968
2900.	36.460	4.968	41.428	14407.63	4.968
3000.	36.628	4.968	41.596	14904.45	4.968
3100.	36.791	4.968	41.759	15401.26	4.968
3200.	36.949	4.968	41.917	15898.08	4.968
3300.	37.101	4.968	42.070	16394.89	4.968
3400.	37.250	4.968	42.218	16891.71	4.968
3500.	37.394	4.968	42.362	17388.52	4.968
3600.	37.534	4.968	42.502	17885.34	4.968
3700.	37.670	4.968	42.638	18382.15	4.968
3800.	37.802	4.968	42.771	18878.97	4.968
3900.	37.931	4.968	42.900	19375.78	4.968
4000.	38.057	4.968	43.025	19872.60	4.968
4100.	38.180	4.968	43.148	20369.41	4.968
4200.	38.300	4.968	43.268	20866.23	4.968
4300.	38.416	4.968	43.385	21363.04	4.968
4400.	38.531	4.968	43.499	21859.86	4.968
4500.	38.642	4.968	43.610	22356.67	4.968
4600.	38.752	4.968	43.720	22853.49	4.968
4700.	38.858	4.968	43.827	23350.30	4.968
4800.	38.963	4.968	43.931	23847.12	4.968
4900.	39.065	4.968	44.034	24343.93	4.968
5000.	39.166	4.968	44.134	24840.75	4.968
5100.	39.264	4.968	44.232	25337.56	4.968
5200.	39.361	4.968	44.329	25834.38	4.968
5300.	39.455	4.968	44.423	26331.19	4.968
5400.	39.548	4.968	44.516	26828.01	4.968
5500.	39.639	4.968	44.607	27324.82	4.968
5600.	39.729	4.968	44.697	27821.64	4.968
5700.	39.817	4.968	44.785	28318.45	4.968
5800.	39.903	4.968	44.871	28815.27	4.968
5900.	39.988	4.968	44.956	29312.08	4.968
6000.	40.072	4.968	45.040	29808.90	4.968
6100.	40.154	4.968	45.122	30305.71	4.968
6200.	40.235	4.968	45.203	30802.53	4.968
6300.	40.314	4.968	45.282	31299.34	4.968
6400.	40.392	4.968	45.360	31796.16	4.968
6500.	40.469	4.968	45.437	32292.97	4.968
6600.	40.545	4.968	45.513	32789.79	4.968
6700.	40.620	4.968	45.588	33286.60	4.968
6800.	40.693	4.968	45.662	33783.42	4.968
6900.	40.766	4.968	45.734	34280.23	4.968
7000.	40.837	4.968	45.806	34777.05	4.968

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.24981
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	1.0452
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.24965

Table 1-3 Thermodynamic Functions for Li (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	19.304	4.968	24.272	248.41	4.968
75.	21.319	4.968	26.287	372.61	4.968
100.	22.748	4.968	27.716	496.81	4.968
125.	23.857	4.968	28.825	621.02	4.968
150.	24.762	4.968	29.731	745.22	4.968
175.	25.528	4.968	30.496	869.43	4.968
200.	26.192	4.968	31.160	993.63	4.968
225.	26.777	4.968	31.745	1117.83	4.968
250.	27.300	4.968	32.268	1242.04	4.968
275.	27.774	4.968	32.742	1366.24	4.968
300.	28.206	4.968	33.174	1490.44	4.968
325.	28.604	4.968	33.572	1614.65	4.968
350.	28.972	4.968	33.940	1738.85	4.968
375.	29.315	4.968	34.283	1863.06	4.968
400.	29.635	4.968	34.603	1987.26	4.968
425.	29.937	4.968	34.905	2111.46	4.968
450.	30.220	4.968	35.189	2235.67	4.968
475.	30.489	4.968	35.457	2359.87	4.968
500.	30.744	4.968	35.712	2484.07	4.968
550.	31.217	4.968	36.186	2732.48	4.968
600.	31.650	4.968	36.618	2980.89	4.968
650.	32.047	4.968	37.016	3229.30	4.968
700.	32.416	4.968	37.384	3477.70	4.968
750.	32.758	4.968	37.726	3726.11	4.968
800.	33.079	4.968	38.047	3974.52	4.968
850.	33.380	4.968	38.348	4222.93	4.968
900.	33.664	4.968	38.632	4471.33	4.968
950.	33.933	4.968	38.901	4719.74	4.968
1000.	34.188	4.968	39.156	4968.15	4.968
1050.	34.430	4.968	39.398	5216.56	4.968
1100.	34.661	4.968	39.629	5464.97	4.968
1150.	34.882	4.968	39.850	5713.37	4.968
1200.	35.093	4.968	40.062	5961.78	4.968
1250.	35.296	4.968	40.264	6210.19	4.968
1300.	35.491	4.968	40.459	6458.60	4.968
1350.	35.679	4.968	40.647	6707.02	4.968
1400.	35.859	4.968	40.827	6955.44	4.968
1450.	36.034	4.968	41.002	7203.87	4.969
1500.	36.202	4.968	41.170	7452.30	4.969
1550.	36.365	4.968	41.333	7700.76	4.969
1600.	36.523	4.968	41.491	7949.23	4.970
1650.	36.676	4.968	41.644	8197.74	4.970
1700.	36.824	4.968	41.792	8446.28	4.971
1750.	36.968	4.968	41.936	8694.87	4.972
1800.	37.108	4.969	42.076	8943.53	4.974
1850.	37.244	4.969	42.213	9192.26	4.976
1900.	37.376	4.969	42.345	9441.09	4.978
1950.	37.506	4.969	42.475	9690.03	4.980
2000.	37.631	4.970	42.601	9939.12	4.983
2050.	37.754	4.970	42.724	10188.37	4.987
273.15	27.740	4.968	32.708	1357.05	4.968
298.15	28.175	4.968	33.143	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 6.94.

Table 1-3 Thermodynamic Functions for Li (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	37.874	4.970	42.844	10437.81	4.991
2150.	37.991	4.971	42.962	10687.48	4.996
2200.	38.105	4.972	43.077	10937.40	5.001
2250.	38.217	4.972	43.189	11187.62	5.007
2300.	38.326	4.973	43.299	11438.17	5.014
2350.	38.433	4.974	43.407	11689.08	5.022
2400.	38.538	4.975	43.513	11940.40	5.031
2450.	38.640	4.976	43.617	12192.18	5.040
2500.	38.741	4.978	43.719	12444.46	5.051
2600.	38.936	4.981	43.917	12950.69	5.075
2700.	39.124	4.985	44.109	13459.49	5.102
2800.	39.306	4.990	44.295	13971.24	5.134
2900.	39.481	4.995	44.476	14486.36	5.169
3000.	39.650	5.002	44.652	15005.23	5.209
3100.	39.814	5.009	44.824	15528.26	5.252
3200.	39.974	5.017	44.991	16055.85	5.300
3300.	40.128	5.027	45.155	16588.38	5.351
3400.	40.278	5.037	45.316	17126.23	5.406
3500.	40.425	5.049	45.473	17669.76	5.465
3600.	40.567	5.061	45.628	18219.31	5.527
3700.	40.706	5.074	45.780	18775.24	5.592
3800.	40.841	5.089	45.930	19337.88	5.661
3900.	40.974	5.105	46.078	19907.56	5.733
4000.	41.103	5.121	46.224	20484.59	5.808
4100.	41.230	5.139	46.369	21069.30	5.887
4200.	41.354	5.158	46.511	21662.01	5.968
4300.	41.475	5.177	46.653	22263.04	6.053
4400.	41.595	5.198	46.793	22872.74	6.141
4500.	41.712	5.220	46.932	23491.44	6.233
4600.	41.827	5.243	47.070	24119.50	6.329
4700.	41.940	5.268	47.207	24757.28	6.428
4800.	42.051	5.293	47.344	25405.15	6.531
4900.	42.160	5.319	47.479	26063.51	6.637
5000.	42.268	5.347	47.615	26732.77	6.748
5100.	42.374	5.375	47.749	27413.34	6.864
5200.	42.479	5.405	47.884	28105.66	6.983
5300.	42.582	5.436	48.018	28810.17	7.108
5400.	42.684	5.468	48.152	29527.33	7.236
5500.	42.785	5.501	48.286	30257.58	7.370
5600.	42.884	5.536	48.420	31001.39	7.508
5700.	42.982	5.572	48.554	31759.23	7.650
5800.	43.080	5.609	48.689	32531.56	7.797
5900.	43.176	5.647	48.823	33318.82	7.949
6000.	43.271	5.687	48.958	34121.46	8.105
6100.	43.365	5.728	49.093	34939.91	8.265
6200.	43.459	5.770	49.229	35774.57	8.429
6300.	43.552	5.814	49.365	36625.83	8.597
6400.	43.644	5.858	49.502	37494.03	8.768
6500.	43.735	5.905	49.639	38379.52	8.942
6600.	43.825	5.952	49.777	39282.56	9.119
6700.	43.915	6.001	49.916	40203.42	9.298
6800.	44.004	6.050	50.055	41142.30	9.479
6900.	44.093	6.101	50.194	42099.37	9.662
7000.	44.181	6.154	50.335	43074.72	9.845

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.14409
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.60287
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.14400

Table 1-4 Thermodynamic Functions for Be (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	18.706	4.968	23.674	248.41	4.968
75.	20.720	4.968	25.689	372.61	4.968
100.	22.150	4.968	27.118	496.81	4.968
125.	23.258	4.968	28.226	621.02	4.968
150.	24.164	4.968	29.132	745.22	4.968
175.	24.930	4.968	29.898	869.43	4.968
200.	25.593	4.968	30.561	993.63	4.968
225.	26.178	4.968	31.147	1117.83	4.968
250.	26.702	4.968	31.670	1242.04	4.968
275.	27.175	4.968	32.144	1366.24	4.968
300.	27.608	4.968	32.576	1490.44	4.968
325.	28.005	4.968	32.974	1614.65	4.968
350.	28.374	4.968	33.342	1738.85	4.968
375.	28.716	4.968	33.684	1863.06	4.968
400.	29.037	4.968	34.005	1987.26	4.968
425.	29.338	4.968	34.306	2111.46	4.968
450.	29.622	4.968	34.590	2235.67	4.968
475.	29.891	4.968	34.859	2359.87	4.968
500.	30.146	4.968	35.114	2484.07	4.968
550.	30.619	4.968	35.587	2732.48	4.968
600.	31.051	4.968	36.020	2980.89	4.968
650.	31.449	4.968	36.417	3229.30	4.968
700.	31.817	4.968	36.785	3477.70	4.968
750.	32.160	4.968	37.128	3726.11	4.968
800.	32.481	4.968	37.449	3974.52	4.968
850.	32.782	4.968	37.750	4222.93	4.968
900.	33.066	4.968	38.034	4471.33	4.968
950.	33.334	4.968	38.303	4719.74	4.968
1000.	33.589	4.968	38.557	4968.15	4.968
1050.	33.832	4.968	38.800	5216.56	4.968
1100.	34.063	4.968	39.031	5464.96	4.968
1150.	34.284	4.968	39.252	5713.37	4.968
1200.	34.495	4.968	39.463	5961.78	4.968
1250.	34.698	4.968	39.666	6210.19	4.968
1300.	34.893	4.968	39.861	6458.59	4.968
1350.	35.080	4.968	40.048	6707.00	4.968
1400.	35.261	4.968	40.229	6955.41	4.968
1450.	35.435	4.968	40.403	7203.82	4.968
1500.	35.604	4.968	40.572	7452.23	4.968
1550.	35.767	4.968	40.735	7700.63	4.968
1600.	35.924	4.968	40.892	7949.04	4.968
1650.	36.077	4.968	41.045	8197.45	4.968
1700.	36.225	4.968	41.194	8445.86	4.968
1750.	36.369	4.968	41.338	8694.27	4.968
1800.	36.509	4.968	41.478	8942.68	4.968
1850.	36.646	4.968	41.614	9191.10	4.968
1900.	36.778	4.968	41.746	9439.52	4.968
1950.	36.907	4.968	41.875	9687.94	4.969
2000.	37.033	4.968	42.001	9936.38	4.969
2050.	37.156	4.968	42.124	10184.82	4.969
2100.	37.275	4.968	42.244	10433.28	4.969
2150.	37.392	4.968	42.360	10681.75	4.970
273.15	27.142	4.968	32.110	1357.05	4.968
298.15	27.577	4.968	32.545	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 9.013.

Table 1-4 Thermodynamic Functions for Be (gas) - Continued

T °K	$\frac{-(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	37.506	4.968	42.475	10930.25	4.970
2250.	37.618	4.968	42.586	11178.78	4.971
2300.	37.727	4.968	42.696	11427.35	4.972
2350.	37.834	4.968	42.803	11675.96	4.973
2400.	37.939	4.969	42.907	11924.63	4.974
2450.	38.041	4.969	43.010	12173.37	4.976
2500.	38.142	4.969	43.110	12422.19	4.977
2600.	38.336	4.969	43.306	12920.14	4.982
2700.	38.524	4.970	43.494	13418.63	4.988
2800.	38.705	4.971	43.675	13917.85	4.997
2900.	38.879	4.972	43.851	14418.01	5.007
3000.	39.048	4.973	44.021	14919.38	5.021
3100.	39.211	4.975	44.186	15422.24	5.037
3200.	39.369	4.977	44.346	15926.93	5.057
3300.	39.522	4.980	44.502	16433.81	5.081
3400.	39.671	4.983	44.654	16943.28	5.109
3500.	39.815	4.987	44.803	17455.79	5.142
3600.	39.956	4.992	44.948	17971.77	5.179
3700.	40.093	4.998	45.090	18491.71	5.221
3800.	40.226	5.004	45.230	19016.11	5.268
3900.	40.356	5.012	45.368	19545.47	5.320
4000.	40.483	5.020	45.503	20080.31	5.378
4100.	40.607	5.030	45.637	20621.15	5.440
4200.	40.729	5.040	45.769	21168.51	5.508
4300.	40.847	5.052	45.899	21722.89	5.581
4400.	40.964	5.065	46.028	22284.78	5.658
4500.	41.078	5.079	46.156	22854.68	5.741
4600.	41.189	5.094	46.283	23433.05	5.827
4700.	41.299	5.111	46.410	24020.31	5.918
4800.	41.407	5.129	46.535	24616.87	6.013
4900.	41.513	5.148	46.660	25223.12	6.112
5000.	41.617	5.168	46.785	25839.41	6.214
5100.	41.720	5.189	46.909	26466.03	6.319
5200.	41.820	5.212	47.033	27103.27	6.426
5300.	41.920	5.236	47.156	27751.36	6.536
5400.	42.018	5.261	47.279	28410.49	6.647
5500.	42.115	5.287	47.402	29080.83	6.760
5600.	42.210	5.315	47.525	29762.48	6.873
5700.	42.305	5.343	47.648	30455.53	6.988
5800.	42.398	5.372	47.770	31160.01	7.102
5900.	42.490	5.403	47.893	31875.92	7.216
6000.	42.581	5.434	48.015	32603.23	7.330
6100.	42.671	5.466	48.137	33341.85	7.443
6200.	42.760	5.499	48.259	34091.69	7.554
6300.	42.849	5.532	48.381	34852.60	7.664
6400.	42.936	5.566	48.502	35624.41	7.772
6500.	43.022	5.601	48.624	36406.92	7.878
6600.	43.108	5.636	48.745	37199.91	7.981
6700.	43.193	5.672	48.865	38003.12	8.082
6800.	43.278	5.708	48.986	38816.28	8.180
6900.	43.361	5.745	49.106	39639.10	8.275
7000.	43.444	5.782	49.226	40471.27	8.367

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.11095
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.46421
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.11088

Table 1-5 Thermodynamic Functions for B (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	22.250	5.479	27.729	273.93	5.072
75.	24.441	5.331	29.772	399.85	5.013
100.	25.962	5.249	31.211	524.89	4.993
125.	27.127	5.197	32.324	649.59	4.984
150.	28.071	5.161	33.232	774.12	4.979
175.	28.865	5.135	34.000	898.56	4.976
200.	29.549	5.115	34.664	1022.94	4.974
225.	30.151	5.099	35.250	1147.28	4.973
250.	30.687	5.086	35.774	1271.59	4.972
275.	31.171	5.076	36.247	1395.88	4.971
300.	31.613	5.067	36.680	1520.15	4.971
325.	32.018	5.060	37.078	1644.42	4.970
350.	32.393	5.053	37.446	1768.68	4.970
375.	32.741	5.048	37.789	1892.92	4.970
400.	33.067	5.043	38.110	2017.17	4.970
425.	33.372	5.039	38.411	2141.41	4.969
450.	33.660	5.035	38.695	2265.64	4.969
475.	33.932	5.031	38.964	2389.87	4.969
500.	34.190	5.028	39.219	2514.10	4.969
550.	34.669	5.023	39.692	2762.55	4.969
600.	35.106	5.018	40.125	3011.00	4.969
650.	35.508	5.015	40.522	3259.43	4.969
700.	35.879	5.011	40.891	3507.87	4.969
750.	36.225	5.008	41.233	3756.30	4.969
800.	36.548	5.006	41.554	4004.72	4.969
850.	36.851	5.004	41.855	4253.15	4.968
900.	37.137	5.002	42.139	4501.57	4.968
950.	37.408	5.000	42.408	4749.99	4.968
1000.	37.664	4.998	42.663	4998.41	4.968
1050.	37.908	4.997	42.905	5246.83	4.968
1100.	38.140	4.996	43.136	5495.25	4.968
1150.	38.363	4.994	43.357	5743.67	4.968
1200.	38.575	4.993	43.568	5992.08	4.968
1250.	38.779	4.992	43.771	6240.50	4.968
1300.	38.975	4.991	43.966	6488.91	4.968
1350.	39.163	4.991	44.154	6737.33	4.968
1400.	39.345	4.990	44.334	6985.74	4.968
1450.	39.520	4.989	44.509	7234.15	4.968
1500.	39.689	4.988	44.677	7482.57	4.968
1550.	39.852	4.988	44.840	7730.98	4.968
1600.	40.011	4.987	44.998	7979.39	4.968
1650.	40.164	4.987	45.151	8227.80	4.968
1700.	40.313	4.986	45.299	8476.22	4.968
1750.	40.457	4.986	45.443	8724.63	4.968
1800.	40.598	4.985	45.583	8973.04	4.968
1850.	40.734	4.985	45.719	9221.45	4.968
1900.	40.867	4.984	45.852	9469.86	4.968
1950.	40.997	4.984	45.981	9718.27	4.968
2000.	41.123	4.983	46.106	9966.68	4.968
2050.	41.246	4.983	46.229	10215.09	4.968
2100.	41.366	4.983	46.349	10463.50	4.968
2150.	41.483	4.982	46.466	10711.91	4.968
273.15	31.137	5.077	36.214	1386.68	4.971
298.15	31.581	5.068	36.649	1510.96	4.971

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 10.82.

Table 1-5 Thermodynamic Functions for B (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	41.598	4.982	46.580	10960.32	4.968
2250.	41.710	4.982	46.692	11208.73	4.968
2300.	41.819	4.981	46.801	11457.14	4.968
2350.	41.927	4.981	46.908	11705.56	4.968
2400.	42.031	4.981	47.012	11953.97	4.968
2450.	42.134	4.981	47.115	12202.38	4.968
2500.	42.235	4.980	47.215	12450.79	4.968
2600.	42.430	4.980	47.410	12947.62	4.968
2700.	42.618	4.979	47.597	13444.45	4.968
2800.	42.799	4.979	47.778	13941.30	4.969
2900.	42.974	4.979	47.952	14438.16	4.969
3000.	43.143	4.978	48.121	14935.04	4.969
3100.	43.306	4.978	48.284	15431.95	4.969
3200.	43.464	4.978	48.442	15928.90	4.970
3300.	43.617	4.978	48.595	16425.90	4.970
3400.	43.766	4.977	48.743	16922.98	4.971
3500.	43.910	4.977	48.887	17420.15	4.972
3600.	44.050	4.977	49.027	17917.43	4.973
3700.	44.186	4.977	49.163	18414.85	4.975
3800.	44.319	4.977	49.296	18912.44	4.977
3900.	44.448	4.977	49.425	19410.24	4.979
4000.	44.574	4.977	49.552	19908.29	4.982
4100.	44.697	4.977	49.675	20406.62	4.985
4200.	44.817	4.977	49.795	20905.28	4.988
4300.	44.934	4.978	49.912	21404.32	4.993
4400.	45.049	4.978	50.027	21903.81	4.997
4500.	45.161	4.979	50.139	22403.78	5.002
4600.	45.270	4.979	50.249	22904.31	5.008
4700.	45.377	4.980	50.357	23405.46	5.015
4800.	45.482	4.981	50.463	23907.29	5.022
4900.	45.585	4.982	50.566	24409.87	5.030
5000.	45.685	4.983	50.668	24913.28	5.038
5100.	45.784	4.984	50.768	25417.59	5.048
5200.	45.881	4.985	50.866	25922.87	5.058
5300.	45.976	4.987	50.963	26429.21	5.069
5400.	46.069	4.988	51.057	26936.67	5.081
5500.	46.161	4.990	51.151	27445.35	5.093
5600.	46.251	4.992	51.243	27955.31	5.106
5700.	46.339	4.994	51.333	28466.64	5.120
5800.	46.426	4.996	51.422	28979.42	5.135
5900.	46.511	4.999	51.510	29493.74	5.151
6000.	46.595	5.002	51.597	30009.67	5.168
6100.	46.678	5.004	51.682	30527.30	5.185
6200.	46.759	5.008	51.767	31046.69	5.203
6300.	46.840	5.011	51.850	31567.95	5.222
6400.	46.919	5.014	51.933	32091.13	5.242
6500.	46.996	5.018	52.014	32616.33	5.262
6600.	47.073	5.022	52.095	33143.62	5.284
6700.	47.148	5.026	52.174	33673.07	5.306
6800.	47.223	5.030	52.253	34204.75	5.328
6900.	47.296	5.035	52.331	34738.75	5.352
7000.	47.369	5.039	52.408	35275.13	5.376

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.092421
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.38669
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.092361

Table 1-6 Thermodynamic Functions for C (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	22.461	6.203	28.664	310.16	5.428
75.	24.913	5.895	30.808	442.13	5.177
100.	26.581	5.702	32.283	570.23	5.085
125.	27.838	5.574	33.412	696.76	5.042
150.	28.846	5.483	34.330	822.50	5.019
175.	29.686	5.416	35.102	947.79	5.005
200.	30.406	5.364	35.770	1072.81	4.997
225.	31.035	5.323	36.358	1197.64	4.990
250.	31.594	5.289	36.884	1322.35	4.986
275.	32.097	5.262	37.359	1446.96	4.983
300.	32.554	5.238	37.792	1571.50	4.981
325.	32.972	5.218	38.191	1695.99	4.979
350.	33.358	5.201	38.560	1820.44	4.977
375.	33.717	5.186	38.903	1944.86	4.976
400.	34.051	5.173	39.224	2069.25	4.975
425.	34.364	5.161	39.526	2193.62	4.974
450.	34.659	5.151	39.810	2317.96	4.974
475.	34.937	5.142	40.079	2442.30	4.973
500.	35.201	5.133	40.334	2566.62	4.973
550.	35.689	5.119	40.808	2815.23	4.972
600.	36.134	5.106	41.240	3063.80	4.971
650.	36.542	5.096	41.638	3312.35	4.971
700.	36.920	5.087	42.007	3560.88	4.970
750.	37.270	5.079	42.350	3809.39	4.970
800.	37.598	5.072	42.670	4057.89	4.970
850.	37.905	5.066	42.972	4306.38	4.970
900.	38.195	5.061	43.256	4554.86	4.970
950.	38.468	5.056	43.524	4803.33	4.969
1000.	38.727	5.052	43.779	5051.80	4.969
1050.	38.974	5.048	44.022	5300.27	4.969
1100.	39.209	5.044	44.253	5548.73	4.969
1150.	39.433	5.041	44.474	5797.21	4.970
1200.	39.647	5.038	44.685	6045.69	4.970
1250.	39.853	5.035	44.888	6294.18	4.970
1300.	40.050	5.033	45.083	6542.70	4.971
1350.	40.240	5.031	45.271	6791.25	4.971
1400.	40.423	5.028	45.452	7039.83	4.972
1450.	40.600	5.027	45.626	7288.47	4.973
1500.	40.770	5.025	45.795	7537.17	4.975
1550.	40.935	5.023	45.958	7785.95	4.976
1600.	41.094	5.022	46.116	8034.82	4.978
1650.	41.249	5.020	46.269	8283.80	4.981
1700.	41.398	5.019	46.418	8532.91	4.984
1750.	41.544	5.018	46.562	8782.16	4.987
1800.	41.685	5.018	46.703	9031.58	4.990
1850.	41.823	5.017	46.840	9281.18	4.994
1900.	41.957	5.016	46.973	9530.98	4.998
1950.	42.087	5.016	47.103	9781.00	5.003
2000.	42.214	5.016	47.229	10031.26	5.008
2050.	42.338	5.016	47.353	10281.78	5.013
2100.	42.459	5.016	47.474	10532.59	5.019
2150.	42.577	5.016	47.592	10783.69	5.025
273.15	32.061	5.264	37.325	1437.74	4.983
298.15	32.521	5.240	37.761	1562.29	4.981

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 12.011.

Table 1-6 Thermodynamic Functions for C (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	42.692	5.016	47.708	11035.10	5.032
2250.	42.805	5.016	47.821	11286.85	5.038
2300.	42.915	5.017	47.932	11538.95	5.046
2350.	43.023	5.018	48.040	11791.42	5.053
2400.	43.128	5.018	48.147	12044.26	5.061
2450.	43.232	5.019	48.251	12297.50	5.069
2500.	43.333	5.020	48.354	12551.14	5.077
2600.	43.530	5.023	48.553	13059.68	5.094
2700.	43.720	5.026	48.746	13569.97	5.112
2800.	43.903	5.029	48.932	14082.06	5.130
2900.	44.079	5.033	49.112	14596.00	5.149
3000.	44.250	5.037	49.287	15111.83	5.168
3100.	44.415	5.042	49.457	15629.55	5.187
3200.	44.575	5.047	49.622	16149.17	5.206
3300.	44.731	5.052	49.782	16670.67	5.224
3400.	44.882	5.057	49.939	17194.05	5.243
3500.	45.028	5.063	50.091	17719.26	5.261
3600.	45.171	5.068	50.239	18246.28	5.279
3700.	45.310	5.074	50.384	18775.05	5.296
3800.	45.445	5.080	50.526	19305.53	5.313
3900.	45.577	5.087	50.664	19837.66	5.329
4000.	45.706	5.093	50.799	20371.38	5.345
4100.	45.832	5.099	50.931	20906.65	5.360
4200.	45.955	5.106	51.061	21443.38	5.375
4300.	46.075	5.112	51.187	21981.53	5.388
4400.	46.193	5.118	51.311	22521.04	5.402
4500.	46.308	5.125	51.433	23061.83	5.414
4600.	46.421	5.131	51.552	23603.84	5.426
4700.	46.531	5.138	51.669	24147.03	5.437
4800.	46.639	5.144	51.783	24691.32	5.448
4900.	46.745	5.150	51.896	25236.67	5.459
5000.	46.850	5.157	52.006	25783.01	5.468
5100.	46.952	5.163	52.115	26330.29	5.477
5200.	47.052	5.169	52.221	26878.47	5.486
5300.	47.151	5.175	52.326	27427.49	5.494
5400.	47.247	5.181	52.428	27977.31	5.502
5500.	47.342	5.187	52.529	28527.89	5.509
5600.	47.436	5.193	52.629	29079.17	5.516
5700.	47.528	5.198	52.726	29631.13	5.523
5800.	47.618	5.204	52.822	30183.73	5.529
5900.	47.707	5.210	52.917	30736.93	5.535
6000.	47.795	5.215	53.010	31290.70	5.540
6100.	47.881	5.220	53.102	31845.01	5.546
6200.	47.966	5.226	53.192	32399.83	5.551
6300.	48.050	5.231	53.281	32955.15	5.555
6400.	48.132	5.236	53.368	33510.92	5.560
6500.	48.213	5.241	53.455	34067.14	5.564
6600.	48.294	5.246	53.540	34623.78	5.568
6700.	48.372	5.251	53.623	35180.82	5.572
6800.	48.450	5.256	53.706	35738.26	5.576
6900.	48.527	5.260	53.787	36296.06	5.580
7000.	48.603	5.265	53.868	36854.23	5.583

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.083257
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.34835
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.083203

Table 1-7 Thermodynamic Functions for N (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	22.775	4.968	27.744	248.41	4.968
75.	24.790	4.968	29.758	372.61	4.968
100.	26.219	4.968	31.187	496.81	4.968
125.	27.328	4.968	32.296	621.02	4.968
150.	28.233	4.968	33.202	745.22	4.968
175.	28.999	4.968	33.967	869.43	4.968
200.	29.663	4.968	34.631	993.63	4.968
225.	30.248	4.968	35.216	1117.83	4.968
250.	30.771	4.968	35.739	1242.04	4.968
275.	31.245	4.968	36.213	1366.24	4.968
300.	31.677	4.968	36.645	1490.44	4.968
325.	32.075	4.968	37.043	1614.65	4.968
350.	32.443	4.968	37.411	1738.85	4.968
375.	32.786	4.968	37.754	1863.06	4.968
400.	33.106	4.968	38.074	1987.26	4.968
425.	33.408	4.968	38.376	2111.46	4.968
450.	33.692	4.968	38.660	2235.67	4.968
475.	33.960	4.968	38.928	2359.87	4.968
500.	34.215	4.968	39.183	2484.07	4.968
550.	34.688	4.968	39.657	2732.48	4.968
600.	35.121	4.968	40.089	2980.89	4.968
650.	35.518	4.968	40.487	3229.30	4.968
700.	35.887	4.968	40.855	3477.70	4.968
750.	36.229	4.968	41.198	3726.11	4.968
800.	36.550	4.968	41.518	3974.52	4.968
850.	36.851	4.968	41.819	4222.93	4.968
900.	37.135	4.968	42.103	4471.33	4.968
950.	37.404	4.968	42.372	4719.74	4.968
1000.	37.659	4.968	42.627	4968.15	4.968
1050.	37.901	4.968	42.869	5216.56	4.968
1100.	38.132	4.968	43.100	5464.96	4.968
1150.	38.353	4.968	43.321	5713.37	4.968
1200.	38.564	4.968	43.533	5961.78	4.968
1250.	38.767	4.968	43.735	6210.19	4.968
1300.	38.962	4.968	43.930	6458.59	4.968
1350.	39.150	4.968	44.118	6707.00	4.968
1400.	39.330	4.968	44.298	6955.41	4.968
1450.	39.505	4.968	44.473	7203.82	4.968
1500.	39.673	4.968	44.641	7452.23	4.968
1550.	39.836	4.968	44.804	7700.63	4.968
1600.	39.994	4.968	44.962	7949.04	4.968
1650.	40.147	4.968	45.115	8197.45	4.968
1700.	40.295	4.968	45.263	8445.87	4.968
1750.	40.439	4.968	45.407	8694.28	4.968
1800.	40.579	4.968	45.547	8942.70	4.968
1850.	40.715	4.968	45.683	9191.12	4.969
1900.	40.847	4.968	45.816	9439.55	4.969
1950.	40.976	4.968	45.945	9687.99	4.969
2000.	41.102	4.968	46.070	9936.44	4.969
2050.	41.225	4.968	46.193	10184.90	4.969
2100.	41.345	4.968	46.313	10433.38	4.970
2150.	41.462	4.968	46.430	10681.88	4.970
273.15	31.211	4.968	36.179	1357.05	4.968
298.15	31.646	4.968	36.615	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 14.008.

Table 1-7 Thermodynamic Functions for N (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	41.576	4.968	46.544	10930.41	4.971
2250.	41.687	4.968	46.656	11178.97	4.972
2300.	41.797	4.969	46.765	11427.57	4.972
2350.	41.904	4.969	46.872	11676.22	4.973
2400.	42.008	4.969	46.977	11924.92	4.975
2450.	42.111	4.969	47.079	12173.69	4.976
2500.	42.211	4.969	47.180	12422.53	4.978
2600.	42.406	4.969	47.375	12920.50	4.982
2700.	42.593	4.970	47.563	13418.91	4.987
2800.	42.774	4.971	47.745	13917.90	4.993
2900.	42.949	4.972	47.920	14417.60	5.001
3000.	43.117	4.973	48.090	14918.17	5.010
3100.	43.280	4.974	48.254	15419.76	5.022
3200.	43.438	4.976	48.414	15922.56	5.035
3300.	43.591	4.978	48.569	16426.75	5.050
3400.	43.740	4.980	48.720	16932.54	5.067
3500.	43.884	4.983	48.867	17440.12	5.086
3600.	44.025	4.986	49.011	17949.72	5.107
3700.	44.161	4.990	49.151	18461.53	5.130
3800.	44.295	4.994	49.288	18975.79	5.155
3900.	44.424	4.998	49.422	19492.69	5.183
4000.	44.551	5.003	49.554	20012.46	5.213
4100.	44.675	5.009	49.683	20535.30	5.244
4200.	44.795	5.015	49.810	21061.40	5.278
4300.	44.913	5.021	49.935	21590.98	5.314
4400.	45.029	5.028	50.057	22124.20	5.351
4500.	45.142	5.036	50.178	22661.25	5.390
4600.	45.253	5.044	50.297	23202.30	5.431
4700.	45.361	5.053	50.414	23747.50	5.473
4800.	45.468	5.062	50.530	24296.99	5.517
4900.	45.572	5.072	50.644	24850.90	5.562
5000.	45.675	5.082	50.757	25409.36	5.608
5100.	45.776	5.093	50.868	25972.47	5.655
5200.	45.875	5.104	50.978	26540.32	5.702
5300.	45.972	5.116	51.088	27112.98	5.751
5400.	46.068	5.128	51.196	27690.54	5.800
5500.	46.162	5.141	51.302	28273.02	5.850
5600.	46.255	5.154	51.408	28860.49	5.900
5700.	46.346	5.167	51.513	29452.95	5.950
5800.	46.436	5.181	51.617	30050.43	6.000
5900.	46.525	5.195	51.720	30652.93	6.050
6000.	46.612	5.210	51.822	31260.43	6.100
6100.	46.698	5.225	51.923	31872.92	6.150
6200.	46.783	5.240	52.024	32490.36	6.199
6300.	46.867	5.256	52.123	33112.71	6.248
6400.	46.950	5.272	52.222	33739.91	6.296
6500.	47.032	5.288	52.320	34371.91	6.344
6600.	47.113	5.304	52.417	35008.63	6.391
6700.	47.193	5.321	52.514	35649.99	6.437
6800.	47.272	5.338	52.609	36295.92	6.482
6900.	47.350	5.355	52.704	36946.30	6.526
7000.	47.427	5.372	52.799	37601.05	6.569

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.071388
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.29869
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.071341

Table 1-8 Thermodynamic Functions for O (gas)

T °K	$\frac{-(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	23.628	5.028	28.657	251.42	5.249
75.	25.691	5.158	30.849	386.84	5.555
100.	27.191	5.275	32.466	527.48	5.666
125.	28.378	5.353	33.730	669.07	5.649
150.	29.358	5.397	34.755	809.52	5.583
175.	30.192	5.418	35.609	948.14	5.506
200.	30.916	5.424	36.340	1084.88	5.434
225.	31.554	5.422	36.976	1219.92	5.371
250.	32.125	5.414	37.539	1353.51	5.317
275.	32.641	5.403	38.044	1485.86	5.272
300.	33.110	5.391	38.501	1617.19	5.235
325.	33.541	5.377	38.919	1747.65	5.203
350.	33.939	5.364	39.303	1877.39	5.177
375.	34.309	5.351	39.660	2006.51	5.154
400.	34.654	5.338	39.992	2135.11	5.135
425.	34.977	5.325	40.302	2263.27	5.118
450.	35.281	5.313	40.595	2391.04	5.104
475.	35.568	5.302	40.870	2518.48	5.092
500.	35.840	5.291	41.131	2645.63	5.081
550.	36.343	5.271	41.614	2899.21	5.063
600.	36.801	5.253	42.054	3151.99	5.049
650.	37.221	5.237	42.458	3404.15	5.038
700.	37.608	5.223	42.831	3655.82	5.029
750.	37.968	5.209	43.178	3907.07	5.021
800.	38.304	5.197	43.502	4157.99	5.015
850.	38.619	5.187	43.806	4408.62	5.010
900.	38.915	5.177	44.092	4659.02	5.006
950.	39.195	5.168	44.362	4909.22	5.002
1000.	39.460	5.159	44.619	5159.25	4.999
1050.	39.711	5.152	44.863	5409.13	4.996
1100.	39.951	5.144	45.095	5658.88	4.994
1150.	40.179	5.138	45.317	5908.52	4.992
1200.	40.398	5.132	45.529	6158.05	4.990
1250.	40.607	5.126	45.733	6407.50	4.988
1300.	40.808	5.121	45.929	6656.88	4.987
1350.	41.001	5.116	46.117	6906.18	4.985
1400.	41.187	5.111	46.298	7155.42	4.984
1450.	41.366	5.107	46.473	7404.61	4.983
1500.	41.539	5.102	46.642	7653.74	4.982
1550.	41.707	5.099	46.805	7902.83	4.981
1600.	41.868	5.095	46.963	8151.89	4.981
1650.	42.025	5.091	47.117	8400.90	4.980
1700.	42.177	5.088	47.265	8649.89	4.979
1750.	42.325	5.085	47.410	8898.85	4.979
1800.	42.468	5.082	47.550	9147.79	4.979
1850.	42.607	5.079	47.686	9396.71	4.978
1900.	42.742	5.077	47.819	9645.61	4.978
1950.	42.874	5.074	47.948	9894.51	4.978
2000.	43.003	5.072	48.074	10143.40	4.978
2050.	43.128	5.069	48.197	10392.29	4.978
2100.	43.250	5.067	48.317	10641.19	4.978
2150.	43.369	5.065	48.434	10890.09	4.978
273.15	32.604	5.404	38.008	1476.11	5.275
298.15	33.077	5.392	38.469	1607.50	5.237

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 16.

Table 1-8 Thermodynamic Functions for O (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	43.486	5.063	48.549	11139.01	4.979
2250.	43.599	5.061	48.661	11387.96	4.979
2300.	43.711	5.060	48.770	11636.93	4.980
2350.	43.819	5.058	48.877	11885.93	4.980
2400.	43.926	5.056	48.982	12134.98	4.981
2450.	44.030	5.055	49.085	12384.07	4.982
2500.	44.132	5.053	49.186	12633.22	4.984
2600.	44.330	5.051	49.381	13131.72	4.986
2700.	44.521	5.048	49.569	13630.53	4.990
2800.	44.705	5.046	49.751	14129.72	4.994
2900.	44.882	5.045	49.926	14629.35	4.999
3000.	45.053	5.043	50.096	15129.50	5.004
3100.	45.218	5.042	50.260	15630.23	5.010
3200.	45.378	5.041	50.419	16131.60	5.017
3300.	45.533	5.041	50.574	16633.69	5.025
3400.	45.684	5.040	50.724	17136.55	5.033
3500.	45.830	5.040	50.870	17640.24	5.041
3600.	45.972	5.040	51.012	18144.82	5.050
3700.	46.110	5.041	51.150	18650.34	5.060
3800.	46.244	5.041	51.285	19156.84	5.070
3900.	46.375	5.042	51.417	19664.38	5.081
4000.	46.503	5.043	51.546	20172.98	5.091
4100.	46.627	5.045	51.672	20682.69	5.103
4200.	46.749	5.046	51.795	21193.52	5.114
4300.	46.868	5.048	51.916	21705.52	5.126
4400.	46.984	5.050	52.033	22218.68	5.138
4500.	47.097	5.052	52.149	22733.04	5.150
4600.	47.208	5.054	52.262	23248.61	5.162
4700.	47.317	5.056	52.374	23765.38	5.174
4800.	47.424	5.059	52.483	24283.37	5.186
4900.	47.528	5.062	52.590	24802.58	5.198
5000.	47.630	5.065	52.695	25323.00	5.210
5100.	47.730	5.068	52.798	25844.63	5.222
5200.	47.829	5.071	52.900	26367.45	5.234
5300.	47.926	5.074	52.999	26891.46	5.246
5400.	48.020	5.077	53.098	27416.65	5.258
5500.	48.114	5.081	53.194	27942.99	5.269
5600.	48.205	5.084	53.289	28470.47	5.280
5700.	48.295	5.088	53.383	28999.07	5.292
5800.	48.384	5.091	53.475	29528.77	5.302
5900.	48.471	5.095	53.566	30059.54	5.313
6000.	48.556	5.099	53.655	30591.37	5.323
6100.	48.641	5.102	53.743	31124.23	5.334
6200.	48.724	5.106	53.830	31658.08	5.344
6300.	48.805	5.110	53.915	32192.92	5.353
6400.	48.886	5.114	54.000	32728.70	5.362
6500.	48.965	5.118	54.083	33265.40	5.372
6600.	49.043	5.122	54.165	33803.00	5.380
6700.	49.121	5.126	54.246	34341.47	5.389
6800.	49.196	5.130	54.326	34880.77	5.397
6900.	49.271	5.133	54.405	35420.89	5.405
7000.	49.345	5.137	54.483	35961.78	5.413

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.062500
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.26150
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.062459

Table 1-9 Thermodynamic Functions for F (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	23.684	4.968	28.652	248.41	4.969
75.	25.699	4.971	30.670	372.86	4.994
100.	27.131	4.985	32.116	498.54	5.068
125.	28.246	5.012	33.258	626.51	5.172
150.	29.163	5.047	34.210	757.08	5.271
175.	29.943	5.085	35.029	889.90	5.350
200.	30.625	5.122	35.747	1024.37	5.403
225.	31.230	5.155	36.385	1159.86	5.433
250.	31.775	5.184	36.958	1295.88	5.446
275.	32.270	5.207	37.477	1432.03	5.445
300.	32.724	5.227	37.951	1568.06	5.436
325.	33.143	5.242	38.385	1703.77	5.421
350.	33.532	5.254	38.786	1839.07	5.402
375.	33.895	5.264	39.158	1973.88	5.382
400.	34.235	5.270	39.505	2108.17	5.361
425.	34.554	5.275	39.830	2241.95	5.341
450.	34.856	5.278	40.134	2375.21	5.320
475.	35.141	5.280	40.421	2507.97	5.301
500.	35.412	5.281	40.693	2640.26	5.282
550.	35.915	5.279	41.195	2903.50	5.248
600.	36.375	5.275	41.650	3165.14	5.218
650.	36.797	5.270	42.067	3425.38	5.192
700.	37.187	5.263	42.450	3684.41	5.169
750.	37.550	5.257	42.806	3942.38	5.150
800.	37.889	5.249	43.138	4199.43	5.133
850.	38.207	5.242	43.449	4455.68	5.118
900.	38.506	5.235	43.741	4711.23	5.105
950.	38.789	5.228	44.017	4966.16	5.093
1000.	39.057	5.221	44.278	5220.55	5.083
1050.	39.312	5.214	44.525	5474.46	5.074
1100.	39.554	5.207	44.761	5727.94	5.066
1150.	39.785	5.201	44.986	5981.05	5.059
1200.	40.007	5.195	45.201	6233.81	5.052
1250.	40.219	5.189	45.408	6486.27	5.046
1300.	40.422	5.183	45.605	6738.45	5.041
1350.	40.618	5.178	45.796	6990.38	5.036
1400.	40.806	5.173	45.979	7242.09	5.032
1450.	40.987	5.168	46.155	7493.60	5.028
1500.	41.162	5.163	46.326	7744.92	5.025
1550.	41.332	5.159	46.490	7996.06	5.021
1600.	41.495	5.154	46.650	8247.06	5.018
1650.	41.654	5.150	46.804	8497.90	5.016
1700.	41.807	5.146	46.954	8748.62	5.013
1750.	41.957	5.142	47.099	8999.22	5.011
1800.	42.101	5.139	47.240	9249.70	5.009
1850.	42.242	5.135	47.377	9500.08	5.007
1900.	42.379	5.132	47.511	9750.36	5.005
1950.	42.512	5.128	47.641	10000.55	5.003
2000.	42.642	5.125	47.767	10250.66	5.001
2050.	42.769	5.122	47.891	10500.69	5.000
273.15	32.235	5.206	37.441	1421.96	5.445
298.15	32.692	5.226	37.917	1558.00	5.437

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 19.0.

Table 1-9 Thermodynamic Functions for F (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	42.892	5.119	48.011	10750.65	4.998
2150.	43.012	5.117	48.129	11000.55	4.997
2200.	43.130	5.114	48.244	11250.37	4.996
2250.	43.245	5.111	48.356	11500.14	4.995
2300.	43.357	5.109	48.466	11749.86	4.994
2350.	43.467	5.106	48.573	11999.52	4.993
2400.	43.575	5.104	48.678	12249.13	4.992
2450.	43.680	5.102	48.781	12498.69	4.991
2500.	43.783	5.099	48.882	12748.21	4.990
2600.	43.983	5.095	49.078	13247.13	4.988
2700.	44.175	5.091	49.266	13745.90	4.987
2800.	44.360	5.087	49.447	14244.54	4.986
2900.	44.539	5.084	49.622	14743.05	4.985
3000.	44.711	5.080	49.791	15241.46	4.984
3100.	44.877	5.077	49.955	15739.77	4.983
3200.	45.038	5.074	50.113	16237.99	4.982
3300.	45.195	5.072	50.266	16736.13	4.981
3400.	45.346	5.069	50.415	17234.19	4.980
3500.	45.493	5.066	50.559	17732.18	4.980
3600.	45.636	5.064	50.699	18230.11	4.979
3700.	45.774	5.062	50.836	18727.98	4.978
3800.	45.909	5.059	50.969	19225.80	4.978
3900.	46.041	5.057	51.098	19723.57	4.977
4000.	46.169	5.055	51.224	20221.29	4.977
4100.	46.293	5.053	51.347	20718.97	4.977
4200.	46.415	5.052	51.467	21216.61	4.976
4300.	46.534	5.050	51.584	21714.21	4.976
4400.	46.650	5.048	51.698	22211.77	4.975
4500.	46.764	5.047	51.810	22709.31	4.975
4600.	46.874	5.045	51.919	23206.81	4.975
4700.	46.983	5.043	52.026	23704.29	4.975
4800.	47.089	5.042	52.131	24201.73	4.974
4900.	47.193	5.041	52.234	24699.16	4.974
5000.	47.295	5.039	52.334	25196.55	4.974
5100.	47.395	5.038	52.433	25693.93	4.974
5200.	47.492	5.037	52.529	26191.29	4.973
5300.	47.588	5.036	52.624	26688.62	4.973
5400.	47.682	5.034	52.717	27185.94	4.973
5500.	47.775	5.033	52.808	27683.24	4.973
5600.	47.866	5.032	52.898	28180.52	4.973
5700.	47.955	5.031	52.986	28677.78	4.973
5800.	48.042	5.030	53.072	29175.04	4.972
5900.	48.128	5.029	53.157	29672.27	4.972
6000.	48.213	5.028	53.241	30169.49	4.972
6100.	48.296	5.027	53.323	30666.70	4.972
6200.	48.377	5.026	53.404	31163.90	4.972
6300.	48.458	5.026	53.483	31661.08	4.972
6400.	48.537	5.025	53.562	32158.26	4.972
6500.	48.615	5.024	53.639	32655.42	4.972
6600.	48.692	5.023	53.715	33152.57	4.971
6700.	48.767	5.022	53.789	33649.71	4.971
6800.	48.842	5.022	53.863	34146.85	4.971
6900.	48.915	5.021	53.936	34643.97	4.971
7000.	48.987	5.020	54.007	35141.08	4.971

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.052632
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.22021
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.052598

Table 1-10 Thermodynamic Functions for Ne (gas)

T °K	$-(F^\circ-H^\circ_0)/T$	$(H^\circ - H^\circ_0)/T$	S°	$H^\circ - H^\circ_0$	C°_p
50.	21.109	4.968	26.077	248.41	4.968
75.	23.124	4.968	28.092	372.61	4.968
100.	24.553	4.968	29.521	496.81	4.968
125.	25.661	4.968	30.630	621.02	4.968
150.	26.567	4.968	31.535	745.22	4.968
175.	27.333	4.968	32.301	869.43	4,968
200.	27.996	4.968	32.965	993.63	4.968
225.	28.582	4.968	33.550	1117.83	4.968
250.	29.105	4.968	34.073	1242.04	4.968
275.	29.579	4.968	34.547	1366.24	4.968
300.	30.011	4.968	34.979	1490.44	4.968
325.	30.408	4.968	35.377	1614.65	4.968
350.	30.777	4.968	35.745	1738.85	4.968
375.	31.119	4.968	36.088	1863.06	4.968
400.	31.440	4.968	36.408	1987.26	4.968
425.	31.741	4.968	36.709	2111.46	4.968
450.	32.025	4.968	36.993	2235.67	4.968
475.	32.294	4.968	37.262	2359.87	4.968
500.	32.549	4.968	37.517	2484.07	4.968
550.	33.022	4.968	37.990	2732.48	4.968
600.	33.454	4.968	38.423	2980.89	4.968
650.	33.852	4.968	38.820	3229.30	4.968
700.	34.220	4.968	39.188	3477.70	4.968
750.	34.563	4.968	39.531	3726.11	4.968
800.	34.884	4.968	39.852	3974.52	4.968
850.	35.185	4.968	40.153	4222.93	4.968
900.	35.469	4.968	40.437	4471.33	4.968
950.	35.738	4.968	40.706	4719.74	4.968
1000.	35.992	4.968	40.960	4968.15	4.968
1050.	36.235	4.968	41.203	5216.56	4.968
1100.	36.466	4.968	41.434	5464.96	4.968
1150.	36.687	4.968	41.655	5713.37	4.968
1200.	36.898	4.968	41.866	5961.78	4.968
1250.	37.101	4.968	42.069	6210.19	4.968
1300.	37.296	4.968	42.264	6458.59	4.968
1350.	37.483	4.968	42.451	6707.00	4.968
1400.	37.664	4.968	42.632	6955.41	4.968
1450.	37.838	4.968	42.806	7203.82	4.968
1500.	38.007	4.968	42.975	7452.22	4.968
1550.	38.170	4.968	43.138	7700.63	4.968
1600.	38.327	4.968	43.296	7949.04	4.968
1650.	38.480	4.968	43.448	8197.45	4.968
1700.	38.629	4.968	43.597	8445.85	4.968
1750.	38.773	4.968	43.741	8694.26	4.968
1800.	38.913	4.968	43.881	8942.67	4.968
1850.	39.049	4.968	44.017	9191.08	4.968
1900.	39.181	4.968	44.149	9439.48	4.968
1950.	39.310	4.968	44.278	9687.89	4.968
2000.	39.436	4.968	44.404	9936.30	4.968
2050.	39.559	4.968	44.527	10184.71	4.968
273.15	29.545	4.968	34.513	1357.05	4.968
298.15	29.980	4.968	34.948	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 20.183.

Table 1-10 Thermodynamic Functions for Ne (gas) - Continued

T °K	$-\frac{(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	39.678	4.968	44.647	10433.11	4.968
2150.	39.795	4.968	44.763	10681.52	4.968
2200.	39.910	4.968	44.878	10929.93	4.968
2250.	40.021	4.968	44.989	11178.34	4.968
2300.	40.130	4.968	45.099	11426.74	4.968
2350.	40.237	4.968	45.205	11675.15	4.968
2400.	40.342	4.968	45.310	11923.56	4.968
2450.	40.444	4.968	45.412	12171.97	4.968
2500.	40.545	4.968	45.513	12420.37	4.968
2600.	40.739	4.968	45.708	12917.19	4.968
2700.	40.927	4.968	45.895	13414.00	4.968
2800.	41.108	4.968	46.076	13910.82	4.968
2900.	41.282	4.968	46.250	14407.63	4.968
3000.	41.450	4.968	46.419	14904.45	4.968
3100.	41.613	4.968	46.581	15401.26	4.968
3200.	41.771	4.968	46.739	15898.08	4.968
3300.	41.924	4.968	46.892	16394.89	4.968
3400.	42.072	4.968	47.040	16891.71	4.968
3500.	42.216	4.968	47.184	17388.52	4.968
3600.	42.356	4.968	47.324	17885.34	4.968
3700.	42.492	4.968	47.460	18382.15	4.968
3800.	42.625	4.968	47.593	18878.97	4.968
3900.	42.754	4.968	47.722	19375.78	4.968
4000.	42.880	4.968	47.848	19872.60	4.968
4100.	43.002	4.968	47.970	20369.41	4.968
4200.	43.122	4.968	48.090	20866.23	4.968
4300.	43.239	4.968	48.207	21363.04	4.968
4400.	43.353	4.968	48.321	21859.86	4.968
4500.	43.465	4.968	48.433	22356.67	4.968
4600.	43.574	4.968	48.542	22853.49	4.968
4700.	43.681	4.968	48.649	23350.30	4.968
4800.	43.785	4.968	48.754	23847.12	4.968
4900.	43.888	4.968	48.856	24343.93	4.968
5000.	43.988	4.968	48.956	24840.75	4.968
5100.	44.087	4.968	49.055	25337.56	4.968
5200.	44.183	4.968	49.151	25834.38	4.968
5300.	44.278	4.968	49.246	26331.19	4.968
5400.	44.371	4.968	49.339	26828.01	4.968
5500.	44.462	4.968	49.430	27324.82	4.968
5600.	44.551	4.968	49.519	27821.64	4.968
5700.	44.639	4.968	49.607	28318.45	4.968
5800.	44.726	4.968	49.694	28815.27	4.968
5900.	44.811	4.968	49.779	29312.08	4.968
6000.	44.894	4.968	49.862	29808.90	4.968
6100.	44.976	4.968	49.944	30305.71	4.968
6200.	45.057	4.968	50.025	30802.53	4.968
6300.	45.136	4.968	50.105	31299.34	4.968
6400.	45.215	4.968	50.183	31796.16	4.968
6500.	45.292	4.968	50.260	32292.97	4.968
6600.	45.368	4.968	50.336	32789.79	4.968
6700.	45.442	4.968	50.410	33286.60	4.968
6800.	45.516	4.968	50.484	33783.42	4.968
6900.	45.588	4.968	50.557	34280.23	4.968
7000.	45.660	4.968	50.628	34777.05	4.968

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.049547
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.20732
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.049514

Table 1-11 Thermodynamic Functions for Na (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	22.875	4.968	27.843	248.41	4.968
75.	24.889	4.968	29.857	372.61	4.968
100.	26.319	4.968	31.287	496.81	4.968
125.	27.427	4.968	32.395	621.02	4.968
150.	28.333	4.968	33.301	745.22	4.968
175.	29.099	4.968	34.067	869.43	4.968
200.	29.762	4.968	34.730	993.63	4.968
225.	30.347	4.968	35.315	1117.83	4.968
250.	30.871	4.968	35.839	1242.04	4.968
275.	31.344	4.968	36.312	1366.24	4.968
300.	31.777	4.968	36.745	1490.44	4.968
325.	32.174	4.968	37.142	1614.65	4.968
350.	32.542	4.968	37.511	1738.85	4.968
375.	32.885	4.968	37.853	1863.06	4.968
400.	33.206	4.968	38.174	1987.26	4.968
425.	33.507	4.968	38.475	2111.46	4.968
450.	33.791	4.968	38.759	2235.67	4.968
475.	34.060	4.968	39.028	2359.87	4.968
500.	34.314	4.968	39.283	2484.07	4.968
550.	34.788	4.968	39.756	2732.48	4.968
600.	35.220	4.968	40.188	2980.89	4.968
650.	35.618	4.968	40.586	3229.30	4.968
700.	35.986	4.968	40.954	3477.70	4.968
750.	36.329	4.968	41.297	3726.11	4.968
800.	36.649	4.968	41.618	3974.52	4.968
850.	36.951	4.968	41.919	4222.93	4.968
900.	37.235	4.968	42.203	4471.33	4.968
950.	37.503	4.968	42.471	4719.74	4.968
1000.	37.758	4.968	42.726	4968.15	4.968
1050.	38.000	4.968	42.969	5216.56	4.968
1100.	38.232	4.968	43.200	5464.96	4.968
1150.	38.452	4.968	43.421	5713.37	4.968
1200.	38.664	4.968	43.632	5961.78	4.968
1250.	38.867	4.968	43.835	6210.19	4.968
1300.	39.062	4.968	44.030	6458.60	4.968
1350.	39.249	4.968	44.217	6707.00	4.968
1400.	39.430	4.968	44.398	6955.41	4.968
1450.	39.604	4.968	44.572	7203.82	4.968
1500.	39.773	4.968	44.741	7452.24	4.968
1550.	39.935	4.968	44.904	7700.65	4.968
1600.	40.093	4.968	45.061	7949.07	4.968
1650.	40.246	4.968	45.214	8197.50	4.969
1700.	40.394	4.968	45.363	8445.94	4.969
1750.	40.538	4.968	45.507	8694.39	4.969
1800.	40.678	4.968	45.647	8942.86	4.970
1850.	40.814	4.968	45.783	9191.35	4.970
1900.	40.947	4.968	45.915	9439.87	4.971
1950.	41.076	4.968	46.044	9688.42	4.972
2000.	41.202	4.969	46.170	9937.03	4.973
2050.	41.324	4.969	46.293	10185.69	4.974
273.15	31.311	4.968	36.279	1357.05	4.968
298.15	31.746	4.968	36.714	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 22.991.

Table 1-11 Thermodynamic Functions for Na (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	41.444	4.969	46.413	10434.42	4.975
2150.	41.561	4.969	46.530	10683.23	4.977
2200.	41.675	4.969	46.645	10932.14	4.979
2250.	41.787	4.969	46.756	11181.17	4.982
2300.	41.896	4.970	46.866	11430.33	4.985
2350.	42.003	4.970	46.973	11679.65	4.988
2400.	42.108	4.970	47.078	11929.15	4.992
2450.	42.210	4.971	47.181	12178.86	4.996
2500.	42.311	4.972	47.282	12428.79	5.001
2600.	42.506	4.973	47.479	12929.47	5.013
2700.	42.693	4.975	47.668	13431.44	5.027
2800.	42.874	4.977	47.851	13934.98	5.044
2900.	43.049	4.979	48.029	14440.40	5.065
3000.	43.218	4.983	48.201	14948.03	5.089
3100.	43.381	4.987	48.368	15458.24	5.116
3200.	43.540	4.991	48.531	15971.42	5.148
3300.	43.693	4.996	48.690	16488.00	5.184
3400.	43.843	5.002	48.845	17008.45	5.225
3500.	43.988	5.010	48.997	17533.27	5.272
3600.	44.129	5.018	49.147	18063.02	5.324
3700.	44.267	5.027	49.293	18598.31	5.383
3800.	44.401	5.037	49.438	19139.80	5.448
3900.	44.532	5.048	49.580	19688.25	5.522
4000.	44.660	5.061	49.721	20244.47	5.604
4100.	44.785	5.075	49.860	20809.38	5.696
4200.	44.907	5.091	49.999	21383.98	5.798
4300.	45.027	5.109	50.137	21969.41	5.912
4400.	45.145	5.129	50.274	22566.89	6.039
4500.	45.261	5.151	50.411	23177.76	6.181
4600.	45.374	5.175	50.549	23803.52	6.337
4700.	45.486	5.201	50.687	24445.75	6.510
4800.	45.595	5.230	50.826	25106.18	6.701
4900.	45.704	5.263	50.966	25786.67	6.912
5000.	45.810	5.298	51.108	26489.18	7.142
5100.	45.916	5.336	51.252	27215.78	7.394
5200.	46.020	5.379	51.398	27968.66	7.668
5300.	46.122	5.425	51.547	28750.05	7.964
5400.	46.224	5.474	51.699	29562.29	8.284
5500.	46.325	5.529	51.854	30407.72	8.628
5600.	46.425	5.587	52.013	31288.73	8.996
5700.	46.525	5.650	52.175	32207.68	9.387
5800.	46.624	5.718	52.342	33166.89	9.801
5900.	46.722	5.791	52.513	34168.61	10.237
6000.	46.820	5.869	52.689	35215.00	10.694
6100.	46.918	5.952	52.870	36308.05	11.170
6200.	47.015	6.040	53.055	37449.60	11.664
6300.	47.113	6.134	53.246	38641.27	12.172
6400.	47.210	6.232	53.442	39884.44	12.693
6500.	47.307	6.335	53.643	41180.21	13.224
6600.	47.405	6.444	53.849	42529.39	13.761
6700.	47.503	6.557	54.060	43932.45	14.301
6800.	47.601	6.675	54.276	45389.55	14.841
6900.	47.699	6.797	54.496	46900.43	15.376
7000.	47.798	6.924	54.721	48464.51	15.904

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.043495
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.18198
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.043467

Table 1-12 Thermodynamic Functions for Mg (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	21.665	4.968	26.633	248.41	4.968
75.	23.679	4.968	28.647	372.61	4.968
100.	25.109	4.968	30.077	496.81	4.968
125.	26.217	4.968	31.185	621.02	4.968
150.	27.123	4.968	32.091	745.22	4.968
175.	27.889	4.968	32.857	869.43	4.968
200.	28.552	4.968	33.520	993.63	4.968
225.	29.137	4.968	34.106	1117.83	4.968
250.	29.661	4.968	34.629	1242.04	4.968
275.	30.134	4.968	35.102	1366.24	4.968
300.	30.567	4.968	35.535	1490.44	4.968
325.	30.964	4.968	35.932	1614.65	4.968
350.	31.332	4.968	36.301	1738.85	4.968
375.	31.675	4.968	36.643	1863.06	4.968
400.	31.996	4.968	36.964	1987.26	4.968
425.	32.297	4.968	37.265	2111.46	4.968
450.	32.581	4.968	37.549	2235.67	4.968
475.	32.850	4.968	37.818	2359.87	4.968
500.	33.104	4.968	38.073	2484.07	4.968
550.	33.578	4.968	38.546	2732.48	4.968
600.	34.010	4.968	38.978	2980.89	4.968
650.	34.408	4.968	39.376	3229.30	4.968
700.	34.776	4.968	39.744	3477.70	4.968
750.	35.119	4.968	40.087	3726.11	4.968
800.	35.440	4.968	40.408	3974.52	4.968
850.	35.741	4.968	40.709	4222.93	4.968
900.	36.025	4.968	40.993	4471.33	4.968
950.	36.293	4.968	41.261	4719.74	4.968
1000.	36.548	4.968	41.516	4968.15	4.968
1050.	36.791	4.968	41.759	5216.56	4.968
1100.	37.022	4.968	41.990	5464.96	4.968
1150.	37.243	4.968	42.211	5713.37	4.968
1200.	37.454	4.968	42.422	5961.78	4.968
1250.	37.657	4.968	42.625	6210.19	4.968
1300.	37.852	4.968	42.820	6458.59	4.968
1350.	38.039	4.968	43.007	6707.00	4.968
1400.	38.220	4.968	43.188	6955.41	4.968
1450.	38.394	4.968	43.362	7203.82	4.968
1500.	38.563	4.968	43.531	7452.23	4.968
1550.	38.725	4.968	43.694	7700.63	4.968
1600.	38.883	4.968	43.851	7949.04	4.968
1650.	39.036	4.968	44.004	8197.45	4.968
1700.	39.184	4.968	44.153	8445.86	4.968
1750.	39.328	4.968	44.297	8694.27	4.968
1800.	39.468	4.968	44.437	8942.68	4.968
1850.	39.604	4.968	44.573	9191.10	4.968
1900.	39.737	4.968	44.705	9439.52	4.968
1950.	39.866	4.968	44.834	9687.95	4.969
2000.	39.992	4.968	44.960	9936.38	4.969
2050.	40.114	4.968	45.083	10184.83	4.969
2100.	40.234	4.968	45.202	10433.29	4.969
2150.	40.351	4.968	45.319	10681.77	4.970
273.15	30.101	4.968	35.069	1357.05	4.968
298.15	30.536	4.968	35.504	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 24.32.

Table 1-12 Thermodynamic Functions for Mg (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	40.465	4.968	45.434	10930.27	4.970
2250.	40.577	4.968	45.545	11178.81	4.971
2300.	40.686	4.968	45.655	11427.38	4.972
2350.	40.793	4.969	45.762	11676.00	4.973
2400.	40.898	4.969	45.866	11924.69	4.974
2450.	41.000	4.969	45.969	12173.44	4.976
2500.	41.100	4.969	46.069	12422.28	4.978
2600.	41.295	4.969	46.265	12920.28	4.983
2700.	41.483	4.970	46.453	13418.84	4.989
2800.	41.664	4.971	46.634	13918.16	4.998
2900.	41.838	4.972	46.810	14418.46	5.009
3000.	42.007	4.973	46.980	14919.99	5.023
3100.	42.170	4.975	47.145	15423.08	5.040
3200.	42.328	4.978	47.305	15928.05	5.060
3300.	42.481	4.980	47.461	16435.28	5.085
3400.	42.630	4.984	47.614	16945.20	5.114
3500.	42.774	4.988	47.762	17458.24	5.148
3600.	42.915	4.993	47.908	17974.87	5.186
3700.	43.052	4.999	48.051	18495.58	5.229
3800.	43.185	5.006	48.191	19020.91	5.278
3900.	43.315	5.013	48.328	19551.37	5.332
4000.	43.442	5.022	48.464	20087.50	5.392
4100.	43.566	5.032	48.598	20629.85	5.457
4200.	43.688	5.043	48.730	21178.98	5.527
4300.	43.807	5.055	48.861	21735.43	5.603
4400.	43.923	5.068	48.991	22299.72	5.684
4500.	44.037	5.083	49.120	22872.40	5.770
4600.	44.149	5.099	49.248	23453.98	5.862
4700.	44.259	5.116	49.375	24044.94	5.958
4800.	44.367	5.135	49.501	24645.76	6.059
4900.	44.473	5.154	49.627	25256.90	6.164
5000.	44.577	5.176	49.753	25878.77	6.274
5100.	44.680	5.198	49.878	26511.78	6.387
5200.	44.781	5.222	50.003	27156.27	6.504
5300.	44.881	5.248	50.128	27812.60	6.623
5400.	44.979	5.274	50.253	28481.06	6.746
5500.	45.076	5.302	50.378	29161.91	6.871
5600.	45.172	5.331	50.503	29855.41	6.999
5700.	45.266	5.362	50.628	30561.74	7.128
5800.	45.360	5.393	50.753	31281.07	7.259
5900.	45.452	5.426	50.878	32013.54	7.391
6000.	45.544	5.460	51.004	32759.24	7.524
6100.	45.634	5.495	51.129	33518.26	7.657
6200.	45.724	5.531	51.255	34290.61	7.790
6300.	45.813	5.568	51.381	35076.31	7.924
6400.	45.901	5.606	51.506	35875.32	8.057
6500.	45.988	5.644	51.632	36687.60	8.189
6600.	46.075	5.684	51.758	37513.07	8.320
6700.	46.160	5.724	51.884	38351.60	8.450
6800.	46.245	5.765	52.011	39203.07	8.579
6900.	46.330	5.807	52.137	40067.32	8.706
7000.	46.414	5.849	52.263	40944.16	8.831

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.041118
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.17204
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.041092

Table 1-13 Thermodynamic Functions for Al (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	23.504	5.440	28.944	272.02	6.379
75.	25.783	5.776	31.558	433.17	6.376
100.	27.463	5.882	33.344	588.17	6.021
125.	28.776	5.878	34.654	734.79	5.725
150.	29.844	5.835	35.679	875.21	5.522
175.	30.739	5.780	36.519	1011.42	5.384
200.	31.508	5.724	37.231	1144.78	5.290
225.	32.179	5.672	37.850	1276.14	5.223
250.	32.774	5.624	38.398	1406.08	5.175
275.	33.308	5.582	38.890	1534.98	5.138
300.	33.792	5.544	39.335	1663.07	5.111
325.	34.234	5.509	39.744	1790.56	5.089
350.	34.641	5.479	40.120	1917.57	5.072
375.	35.018	5.451	40.470	2044.20	5.058
400.	35.369	5.426	40.796	2170.51	5.047
425.	35.698	5.404	41.101	2296.57	5.038
450.	36.006	5.383	41.389	2422.42	5.030
475.	36.296	5.364	41.661	2548.09	5.024
500.	36.571	5.347	41.918	2673.61	5.018
550.	37.079	5.317	42.396	2924.28	5.009
600.	37.541	5.291	42.832	3174.56	5.002
650.	37.963	5.269	43.232	3424.55	4.997
700.	38.353	5.249	43.602	3674.30	4.993
750.	38.715	5.232	43.947	3923.87	4.990
800.	39.052	5.217	44.268	4173.30	4.987
850.	39.368	5.203	44.571	4422.60	4.985
900.	39.665	5.191	44.856	4671.80	4.983
950.	39.945	5.180	45.125	4920.91	4.982
1000.	40.211	5.170	45.380	5169.95	4.980
1050.	40.463	5.161	45.623	5418.93	4.979
1100.	40.702	5.153	45.855	5667.86	4.978
1150.	40.931	5.145	46.076	5916.74	4.977
1200.	41.150	5.138	46.288	6165.58	4.976
1250.	41.360	5.132	46.491	6414.39	4.976
1300.	41.561	5.126	46.686	6663.16	4.975
1350.	41.754	5.120	46.874	6911.91	4.975
1400.	41.940	5.115	47.055	7160.63	4.974
1450.	42.120	5.110	47.230	7409.33	4.974
1500.	42.293	5.105	47.398	7658.01	4.973
1550.	42.460	5.101	47.561	7906.67	4.973
1600.	42.622	5.097	47.719	8155.32	4.973
1650.	42.779	5.093	47.872	8403.95	4.972
1700.	42.931	5.090	48.021	8652.57	4.972
1750.	43.078	5.086	48.165	8901.18	4.972
1800.	43.222	5.083	48.305	9149.77	4.972
1850.	43.361	5.080	48.441	9398.36	4.972
1900.	43.496	5.077	48.574	9646.93	4.971
1950.	43.628	5.075	48.703	9895.50	4.971
2000.	43.757	5.072	48.829	10144.06	4.971
2050.	43.882	5.070	48.951	10392.61	4.971
273.15	33.270	5.585	38.855	1525.47	5.141
298.15	33.758	5.546	39.304	1653.62	5.113

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 26.98.

Table 1-13 Thermodynamic Functions for Al (gas) - Continued

T °K	$-\frac{(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	44.004	5.067	49.071	10641.15	4.971
2150.	44.123	5.065	49.188	10889.69	4.971
2200.	44.240	5.063	49.302	11138.22	4.971
2250.	44.353	5.061	49.414	11386.75	4.970
2300.	44.465	5.059	49.523	11635.27	4.970
2350.	44.573	5.057	49.630	11883.79	4.970
2400.	44.680	5.055	49.735	12132.31	4.970
2450.	44.784	5.053	49.837	12380.82	4.970
2500.	44.886	5.052	49.938	12629.33	4.970
2600.	45.084	5.049	50.133	13126.34	4.970
2700.	45.275	5.046	50.320	13623.36	4.970
2800.	45.458	5.043	50.501	14120.38	4.970
2900.	45.635	5.040	50.675	14617.42	4.971
3000.	45.806	5.038	50.844	15114.49	4.971
3100.	45.971	5.036	51.007	15611.60	4.972
3200.	46.131	5.034	51.165	16108.79	4.972
3300.	46.286	5.032	51.318	16606.08	4.973
3400.	46.436	5.030	51.466	17103.50	4.975
3500.	46.582	5.029	51.611	17601.08	4.977
3600.	46.723	5.027	51.751	18098.89	4.979
3700.	46.861	5.026	51.887	18596.97	4.982
3800.	46.995	5.025	52.020	19095.38	4.986
3900.	47.126	5.024	52.150	19594.22	4.991
4000.	47.253	5.023	52.276	20093.55	4.996
4100.	47.377	5.023	52.400	20593.48	5.003
4200.	47.498	5.022	52.520	21094.12	5.010
4300.	47.616	5.022	52.638	21595.60	5.019
4400.	47.731	5.022	52.754	22098.04	5.030
4500.	47.844	5.023	52.867	22601.61	5.042
4600.	47.955	5.023	52.978	23106.46	5.055
4700.	48.063	5.024	53.087	23612.77	5.071
4800.	48.169	5.025	53.194	24120.74	5.089
4900.	48.272	5.027	53.299	24630.58	5.108
5000.	48.374	5.029	53.402	25142.51	5.131
5100.	48.473	5.031	53.504	25656.77	5.155
5200.	48.571	5.033	53.604	26173.62	5.182
5300.	48.667	5.036	53.703	26693.32	5.212
5400.	48.761	5.040	53.801	27216.16	5.245
5500.	48.854	5.044	53.898	27742.43	5.281
5600.	48.945	5.049	53.993	28272.44	5.320
5700.	49.034	5.054	54.088	28806.53	5.362
5800.	49.122	5.059	54.181	29345.02	5.408
5900.	49.208	5.066	54.274	29888.26	5.457
6000.	49.294	5.073	54.366	30436.61	5.510
6100.	49.378	5.080	54.458	30990.43	5.567
6200.	49.460	5.089	54.549	31550.10	5.627
6300.	49.542	5.098	54.640	32116.01	5.691
6400.	49.622	5.108	54.730	32688.53	5.760
6500.	49.701	5.118	54.820	33268.06	5.832
6600.	49.780	5.130	54.909	33854.99	5.908
6700.	49.857	5.142	54.999	34449.73	5.988
6800.	49.933	5.155	55.088	35052.67	6.072
6900.	50.008	5.169	55.177	35664.20	6.160
7000.	50.083	5.184	55.266	36284.72	6.251

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.037065
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.15508
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.037040

Table 1-14 Thermodynamic Functions for Si (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	22.667	6.123	28.790	306.16	7.187
75.	25.223	6.450	31.673	483.73	6.996
100.	27.096	6.551	33.646	655.07	6.698
125.	28.559	6.547	35.106	818.41	6.372
150.	29.748	6.493	36.241	974.02	6.087
175.	30.743	6.419	37.162	1123.25	5.861
200.	31.595	6.338	37.933	1267.52	5.688
225.	32.337	6.258	38.595	1408.01	5.556
250.	32.992	6.182	39.175	1545.60	5.455
275.	33.578	6.113	39.691	1680.95	5.377
300.	34.107	6.049	40.156	1814.56	5.315
325.	34.589	5.990	40.579	1946.79	5.265
350.	35.031	5.937	40.968	2077.91	5.226
375.	35.439	5.888	41.327	2208.13	5.193
400.	35.818	5.844	41.662	2337.61	5.166
425.	36.171	5.803	41.974	2466.47	5.144
450.	36.501	5.766	42.268	2594.82	5.125
475.	36.812	5.732	42.544	2722.73	5.109
500.	37.105	5.701	42.806	2850.28	5.095
550.	37.646	5.644	43.291	3104.44	5.073
600.	38.135	5.596	43.731	3357.65	5.056
650.	38.581	5.554	44.135	3610.11	5.043
700.	38.992	5.517	44.509	3862.00	5.033
750.	39.371	5.485	44.856	4113.45	5.025
800.	39.724	5.456	45.180	4364.55	5.019
850.	40.054	5.430	45.484	4615.40	5.015
900.	40.364	5.407	45.770	4866.08	5.012
950.	40.655	5.386	46.041	5116.67	5.011
1000.	40.931	5.367	46.299	5367.24	5.012
1050.	41.193	5.350	46.543	5617.86	5.013
1100.	41.441	5.335	46.776	5868.61	5.017
1150.	41.678	5.321	46.999	6119.56	5.021
1200.	41.904	5.309	47.213	6370.76	5.027
1250.	42.121	5.298	47.419	6622.30	5.034
1300.	42.328	5.288	47.616	6874.23	5.043
1350.	42.528	5.279	47.807	7126.61	5.052
1400.	42.720	5.271	47.991	7379.49	5.063
1450.	42.904	5.264	48.169	7632.93	5.075
1500.	43.083	5.258	48.341	7886.96	5.087
1550.	43.255	5.253	48.508	8141.62	5.100
1600.	43.422	5.248	48.670	8396.95	5.113
1650.	43.583	5.244	48.827	8652.97	5.128
1700.	43.740	5.241	48.981	8909.71	5.142
1750.	43.892	5.238	49.130	9167.18	5.157
1800.	44.039	5.236	49.276	9425.39	5.172
1850.	44.183	5.235	49.417	9684.35	5.187
1900.	44.322	5.234	49.556	9944.06	5.202
1950.	44.458	5.233	49.691	10204.53	5.217
2000.	44.591	5.233	49.824	10465.75	5.232
2050.	44.720	5.233	49.953	10727.71	5.247
273.15	33.537	6.118	39.655	1671.00	5.382
298.15	34.070	6.053	40.123	1804.73	5.319

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 28.09.

Table 1-14. Thermodynamic Functions for Si (gas) - Continued

T °K	$-(F^\circ-H^\circ_0)/T$	$(H^\circ - H^\circ_0)/T$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	44.846	5.234	50.080	10990.40	5.261
2150.	44.969	5.234	50.203	11253.81	5.275
2200.	45.089	5.235	50.325	11517.92	5.289
2250.	45.207	5.237	50.444	11782.72	5.303
2300.	45.322	5.238	50.561	12048.19	5.316
2350.	45.435	5.240	50.675	12314.31	5.329
2400.	45.545	5.242	50.787	12581.06	5.341
2450.	45.653	5.244	50.898	12848.42	5.353
2500.	45.759	5.247	51.006	13116.36	5.365
2600.	45.965	5.252	51.217	13653.90	5.386
2700.	46.164	5.257	51.420	14193.51	5.406
2800.	46.355	5.263	51.617	14735.00	5.424
2900.	46.540	5.268	51.808	15278.19	5.440
3000.	46.718	5.274	51.993	15822.89	5.454
3100.	46.891	5.280	52.172	16368.94	5.467
3200.	47.059	5.286	52.345	16916.17	5.478
3300.	47.222	5.292	52.514	17464.43	5.487
3400.	47.380	5.298	52.678	18013.57	5.495
3500.	47.534	5.304	52.837	18563.47	5.502
3600.	47.683	5.309	52.993	19113.99	5.508
3700.	47.829	5.315	53.143	19665.03	5.513
3800.	47.970	5.320	53.291	20216.47	5.516
3900.	48.109	5.325	53.434	20768.23	5.519
4000.	48.244	5.330	53.574	21320.22	5.521
4100.	48.375	5.335	53.710	21872.36	5.522
4200.	48.504	5.339	53.843	22424.58	5.522
4300.	48.630	5.343	53.973	22976.83	5.522
4400.	48.752	5.348	54.100	23529.04	5.522
4500.	48.873	5.351	54.224	24081.18	5.521
4600.	48.990	5.355	54.345	24633.21	5.520
4700.	49.105	5.359	54.464	25185.10	5.518
4800.	49.218	5.362	54.580	25736.82	5.516
4900.	49.329	5.365	54.694	26288.36	5.514
5000.	49.437	5.368	54.805	26839.71	5.512
5100.	49.544	5.371	54.914	27390.86	5.511
5200.	49.648	5.373	55.021	27941.82	5.509
5300.	49.750	5.376	55.126	28492.59	5.507
5400.	49.851	5.378	55.229	29043.20	5.505
5500.	49.950	5.381	55.330	29593.67	5.504
5600.	50.047	5.383	55.429	30144.01	5.503
5700.	50.142	5.385	55.527	30694.27	5.502
5800.	50.236	5.387	55.623	31244.49	5.502
5900.	50.328	5.389	55.717	31794.71	5.502
6000.	50.418	5.391	55.809	32344.99	5.503
6100.	50.507	5.393	55.900	32895.38	5.505
6200.	50.595	5.395	55.990	33445.94	5.507
6300.	50.681	5.396	56.078	33996.75	5.510
6400.	50.766	5.398	56.164	34547.87	5.513
6500.	50.850	5.400	56.250	35099.39	5.517
6600.	50.933	5.402	56.334	35651.39	5.523
6700.	51.014	5.404	56.417	36203.96	5.529
6800.	51.094	5.405	56.499	36757.19	5.536
6900.	51.173	5.407	56.580	37311.18	5.544
7000.	51.251	5.409	56.660	37866.03	5.553

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.035600
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.14895
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.035577

Table 1-15 Thermodynamic Functions for P (gas)

T °K	$-\frac{(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	25.141	4.968	30.109	248.41	4.968
75.	27.155	4.968	32.123	372.61	4.968
100.	28.585	4.968	33.553	496.81	4.968
125.	29.693	4.968	34.661	621.02	4.968
150.	30.599	4.968	35.567	745.22	4.968
175.	31.365	4.968	36.333	869.43	4.968
200.	32.028	4.968	36.996	993.63	4.968
225.	32.613	4.968	37.581	1117.83	4.968
250.	33.137	4.968	38.105	1242.04	4.968
275.	33.610	4.968	38.578	1366.24	4.968
300.	34.043	4.968	39.011	1490.44	4.968
325.	34.440	4.968	39.408	1614.65	4.968
350.	34.808	4.968	39.777	1738.85	4.968
375.	35.151	4.968	40.119	1863.06	4.968
400.	35.472	4.968	40.440	1987.26	4.968
425.	35.773	4.968	40.741	2111.46	4.968
450.	36.057	4.968	41.025	2235.67	4.968
475.	36.326	4.968	41.294	2359.87	4.968
500.	36.580	4.968	41.549	2484.07	4.968
550.	37.054	4.968	42.022	2732.48	4.968
600.	37.486	4.968	42.454	2980.89	4.968
650.	37.884	4.968	42.852	3229.30	4.968
700.	38.252	4.968	43.220	3477.70	4.968
750.	38.595	4.968	43.563	3726.11	4.968
800.	38.915	4.968	43.884	3974.52	4.968
850.	39.217	4.968	44.185	4222.93	4.968
900.	39.501	4.968	44.469	4471.34	4.968
950.	39.769	4.968	44.737	4719.75	4.968
1000.	40.024	4.968	44.992	4968.16	4.968
1050.	40.266	4.968	45.235	5216.57	4.968
1100.	40.498	4.968	45.466	5464.99	4.969
1150.	40.718	4.968	45.687	5713.43	4.969
1200.	40.930	4.968	45.898	5961.88	4.969
1250.	41.133	4.968	46.101	6210.36	4.970
1300.	41.328	4.968	46.296	6458.87	4.971
1350.	41.515	4.968	46.484	6707.45	4.972
1400.	41.696	4.969	46.664	6956.09	4.974
1450.	41.870	4.969	46.839	7204.84	4.976
1500.	42.039	4.969	47.008	7453.72	4.979
1550.	42.202	4.970	47.171	7702.75	4.983
1600.	42.359	4.970	47.329	7951.99	4.987
1650.	42.512	4.971	47.483	8201.47	4.992
1700.	42.661	4.971	47.632	8451.24	4.999
1750.	42.805	4.972	47.777	8701.36	5.006
1800.	42.945	4.973	47.918	8951.87	5.015
1850.	43.081	4.975	48.056	9202.84	5.024
1900.	43.214	4.976	48.190	9454.34	5.036
1950.	43.343	4.978	48.321	9706.43	5.048
2000.	43.469	4.980	48.449	9959.17	5.062
2050.	43.592	4.982	48.574	10212.64	5.077
2100.	43.712	4.984	48.696	10466.92	5.094
2150.	43.830	4.987	48.817	10722.06	5.112
273.15	33.577	4.968	38.545	1357.05	4.968
298.15	34.012	4.968	38.980	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 30.975.

Table 1-15 Thermodynamic Functions for P (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2200.	43.944	4.990	48.934	10978.15	5.132
2250.	44.056	4.993	49.050	11235.26	5.153
2300.	44.166	4.997	49.163	11493.46	5.175
2350.	44.274	5.001	49.275	11752.81	5.199
2400.	44.379	5.006	49.385	12013.41	5.225
2450.	44.482	5.010	49.493	12275.29	5.251
2500.	44.584	5.015	49.599	12538.55	5.279
2600.	44.780	5.027	49.807	13069.41	5.339
2700.	44.970	5.039	50.010	13606.45	5.403
2800.	45.154	5.054	50.208	14150.10	5.471
2900.	45.332	5.069	50.401	14700.74	5.542
3000.	45.504	5.086	50.590	15258.67	5.617
3100.	45.671	5.105	50.775	15824.16	5.693
3200.	45.833	5.124	50.957	16397.40	5.772
3300.	45.991	5.145	51.136	16978.52	5.851
3400.	46.145	5.167	51.312	17567.60	5.931
3500.	46.295	5.190	51.485	18164.67	6.011
3600.	46.442	5.214	51.656	18769.70	6.090
3700.	46.585	5.239	51.823	19382.62	6.168
3800.	46.725	5.264	51.989	20003.31	6.245
3900.	46.862	5.290	52.152	20631.60	6.320
4000.	46.996	5.317	52.313	21267.31	6.393
4100.	47.128	5.344	52.472	21910.20	6.464
4200.	47.257	5.371	52.628	22560.02	6.532
4300.	47.384	5.399	52.783	23216.49	6.597
4400.	47.508	5.427	52.935	23879.31	6.659
4500.	47.630	5.455	53.086	24548.17	6.718
4600.	47.751	5.483	53.234	25222.73	6.773
4700.	47.869	5.511	53.380	25902.67	6.825
4800.	47.985	5.539	53.524	26587.65	6.874
4900.	48.100	5.567	53.666	27277.30	6.919
5000.	48.212	5.594	53.807	27971.30	6.961
5100.	48.323	5.621	53.945	28669.29	6.999
5200.	48.433	5.648	54.081	29370.93	7.034
5300.	48.541	5.675	54.215	30075.89	7.065
5400.	48.647	5.701	54.348	30783.84	7.093
5500.	48.752	5.726	54.478	31494.45	7.118
5600.	48.855	5.751	54.607	32207.42	7.140
5700.	48.957	5.776	54.733	32922.45	7.160
5800.	49.058	5.800	54.858	33639.24	7.176
5900.	49.157	5.823	54.981	34357.52	7.189
6000.	49.255	5.846	55.102	35077.03	7.200
6100.	49.352	5.868	55.221	35797.51	7.209
6200.	49.448	5.890	55.338	36518.73	7.215
6300.	49.542	5.911	55.453	37240.45	7.219
6400.	49.635	5.932	55.567	37962.47	7.221
6500.	49.728	5.951	55.679	38684.59	7.221
6600.	49.819	5.971	55.789	39406.61	7.219
6700.	49.909	5.989	55.898	40128.36	7.216
6800.	49.997	6.007	56.005	40849.69	7.211
6900.	50.085	6.025	56.110	41570.44	7.204
7000.	50.172	6.041	56.214	42290.48	7.196

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.032284
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.13508
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.032263

Table 1-16 Thermodynamic Functions for S (gas)

T °K	$\frac{-(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	25.687	4.968	30.656	248.42	4.970
75.	27.702	4.973	32.675	372.95	5.003
100.	29.135	4.992	34.127	499.15	5.104
125.	30.253	5.028	35.281	628.49	5.246
150.	31.173	5.076	36.250	761.47	5.389
175.	31.960	5.130	37.090	897.73	5.506
200.	32.648	5.183	37.831	1036.50	5.589
225.	33.262	5.231	38.493	1176.93	5.640
250.	33.815	5.273	39.088	1318.27	5.664
275.	34.319	5.309	39.628	1459.95	5.668
300.	34.783	5.338	40.121	1601.54	5.658
325.	35.211	5.362	40.573	1742.75	5.638
350.	35.609	5.381	40.990	1883.40	5.613
375.	35.981	5.396	41.376	2023.36	5.584
400.	36.329	5.406	41.736	2162.58	5.554
425.	36.657	5.414	42.072	2301.04	5.523
450.	36.967	5.419	42.386	2438.74	5.493
475.	37.260	5.423	42.683	2575.70	5.464
500.	37.538	5.424	42.962	2711.95	5.436
550.	38.055	5.423	43.478	2982.45	5.385
600.	38.527	5.418	43.944	3250.55	5.340
650.	38.960	5.410	44.370	3516.53	5.301
700.	39.361	5.401	44.762	3780.68	5.266
750.	39.733	5.391	45.124	4043.24	5.237
800.	40.081	5.381	45.461	4304.42	5.211
850.	40.407	5.370	45.776	4564.39	5.188
900.	40.713	5.359	46.072	4823.31	5.169
950.	41.003	5.349	46.351	5081.32	5.152
1000.	41.277	5.339	46.615	5338.51	5.137
1050.	41.537	5.329	46.866	5595.01	5.123
1100.	41.785	5.319	47.104	5850.88	5.112
1150.	42.021	5.310	47.331	6106.21	5.102
1200.	42.247	5.301	47.548	6361.07	5.093
1250.	42.463	5.292	47.755	6615.53	5.085
1300.	42.670	5.284	47.955	6869.64	5.079
1350.	42.870	5.277	48.146	7123.45	5.074
1400.	43.061	5.269	48.331	7377.03	5.069
1450.	43.246	5.262	48.509	7630.42	5.066
1500.	43.425	5.256	48.680	7883.67	5.064
1550.	43.597	5.250	48.846	8136.82	5.062
1600.	43.763	5.244	49.007	8389.93	5.062
1650.	43.925	5.238	49.163	8643.03	5.062
1700.	44.081	5.233	49.314	8896.16	5.063
1750.	44.233	5.228	49.461	9149.38	5.065
1800.	44.380	5.224	49.603	9402.70	5.068
1850.	44.523	5.220	49.742	9656.18	5.071
273.15	34.284	5.306	39.590	1449.47	5.668
298.15	34.750	5.336	40.086	1591.07	5.659

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 32.066.

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Table 1-16 Thermodynamic Functions for S (gas) - Continued

T °K	$-(F^\circ - H^\circ_0)/T$	$(H^\circ - H^\circ_0)/T$	S°	$H^\circ - H^\circ_0$	C°_p
1900.	44.662	5.216	49.878	9909.84	5.075
1950.	44.797	5.212	50.010	10163.72	5.080
2000.	44.929	5.209	50.138	10417.85	5.085
2050.	45.058	5.206	50.264	10672.26	5.091
2100.	45.183	5.203	50.387	10926.97	5.097
2150.	45.306	5.201	50.507	11182.01	5.104
2200.	45.425	5.199	50.624	11437.41	5.112
2250.	45.542	5.197	50.739	11693.18	5.119
2300.	45.656	5.195	50.852	11949.34	5.127
2350.	45.768	5.194	50.962	12205.92	5.136
2400.	45.877	5.193	51.070	12462.92	5.144
2450.	45.984	5.192	51.176	12720.35	5.153
2500.	46.089	5.191	51.281	12978.24	5.162
2600.	46.293	5.191	51.483	13495.40	5.181
2700.	46.489	5.191	51.679	14014.45	5.200
2800.	46.678	5.191	51.869	14535.44	5.219
2900.	46.860	5.193	52.052	15058.35	5.239
3000.	47.036	5.194	52.230	15583.21	5.258
3100.	47.206	5.197	52.403	16109.96	5.277
3200.	47.371	5.200	52.571	16638.59	5.295
3300.	47.531	5.203	52.734	17169.04	5.313
3400.	47.687	5.206	52.893	17701.25	5.331
3500.	47.838	5.210	53.048	18235.16	5.347
3600.	47.984	5.214	53.198	18770.69	5.363
3700.	48.127	5.218	53.346	19307.77	5.378
3800.	48.267	5.223	53.489	19846.31	5.392
3900.	48.402	5.227	53.629	20386.24	5.406
4000.	48.535	5.232	53.767	20927.47	5.419
4100.	48.664	5.237	53.900	21469.92	5.430
4200.	48.790	5.241	54.031	22013.50	5.441
4300.	48.914	5.246	54.160	22558.15	5.451
4400.	49.034	5.251	54.285	23103.77	5.461
4500.	49.152	5.256	54.408	23650.30	5.470
4600.	49.268	5.260	54.528	24197.65	5.477
4700.	49.381	5.265	54.646	24745.76	5.485
4800.	49.492	5.270	54.762	25294.56	5.491
4900.	49.601	5.274	54.875	25843.97	5.497
5000.	49.707	5.279	54.986	26393.95	5.502
5100.	49.812	5.283	55.095	26944.42	5.507
5200.	49.914	5.288	55.202	27495.34	5.511
5300.	50.015	5.292	55.307	28046.64	5.515
5400.	50.114	5.296	55.410	28598.28	5.518
5500.	50.211	5.300	55.511	29150.20	5.521
5600.	50.307	5.304	55.611	29702.37	5.523
5700.	50.401	5.308	55.709	30254.75	5.525
5800.	50.493	5.312	55.805	30807.28	5.526
5900.	50.584	5.315	55.899	31359.95	5.527
6000.	50.673	5.319	55.992	31912.70	5.528
6100.	50.761	5.322	56.083	32465.52	5.528
6200.	50.848	5.326	56.173	33018.37	5.529
6300.	50.933	5.329	56.262	33571.22	5.529
6400.	51.017	5.332	56.349	34124.06	5.528
6500.	51.100	5.335	56.435	34676.86	5.528
6600.	51.181	5.338	56.519	35229.60	5.527
6700.	51.261	5.341	56.602	35782.26	5.526
6800.	51.341	5.343	56.684	36334.83	5.525
6900.	51.419	5.346	56.765	36887.29	5.524
7000.	51.496	5.349	56.844	37439.64	5.523

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.031186
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.13048
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.031165

Table 1-17 Thermodynamic Functions for Cl (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	25.544	4.968	30.512	248.41	4.968
75.	27.558	4.968	32.526	372.61	4.968
100.	28.987	4.968	33.956	496.82	4.969
125.	30.096	4.969	35.065	621.07	4.972
150.	31.002	4.970	35.972	745.49	4.983
175.	31.768	4.973	36.742	870.33	5.005
200.	32.433	4.979	37.412	995.85	5.039
225.	33.020	4.988	38.008	1122.33	5.081
250.	33.546	5.000	38.546	1249.92	5.128
275.	34.023	5.014	39.037	1378.72	5.176
300.	34.460	5.029	39.489	1508.73	5.224
325.	34.863	5.046	39.909	1639.88	5.268
350.	35.238	5.063	40.301	1772.09	5.307
375.	35.588	5.081	40.668	1905.21	5.342
400.	35.916	5.098	41.014	2039.13	5.371
425.	36.226	5.115	41.340	2173.70	5.394
450.	36.518	5.131	41.649	2308.79	5.413
475.	36.796	5.146	41.942	2444.29	5.427
500.	37.061	5.160	42.221	2580.08	5.436
550.	37.554	5.186	42.739	2852.19	5.446
600.	38.006	5.208	43.213	3124.51	5.445
650.	38.423	5.225	43.649	3396.57	5.437
700.	38.811	5.240	44.051	3668.09	5.423
750.	39.173	5.252	44.425	3938.86	5.407
800.	39.512	5.261	44.773	4208.77	5.389
850.	39.831	5.268	45.099	4477.75	5.370
900.	40.133	5.273	45.406	4745.77	5.351
950.	40.418	5.277	45.695	5012.83	5.332
1000.	40.689	5.279	45.968	5278.97	5.314
1050.	40.946	5.280	46.226	5544.20	5.296
1100.	41.192	5.281	46.472	5808.57	5.279
1150.	41.427	5.280	46.707	6072.11	5.263
1200.	41.651	5.279	46.930	6334.88	5.248
1250.	41.867	5.278	47.144	6596.92	5.234
1300.	42.074	5.276	47.349	6858.27	5.220
1350.	42.273	5.273	47.546	7118.97	5.208
1400.	42.465	5.271	47.735	7379.06	5.196
1450.	42.649	5.268	47.917	7638.59	5.185
1500.	42.828	5.265	48.093	7897.58	5.175
1550.	43.001	5.262	48.263	8156.07	5.165
1600.	43.168	5.259	48.426	8414.09	5.156
1650.	43.329	5.256	48.585	8671.67	5.147
1700.	43.486	5.252	48.738	8928.84	5.139
1750.	43.638	5.249	48.887	9185.61	5.132
1800.	43.786	5.246	49.032	9442.03	5.125
1850.	43.930	5.242	49.172	9698.10	5.118
1900.	44.070	5.239	49.309	9953.85	5.112
1950.	44.206	5.236	49.441	10209.29	5.106
273.15	33.989	5.012	39.002	1369.15	5.173
298.15	34.429	5.028	39.457	1499.07	5.220

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 35.457.

Table 1-17 Thermodynamic Functions for Cl (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2000.	44.338	5.232	49.570	10464.45	5.100
2050.	44.467	5.229	49.696	10719.34	5.095
2100.	44.593	5.226	49.819	10973.98	5.090
2150.	44.716	5.222	49.939	11228.37	5.086
2200.	44.836	5.219	50.056	11482.54	5.081
2250.	44.954	5.216	50.170	11736.49	5.077
2300.	45.068	5.213	50.281	11990.23	5.073
2350.	45.180	5.210	50.390	12243.79	5.069
2400.	45.290	5.207	50.497	12497.16	5.066
2450.	45.397	5.204	50.601	12750.35	5.062
2500.	45.502	5.201	50.704	13003.38	5.059
2600.	45.706	5.196	50.902	13508.98	5.053
2700.	45.902	5.190	51.093	14014.01	5.048
2800.	46.091	5.185	51.276	14518.52	5.043
2900.	46.273	5.180	51.453	15022.57	5.038
3000.	46.448	5.175	51.624	15526.18	5.034
3100.	46.618	5.171	51.789	16029.40	5.030
3200.	46.782	5.166	51.948	16532.26	5.027
3300.	46.941	5.162	52.103	17034.79	5.024
3400.	47.095	5.158	52.253	17537.01	5.021
3500.	47.244	5.154	52.398	18038.95	5.018
3600.	47.390	5.150	52.540	18540.63	5.016
3700.	47.531	5.147	52.677	19042.07	5.013
3800.	47.668	5.143	52.811	19543.29	5.011
3900.	47.801	5.140	52.941	20044.29	5.009
4000.	47.931	5.136	53.068	20545.10	5.007
4100.	48.058	5.133	53.191	21045.74	5.005
4200.	48.182	5.130	53.312	21546.20	5.004
4300.	48.303	5.127	53.430	22046.51	5.002
4400.	48.420	5.124	53.545	22546.66	5.001
4500.	48.536	5.121	53.657	23046.68	5.000
4600.	48.648	5.119	53.767	23546.57	4.998
4700.	48.758	5.116	53.874	24046.33	4.997
4800.	48.866	5.114	53.980	24545.98	4.996
4900.	48.971	5.111	54.083	25045.52	4.995
5000.	49.074	5.109	54.183	25544.96	4.994
5100.	49.176	5.107	54.282	26044.30	4.993
5200.	49.275	5.105	54.379	26543.55	4.992
5300.	49.372	5.102	54.474	27042.71	4.991
5400.	49.467	5.100	54.568	27541.79	4.990
5500.	49.561	5.098	54.659	28040.79	4.990
5600.	49.653	5.096	54.749	28539.71	4.989
5700.	49.743	5.094	54.837	29038.57	4.988
5800.	49.832	5.093	54.924	29537.36	4.988
5900.	49.919	5.091	55.009	30036.09	4.987
6000.	50.004	5.089	55.093	30534.76	4.986
6100.	50.088	5.087	55.176	31033.37	4.986
6200.	50.171	5.086	55.257	31531.93	4.985
6300.	50.252	5.084	55.336	32030.43	4.985
6400.	50.332	5.083	55.415	32528.89	4.984
6500.	50.411	5.081	55.492	33027.31	4.984
6600.	50.489	5.080	55.568	33525.68	4.984
6700.	50.565	5.078	55.643	34024.01	4.983
6800.	50.640	5.077	55.717	34522.30	4.983
6900.	50.714	5.075	55.790	35020.56	4.982
7000.	50.787	5.074	55.862	35518.79	4.982

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.028203
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.11800
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.028185

Table 1-18 Thermodynamic Functions for A (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	23.144	4.968	28.112	248.41	4.968
75.	25.158	4.968	30.127	372.61	4.968
100.	26.588	4.968	31.556	496.81	4.968
125.	27.696	4.968	32.664	621.02	4.968
150.	28.602	4.968	33.570	745.22	4.968
175.	29.368	4.968	34.336	869.43	4.968
200.	30.031	4.968	34.999	993.63	4.968
225.	30.616	4.968	35.585	1117.83	4.968
250.	31.140	4.968	36.108	1242.04	4.968
275.	31.613	4.968	36.582	1366.24	4.968
300.	32.046	4.968	37.014	1490.44	4.968
325.	32.443	4.968	37.412	1614.65	4.968
350.	32.812	4.968	37.780	1738.85	4.968
375.	33.154	4.968	38.122	1863.06	4.968
400.	33.475	4.968	38.443	1987.26	4.968
425.	33.776	4.968	38.744	2111.46	4.968
450.	34.060	4.968	39.028	2235.67	4.968
475.	34.329	4.968	39.297	2359.87	4.968
500.	34.584	4.968	39.552	2484.07	4.968
550.	35.057	4.968	40.025	2732.48	4.968
600.	35.489	4.968	40.457	2980.89	4.968
650.	35.887	4.968	40.855	3229.30	4.968
700.	36.255	4.968	41.223	3477.70	4.968
750.	36.598	4.968	41.566	3726.11	4.968
800.	36.919	4.968	41.887	3974.52	4.968
850.	37.220	4.968	42.188	4222.93	4.968
900.	37.504	4.968	42.472	4471.33	4.968
950.	37.772	4.968	42.741	4719.74	4.968
1000.	38.027	4.968	42.995	4968.15	4.968
1050.	38.270	4.968	43.238	5216.56	4.968
1100.	38.501	4.968	43.469	5464.96	4.968
1150.	38.722	4.968	43.690	5713.37	4.968
1200.	38.933	4.968	43.901	5961.78	4.968
1250.	39.136	4.968	44.104	6210.19	4.968
1300.	39.331	4.968	44.299	6458.59	4.968
1350.	39.518	4.968	44.486	6707.00	4.968
1400.	39.699	4.968	44.667	6955.41	4.968
1450.	39.873	4.968	44.841	7203.82	4.968
1500.	40.042	4.968	45.010	7452.22	4.968
1550.	40.205	4.968	45.173	7700.63	4.968
1600.	40.362	4.968	45.330	7949.04	4.968
1650.	40.515	4.968	45.483	8197.45	4.968
1700.	40.663	4.968	45.632	8445.85	4.968
1750.	40.807	4.968	45.776	8694.26	4.968
1800.	40.947	4.968	45.916	8942.67	4.968
1850.	41.084	4.968	46.052	9191.08	4.968
1900.	41.216	4.968	46.184	9439.48	4.968
1950.	41.345	4.968	46.313	9687.89	4.968
2000.	41.471	4.968	46.439	9936.30	4.968
2050.	41.594	4.968	46.562	10184.71	4.968
273.15	31.580	4.968	36.548	1357.05	4.968
298.15	32.015	4.968	36.983	1481.25	4.968

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units. The atomic weight = 39.944.

Table 1-18 Thermodynamic Functions for A (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2100.	41.713	4.968	46.681	10433.11	4.968
2150.	41.830	4.968	46.798	10681.52	4.968
2200.	41.944	4.968	46.913	10929.93	4.968
2250.	42.056	4.968	47.024	11178.34	4.968
2300.	42.165	4.968	47.133	11426.74	4.968
2350.	42.272	4.968	47.240	11675.15	4.968
2400.	42.377	4.968	47.345	11923.56	4.968
2450.	42.479	4.968	47.447	12171.97	4.968
2500.	42.579	4.968	47.548	12420.37	4.968
2600.	42.774	4.968	47.742	12917.19	4.968
2700.	42.962	4.968	47.930	13414.00	4.968
2800.	43.143	4.968	48.111	13910.82	4.968
2900.	43.317	4.968	48.285	14407.63	4.968
3000.	43.485	4.968	48.453	14904.45	4.968
3100.	43.648	4.968	48.616	15401.26	4.968
3200.	43.806	4.968	48.774	15898.08	4.968
3300.	43.959	4.968	48.927	16394.89	4.968
3400.	44.107	4.968	49.075	16891.71	4.968
3500.	44.251	4.968	49.219	17388.52	4.968
3600.	44.391	4.968	49.359	17885.34	4.968
3700.	44.527	4.968	49.495	18382.15	4.968
3800.	44.660	4.968	49.628	18878.97	4.968
3900.	44.789	4.968	49.757	19375.78	4.968
4000.	44.915	4.968	49.883	19872.60	4.968
4100.	45.037	4.968	50.005	20369.41	4.968
4200.	45.157	4.968	50.125	20866.23	4.968
4300.	45.274	4.968	50.242	21363.04	4.968
4400.	45.388	4.968	50.356	21859.86	4.968
4500.	45.500	4.968	50.468	22356.67	4.968
4600.	45.609	4.968	50.577	22853.49	4.968
4700.	45.716	4.968	50.684	23350.30	4.968
4800.	45.820	4.968	50.788	23847.12	4.968
4900.	45.923	4.968	50.891	24343.93	4.968
5000.	46.023	4.968	50.991	24840.75	4.968
5100.	46.122	4.968	51.090	25337.56	4.968
5200.	46.218	4.968	51.186	25834.38	4.968
5300.	46.313	4.968	51.281	26331.19	4.968
5400.	46.405	4.968	51.374	26828.01	4.968
5500.	46.497	4.968	51.465	27324.82	4.968
5600.	46.586	4.968	51.554	27821.64	4.968
5700.	46.674	4.968	51.642	28318.45	4.968
5800.	46.761	4.968	51.729	28815.27	4.968
5900.	46.845	4.968	51.814	29312.08	4.968
6000.	46.929	4.968	51.897	29808.90	4.968
6100.	47.011	4.968	51.979	30305.72	4.968
6200.	47.092	4.968	52.060	30802.53	4.968
6300.	47.171	4.968	52.139	31299.35	4.968
6400.	47.250	4.968	52.218	31796.16	4.968
6500.	47.327	4.968	52.295	32292.98	4.968
6600.	47.402	4.968	52.371	32789.79	4.968
6700.	47.477	4.968	52.445	33286.61	4.968
6800.	47.551	4.968	52.519	33783.42	4.968
6900.	47.623	4.968	52.591	34280.24	4.968
7000.	47.695	4.968	52.663	34777.06	4.968

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.025035
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.10475
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.025019

Table 1-19. Thermodynamic Functions for Li_2 (gas)

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
50.	26.461	6.946	33.408	347.3	6.971
75.	29.281	6.968	36.249	522.6	7.078
100.	31.292	7.023	38.315	702.3	7.310
125.	32.868	7.108	39.976	888.4	7.582
150.	34.173	7.208	41.381	1081.2	7.834
175.	35.292	7.313	42.605	1279.8	8.045
200.	36.275	7.416	43.691	1483.1	8.216
225.	37.154	7.513	44.667	1690.3	8.354
250.	37.950	7.602	45.553	1900.6	8.465
275.	38.679	7.685	46.364	2113.4	8.555
300.	39.351	7.761	47.112	2328.2	8.630
325.	39.975	7.830	47.805	2544.8	8.692
350.	40.558	7.894	48.451	2762.7	8.745
375.	41.104	7.952	49.056	2981.9	8.790
400.	41.619	8.005	49.625	3202.2	8.829
425.	42.106	8.055	50.161	3423.3	8.864
450.	42.568	8.101	50.668	3645.3	8.894
475.	43.007	8.143	51.150	3868.0	8.922
500.	43.425	8.183	51.608	4091.4	8.947
550.	44.209	8.254	52.463	4539.8	8.990
600.	44.930	8.317	53.247	4990.3	9.028
650.	45.598	8.373	53.971	5442.5	9.061
700.	46.220	8.423	54.643	5896.3	9.091
750.	46.802	8.469	55.271	6351.4	9.118
800.	47.350	8.510	55.860	6807.9	9.144
850.	47.867	8.548	56.415	7265.7	9.168
900.	48.357	8.583	56.940	7724.6	9.191
950.	48.822	8.615	57.437	8184.6	9.212
1000.	49.264	8.646	57.910	8645.6	9.233
1050.	49.687	8.674	58.361	9107.7	9.254
1100.	50.091	8.701	58.791	9570.8	9.273
1150.	50.478	8.726	59.204	10034.8	9.293
1200.	50.850	8.750	59.599	10499.7	9.311
1250.	51.207	8.773	59.980	10965.6	9.330
1300.	51.552	8.794	60.346	11432.4	9.348
1350.	51.884	8.815	60.699	11900.1	9.366
1400.	52.204	8.835	61.039	12368.6	9.383
1450.	52.515	8.854	61.368	12838.0	9.400
1500.	52.815	8.872	61.687	13308.2	9.417
1550.	53.106	8.890	61.996	13779.3	9.434
1600.	53.388	8.907	62.295	14251.1	9.450
1650.	53.663	8.924	62.586	14723.8	9.466
1700.	53.929	8.940	62.869	15197.2	9.482
1750.	54.188	8.955	63.143	15671.5	9.498
1800.	54.441	8.970	63.411	16146.4	9.513
1850.	54.686	8.985	63.671	16622.2	9.528
1900.	54.926	8.999	63.925	17098.7	9.543
1950.	55.160	9.013	64.173	17575.9	9.558
2000.	55.388	9.027	64.415	18053.8	9.572
2050.	55.611	9.040	64.651	18532.4	9.586
2100.	55.829	9.053	64.882	19011.8	9.600
2150.	56.041	9.066	65.107	19491.8	9.614
2200.	56.250	9.078	65.328	19972.4	9.628
2250.	56.454	9.091	65.544	20453.7	9.641
273.15	38.627	7.679	46.306	2097.6	8.549
298.15	39.303	7.755	47.058	2312.3	8.625

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 0.6796 cm^{-1}, α_e = 0.00731 cm^{-1}, D_e = 10.07 x 10^{-6} cm^{-1},

$\omega_e x_e$ = 2.627 cm^{-1}, ω_e = 353.121 cm^{-1}, and the molecular weight = 13.88

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-19. Thermodynamic Functions for Li_2 (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2300.	56.653	9.102	65.756	20935.7	9.654
2350.	56.849	9.114	65.963	21418.3	9.666
2400.	57.041	9.126	66.166	21901.5	9.679
2450.	57.229	9.137	66.366	22385.3	9.691
2500.	57.413	9.148	66.561	22869.7	9.702
2600.	57.772	9.169	66.941	23840.2	9.725
2700.	58.118	9.190	67.308	24812.8	9.746
2800.	58.452	9.210	67.662	25787.5	9.766
2900.	58.775	9.229	68.004	26764.0	9.785
3000.	59.088	9.247	68.335	27742.4	9.802
3100.	59.391	9.265	68.656	28722.3	9.818
3200.	59.684	9.282	68.967	29703.8	9.832
3300.	59.970	9.299	69.269	30686.5	9.844
3400.	60.247	9.315	69.562	31670.5	9.855
3500.	60.517	9.330	69.847	32655.4	9.864
3600.	60.779	9.345	70.124	33641.1	9.871
3700.	61.035	9.359	70.393	34627.5	9.876
3800.	61.284	9.372	70.656	35614.3	9.879
3900.	61.527	9.385	70.912	36601.4	9.880
4000.	61.764	9.397	71.161	37588.6	9.879
4100.	61.995	9.409	71.404	38575.6	9.876
4200.	62.222	9.420	71.641	39562.2	9.871
4300.	62.443	9.430	71.872	40548.3	9.863
4400.	62.659	9.439	72.098	41533.5	9.852
4500.	62.870	9.448	72.319	42517.7	9.839
4600.	63.077	9.457	72.534	43500.6	9.824
4700.	63.280	9.464	72.744	44481.9	9.806
4800.	63.479	9.471	72.950	45461.5	9.785
4900.	63.674	9.477	73.151	46439.0	9.761
5000.	63.864	9.483	73.347	47414.2	9.734
5100.	64.051	9.488	73.539	48386.7	9.705
5200.	64.235	9.492	73.727	49356.3	9.672
5300.	64.415	9.495	73.910	50322.8	9.636
5400.	64.592	9.497	74.089	51285.7	9.597
5500.	64.766	9.499	74.265	52244.8	9.554
5600.	64.936	9.500	74.436	53199.8	9.508
5700.	65.104	9.500	74.604	54150.3	9.459
5800.	65.268	9.499	74.767	55096.1	9.406
5900.	65.430	9.498	74.928	56036.7	9.349
6000.	65.589	9.495	75.084	56971.8	9.288
6100.	65.745	9.492	75.237	57901.0	9.224
6200.	65.899	9.488	75.387	58824.1	9.155
6300.	66.050	9.483	75.533	59740.5	9.083
6400.	66.199	9.477	75.675	60650.0	9.006
6500.	66.345	9.470	75.814	61552.1	8.925
6600.	66.489	9.462	75.950	62446.4	8.840
6700.	66.630	9.453	76.083	63332.5	8.750
6800.	66.770	9.443	76.212	64210.0	8.656
6900.	66.907	9.432	76.339	65078.5	8.557
7000.	67.042	9.420	76.462	65937.6	8.454

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.072046
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.30144
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.07199

Table 1-20. Thermodynamic Functions for LiF (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	28.313	6.930	35.243	346.5	6.958
75.	31.125	6.940	38.064	520.5	6.959
100.	33.122	6.945	40.066	694.5	6.960
125.	34.672	6.948	41.620	868.5	6.968
150.	35.939	6.953	42.892	1043.0	6.990
175.	37.012	6.961	43.973	1218.2	7.034
200.	37.942	6.974	44.916	1394.9	7.101
225.	38.764	6.993	45.757	1573.4	7.187
250.	39.502	7.017	46.520	1754.3	7.285
275.	40.173	7.046	47.219	1937.8	7.391
300.	40.787	7.080	47.867	2123.9	7.498
325.	41.355	7.116	48.471	2312.7	7.605
350.	41.884	7.154	49.038	2504.1	7.707
375.	42.379	7.195	49.573	2698.0	7.803
400.	42.844	7.235	50.080	2894.2	7.893
425.	43.284	7.277	50.561	3092.6	7.977
450.	43.701	7.318	51.019	3293.0	8.055
475.	44.098	7.358	51.457	3495.3	8.126
500.	44.477	7.398	51.875	3699.2	8.192
550.	45.185	7.476	52.661	4111.8	8.307
600.	45.839	7.549	53.389	4529.7	8.405
650.	46.446	7.619	54.065	4952.0	8.488
700.	47.013	7.683	54.696	5378.2	8.559
750.	47.545	7.744	55.289	5807.7	8.620
800.	48.047	7.800	55.847	6240.1	8.673
850.	48.521	7.853	56.374	6674.9	8.720
900.	48.972	7.902	56.874	7111.9	8.761
950.	49.400	7.948	57.348	7550.9	8.797
1000.	49.809	7.992	57.800	7991.5	8.830
1050.	50.200	8.032	58.232	8433.8	8.860
1100.	50.574	8.070	58.645	8877.4	8.887
1150.	50.934	8.106	59.040	9322.3	8.911
1200.	51.280	8.140	59.420	9768.5	8.934
1250.	51.612	8.173	59.785	10215.7	8.955
1300.	51.934	8.203	60.137	10663.9	8.975
1350.	52.244	8.232	60.476	11113.1	8.993
1400.	52.544	8.259	60.803	11563.1	9.011
1450.	52.834	8.286	61.119	12014.0	9.027
1500.	53.115	8.310	61.426	12465.7	9.043
1550.	53.388	8.334	61.722	12918.2	9.058
1600.	53.653	8.357	62.010	13371.4	9.072
1650.	53.910	8.379	62.289	13825.3	9.086
1700.	54.161	8.400	62.561	14279.8	9.099
1750.	54.404	8.420	62.824	14735.0	9.112
1800.	54.642	8.439	63.081	15190.8	9.124
1850.	54.873	8.458	63.331	15647.2	9.136
1900.	55.099	8.476	63.575	16104.2	9.147
1950.	55.319	8.493	63.813	16561.8	9.159
2000.	55.535	8.510	64.045	17019.9	9.170
2050.	55.745	8.526	64.271	17478.5	9.181
2100.	55.951	8.542	64.492	17937.7	9.191
2150.	56.152	8.557	64.709	18397.4	9.201
2200.	56.348	8.572	64.920	18857.6	9.212
2250.	56.541	8.586	65.127	19318.3	9.222
2300.	56.730	8.600	65.330	19779.5	9.231
273.15	40.125	7.044	47.169	1924.1	7.383
298.15	40.743	7.077	47.820	2110.0	7.491

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 1.3780$ cm^{-1}, $\alpha_e = 0.01971$ cm^{-1}, $D_e = 14.21 \times 10^{-6}$ cm^{-1}, $\omega_e x_e = 7.90$ cm^{-1}, $\omega_e = 906.2$ cm^{-1}, and the molecular weight = 25.94.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-20. Thermodynamic Functions for LiF (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2350.	56.915	8.613	65.528	20241.2	9.241
2400.	57.096	8.626	65.723	20703.4	9.251
2450.	57.274	8.639	65.914	21166.0	9.260
2500.	57.449	8.652	66.101	21629.1	9.269
2600.	57.789	8.676	66.464	22556.6	9.288
2700.	58.116	8.698	66.815	23485.9	9.306
2800.	58.433	8.720	67.153	24417.0	9.323
2900.	58.739	8.741	67.480	25349.7	9.340
3000.	59.036	8.761	67.797	26284.2	9.357
3100.	59.323	8.781	68.104	27220.3	9.374
3200.	59.602	8.799	68.401	28158.0	9.391
3300.	59.873	8.817	68.690	29097.3	9.407
3400.	60.136	8.835	68.971	30038.2	9.423
3500.	60.392	8.852	69.244	30980.7	9.439
3600.	60.642	8.868	69.510	31924.7	9.454
3700.	60.885	8.884	69.769	32870.3	9.470
3800.	61.122	8.899	70.021	33817.3	9.485
3900.	61.353	8.914	70.267	34765.8	9.500
4000.	61.579	8.929	70.507	35715.8	9.515
4100.	61.799	8.943	70.742	36667.2	9.529
4200.	62.014	8.957	70.972	37620.0	9.544
4300.	62.225	8.971	71.196	38574.3	9.558
4400.	62.431	8.984	71.415	39529.9	9.572
4500.	62.633	8.997	71.630	40487.0	9.586
4600.	62.831	9.010	71.841	41445.3	9.600
4700.	63.024	9.022	72.047	42405.0	9.613
4800.	63.214	9.035	72.249	43366.0	9.627
4900.	63.400	9.047	72.447	44328.3	9.640
5000.	63.583	9.058	72.641	45291.9	9.653
5100.	63.762	9.070	72.832	46256.7	9.665
5200.	63.938	9.081	73.019	47222.8	9.678
5300.	64.111	9.092	73.203	48190.1	9.690
5400.	64.281	9.103	73.384	49158.6	9.702
5500.	64.448	9.114	73.562	50128.2	9.714
5600.	64.612	9.125	73.736	51099.0	9.726
5700.	64.773	9.135	73.908	52070.9	9.737
5800.	64.932	9.146	74.077	53043.9	9.748
5900.	65.088	9.156	74.243	54018.0	9.759
6000.	65.241	9.166	74.407	54993.2	9.770
6100.	65.393	9.175	74.568	55969.3	9.780
6200.	65.542	9.185	74.726	56946.5	9.790
6300.	65.688	9.194	74.883	57924.7	9.800
6400.	65.833	9.204	75.037	58903.8	9.809
6500.	65.975	9.213	75.188	59883.8	9.819
6600.	66.116	9.222	75.338	60864.7	9.828
6700.	66.254	9.231	75.485	61846.5	9.836
6800.	66.391	9.240	75.630	62829.2	9.845
6900.	66.525	9.248	75.773	63812.6	9.853
7000.	66.658	9.257	75.915	64796.9	9.860

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.038551
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.16130
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.038526

Table 1-21. Thermodynamic Functions for LiCl (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	31.076	6.943	38.019	347.1	6.957
75.	33.892	6.948	40.840	521.1	6.960
100.	35.891	6.952	42.844	695.2	6.976
125.	37.444	6.962	44.405	870.2	7.028
150.	38.714	6.980	45.694	1047.0	7.123
175.	39.792	7.009	46.802	1226.6	7.251
200.	40.731	7.048	47.779	1409.7	7.395
225.	41.564	7.095	48.659	1596.4	7.543
250.	42.314	7.147	49.461	1786.8	7.684
275.	42.997	7.202	50.200	1980.6	7.816
300.	43.627	7.258	50.885	2177.5	7.935
325.	44.210	7.315	51.524	2377.2	8.042
350.	44.754	7.370	52.124	2579.5	8.137
375.	45.264	7.424	52.688	2784.0	8.222
400.	45.745	7.476	53.221	2990.5	8.296
425.	46.200	7.526	53.726	3198.7	8.363
450.	46.631	7.575	54.206	3408.6	8.422
475.	47.042	7.621	54.663	3619.8	8.474
500.	47.434	7.664	55.099	3832.2	8.522
550.	48.168	7.746	55.915	4260.4	8.602
600.	48.846	7.820	56.666	4692.2	8.667
650.	49.474	7.888	57.362	5126.9	8.722
700.	50.061	7.949	58.010	5564.2	8.768
750.	50.612	8.005	58.616	6003.6	8.807
800.	51.130	8.056	59.186	6444.8	8.841
850.	51.620	8.103	59.723	6887.6	8.870
900.	52.084	8.146	60.230	7331.7	8.897
950.	52.526	8.186	60.712	7777.1	8.920
1000.	52.946	8.224	61.170	8223.7	8.941
1050.	53.348	8.258	61.607	8671.2	8.961
1100.	53.733	8.291	62.024	9119.7	8.979
1150.	54.103	8.321	62.423	9569.0	8.995
1200.	54.457	8.349	62.807	10019.1	9.011
1250.	54.799	8.376	63.175	10470.0	9.025
1300.	55.128	8.401	63.529	10921.6	9.039
1350.	55.445	8.425	63.870	11373.8	9.052
1400.	55.752	8.448	64.200	11826.7	9.064
1450.	56.049	8.469	64.518	12280.1	9.076
1500.	56.336	8.489	64.826	12734.2	9.088
1550.	56.615	8.509	65.124	13188.8	9.099
1600.	56.885	8.527	65.413	13644.0	9.109
1650.	57.148	8.545	65.693	14099.6	9.120
1700.	57.403	8.562	65.965	14555.8	9.130
1750.	57.652	8.579	66.230	15012.5	9.140
1800.	57.893	8.594	66.488	15469.7	9.150
1850.	58.129	8.609	66.738	15927.3	9.159
1900.	58.359	8.624	66.983	16385.5	9.168
1950.	58.583	8.638	67.221	16844.0	9.178
2000.	58.802	8.652	67.453	17303.1	9.187
2050.	59.016	8.665	67.680	17762.5	9.195
2100.	59.224	8.677	67.902	18222.4	9.204
2150.	59.429	8.690	68.118	18682.8	9.213
2200.	59.629	8.702	68.330	19143.5	9.221
2250.	59.824	8.713	68.537	19604.7	9.230
273.15	42.949	7.198	50.147	1966.1	7.807
298.15	43.582	7.254	50.836	2162.8	7.927

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 0.7103$ cm^{-1}, $\alpha_e = 0.0062$ cm^{-1}, $D_e = 3.393 \times 10^{-6}$ cm^{-1},

$\omega_e x_e = 4.3$ cm^{-1}, $\omega_e = 650.0$ cm^{-1}, and the molecular weight = 42.3970..

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-21. Thermodynamic Functions for LiCl (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2300.	60.016	8.724	68.740	20066.3	9.238
2350.	60.204	8.735	68.939	20528.3	9.247
2400.	60.388	8.746	69.134	20990.8	9.255
2450.	60.568	8.757	69.324	21453.6	9.263
2500.	60.745	8.767	69.512	21916.8	9.271
2600.	61.089	8.786	69.875	22844.5	9.287
2700.	61.421	8.805	70.226	23773.8	9.303
2800.	61.741	8.823	70.564	24704.6	9.319
2900.	62.051	8.840	70.891	25636.9	9.334
3000.	62.351	8.857	71.208	26570.8	9.350
3100.	62.641	8.873	71.514	27506.1	9.365
3200.	62.923	8.888	71.812	28443.0	9.380
3300.	63.197	8.903	72.100	29381.3	9.395
3400.	63.463	8.918	72.381	30321.1	9.410
3500.	63.721	8.932	72.653	31262.4	9.424
3600.	63.973	8.946	72.919	32205.0	9.439
3700.	64.218	8.959	73.177	33149.1	9.453
3800.	64.457	8.972	73.429	34094.6	9.467
3900.	64.690	8.985	73.675	35041.5	9.481
4000.	64.918	8.997	73.915	35989.8	9.495
4100.	65.140	9.010	74.149	36939.5	9.509
4200.	65.357	9.022	74.378	37890.5	9.523
4300.	65.569	9.033	74.602	38842.9	9.537
4400.	65.777	9.045	74.821	39796.6	9.550
4500.	65.980	9.056	75.036	40751.6	9.563
4600.	66.179	9.067	75.246	41707.9	9.577
4700.	66.374	9.078	75.452	42665.5	9.590
4800.	66.565	9.088	75.653	43624.3	9.602
4900.	66.752	9.099	75.851	44584.5	9.615
5000.	66.936	9.109	76.045	45545.8	9.628
5100.	67.116	9.119	76.236	46508.4	9.640
5200.	67.293	9.129	76.422	47472.2	9.652
5300.	67.467	9.139	76.606	48437.2	9.664
5400.	67.638	9.149	76.786	49403.3	9.676
5500.	67.805	9.158	76.964	50370.6	9.688
5600.	67.970	9.168	77.138	51339.1	9.699
5700.	68.132	9.177	77.309	52308.6	9.710
5800.	68.292	9.186	77.478	53279.2	9.721
5900.	68.449	9.195	77.644	54251.0	9.732
6000.	68.603	9.204	77.807	55223.7	9.743
6100.	68.755	9.213	77.968	56197.5	9.753
6200.	68.905	9.221	78.126	57172.3	9.763
6300.	69.052	9.230	78.282	58148.1	9.773
6400.	69.197	9.238	78.436	59124.9	9.783
6500.	69.340	9.247	78.587	60102.6	9.792
6600.	69.481	9.255	78.736	61081.2	9.801
6700.	69.620	9.263	78.883	62060.7	9.810
6800.	69.757	9.271	79.028	63041.0	9.819
6900.	69.892	9.279	79.171	64022.2	9.827
7000.	70.026	9.286	79.312	65004.2	9.835

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.023587
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.098688
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.023572

Table 1-22. Thermodynamic Functions for BeO (gas)

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
50.	27.847	6.924	34.771	346.2	6.956
75.	30.657	6.935	37.592	520.1	6.957
100.	32.653	6.941	39.593	694.1	6.957
125.	34.202	6.944	41.146	868.0	6.958
150.	35.468	6.946	42.414	1041.9	6.958
175.	36.539	6.948	43.487	1215.9	6.960
200.	37.467	6.950	44.417	1390.0	6.965
225.	38.286	6.952	45.238	1564.2	6.974
250.	39.018	6.955	45.973	1738.7	6.991
275.	39.681	6.959	46.641	1913.8	7.016
300.	40.287	6.965	47.252	2089.6	7.049
325.	40.845	6.973	47.818	2266.3	7.091
350.	41.362	6.983	48.345	2444.2	7.140
375.	41.844	6.996	48.840	2623.4	7.194
400.	42.296	7.010	49.306	2804.0	7.254
425.	42.722	7.026	49.748	2986.1	7.316
450.	43.124	7.044	50.168	3169.8	7.380
475.	43.505	7.063	50.568	3355.1	7.445
500.	43.868	7.084	50.952	3542.0	7.510
550.	44.545	7.129	51.674	3920.7	7.637
600.	45.167	7.176	52.343	4305.6	7.757
650.	45.744	7.225	52.969	4696.3	7.868
700.	46.281	7.275	53.556	5092.3	7.970
750.	46.785	7.324	54.109	5493.1	8.062
800.	47.259	7.373	54.632	5898.4	8.145
850.	47.707	7.421	55.128	6307.5	8.220
900.	48.133	7.467	55.600	6720.3	8.288
950.	48.538	7.512	56.049	7136.2	8.349
1000.	48.924	7.555	56.479	7555.1	8.404
1050.	49.294	7.597	56.890	7976.5	8.454
1100.	49.648	7.637	57.285	8400.3	8.499
1150.	49.988	7.675	57.663	8826.3	8.540
1200.	50.316	7.712	58.028	9254.2	8.577
1250.	50.631	7.747	58.378	9683.9	8.611
1300.	50.936	7.781	58.717	10115.2	8.642
1350.	51.230	7.813	59.043	10548.1	8.671
1400.	51.515	7.844	59.359	10982.3	8.698
1450.	51.791	7.874	59.665	11417.8	8.722
1500.	52.058	7.903	59.961	11854.5	8.745
1550.	52.318	7.930	60.248	12292.2	8.766
1600.	52.570	7.957	60.527	12731.0	8.786
1650.	52.815	7.982	60.797	13170.8	8.804
1700.	53.054	8.007	61.060	13611.4	8.822
1750.	53.286	8.030	61.316	14052.9	8.838
1800.	53.513	8.053	61.565	14495.2	8.853
1850.	53.734	8.075	61.808	14938.2	8.868
1900.	53.949	8.096	62.045	15381.9	8.882
1950.	54.160	8.116	62.276	15826.3	8.895
2000.	54.365	8.136	62.501	16271.3	8.907
2050.	54.567	8.155	62.721	16717.0	8.919
2100.	54.763	8.173	62.936	17163.2	8.930
2150.	54.956	8.191	63.146	17609.9	8.941
2200.	55.144	8.208	63.352	18057.2	8.952
2250.	55.329	8.224	63.553	18505.0	8.962
273.15	39.634	6.959	46.593	1900.8	7.014
298.15	40.244	6.965	47.209	2076.6	7.046

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 1.6510 cm^{-1}, α_e = 0.0190 cm^{-1}, $D_e = 8.198 \times 10^{-6}$ cm^{-1},

$\omega_e x_e$ = 11.731 cm^{-1}, ω_e = 1487.19 cm^{-1}, and the molecular weight = 25.013.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-22. Thermodynamic Functions for BeO (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2300.	55.510	8.241	63.750	18953.3	8.971
2350.	55.687	8.256	63.943	19402.1	8.980
2400.	55.861	8.271	64.133	19851.3	8.989
2450.	56.032	8.286	64.318	20300.9	8.998
2500.	56.199	8.300	64.500	20751.0	9.006
2600.	56.525	8.328	64.853	21652.4	9.022
2700.	56.840	8.354	65.194	22555.3	9.037
2800.	57.144	8.378	65.523	23459.7	9.052
2900.	57.439	8.402	65.841	24365.4	9.066
3000.	57.724	8.424	66.148	25272.5	9.079
3100.	58.001	8.445	66.446	26180.9	9.091
3200.	58.269	8.466	66.735	27090.5	9.103
3300.	58.530	8.485	67.015	28001.3	9.115
3400.	58.783	8.504	67.287	28913.3	9.127
3500.	59.030	8.522	67.552	29826.4	9.138
3600.	59.270	8.539	67.809	30740.6	9.149
3700.	59.504	8.556	68.060	31655.8	9.159
3800.	59.733	8.572	68.304	32572.1	9.170
3900.	59.956	8.587	68.543	33489.4	9.180
4000.	60.173	8.602	68.775	34407.7	9.190
4100.	60.386	8.616	69.002	35327.0	9.200
4200.	60.593	8.630	69.224	36247.2	9.210
4300.	60.797	8.644	69.440	37168.4	9.219
4400.	60.995	8.657	69.652	38090.6	9.229
4500.	61.190	8.670	69.860	39013.6	9.238
4600.	61.381	8.682	70.063	39937.6	9.247
4700.	61.567	8.694	70.262	40862.5	9.256
4800.	61.751	8.706	70.456	41788.3	9.265
4900.	61.930	8.717	70.647	42715.0	9.274
5000.	62.106	8.729	70.835	43642.5	9.283
5100.	62.279	8.739	71.019	44571.0	9.292
5200.	62.449	8.750	71.199	45500.3	9.301
5300.	62.616	8.760	71.376	46430.4	9.309
5400.	62.779	8.771	71.550	47361.4	9.318
5500.	62.940	8.781	71.721	48293.2	9.326
5600.	63.099	8.790	71.889	49225.9	9.335
5700.	63.254	8.800	72.054	50159.4	9.343
5800.	63.407	8.809	72.216	51093.8	9.352
5900.	63.558	8.818	72.376	52029.0	9.360
6000.	63.706	8.827	72.533	52964.9	9.368
6100.	63.852	8.836	72.688	53901.7	9.377
6200.	63.996	8.845	72.841	54839.3	9.385
6300.	64.137	8.854	72.991	55777.8	9.393
6400.	64.276	8.862	73.139	56717.0	9.401
6500.	64.414	8.870	73.284	57657.0	9.409
6600.	64.549	8.878	73.428	58597.8	9.417
6700.	64.683	8.886	73.569	59539.4	9.425
6800.	64.814	8.894	73.709	60481.7	9.433
6900.	64.944	8.902	73.846	61424.9	9.441
7000.	65.072	8.910	73.982	62368.8	9.449

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.039979
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.16727
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.039953

Table 1-23. Thermodynamic Functions for BeF (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	29.766	6.928	36.693	346.4	6.957
75.	32.577	6.937	39.514	520.3	6.957
100.	34.573	6.942	41.516	694.2	6.957
125.	36.123	6.945	43.068	868.2	6.958
150.	37.389	6.948	44.337	1042.2	6.960
175.	38.460	6.950	45.410	1216.2	6.966
200.	39.389	6.953	46.341	1390.5	6.980
225.	40.208	6.957	47.165	1565.3	7.004
250.	40.941	6.963	47.904	1740.8	7.040
275.	41.605	6.972	48.577	1917.4	7.087
300.	42.212	6.984	49.196	2095.3	7.144
325.	42.772	6.999	49.771	2274.7	7.209
350.	43.291	7.017	50.308	2455.8	7.280
375.	43.776	7.037	50.813	2638.7	7.355
400.	44.231	7.059	51.290	2823.5	7.431
425.	44.659	7.083	51.742	3010.3	7.507
450.	45.065	7.109	52.174	3198.9	7.582
475.	45.450	7.135	52.586	3389.4	7.655
500.	45.817	7.163	52.980	3581.6	7.726
550.	46.502	7.221	53.723	3971.3	7.858
600.	47.133	7.279	54.412	4367.2	7.977
650.	47.718	7.337	55.054	4768.8	8.084
700.	48.264	7.393	55.657	5175.4	8.178
750.	48.776	7.449	56.224	5586.4	8.261
800.	49.258	7.502	56.760	6001.3	8.335
850.	49.714	7.553	57.267	6419.7	8.400
900.	50.147	7.601	57.749	6841.2	8.458
950.	50.560	7.648	58.207	7265.4	8.509
1000.	50.953	7.692	58.645	7692.0	8.555
1050.	51.329	7.734	59.063	8120.8	8.597
1100.	51.690	7.774	59.464	8551.6	8.634
1150.	52.037	7.812	59.849	8984.2	8.668
1200.	52.370	7.849	60.218	9418.3	8.699
1250.	52.691	7.883	60.574	9854.0	8.727
1300.	53.001	7.916	60.917	10291.0	8.753
1350.	53.300	7.948	61.248	10729.2	8.776
1400.	53.590	7.978	61.567	11168.5	8.798
1450.	53.870	8.006	61.876	11608.9	8.818
1500.	54.142	8.034	62.175	12050.3	8.837
1550.	54.406	8.060	62.466	12492.6	8.855
1600.	54.662	8.085	62.747	12935.7	8.871
1650.	54.911	8.109	63.020	13379.6	8.886
1700.	55.154	8.132	63.286	13824.3	8.901
1750.	55.390	8.154	63.544	14269.7	8.915
1800.	55.620	8.175	63.795	14715.7	8.928
1850.	55.844	8.196	64.040	15162.4	8.940
1900.	56.063	8.216	64.278	15609.6	8.952
1950.	56.276	8.235	64.511	16057.5	8.963
2000.	56.485	8.253	64.738	16505.8	8.974
2050.	56.689	8.271	64.960	16954.7	8.984
2100.	56.889	8.288	65.176	17404.1	8.994
2150.	57.084	8.304	65.388	17854.0	9.003
2200.	57.275	8.320	65.595	18304.4	9.012
2250.	57.462	8.336	65.798	18755.2	9.021
273.15	41.558	6.972	48.530	1904.3	7.083
298.15	42.169	6.983	49.152	2082.1	7.140

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

B_e = 1.4877 cm^{-1}, α_e = 0.0168 cm^{-1}, $D_e = 8.21 \times 10^{-6}$ cm^{-1}, 28.013.

$\omega_e x_e$ = 9.12 cm^{-1}, ω_e = 1265.6 cm^{-1}, and the molecular weight = 28.013

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-23. Thermodynamic Functions for BeF (gas) - Continued

T °K	$-\frac{(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ-H^\circ_0}{T}$	S°	$H^\circ-H^\circ_0$	C_p°
2300.	57.645	8.351	65.996	19206.4	9.030
2350.	57.825	8.365	66.190	19658.1	9.038
2400.	58.001	8.379	66.380	20110.1	9.046
2450.	58.174	8.393	66.567	20562.6	9.054
2500.	58.344	8.406	66.750	21015.4	9.062
2600.	58.674	8.432	67.106	21922.2	9.076
2700.	58.993	8.456	67.448	22830.4	9.090
2800.	59.301	8.479	67.779	23740.0	9.104
2900.	59.598	8.500	68.099	24650.9	9.117
3000.	59.887	8.521	68.408	25563.1	9.129
3100.	60.167	8.541	68.707	26476.5	9.142
3200.	60.438	8.560	68.998	27391.1	9.154
3300.	60.702	8.578	69.279	28306.8	9.165
3400.	60.958	8.595	69.553	29223.7	9.176
3500.	61.207	8.612	69.819	30141.7	9.188
3600.	61.450	8.628	70.078	31060.8	9.198
3700.	61.687	8.644	70.330	31981.0	9.209
3800.	61.917	8.658	70.576	32902.2	9.220
3900.	62.142	8.673	70.815	33824.4	9.230
4000.	62.362	8.687	71.049	34747.7	9.240
4100.	62.576	8.700	71.277	35671.9	9.251
4200.	62.786	8.714	71.500	36597.2	9.261
4300.	62.991	8.726	71.718	37523.4	9.270
4400.	63.192	8.739	71.931	38450.6	9.280
4500.	63.388	8.751	72.139	39378.8	9.290
4600.	63.581	8.763	72.343	40307.9	9.300
4700.	63.769	8.774	72.543	41238.0	9.309
4800.	63.954	8.785	72.739	42169.0	9.319
4900.	64.135	8.796	72.931	43101.0	9.328
5000.	64.313	8.807	73.120	44033.8	9.337
5100.	64.487	8.817	73.305	44967.6	9.347
5200.	64.659	8.827	73.486	45902.3	9.356
5300.	64.827	8.837	73.664	46837.8	9.365
5400.	64.992	8.847	73.839	47774.3	9.374
5500.	65.154	8.857	74.011	48711.7	9.383
5600.	65.314	8.866	74.180	49649.9	9.392
5700.	65.471	8.875	74.346	50589.1	9.401
5800.	65.625	8.884	74.509	51529.1	9.410
5900.	65.777	8.893	74.670	52470.0	9.419
6000.	65.926	8.902	74.828	53411.7	9.428
6100.	66.073	8.911	74.984	54354.3	9.436
6200.	66.218	8.919	75.137	55297.8	9.445
6300.	66.361	8.927	75.288	56242.1	9.454
6400.	66.502	8.936	75.437	57187.2	9.462
6500.	66.640	8.944	75.584	58133.2	9.471
6600.	66.776	8.952	75.728	59080.0	9.479
6700.	66.911	8.959	75.870	60027.7	9.488
6800.	67.044	8.967	76.011	60976.1	9.496
6900.	67.175	8.975	76.149	61925.4	9.504
7000.	67.304	8.982	76.286	62875.6	9.513

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.035698
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.14936
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.035675

Table 1-24. Thermodynamic Functions for BeCl (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	32.447	6.941	39.388	347.1	6.957
75.	35.262	6.947	42.209	521.0	6.957
100.	37.261	6.949	44.211	694.9	6.960
125.	38.812	6.952	45.764	869.0	6.971
150.	40.080	6.958	47.038	1043.6	7.001
175.	41.153	6.968	48.121	1219.3	7.058
200.	42.085	6.984	49.068	1396.7	7.138
225.	42.908	7.006	49.915	1576.4	7.237
250.	43.648	7.035	50.683	1758.6	7.345
275.	44.320	7.068	51.388	1943.7	7.458
300.	44.937	7.105	52.042	2131.6	7.571
325.	45.507	7.145	52.652	2322.2	7.679
350.	46.038	7.187	53.225	2515.4	7.781
375.	46.535	7.230	53.765	2711.2	7.876
400.	47.003	7.273	54.276	2909.2	7.963
425.	47.445	7.316	54.761	3109.3	8.044
450.	47.865	7.358	55.223	3311.3	8.117
475.	48.264	7.400	55.664	3515.1	8.184
500.	48.644	7.441	56.085	3720.4	8.245
550.	49.357	7.519	56.876	4135.4	8.351
600.	50.015	7.592	57.607	4555.3	8.440
650.	50.625	7.660	58.285	4979.2	8.515
700.	51.195	7.724	58.919	5406.5	8.578
750.	51.730	7.782	59.512	5836.8	8.631
800.	52.234	7.837	60.071	6269.5	8.678
850.	52.711	7.888	60.598	6704.4	8.718
900.	53.163	7.935	61.098	7141.2	8.753
950.	53.593	7.979	61.572	7579.6	8.784
1000.	54.003	8.020	62.023	8019.5	8.812
1050.	54.396	8.058	62.453	8460.7	8.836
1100.	54.771	8.094	62.865	8903.1	8.859
1150.	55.132	8.127	63.259	9346.6	8.879
1200.	55.478	8.159	63.637	9791.0	8.898
1250.	55.812	8.189	64.001	10236.3	8.915
1300.	56.134	8.217	64.351	10682.4	8.931
1350.	56.444	8.244	64.688	11129.2	8.945
1400.	56.745	8.269	65.014	11576.8	8.959
1450.	57.035	8.293	65.328	12025.1	8.972
1500.	57.317	8.316	65.633	12474.0	8.984
1550.	57.590	8.338	65.927	12923.4	8.996
1600.	57.855	8.358	66.213	13373.5	9.007
1650.	58.112	8.378	66.490	13824.0	9.017
1700.	58.363	8.397	66.760	14275.1	9.027
1750.	58.606	8.415	67.021	14726.6	9.037
1800.	58.844	8.433	67.276	15178.7	9.046
1850.	59.075	8.449	67.524	15631.2	9.055
1900.	59.300	8.465	67.766	16084.1	9.064
1950.	59.520	8.481	68.001	16537.4	9.072
2000.	59.735	8.496	68.231	16991.2	9.080
2050.	59.945	8.510	68.455	17445.3	9.088
2100.	60.150	8.524	68.674	17899.9	9.096
2150.	60.351	8.537	68.888	18354.8	9.104
2200.	60.548	8.550	69.098	18810.1	9.111
2250.	60.740	8.563	69.302	19265.8	9.118
273.15	44.272	7.065	51.338	1929.9	7.450
298.15	44.893	7.102	51.995	2117.6	7.562

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

B_e = 0.766 cm^{-1}, α_e = 0.007 cm^{-1}, D_e = 2.5×10^{-6} cm^{-1},

$\omega_e x_e$ = 5.11 cm^{-1}, ω_e = 846.6 cm^{-1}, and the molecular weight = 44.47.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

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Table 1-24. Thermodynamic Functions for BeCl (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2300.	60.928	8.575	69.503	19721.8	9.125
2350.	61.113	8.586	69.699	20178.2	9.132
2400.	61.293	8.598	69.891	20634.9	9.139
2450.	61.471	8.609	70.080	21092.0	9.146
2500.	61.645	8.620	70.265	21549.4	9.153
2600.	61.983	8.640	70.624	22465.2	9.166
2700.	62.310	8.660	70.970	23382.3	9.179
2800.	62.625	8.679	71.304	24300.6	9.192
2900.	62.930	8.697	71.626	25220.2	9.204
3000.	63.225	8.714	71.938	26141.0	9.216
3100.	63.511	8.730	72.241	27063.0	9.229
3200.	63.788	8.746	72.534	27986.2	9.240
3300.	64.057	8.761	72.818	28910.6	9.252
3400.	64.319	8.775	73.094	29836.1	9.264
3500.	64.573	8.789	73.363	30762.8	9.275
3600.	64.821	8.803	73.624	31690.5	9.287
3700.	65.062	8.816	73.878	32619.5	9.298
3800.	65.297	8.829	74.126	33549.5	9.309
3900.	65.527	8.841	74.368	34480.6	9.321
4000.	65.751	8.853	74.604	35412.8	9.332
4100.	65.969	8.865	74.834	36346.2	9.343
4200.	66.183	8.876	75.059	37280.6	9.354
4300.	66.392	8.887	75.279	38216.0	9.365
4400.	66.596	8.898	75.495	39152.6	9.375
4500.	66.796	8.909	75.705	40090.2	9.386
4600.	66.992	8.919	75.911	41028.8	9.397
4700.	67.184	8.929	76.113	41968.5	9.408
4800.	67.372	8.939	76.311	42909.3	9.418
4900.	67.556	8.949	76.505	43851.0	9.429
5000.	67.737	8.959	76.696	44793.8	9.439
5100.	67.914	8.968	76.882	45737.7	9.450
5200.	68.088	8.977	77.066	46682.5	9.460
5300.	68.259	8.986	77.246	47628.4	9.470
5400.	68.427	8.995	77.423	48575.3	9.481
5500.	68.592	9.004	77.596	49523.1	9.491
5600.	68.754	9.013	77.767	50472.0	9.501
5700.	68.914	9.021	77.935	51421.9	9.511
5800.	69.071	9.030	78.100	52372.7	9.521
5900.	69.225	9.038	78.263	53324.5	9.531
6000.	69.377	9.046	78.423	54277.3	9.541
6100.	69.526	9.054	78.580	55231.0	9.550
6200.	69.673	9.062	78.735	56185.7	9.560
6300.	69.818	9.070	78.888	57141.4	9.570
6400.	69.961	9.078	79.039	58098.0	9.579
6500.	70.102	9.085	79.187	59055.5	9.589
6600.	70.240	9.093	79.333	60013.9	9.598
6700.	70.377	9.100	79.477	60973.3	9.608
6800.	70.511	9.108	79.619	61933.6	9.617
6900.	70.644	9.115	79.759	62894.7	9.626
7000.	70.775	9.122	79.898	63856.8	9.635

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.022487
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.094086
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.022472

Table 1-25. Thermodynamic Functions for MgO (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	31.345	6.945	38.290	347.3	6.956
75.	34.162	6.949	41.111	521.2	6.957
100.	36.162	6.951	43.113	695.1	6.961
125.	37.713	6.955	44.668	869.3	6.979
150.	38.982	6.962	45.944	1044.3	7.024
175.	40.056	6.976	47.032	1220.8	7.099
200.	40.989	6.997	47.986	1399.5	7.198
225.	41.814	7.026	48.840	1580.8	7.313
250.	42.556	7.061	49.617	1765.2	7.434
275.	43.231	7.100	50.331	1952.5	7.555
300.	43.851	7.143	50.994	2142.9	7.672
325.	44.424	7.188	51.612	2336.1	7.782
350.	44.959	7.234	52.193	2532.0	7.884
375.	45.459	7.281	52.740	2730.2	7.978
400.	45.931	7.327	53.258	2930.8	8.063
425.	46.376	7.372	53.749	3133.3	8.140
450.	46.799	7.417	54.216	3337.7	8.209
475.	47.201	7.460	54.662	3543.7	8.272
500.	47.585	7.502	55.087	3751.2	8.329
550.	48.304	7.582	55.886	4170.3	8.428
600.	48.967	7.656	56.623	4593.8	8.510
650.	49.582	7.725	57.307	5021.0	8.578
700.	50.157	7.788	57.945	5451.3	8.635
750.	50.696	7.846	58.542	5884.3	8.684
800.	51.204	7.899	59.104	6319.6	8.726
850.	51.685	7.949	59.634	6756.8	8.762
900.	52.141	7.995	60.136	7195.7	8.794
950.	52.574	8.038	60.612	7636.2	8.823
1000.	52.987	8.078	61.065	8077.9	8.848
1050.	53.382	8.115	61.497	8520.9	8.870
1100.	53.761	8.150	61.911	8964.9	8.891
1150.	54.124	8.183	62.306	9409.9	8.910
1200.	54.472	8.213	62.686	9855.8	8.927
1250.	54.808	8.242	63.050	10302.6	8.943
1300.	55.132	8.269	63.401	10750.1	8.958
1350.	55.445	8.295	63.740	11198.3	8.972
1400.	55.747	8.319	64.066	11647.2	8.985
1450.	56.039	8.343	64.382	12096.7	8.997
1500.	56.322	8.365	64.687	12546.8	9.009
1550.	56.597	8.385	64.982	12997.5	9.020
1600.	56.863	8.405	65.269	13448.7	9.030
1650.	57.122	8.424	65.547	13900.4	9.040
1700.	57.374	8.443	65.817	14352.6	9.050
1750.	57.619	8.460	66.079	14805.4	9.060
1800.	57.858	8.477	66.335	15258.5	9.069
1850.	58.090	8.493	66.583	15712.1	9.078
1900.	58.317	8.509	66.825	16166.2	9.086
1950.	58.538	8.523	67.061	16620.7	9.095
2000.	58.754	8.538	67.292	17075.6	9.103
2050.	58.965	8.552	67.516	17530.9	9.111
2100.	59.171	8.565	67.736	17986.5	9.119
2150.	59.373	8.578	67.951	18442.6	9.127
2200.	59.570	8.590	68.161	18899.1	9.134
2250.	59.763	8.603	68.366	19355.9	9.142
273.15	43.183	7.097	50.280	1938.6	7.547
298.15	43.807	7.140	50.946	2128.7	7.664

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 0.5743 cm^{-1}, α_e = 0.005 cm^{-1}, D_e = 1.22×10^{-6} cm^{-1},

$\omega_e x_e$ = 5.18 cm^{-1}, ω_e = 785.06 cm^{-1}, and the molecular weight = 40.32.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-25. Thermodynamic Functions for MgO (gas) - Continued

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
2300.	59.952	8.614	68.567	19813.1	9.149
2350.	60.138	8.626	68.764	20270.7	9.156
2400.	60.319	8.637	68.956	20728.6	9.163
2450.	60.498	8.648	69.145	21186.9	9.171
2500.	60.672	8.658	69.331	21645.5	9.178
2600.	61.012	8.678	69.691	22563.7	9.191
2700.	61.340	8.698	70.038	23483.4	9.205
2800.	61.657	8.716	70.372	24404.3	9.218
2900.	61.963	8.733	70.696	25326.6	9.231
3000.	62.259	8.750	71.009	26250.1	9.244
3100.	62.546	8.766	71.312	27175.0	9.257
3200.	62.825	8.782	71.606	28101.1	9.270
3300.	63.095	8.796	71.891	29028.4	9.283
3400.	63.358	8.811	72.169	29957.0	9.295
3500.	63.613	8.825	72.438	30886.8	9.308
3600.	63.862	8.838	72.700	31817.9	9.320
3700.	64.104	8.851	72.955	32750.1	9.332
3800.	64.340	8.864	73.204	33683.6	9.344
3900.	64.570	8.876	73.447	34618.2	9.357
4000.	64.795	8.889	73.684	35554.1	9.369
4100.	65.015	8.900	73.915	36491.1	9.381
4200.	65.229	8.912	74.141	37429.3	9.392
4300.	65.439	8.923	74.362	38368.7	9.404
4400.	65.644	8.934	74.578	39309.2	9.416
4500.	65.845	8.945	74.790	40250.9	9.428
4600.	66.041	8.955	74.997	41193.8	9.440
4700.	66.234	8.965	75.200	42137.7	9.451
4800.	66.423	8.976	75.398	43082.9	9.463
4900.	66.608	8.986	75.593	44029.1	9.474
5000.	66.789	8.995	75.785	44976.5	9.486
5100.	66.967	9.005	75.972	45925.0	9.497
5200.	67.142	9.014	76.157	46874.6	9.508
5300.	67.314	9.024	76.337	47825.4	9.520
5400.	67.482	9.033	76.515	48777.2	9.531
5500.	67.648	9.042	76.690	49730.1	9.542
5600.	67.811	9.051	76.862	50684.1	9.553
5700.	67.971	9.060	77.031	51639.2	9.564
5800.	68.129	9.068	77.197	52595.3	9.575
5900.	68.283	9.077	77.360	53552.5	9.585
6000.	68.436	9.085	77.521	54510.8	9.596
6100.	68.586	9.093	77.679	55470.1	9.607
6200.	68.734	9.102	77.835	56430.5	9.617
6300.	68.879	9.110	77.989	57391.8	9.628
6400.	69.023	9.118	78.140	58354.2	9.638
6500.	69.164	9.126	78.290	59317.7	9.648
6600.	69.303	9.134	78.437	60282.1	9.658
6700.	69.440	9.141	78.582	61247.5	9.668
6800.	69.576	9.149	78.725	62213.8	9.678
6900.	69.709	9.157	78.866	63181.2	9.688
7000.	69.841	9.164	79.005	64149.5	9.698

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.024802
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.010377
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.024786

Table 1-26. Thermodynamic Functions for MgF (gas)

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
50.	33.148	6.946	40.094	347.3	6.957
75.	35.965	6.950	42.914	521.2	6.958
100.	37.964	6.952	44.917	695.2	6.965
125.	39.516	6.958	46.474	869.7	6.996
150.	40.786	6.969	47.755	1045.3	7.062
175.	41.861	6.989	48.850	1223.1	7.160
200.	42.796	7.018	49.814	1403.6	7.281
225.	43.625	7.054	50.679	1587.2	7.413
250.	44.370	7.097	51.467	1774.2	7.545
275.	45.049	7.143	52.192	1964.4	7.673
300.	45.673	7.193	52.865	2157.8	7.792
325.	46.250	7.243	53.493	2354.0	7.902
350.	46.789	7.294	54.083	2552.8	8.001
375.	47.294	7.344	54.638	2753.9	8.090
400.	47.769	7.393	55.162	2957.2	8.170
425.	48.219	7.441	55.660	3162.4	8.242
450.	48.646	7.487	56.133	3369.2	8.306
475.	49.052	7.532	56.584	3577.6	8.364
500.	49.439	7.575	57.014	3787.4	8.416
550.	50.165	7.655	57.820	4210.5	8.505
600.	50.834	7.729	58.564	4637.6	8.577
650.	51.456	7.797	59.252	5068.0	8.637
700.	52.036	7.859	59.894	5501.2	8.688
750.	52.580	7.916	60.495	5936.7	8.731
800.	53.092	7.968	61.060	6374.1	8.767
850.	53.577	8.016	61.593	6813.3	8.799
900.	54.036	8.060	62.096	7254.0	8.827
950.	54.473	8.101	62.574	7696.0	8.852
1000.	54.890	8.139	63.029	8139.1	8.874
1050.	55.288	8.175	63.462	8583.3	8.894
1100.	55.669	8.208	63.876	9028.4	8.912
1150.	56.034	8.239	64.273	9474.4	8.928
1200.	56.385	8.268	64.653	9921.2	8.943
1250.	56.724	8.295	65.018	10368.7	8.957
1300.	57.049	8.321	65.370	10816.9	8.970
1350.	57.364	8.345	65.709	11265.7	8.983
1400.	57.668	8.368	66.036	11715.1	8.994
1450.	57.962	8.390	66.351	12165.0	9.005
1500.	58.246	8.410	66.657	12615.5	9.015
1550.	58.523	8.430	66.953	13066.5	9.025
1600.	58.790	8.449	67.239	13517.9	9.035
1650.	59.051	8.467	67.517	13969.9	9.044
1700.	59.304	8.484	67.787	14422.2	9.052
1750.	59.550	8.500	68.050	14875.0	9.061
1800.	59.789	8.516	68.305	15328.2	9.069
1850.	60.023	8.531	68.554	15781.9	9.077
1900.	60.251	8.545	68.796	16235.9	9.085
1950.	60.473	8.559	69.032	16690.2	9.093
2000.	60.690	8.573	69.262	17145.0	9.100
2050.	60.901	8.585	69.487	17600.1	9.107
2100.	61.108	8.598	69.706	18055.6	9.114
2150.	61.311	8.610	69.921	18511.5	9.121
2200.	61.509	8.622	70.131	18967.6	9.128
2250.	61.703	8.633	70.336	19424.2	9.135
2300.	61.893	8.644	70.537	19881.0	9.142
273.15	45.001	7.140	52.141	1950.3	7.664
298.15	45.628	7.189	52.817	2143.4	7.784

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

B_e = 0.516 cm^{-1}, α_e = 0.004 cm^{-1}, D_e = 1.1×10^{-6} cm^{-1},

$\omega_e x_e$ = 3.84 cm^{-1}, ω_e = 717.0 cm^{-1}, and the molecular weight = 43.32.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-26. Thermodynamic Functions for MgF (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2350.	62.079	8.655	70.733	20338.2	9.148
2400.	62.261	8.665	70.926	20795.7	9.155
2450.	62.440	8.675	71.115	21253.5	9.161
2500.	62.615	8.685	71.300	21711.7	9.168
2600.	62.956	8.703	71.659	22628.9	9.180
2700.	63.285	8.721	72.006	23547.4	9.193
2800.	63.602	8.738	72.340	24467.1	9.205
2900.	63.909	8.754	72.663	25388.0	9.217
3000.	64.206	8.770	72.976	26310.0	9.229
3100.	64.494	8.785	73.278	27233.3	9.241
3200.	64.773	8.799	73.572	28157.7	9.252
3300.	65.043	8.813	73.857	29083.2	9.264
3400.	65.307	8.826	74.133	30009.9	9.276
3500.	65.563	8.839	74.402	30937.8	9.287
3600.	65.812	8.852	74.664	31866.7	9.298
3700.	66.054	8.864	74.918	32796.7	9.310
3800.	66.291	8.876	75.167	33727.9	9.321
3900.	66.521	8.887	75.409	34660.2	9.332
4000.	66.746	8.898	75.645	35593.5	9.343
4100.	66.966	8.909	75.875	36528.0	9.354
4200.	67.181	8.920	76.101	37463.5	9.365
4300.	67.391	8.930	76.321	38400.1	9.376
4400.	67.596	8.940	76.536	39337.8	9.387
4500.	67.797	8.950	76.747	40276.5	9.398
4600.	67.994	8.960	76.954	41216.3	9.408
4700.	68.186	8.970	77.156	42157.1	9.419
4800.	68.375	8.979	77.354	43099.0	9.430
4900.	68.560	8.988	77.548	44042.0	9.440
5000.	68.742	8.997	77.739	44986.0	9.451
5100.	68.920	9.006	77.926	45931.0	9.462
5200.	69.095	9.015	78.110	46877.0	9.472
5300.	69.266	9.023	78.290	47824.1	9.482
5400.	69.435	9.032	78.467	48772.2	9.493
5500.	69.601	9.040	78.641	49721.3	9.503
5600.	69.763	9.048	78.812	50671.4	9.513
5700.	69.924	9.057	78.980	51622.5	9.523
5800.	70.081	9.065	79.146	52574.6	9.533
5900.	70.236	9.072	79.308	53527.6	9.543
6000.	70.388	9.080	79.468	54481.7	9.553
6100.	70.538	9.088	79.626	55436.7	9.563
6200.	70.686	9.096	79.781	56392.7	9.573
6300.	70.831	9.103	79.934	57349.6	9.583
6400.	70.975	9.111	80.085	58307.5	9.592
6500.	71.116	9.118	80.234	59266.4	9.602
6600.	71.255	9.125	80.380	60226.2	9.612
6700.	71.392	9.132	80.524	61186.9	9.621
6800.	71.527	9.139	80.667	62148.5	9.630
6900.	71.660	9.147	80.807	63111.0	9.640
7000.	71.792	9.153	80.945	64074.5	9.649

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.023084
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.096583
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.023069

Table 1-27. Thermodynamic Functions for MgCl (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	35.579	6.951	42.530	347.6	6.957
75.	38.398	6.956	45.354	521.7	6.980
100.	40.401	6.972	47.372	697.2	7.073
125.	41.960	7.008	48.968	876.0	7.239
150.	43.242	7.063	50.305	1059.4	7.439
175.	44.336	7.131	51.467	1247.9	7.638
200.	45.293	7.206	52.499	1441.2	7.820
225.	46.146	7.283	53.429	1638.7	7.978
250.	46.917	7.359	54.277	1839.8	8.112
275.	47.622	7.433	55.055	2044.1	8.226
300.	48.272	7.503	55.775	2251.0	8.321
325.	48.875	7.569	56.445	2460.0	8.402
350.	49.439	7.631	57.070	2671.0	8.470
375.	49.967	7.689	57.656	2883.5	8.529
400.	50.465	7.743	58.208	3097.3	8.579
425.	50.936	7.794	58.730	3312.4	8.622
450.	51.383	7.841	59.224	3528.4	8.660
475.	51.808	7.885	59.693	3745.3	8.693
500.	52.214	7.926	60.140	3963.0	8.722
550.	52.973	8.001	60.973	4400.4	8.771
600.	53.672	8.067	61.738	4840.0	8.811
650.	54.320	8.125	62.445	5281.4	8.843
700.	54.924	8.178	63.101	5724.3	8.871
750.	55.490	8.225	63.714	6168.4	8.894
800.	56.022	8.267	64.289	6613.6	8.914
850.	56.524	8.306	64.830	7059.7	8.932
900.	57.000	8.341	65.341	7506.7	8.947
950.	57.452	8.373	65.825	7954.4	8.962
1000.	57.882	8.403	66.285	8402.8	8.975
1050.	58.292	8.430	66.723	8851.9	8.987
1100.	58.685	8.456	67.141	9301.5	8.998
1150.	59.062	8.480	67.541	9751.6	9.008
1200.	59.423	8.502	67.925	10202.3	9.018
1250.	59.770	8.523	68.293	10653.4	9.028
1300.	60.105	8.542	68.647	11105.0	9.037
1350.	60.428	8.561	68.989	11557.0	9.045
1400.	60.740	8.578	69.318	12009.5	9.054
1450.	61.041	8.595	69.636	12462.3	9.062
1500.	61.332	8.610	69.943	12915.6	9.069
1550.	61.615	8.625	70.240	13369.2	9.077
1600.	61.889	8.640	70.529	13823.3	9.084
1650.	62.155	8.653	70.808	14277.6	9.092
1700.	62.414	8.666	71.080	14732.4	9.099
1750.	62.665	8.679	71.344	15187.5	9.106
1800.	62.910	8.690	71.600	15642.9	9.113
1850.	63.148	8.702	71.850	16098.7	9.120
1900.	63.380	8.713	72.093	16554.8	9.126
1950.	63.607	8.724	72.330	17011.2	9.133
2000.	63.827	8.734	72.561	17468.0	9.140
2050.	64.043	8.744	72.787	17925.1	9.146
2100.	64.254	8.754	73.008	18382.6	9.153
2150.	64.460	8.763	73.223	18840.3	9.159
2200.	64.662	8.772	73.434	19298.4	9.165
2250.	64.859	8.781	73.640	19756.8	9.172
273.15	47.572	7.428	55.000	2028.9	8.218
298.15	48.226	7.498	55.724	2235.6	8.315

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

$B_e = 0.245$ cm^{-1}, $\alpha_e = 0.001$ cm^{-1}, $D_e = 0.25 \times 10^{-6}$ cm^{-1},

$\omega_e x_e = 2.05$ cm^{-1}, $\omega_e = 465.4$ cm^{-1}, and the molecular weight = 59.777

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-27. Thermodynamic Functions for MgCl (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2300.	65.052	8.789	73.841	20215.5	9.178
2350.	65.241	8.798	74.039	20674.5	9.184
2400.	65.426	8.806	74.232	21133.8	9.191
2450.	65.608	8.814	74.422	21593.4	9.197
2500.	65.786	8.821	74.607	22053.4	9.203
2600.	66.132	8.836	74.969	22974.2	9.215
2700.	66.466	8.850	75.316	23896.2	9.228
2800.	66.788	8.864	75.652	24819.5	9.240
2900.	67.099	8.877	75.977	25743.9	9.252
3000.	67.400	8.890	76.290	26669.6	9.264
3100.	67.692	8.902	76.594	27596.5	9.276
3200.	67.975	8.914	76.889	28524.5	9.288
3300.	68.249	8.925	77.175	29453.7	9.300
3400.	68.516	8.937	77.452	30384.2	9.312
3500.	68.775	8.947	77.722	31315.8	9.324
3600.	69.027	8.958	77.985	32248.5	9.336
3700.	69.273	8.968	78.241	33182.5	9.348
3800.	69.512	8.978	78.490	34117.6	9.359
3900.	69.745	8.988	78.733	35053.9	9.371
4000.	69.973	8.998	78.970	35991.4	9.383
4100.	70.195	9.007	79.202	36930.0	9.395
4200.	70.412	9.017	79.429	37869.7	9.406
4300.	70.624	9.026	79.650	38810.6	9.418
4400.	70.832	9.035	79.866	39752.7	9.429
4500.	71.035	9.044	80.078	40695.9	9.441
4600.	71.234	9.052	80.286	41640.2	9.452
4700.	71.428	9.061	80.489	42585.6	9.464
4800.	71.619	9.069	80.688	43532.2	9.475
4900.	71.806	9.078	80.883	44479.9	9.486
5000.	71.989	9.086	81.075	45428.7	9.497
5100.	72.169	9.094	81.263	46378.6	9.509
5200.	72.346	9.102	81.448	47329.6	9.520
5300.	72.519	9.110	81.629	48281.7	9.531
5400.	72.689	9.118	81.807	49234.9	9.542
5500.	72.857	9.125	81.982	50189.2	9.553
5600.	73.021	9.133	82.154	51144.6	9.563
5700.	73.183	9.141	82.323	52101.0	9.574
5800.	73.342	9.148	82.490	53058.4	9.585
5900.	73.498	9.155	82.653	54017.0	9.595
6000.	73.652	9.163	82.815	54976.5	9.606
6100.	73.803	9.170	82.973	55937.1	9.616
6200.	73.952	9.177	83.129	56898.7	9.626
6300.	74.099	9.184	83.283	57861.3	9.637
6400.	74.244	9.191	83.435	58825.0	9.647
6500.	74.386	9.198	83.584	59789.6	9.657
6600.	74.526	9.205	83.732	60755.2	9.667
6700.	74.665	9.212	83.877	61721.7	9.676
6800.	74.801	9.219	84.020	62689.3	9.686
6900.	74.936	9.226	84.162	63657.7	9.695
7000.	75.068	9.232	84.301	64627.1	9.705

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.016729
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.069994
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.016718

Table 1-28. Thermodynamic Functions for AlO (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	32.695	6.944	39.639	347.2	6.956
75.	35.511	6.948	42.459	521.1	6.957
100.	37.511	6.950	44.461	695.0	6.957
125.	39.062	6.952	46.013	869.0	6.961
150.	40.329	6.954	47.284	1043.1	6.974
175.	41.402	6.959	48.360	1217.8	7.003
200.	42.331	6.967	49.299	1393.5	7.052
225.	43.153	6.980	50.133	1570.6	7.119
250.	43.889	6.998	50.887	1749.5	7.200
275.	44.557	7.021	51.578	1930.7	7.292
300.	45.169	7.047	52.216	2114.2	7.389
325.	45.734	7.077	52.811	2300.1	7.487
350.	46.260	7.110	53.370	2488.5	7.583
375.	46.752	7.145	53.896	2679.2	7.677
400.	47.214	7.181	54.394	2872.3	7.765
425.	47.650	7.218	54.868	3067.5	7.849
450.	48.064	7.255	55.319	3264.7	7.927
475.	48.457	7.292	55.749	3463.8	8.000
500.	48.832	7.329	56.161	3664.6	8.067
550.	49.534	7.402	56.936	4071.0	8.186
600.	50.181	7.472	57.653	4482.9	8.288
650.	50.782	7.538	58.320	4899.6	8.375
700.	51.343	7.600	58.943	5320.3	8.450
750.	51.869	7.659	59.528	5744.4	8.514
800.	52.365	7.714	60.080	6171.5	8.569
850.	52.834	7.766	60.600	6601.1	8.617
900.	53.280	7.815	61.094	7033.1	8.659
950.	53.703	7.860	61.563	7467.0	8.697
1000.	54.108	7.903	62.010	7902.7	8.730
1050.	54.494	7.943	62.437	8339.9	8.760
1100.	54.865	7.981	62.845	8778.6	8.786
1150.	55.220	8.016	63.236	9218.5	8.810
1200.	55.562	8.050	63.612	9659.5	8.832
1250.	55.891	8.081	63.973	10101.7	8.852
1300.	56.209	8.111	64.320	10544.7	8.871
1350.	56.515	8.140	64.655	10988.7	8.888
1400.	56.812	8.167	64.979	11433.5	8.904
1450.	57.099	8.192	65.291	11879.0	8.918
1500.	57.377	8.217	65.594	12325.3	8.932
1550.	57.647	8.240	65.887	12772.2	8.945
1600.	57.909	8.262	66.171	13219.7	8.958
1650.	58.163	8.284	66.447	13667.9	8.969
1700.	58.411	8.304	66.715	14116.6	8.980
1750.	58.652	8.323	66.975	14565.8	8.991
1800.	58.887	8.342	67.229	15015.6	9.001
1850.	59.116	8.360	67.475	15465.9	9.010
1900.	59.339	8.377	67.716	15916.6	9.020
1950.	59.556	8.394	67.950	16367.8	9.029
2000.	59.769	8.410	68.179	16819.4	9.037
2050.	59.977	8.425	68.402	17271.4	9.046
2100.	60.180	8.440	68.620	17723.9	9.054
2150.	60.379	8.454	68.833	18176.7	9.062
2200.	60.573	8.468	69.042	18630.0	9.069
2250.	60.764	8.482	69.245	19083.6	9.077
273.15	44.510	7.019	51.528	1917.2	7.285
298.15	45.125	7.045	52.170	2100.5	7.381

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

$B_e = 0.6414$ cm^{-1}, $\alpha_e = 0.00580$ cm^{-1}, $D_e = 1.08 \times 10^{-6}$ cm^{-1},

$\omega_e x_e = 6.97$ cm^{-1}, $\omega_e = 979.23$ cm^{-1}, and the molecular weight = 42.98.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-28. Thermodynamic Functions for AlO (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2300.	60.950	8.495	69.445	19537.5	9.084
2350.	61.133	8.507	69.640	19991.9	9.091
2400.	61.312	8.519	69.832	20446.6	9.098
2450.	61.488	8.531	70.019	20901.6	9.105
2500.	61.661	8.543	70.203	21357.0	9.112
2600.	61.996	8.565	70.561	22268.8	9.125
2700.	62.320	8.586	70.906	23181.8	9.138
2800.	62.632	8.606	71.238	24096.1	9.151
2900.	62.935	8.625	71.559	25011.7	9.163
3000.	63.227	8.643	71.870	25928.4	9.175
3100.	63.511	8.660	72.171	26846.3	9.187
3200.	63.786	8.677	72.463	27765.4	9.198
3300.	64.053	8.693	72.746	28685.6	9.210
3400.	64.313	8.708	73.021	29607.0	9.221
3500.	64.565	8.723	73.288	30529.4	9.232
3600.	64.811	8.737	73.548	31453.0	9.243
3700.	65.051	8.751	73.801	32377.6	9.254
3800.	65.284	8.764	74.048	33303.3	9.265
3900.	65.512	8.777	74.289	34230.1	9.276
4000.	65.734	8.789	74.524	35157.9	9.287
4100.	65.951	8.802	74.753	36086.8	9.297
4200.	66.164	8.814	74.977	37016.8	9.308
4300.	66.371	8.825	75.196	37947.7	9.318
4400.	66.574	8.836	75.410	38879.8	9.329
4500.	66.772	8.847	75.620	39812.8	9.339
4600.	66.967	8.858	75.825	40746.9	9.350
4700.	67.157	8.868	76.026	41681.9	9.360
4800.	67.344	8.879	76.223	42618.0	9.370
4900.	67.527	8.889	76.416	43555.1	9.380
5000.	67.707	8.899	76.606	44493.3	9.391
5100.	67.883	8.908	76.791	45432.4	9.401
5200.	68.056	8.918	76.974	46372.5	9.411
5300.	68.226	8.927	77.153	47313.6	9.421
5400.	68.393	8.936	77.329	48255.6	9.431
5500.	68.557	8.945	77.502	49198.7	9.441
5600.	68.718	8.954	77.672	50142.7	9.451
5700.	68.876	8.963	77.839	51087.8	9.461
5800.	69.032	8.971	78.003	52033.7	9.471
5900.	69.185	8.980	78.165	52980.7	9.480
6000.	69.336	8.988	78.324	53928.6	9.490
6100.	69.485	8.996	78.481	54877.5	9.500
6200.	69.631	9.004	78.635	55827.3	9.509
6300.	69.775	9.012	78.787	56778.1	9.519
6400.	69.917	9.020	78.937	57729.8	9.529
6500.	70.057	9.028	79.085	58682.4	9.538
6600.	70.195	9.036	79.230	59636.0	9.548
6700.	70.330	9.043	79.374	60590.5	9.557
6800.	70.464	9.051	79.515	61546.0	9.567
6900.	70.596	9.058	79.655	62502.3	9.576
7000.	70.727	9.066	79.792	63459.6	9.585

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.023267
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.097349
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.023252

Table 1-29. Thermodynamic Functions for AlF (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	31.814	6.945	38.759	347.3	6.956
75.	34.631	6.949	41.580	521.2	6.957
100.	36.630	6.951	43.582	695.1	6.960
125.	38.182	6.954	45.136	869.3	6.976
150.	39.450	6.961	46.411	1044.1	7.016
175.	40.524	6.973	47.498	1220.4	7.086
200.	41.457	6.993	48.450	1398.6	7.179
225.	42.282	7.020	49.302	1579.5	7.289
250.	43.023	7.053	50.076	1763.2	7.407
275.	43.697	7.090	50.787	1949.8	7.526
300.	44.316	7.132	51.447	2139.5	7.642
325.	44.888	7.175	52.063	2331.9	7.752
350.	45.421	7.220	52.641	2527.0	7.854
375.	45.921	7.265	53.187	2724.5	7.947
400.	46.391	7.311	53.702	2924.3	8.033
425.	46.836	7.355	54.192	3126.1	8.111
450.	47.258	7.399	54.657	3329.7	8.181
475.	47.659	7.442	55.101	3535.1	8.245
500.	48.042	7.484	55.526	3742.0	8.303
550.	48.759	7.563	56.322	4159.7	8.404
600.	49.420	7.637	57.057	4582.0	8.487
650.	50.034	7.705	57.739	5008.1	8.556
700.	50.607	7.768	58.375	5437.4	8.614
750.	51.145	7.826	58.971	5869.4	8.664
800.	51.652	7.880	59.532	6303.7	8.707
850.	52.131	7.929	60.061	6740.0	8.744
900.	52.586	7.976	60.561	7178.0	8.776
950.	53.018	8.018	61.037	7617.5	8.805
1000.	53.431	8.058	61.489	8058.4	8.830
1050.	53.825	8.096	61.920	8500.5	8.853
1100.	54.202	8.131	62.333	8943.6	8.874
1150.	54.564	8.163	62.727	9387.8	8.892
1200.	54.912	8.194	63.106	9832.8	8.909
1250.	55.247	8.223	63.470	10278.6	8.925
1300.	55.570	8.250	63.821	10725.2	8.940
1350.	55.882	8.276	64.158	11172.6	8.953
1400.	56.184	8.300	64.484	11620.5	8.966
1450.	56.475	8.324	64.799	12069.1	8.978
1500.	56.758	8.346	65.103	12518.3	8.990
1550.	57.032	8.366	65.398	12968.0	9.000
1600.	57.298	8.386	65.684	13418.2	9.011
1650.	57.556	8.405	65.961	13869.0	9.020
1700.	57.807	8.424	66.231	14320.2	9.030
1750.	58.052	8.441	66.493	14771.9	9.039
1800.	58.290	8.458	66.747	15224.0	9.048
1850.	58.522	8.474	66.995	15676.6	9.056
1900.	58.748	8.489	67.237	16129.5	9.064
1950.	58.968	8.504	67.472	16582.9	9.072
2000.	59.184	8.518	67.702	17036.6	9.080
2050.	59.394	8.532	67.926	17490.8	9.088
2100.	59.600	8.545	68.145	17945.3	9.095
2150.	59.801	8.558	68.360	18400.2	9.102
2200.	59.998	8.571	68.569	18855.4	9.109
2250.	60.191	8.583	68.774	19311.0	9.116
273.15	43.649	7.087	50.736	1935.9	7.518
298.15	44.271	7.128	51.400	2125.3	7.634

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 0.5523 cm^{-1}, α_e = 0.0048 cm^{-1}, D_e = 0.97×10^{-6} cm^{-1},

$\omega_e x_e$ = 4.75. cm^{-1}, ω_e = 801.0 cm^{-1}, and the molecular weight = 45.98.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-29. Thermodynamic Functions for AlF (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2300.	60.380	8.594	68.974	19766.9	9.123
2350.	60.565	8.606	69.170	20223.1	9.130
2400.	60.746	8.617	69.362	20679.7	9.137
2450.	60.924	8.627	69.551	21136.7	9.143
2500.	61.098	8.638	69.735	21593.9	9.150
2600.	61.437	8.657	70.094	22509.3	9.163
2700.	61.764	8.676	70.440	23426.0	9.175
2800.	62.080	8.694	70.774	24344.0	9.187
2900.	62.385	8.711	71.097	25263.1	9.200
3000.	62.681	8.728	71.408	26183.4	9.211
3100.	62.967	8.744	71.711	27104.9	9.223
3200.	63.245	8.759	72.003	28027.6	9.235
3300.	63.514	8.773	72.288	28951.4	9.247
3400.	63.776	8.787	72.564	29876.3	9.258
3500.	64.031	8.801	72.832	30802.4	9.269
3600.	64.279	8.814	73.093	31729.6	9.281
3700.	64.521	8.826	73.347	32657.8	9.292
3800.	64.756	8.839	73.595	33587.2	9.303
3900.	64.986	8.851	73.837	34517.7	9.314
4000.	65.210	8.862	74.072	35449.3	9.325
4100.	65.429	8.874	74.303	36382.0	9.336
4200.	65.643	8.885	74.527	37315.7	9.347
4300.	65.852	8.895	74.747	38250.5	9.358
4400.	66.056	8.906	74.962	39186.4	9.369
4500.	66.256	8.916	75.173	40123.3	9.380
4600.	66.452	8.926	75.379	41061.3	9.391
4700.	66.644	8.936	75.581	42000.4	9.401
4800.	66.833	8.946	75.778	42940.5	9.412
4900.	67.017	8.955	75.972	43881.6	9.423
5000.	67.198	8.965	76.163	44823.8	9.433
5100.	67.375	8.974	76.349	45767.0	9.444
5200.	67.549	8.983	76.532	46711.3	9.454
5300.	67.721	8.992	76.712	47656.5	9.465
5400.	67.889	9.001	76.889	48602.8	9.475
5500.	68.054	9.009	77.063	49550.1	9.485
5600.	68.216	9.018	77.233	50498.4	9.496
5700.	68.375	9.026	77.401	51447.7	9.506
5800.	68.532	9.034	77.566	52398.1	9.516
5900.	68.687	9.042	77.729	53349.4	9.526
6000.	68.839	9.050	77.889	54301.7	9.536
6100.	68.988	9.058	78.046	55254.9	9.546
6200.	69.135	9.066	78.201	56209.2	9.556
6300.	69.280	9.074	78.354	57164.4	9.566
6400.	69.423	9.081	78.504	58120.6	9.576
6500.	69.564	9.089	78.653	59077.8	9.586
6600.	69.702	9.096	78.799	60035.9	9.595
6700.	69.839	9.104	78.943	60994.9	9.605
6800.	69.974	9.111	79.085	61954.9	9.615
6900.	70.107	9.118	79.225	62915.9	9.624
7000.	70.238	9.125	79.363	63877.7	9.633

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.021749
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.090998
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.021735

Table 1-30. Thermodynamic Functions for AlCl (gas)

T °K	$-\frac{(F^\circ-H^\circ_0)}{T}$	$\frac{H^\circ-H^\circ_0}{T}$	S°	$H^\circ-H^\circ_0$	C_p°
50.	34.360	6.951	41.311	347.6	6.957
75.	37.179	6.955	44.134	521.6	6.975
100.	39.181	6.969	46.150	696.9	7.056
125.	40.739	7.000	47.740	875.1	7.209
150.	42.020	7.051	49.071	1057.6	7.400
175.	43.111	7.115	50.226	1245.1	7.595
200.	44.066	7.186	51.252	1437.3	7.777
225.	44.917	7.261	52.178	1633.7	7.937
250.	45.686	7.336	53.021	1833.9	8.074
275.	46.388	7.408	53.796	2037.3	8.191
300.	47.036	7.478	54.513	2243.3	8.291
325.	47.637	7.544	55.181	2451.7	8.375
350.	48.198	7.606	55.804	2662.0	8.447
375.	48.725	7.664	56.389	2873.9	8.508
400.	49.221	7.718	56.940	3087.3	8.562
425.	49.691	7.769	57.460	3301.9	8.608
450.	50.136	7.817	57.953	3517.6	8.648
475.	50.560	7.862	58.422	3734.3	8.683
500.	50.964	7.903	58.868	3951.7	8.714
550.	51.721	7.980	59.701	4388.8	8.766
600.	52.419	8.047	60.466	4828.2	8.809
650.	53.065	8.107	61.172	5269.5	8.844
700.	53.668	8.161	61.829	5712.5	8.873
750.	54.233	8.209	62.442	6156.8	8.899
800.	54.764	8.253	63.017	6602.3	8.921
850.	55.265	8.293	63.558	7048.8	8.940
900.	55.740	8.329	64.069	7496.2	8.958
950.	56.192	8.363	64.554	7944.5	8.973
1000.	56.621	8.393	65.015	8393.5	8.988
1050.	57.031	8.422	65.454	8843.2	9.001
1100.	57.424	8.449	65.872	9293.5	9.014
1150.	57.800	8.473	66.273	9744.5	9.026
1200.	58.161	8.497	66.658	10196.0	9.037
1250.	58.508	8.518	67.027	10648.0	9.047
1300.	58.843	8.539	67.382	11100.6	9.057
1350.	59.165	8.558	67.724	11553.7	9.067
1400.	59.477	8.577	68.053	12007.2	9.077
1450.	59.778	8.594	68.372	12461.2	9.086
1500.	60.070	8.610	68.680	12915.6	9.095
1550.	60.352	8.626	68.978	13370.5	9.103
1600.	60.626	8.641	69.267	13825.8	9.112
1650.	60.892	8.655	69.548	14281.5	9.120
1700.	61.151	8.669	69.820	14737.7	9.128
1750.	61.402	8.682	70.085	15194.2	9.137
1800.	61.647	8.695	70.342	15651.1	9.144
1850.	61.885	8.707	70.593	16108.4	9.152
1900.	62.118	8.719	70.837	16566.1	9.160
1950.	62.344	8.730	71.075	17024.2	9.168
2000.	62.565	8.741	71.307	17482.6	9.175
2050.	62.781	8.752	71.533	17941.4	9.183
2100.	62.992	8.762	71.754	18400.6	9.190
2150.	63.198	8.772	71.971	18860.2	9.198
2200.	63.400	8.782	72.182	19320.1	9.205
2250.	63.597	8.791	72.389	19780.4	9.213
273.15	46.338	7.403	53.741	2022.1	8.183
298.15	46.990	7.473	54.462	2228.0	8.284

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 0.242 cm^{-1}, α_e = 0.002 cm^{-1}, D_e = 0.24 x 10^{-6} cm^{-1},

$\omega_e x_e$ = 1.95 cm^{-1}, ω_e = 481.3 cm^{-1}, and the molecular weight = 62.437.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-30. Thermodynamic Functions for AlCl (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2300.	63.791	8.800	72.591	20241.0	9.220
2350.	63.980	8.809	72.789	20702.0	9.227
2400.	64.165	8.818	72.984	21163.4	9.234
2450.	64.347	8.827	73.174	21625.1	9.242
2500.	64.526	8.835	73.360	22087.1	9.249
2600.	64.872	8.851	73.723	23012.3	9.263
2700.	65.206	8.866	74.073	23938.8	9.277
2800.	65.529	8.881	74.410	24866.7	9.291
2900.	65.841	8.895	74.736	25796.0	9.305
3000.	66.142	8.909	75.051	26726.7	9.319
3100.	66.434	8.922	75.356	27658.7	9.333
3200.	66.718	8.935	75.653	28592.1	9.347
3300.	66.992	8.948	75.940	29526.8	9.361
3400.	67.260	8.960	76.219	30462.8	9.374
3500.	67.519	8.971	76.491	31400.2	9.388
3600.	67.772	8.983	76.755	32338.9	9.402
3700.	68.018	8.994	77.012	33278.9	9.415
3800.	68.258	9.005	77.263	34220.2	9.429
3900.	68.491	9.016	77.508	35162.9	9.442
4000.	68.720	9.027	77.746	36106.8	9.455
4100.	68.942	9.037	77.979	37052.0	9.469
4200.	69.160	9.047	78.207	37998.5	9.482
4300.	69.373	9.057	78.430	38946.3	9.495
4400.	69.581	9.067	78.648	39895.3	9.508
4500.	69.784	9.077	78.861	40845.6	9.521
4600.	69.983	9.086	79.070	41797.1	9.534
4700.	70.179	9.096	79.274	42749.9	9.547
4800.	70.370	9.105	79.475	43704.0	9.559
4900.	70.557	9.114	79.672	44659.2	9.572
5000.	70.741	9.123	79.864	45615.7	9.584
5100.	70.922	9.132	80.054	46573.3	9.597
5200.	71.099	9.141	80.240	47532.2	9.609
5300.	71.273	9.149	80.422	48492.3	9.621
5400.	71.443	9.158	80.601	49453.5	9.633
5500.	71.611	9.167	80.778	50415.9	9.645
5600.	71.776	9.175	80.951	51379.4	9.657
5700.	71.938	9.183	81.121	52344.1	9.669
5800.	72.097	9.191	81.289	53309.9	9.681
5900.	72.254	9.199	81.454	54276.9	9.692
6000.	72.409	9.207	81.616	55244.9	9.703
6100.	72.560	9.215	81.776	56214.0	9.714
6200.	72.710	9.223	81.933	57184.2	9.725
6300.	72.857	9.231	82.088	58155.5	9.736
6400.	73.002	9.239	82.241	59127.8	9.747
6500.	73.145	9.246	82.391	60101.1	9.758
6600.	73.286	9.254	82.540	61075.5	9.768
6700.	73.425	9.261	82.686	62050.8	9.778
6800.	73.561	9.269	82.830	63027.1	9.788
6900.	73.696	9.276	82.972	64004.4	9.798
7000.	73.829	9.283	83.113	64982.7	9.808

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.016016
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.067011
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.016006

Table 1-31. Thermodynamic Functions for F_2 (gas)

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
50.	28.934	6.939	35.874	347.0	6.957
75.	31.749	6.945	38.694	520.9	6.957
100.	33.748	6.948	40.696	694.8	6.959
125.	35.298	6.951	42.249	868.9	6.966
150.	36.566	6.955	43.521	1043.2	6.987
175.	37.639	6.962	44.601	1218.4	7.031
200.	38.569	6.975	45.544	1395.0	7.097
225.	39.392	6.993	46.385	1573.4	7.182
250.	40.130	7.017	47.146	1754.2	7.280
275.	40.800	7.045	47.845	1937.5	7.386
300.	41.414	7.078	48.492	2123.5	7.494
325.	41.982	7.114	49.096	2312.2	7.600
350.	42.511	7.153	49.663	2503.5	7.703
375.	43.005	7.193	50.198	2697.3	7.800
400.	43.471	7.234	50.705	2893.4	7.891
425.	43.911	7.275	51.186	3091.8	7.976
450.	44.328	7.316	51.644	3292.2	8.055
475.	44.724	7.357	52.081	3494.5	8.128
500.	45.103	7.397	52.500	3698.5	8.195
550.	45.811	7.475	53.287	4111.3	8.313
600.	46.465	7.549	54.014	4529.5	8.414
650.	47.072	7.619	54.691	4952.4	8.499
700.	47.639	7.685	55.324	5379.2	8.573
750.	48.171	7.746	55.918	5809.5	8.637
800.	48.673	7.804	56.477	6242.8	8.693
850.	49.148	7.857	57.005	6678.7	8.743
900.	49.598	7.908	57.506	7117.0	8.787
950.	50.027	7.955	57.982	7557.3	8.826
1000.	50.436	7.999	58.436	7999.5	8.862
1050.	50.828	8.041	58.869	8443.4	8.894
1100.	51.203	8.081	59.283	8888.8	8.924
1150.	51.563	8.118	59.681	9335.7	8.952
1200.	51.909	8.153	60.062	9783.9	8.977
1250.	52.242	8.187	60.429	10233.3	9.002
1300.	52.564	8.218	60.782	10683.9	9.024
1350.	52.875	8.249	61.123	11135.6	9.046
1400.	53.175	8.277	61.453	11588.3	9.066
1450.	53.466	8.305	61.771	12042.1	9.085
1500.	53.748	8.331	62.079	12496.7	9.104
1550.	54.022	8.356	62.378	12952.3	9.122
1600.	54.287	8.380	62.668	13408.7	9.139
1650.	54.546	8.404	62.949	13866.0	9.156
1700.	54.797	8.426	63.223	14324.1	9.172
1750.	55.041	8.447	63.489	14783.0	9.188
1800.	55.279	8.468	63.748	15242.7	9.203
1850.	55.512	8.488	64.000	15703.1	9.218
1900.	55.738	8.507	64.246	16164.2	9.233
1950.	55.959	8.526	64.486	16626.1	9.247
2000.	56.175	8.544	64.720	17088.7	9.261
2050.	56.387	8.562	64.948	17552.0	9.275
2100.	56.593	8.579	65.172	18016.0	9.289
2150.	56.795	8.596	65.391	18480.6	9.303
2200.	56.993	8.612	65.604	18945.9	9.316
273.15	40.752	7.043	47.795	1923.8	7.378
298.15	41.370	7.076	48.446	2109.6	7.486

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 0.8901$ cm^{-1}, $\alpha_e = 0.0146$ cm^{-1}, $D_e = 3.34 \times 10^{-6}$ cm^{-1}, $\omega_e x_e = 13.6$ cm^{-1}, $\omega_e = 919.0$ cm^{-1}, and the molecular weight = 38.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-31. Thermodynamic Functions for F_2 (gas) - Continued

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
2250.	57.186	8.628	65.814	19411.9	9.329
2300.	57.376	8.643	66.019	19878.5	9.342
2350.	57.562	8.658	66.220	20345.7	9.355
2400.	57.744	8.672	66.417	20813.6	9.368
2450.	57.923	8.687	66.610	21282.1	9.380
2500.	58.099	8.701	66.799	21751.3	9.393
2600.	58.440	8.727	67.168	22691.4	9.418
2700.	58.770	8.753	67.523	23633.9	9.442
2800.	59.089	8.778	67.867	24578.8	9.466
2900.	59.397	8.802	68.199	25526.1	9.489
3000.	59.696	8.825	68.521	26475.6	9.513
3100.	59.985	8.848	68.833	27427.4	9.535
3200.	60.266	8.869	69.135	28381.5	9.558
3300.	60.539	8.890	69.429	29337.8	9.580
3400.	60.805	8.911	69.715	30296.2	9.602
3500.	61.063	8.931	69.993	31256.8	9.624
3600.	61.315	8.950	70.264	32219.5	9.645
3700.	61.560	8.969	70.529	33184.3	9.666
3800.	61.799	8.987	70.786	34151.2	9.687
3900.	62.032	9.005	71.037	35120.0	9.707
4000.	62.260	9.023	71.283	36090.8	9.727
4100.	62.483	9.040	71.523	37063.6	9.746
4200.	62.701	9.057	71.758	38038.3	9.765
4300.	62.914	9.073	71.987	39014.8	9.784
4400.	63.122	9.089	72.212	39993.1	9.802
4500.	63.326	9.105	72.432	40973.2	9.820
4600.	63.526	9.121	72.647	41955.1	9.837
4700.	63.722	9.136	72.858	42938.6	9.854
4800.	63.915	9.151	73.065	43923.7	9.870
4900.	64.103	9.165	73.268	44910.5	9.886
5000.	64.288	9.180	73.468	45898.7	9.901
5100.	64.470	9.194	73.663	46888.5	9.915
5200.	64.648	9.208	73.856	47879.6	9.929
5300.	64.823	9.221	74.044	48872.1	9.943
5400.	64.995	9.234	74.230	49865.9	9.956
5500.	65.165	9.247	74.412	50861.0	9.968
5600.	65.331	9.260	74.591	51857.2	9.979
5700.	65.495	9.273	74.767	52854.5	9.990
5800.	65.656	9.285	74.941	53852.8	9.999
5900.	65.814	9.297	75.111	54852.1	10.009
6000.	65.970	9.309	75.279	55852.3	10.017
6100.	66.124	9.320	75.444	56853.3	10.024
6200.	66.275	9.331	75.606	57855.0	10.031
6300.	66.424	9.342	75.766	58857.4	10.037
6400.	66.571	9.353	75.924	59860.3	10.042
6500.	66.715	9.364	76.079	60863.7	10.046
6600.	66.858	9.374	76.232	61867.5	10.049
6700.	66.999	9.384	76.382	62871.6	10.051
6800.	67.137	9.394	76.531	63875.9	10.052
6900.	67.274	9.403	76.677	64880.3	10.052
7000.	67.409	9.412	76.821	65884.7	10.051

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.026316
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.11011
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.026299

Table 1-32. Thermodynamic Functions for HF (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	22.528	6.549	29.077	327.5	6.972
75.	25.213	6.688	31.902	501.6	6.964
100.	27.148	6.757	33.905	675.7	6.962
125.	28.660	6.798	35.458	849.7	6.961
150.	29.902	6.825	36.728	1023.8	6.961
175.	30.956	6.845	37.801	1197.8	6.961
200.	31.871	6.859	38.730	1371.9	6.962
225.	32.680	6.871	39.550	1545.9	6.962
250.	33.404	6.880	40.284	1720.0	6.963
275.	34.060	6.887	40.948	1894.0	6.963
300.	34.660	6.894	41.553	2068.1	6.964
325.	35.212	6.899	42.111	2242.3	6.965
350.	35.723	6.904	42.627	2416.4	6.965
375.	36.200	6.908	43.108	2590.5	6.966
400.	36.646	6.912	43.557	2764.7	6.967
425.	37.065	6.915	43.980	2938.9	6.968
450.	37.460	6.918	44.378	3113.1	6.969
475.	37.834	6.921	44.755	3287.3	6.970
500.	38.189	6.923	45.112	3461.6	6.972
550.	38.849	6.928	45.777	3810.3	6.977
600.	39.452	6.932	46.385	4159.4	6.986
650.	40.007	6.937	46.944	4509.0	6.998
700.	40.522	6.942	47.463	4859.2	7.014
750.	41.001	6.947	47.948	5210.5	7.036
800.	41.449	6.954	48.403	5562.9	7.062
850.	41.871	6.961	48.832	5916.7	7.093
900.	42.269	6.969	49.238	6272.2	7.128
950.	42.646	6.978	49.625	6629.6	7.167
1000.	43.004	6.989	49.993	6989.0	7.209
1050.	43.346	7.001	50.346	7350.5	7.254
1100.	43.672	7.013	50.685	7714.4	7.302
1150.	43.984	7.027	51.010	8080.7	7.351
1200.	44.283	7.041	51.324	8449.5	7.401
1250.	44.571	7.057	51.627	8820.8	7.451
1300.	44.848	7.073	51.921	9194.7	7.503
1350.	45.115	7.090	52.205	9571.1	7.554
1400.	45.373	7.107	52.480	9950.0	7.604
1450.	45.623	7.125	52.748	10331.5	7.654
1500.	45.865	7.144	53.008	10715.4	7.703
1550.	46.099	7.162	53.262	11101.8	7.752
1600.	46.327	7.182	53.509	11490.6	7.799
1650.	46.548	7.201	53.749	11881.7	7.845
1700.	46.764	7.221	53.984	12275.1	7.890
1750.	46.973	7.240	54.214	12670.7	7.934
1800.	47.177	7.260	54.438	13068.4	7.976
1850.	47.377	7.280	54.657	13468.3	8.017
1900.	47.571	7.300	54.871	13870.1	8.057
1950.	47.761	7.320	55.081	14274.0	8.096
2000.	47.946	7.340	55.286	14679.7	8.133
2050.	48.128	7.360	55.488	15087.2	8.169
2100.	48.305	7.379	55.685	15496.6	8.204
2150.	48.479	7.399	55.878	15907.6	8.238
2200.	48.650	7.418	56.068	16320.3	8.270
2250.	48.817	7.438	56.254	16734.6	8.302
2300.	48.980	7.457	56.437	17150.4	8.332
273.15	34.014	6.887	40.901	1881.2	6.963
298.15	34.617	6.893	41.510	2055.3	6.964

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 20.9456 \text{ cm}^{-1}$, $\alpha_e = 0.7888 \text{ cm}^{-1}$, $D_e = 0.002131 \times 10^{-6} \text{ cm}^{-1}$,

$\omega_e x_e = 88.726 \text{cm}^{-1}$, $\omega_e = 4137.25 \text{ cm}^{-1}$, and the molecular weight = 20.008.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

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Table 1-32. Thermodynamic Functions for HF (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2350.	49.141	7.476	56.616	17567.8	8.362
2400.	49.298	7.494	56.793	17986.6	8.390
2450.	49.453	7.513	56.966	18406.7	8.417
2500.	49.605	7.531	57.136	18828.3	8.444
2600.	49.901	7.567	57.469	19675.2	8.495
2700.	50.187	7.603	57.790	20527.0	8.542
2800.	50.465	7.637	58.102	21383.4	8.586
2900.	50.733	7.670	58.404	22244.2	8.628
3000.	50.994	7.703	58.697	23108.9	8.667
3100.	51.247	7.735	58.981	23977.5	8.705
3200.	51.493	7.766	59.258	24849.7	8.740
3300.	51.732	7.796	59.528	25725.3	8.773
3400.	51.965	7.825	59.790	26604.1	8.804
3500.	52.193	7.853	60.046	27486.0	8.834
3600.	52.414	7.881	60.295	28370.8	8.863
3700.	52.631	7.908	60.538	29258.3	8.890
3800.	52.842	7.934	60.776	30148.5	8.916
3900.	53.048	7.959	61.007	31041.3	8.940
4000.	53.250	7.984	61.234	31936.4	8.964
4100.	53.447	8.008	61.456	32833.9	8.987
4200.	53.641	8.032	61.672	33733.6	9.009
4300.	53.830	8.055	61.885	34635.4	9.030
4400.	54.015	8.077	62.092	35539.4	9.050
4500.	54.197	8.099	62.296	36445.3	9.070
4600.	54.375	8.120	62.495	37353.1	9.089
4700.	54.550	8.141	62.691	38262.8	9.107
4800.	54.722	8.161	62.883	39174.3	9.125
4900.	54.890	8.181	63.071	40087.5	9.142
5000.	55.056	8.200	63.256	41002.5	9.159
5100.	55.218	8.219	63.438	41919.0	9.175
5200.	55.378	8.238	63.616	42837.2	9.191
5300.	55.535	8.256	63.791	43757.0	9.207
5400.	55.689	8.274	63.963	44678.3	9.222
5500.	55.841	8.291	64.132	45601.0	9.237
5600.	55.991	8.308	64.299	46525.2	9.251
5700.	56.138	8.325	64.463	47450.8	9.265
5800.	56.283	8.341	64.624	48377.8	9.279
5900.	56.426	8.357	64.783	49306.2	9.292
6000.	56.566	8.373	64.939	50235.9	9.306
6100.	56.705	8.388	65.093	51166.9	9.318
6200.	56.841	8.403	65.244	52099.1	9.331
6300.	56.976	8.418	65.394	53032.6	9.344
6400.	57.108	8.432	65.541	53967.3	9.356
6500.	57.239	8.447	65.686	54903.3	9.368
6600.	57.368	8.461	65.829	55840.4	9.380
6700.	57.495	8.474	65.970	56778.7	9.391
6800.	57.621	8.488	66.109	57718.1	9.403
6900.	57.745	8.501	66.246	58658.6	9.414
7000.	57.867	8.514	66.382	59600.3	9.425

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.049980
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.20912
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.049947

Table 1-33. Thermodynamic Functions for Cl_2 (gas)

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
50.	33.373	6.951	40.325	347.6	6.956
75.	36.192	6.954	43.146	521.5	6.962
100.	38.193	6.960	45.153	696.0	7.001
125.	39.748	6.977	46.724	872.1	7.097
150.	41.022	7.008	48.031	1051.2	7.241
175.	42.106	7.053	49.159	1234.3	7.407
200.	43.051	7.108	50.159	1421.6	7.576
225.	43.892	7.169	51.061	1613.0	7.736
250.	44.651	7.233	51.884	1808.3	7.881
275.	45.343	7.298	52.641	2006.9	8.008
300.	45.981	7.362	53.343	2208.6	8.120
325.	46.573	7.424	53.997	2412.8	8.217
350.	47.125	7.484	54.609	2619.3	8.302
375.	47.643	7.541	55.184	2827.8	8.375
400.	48.132	7.595	55.727	3038.0	8.439
425.	48.594	7.646	56.240	3249.7	8.495
450.	49.032	7.695	56.727	3462.7	8.544
475.	49.449	7.741	57.190	3676.9	8.588
500.	49.847	7.784	57.632	3892.0	8.627
550.	50.593	7.864	58.457	4325.1	8.692
600.	51.281	7.935	59.216	4761.1	8.746
650.	51.918	7.999	59.917	5199.5	8.790
700.	52.513	8.057	60.570	5639.9	8.827
750.	53.071	8.109	61.180	6082.1	8.859
800.	53.596	8.157	61.753	6525.7	8.886
850.	54.092	8.201	62.292	6970.6	8.910
900.	54.562	8.241	62.802	7416.7	8.932
950.	55.008	8.278	63.286	7863.7	8.951
1000.	55.434	8.312	63.745	8311.7	8.969
1050.	55.840	8.343	64.183	8760.6	8.985
1100.	56.229	8.373	64.602	9210.2	9.001
1150.	56.601	8.401	65.002	9660.6	9.015
1200.	56.959	8.426	65.386	10111.6	9.028
1250.	57.304	8.451	65.755	10563.3	9.041
1300.	57.636	8.474	66.109	11015.7	9.053
1350.	57.956	8.495	66.451	11468.6	9.064
1400.	58.265	8.516	66.781	11922.0	9.076
1450.	58.564	8.535	67.100	12376.1	9.086
1500.	58.854	8.554	67.408	12830.6	9.097
1550.	59.135	8.571	67.706	13285.7	9.107
1600.	59.407	8.588	67.995	13741.2	9.117
1650.	59.672	8.604	68.276	14197.3	9.127
1700.	59.929	8.620	68.549	14653.8	9.136
1750.	60.179	8.635	68.814	15110.8	9.146
1800.	60.422	8.649	69.071	15568.3	9.155
1850.	60.659	8.663	69.322	16026.2	9.164
1900.	60.891	8.676	69.567	16484.5	9.173
1950.	61.116	8.689	69.805	16943.3	9.182
2000.	61.336	8.701	70.037	17402.6	9.191
2050.	61.551	8.713	70.264	17862.3	9.199
2100.	61.761	8.725	70.486	18322.4	9.208
2150.	61.967	8.736	70.703	18782.9	9.217
2200.	62.168	8.747	70.915	19243.9	9.225
2250.	62.364	8.758	71.122	19705.3	9.234
273.15	45.294	7.293	52.587	1992.1	7.999
298.15	45.935	7.357	53.292	2193.5	8.112

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 0.2404$ cm^{-1}, $\alpha_e = 0.00166$ cm^{-1}, $D_e = 0.1766 \times 10^{-6}$ cm^{-1},

$\omega_e x_e = 3.94$ cm^{-1}, $\omega_e = 561.0$ cm^{-1}, and the molecular weight = 70.914.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-33. Thermodynamic Functions for Cl_2 (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2300.	62.557	8.768	71.325	20167.1	9.242
2350.	62.745	8.778	71.524	20629.3	9.250
2400.	62.930	8.788	71.719	21091.9	9.259
2450.	63.112	8.798	71.909	21555.0	9.267
2500.	63.289	8.807	72.097	22018.4	9.275
2600.	63.635	8.826	72.461	22946.6	9.292
2700.	63.968	8.843	72.811	23876.3	9.308
2800.	64.290	8.860	73.150	24807.7	9.324
2900.	64.601	8.876	73.477	25740.7	9.341
3000.	64.902	8.892	73.794	26675.2	9.357
3100.	65.194	8.907	74.101	27611.4	9.373
3200.	65.477	8.922	74.399	28549.2	9.389
3300.	65.752	8.936	74.687	29488.5	9.405
3400.	66.018	8.950	74.968	30429.4	9.420
3500.	66.278	8.963	75.241	31371.8	9.436
3600.	66.530	8.977	75.507	32315.8	9.452
3700.	66.776	8.990	75.766	33261.3	9.467
3800.	67.016	9.002	76.018	34208.4	9.483
3900.	67.250	9.015	76.265	35157.0	9.498
4000.	67.478	9.027	76.505	36107.1	9.514
4100.	67.701	9.039	76.740	37058.7	9.529
4200.	67.919	9.050	76.969	38011.9	9.544
4300.	68.132	9.062	77.194	38966.5	9.559
4400.	68.340	9.073	77.414	39922.6	9.574
4500.	68.544	9.084	77.629	40880.1	9.589
4600.	68.744	9.095	77.839	41839.1	9.603
4700.	68.939	9.106	78.046	42799.6	9.618
4800.	69.131	9.117	78.248	43761.5	9.632
4900.	69.319	9.128	78.446	44724.8	9.647
5000.	69.503	9.138	78.641	45689.5	9.661
5100.	69.684	9.148	78.832	46655.6	9.675
5200.	69.862	9.158	79.020	47623.0	9.688
5300.	70.036	9.168	79.204	48591.8	9.702
5400.	70.207	9.178	79.386	49562.0	9.715
5500.	70.376	9.188	79.564	50533.4	9.729
5600.	70.541	9.198	79.739	51506.2	9.742
5700.	70.704	9.207	79.911	52480.2	9.755
5800.	70.864	9.216	80.080	53455.5	9.767
5900.	71.021	9.226	80.247	54432.0	9.780
6000.	71.176	9.235	80.411	55409.8	9.792
6100.	71.329	9.244	80.573	56388.7	9.804
6200.	71.479	9.253	80.732	57368.8	9.815
6300.	71.627	9.262	80.889	58350.0	9.827
6400.	71.773	9.271	81.043	59332.4	9.838
6500.	71.916	9.279	81.195	60315.8	9.849
6600.	72.058	9.288	81.346	61300.3	9.859
6700.	72.197	9.296	81.494	62285.9	9.869
6800.	72.335	9.305	81.640	63272.4	9.879
6900.	72.470	9.313	81.783	64259.9	9.889
7000.	72.604	9.321	81.925	65248.4	9.898

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.014102
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.059003
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.014093

Table 1-34. Thermodynamic Functions for HCl (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	25.465	6.753	32.218	337.7	6.961
75.	28.218	6.822	35.040	511.7	6.959
100.	30.185	6.856	37.042	685.6	6.959
125.	31.718	6.877	38.595	859.6	6.959
150.	32.973	6.891	39.863	1033.6	6.960
175.	34.036	6.901	40.936	1207.6	6.960
200.	34.958	6.908	41.866	1381.6	6.961
225.	35.772	6.914	42.686	1555.7	6.962
250.	36.500	6.919	43.419	1729.7	6.962
275.	37.160	6.923	44.083	1903.8	6.963
300.	37.763	6.926	44.689	2077.8	6.964
325.	38.317	6.929	45.246	2252.0	6.965
350.	38.831	6.932	45.762	2426.1	6.967
375.	39.309	6.934	46.243	2600.3	6.969
400.	39.757	6.936	46.693	2774.6	6.973
425.	40.177	6.939	47.116	2949.0	6.978
450.	40.574	6.941	47.515	3123.5	6.985
475.	40.949	6.944	47.893	3298.2	6.993
500.	41.305	6.946	48.252	3473.2	7.004
550.	41.968	6.953	48.921	3824.0	7.032
600.	42.573	6.961	49.534	4176.5	7.068
650.	43.131	6.971	50.101	4531.0	7.114
700.	43.648	6.983	50.630	4888.0	7.166
750.	44.130	6.997	51.127	5247.7	7.225
800.	44.582	7.013	51.595	5610.5	7.288
850.	45.008	7.031	52.039	5976.6	7.354
900.	45.410	7.051	52.461	6346.0	7.422
950.	45.792	7.072	52.864	6718.9	7.491
1000.	46.155	7.095	53.250	7095.1	7.560
1050.	46.502	7.119	53.621	7474.8	7.627
1100.	46.834	7.143	53.977	7857.8	7.693
1150.	47.152	7.169	54.321	8244.1	7.758
1200.	47.457	7.195	54.652	8633.5	7.820
1250.	47.752	7.221	54.973	9026.0	7.880
1300.	48.035	7.247	55.283	9421.5	7.937
1350.	48.309	7.274	55.583	9819.7	7.992
1400.	48.574	7.300	55.875	10220.6	8.045
1450.	48.831	7.327	56.158	10624.2	8.095
1500.	49.080	7.353	56.433	11030.1	8.143
1550.	49.321	7.380	56.701	11438.4	8.189
1600.	49.556	7.406	56.962	11848.9	8.232
1650.	49.784	7.431	57.216	12261.6	8.274
1700.	50.007	7.457	57.463	12676.3	8.313
1750.	50.223	7.482	57.705	13092.9	8.351
1800.	50.434	7.506	57.941	13511.3	8.387
1850.	50.640	7.531	58.171	13931.5	8.421
1900.	50.841	7.554	58.396	14353.4	8.454
1950.	51.038	7.578	58.616	14776.8	8.485
2000.	51.230	7.601	58.831	15201.8	8.515
2050.	51.418	7.624	59.042	15628.2	8.543
2100.	51.602	7.646	59.248	16056.0	8.570
2150.	51.782	7.668	59.450	16485.2	8.596
2200.	51.959	7.689	59.648	16915.6	8.621
2250.	52.132	7.710	59.842	17347.2	8.645
2300.	52.301	7.730	60.032	17780.0	8.668
273.15	37.113	6.923	44.036	1890.9	6.963
298.15	37.720	6.926	44.646	2065.0	6.964

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 10.5896 \text{ cm}^{-1}$, $\alpha_e = 0.2993 \text{ cm}^{-1}$, $D_e = 0.0533 \times 10^{-6} \text{ cm}^{-1}$,

$\omega_e x_e = 52.24 \text{ cm}^{-1}$, $\omega_e = 2989.99 \text{ cm}^{-1}$, and the molecular weight = 36.465 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-34. Thermodynamic Functions for HCl (gas) - Continued

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
2350.	52.468	7.751	60.218	18214.0	8.690
2400.	52.631	7.770	60.402	18649.0	8.711
2450.	52.792	7.790	60.581	19085.0	8.732
2500.	52.949	7.809	60.758	19522.1	8.752
2600.	53.256	7.846	61.102	20399.0	8.789
2700.	53.553	7.881	61.434	21279.6	8.824
2800.	53.840	7.916	61.756	22163.5	8.856
2900.	54.118	7.948	62.067	23050.5	8.887
3000.	54.388	7.980	62.369	23940.5	8.915
3100.	54.651	8.011	62.661	24833.3	8.942
3200.	54.905	8.040	62.946	25728.7	8.968
3300.	55.153	8.069	63.222	26626.6	8.993
3400.	55.394	8.096	63.491	27526.9	9.016
3500.	55.629	8.123	63.752	28429.4	9.038
3600.	55.859	8.148	64.007	29334.1	9.059
3700.	56.082	8.173	64.255	30240.9	9.080
3800.	56.300	8.197	64.498	31149.6	9.100
3900.	56.514	8.221	64.734	32060.3	9.119
4000.	56.722	8.243	64.965	32972.8	9.137
4100.	56.926	8.265	65.191	33887.1	9.155
4200.	57.125	8.286	65.411	34803.2	9.172
4300.	57.320	8.307	65.627	35720.9	9.188
4400.	57.511	8.327	65.839	36640.2	9.205
4500.	57.699	8.347	66.046	37561.2	9.220
4600.	57.882	8.366	66.248	38483.6	9.236
4700.	58.062	8.385	66.447	39407.6	9.251
4800.	58.239	8.403	66.642	40333.0	9.265
4900.	58.412	8.420	66.833	41259.9	9.280
5000.	58.582	8.438	67.020	42188.1	9.294
5100.	58.750	8.454	67.204	43117.8	9.307
5200.	58.914	8.471	67.385	44048.8	9.321
5300.	59.075	8.487	67.562	44981.1	9.334
5400.	59.234	8.503	67.737	45914.6	9.347
5500.	59.390	8.518	67.908	46849.5	9.360
5600.	59.544	8.533	68.077	47785.6	9.373
5700.	59.695	8.548	68.243	48723.0	9.385
5800.	59.843	8.562	68.406	49661.5	9.397
5900.	59.990	8.576	68.566	50601.3	9.409
6000.	60.134	8.590	68.724	51542.2	9.421
6100.	60.276	8.604	68.880	52484.2	9.433
6200.	60.416	8.617	69.033	53427.5	9.444
6300.	60.554	8.630	69.184	54371.8	9.455
6400.	60.690	8.643	69.333	55317.2	9.467
6500.	60.824	8.656	69.480	56263.8	9.478
6600.	60.956	8.668	69.624	57211.4	9.489
6700.	61.086	8.681	69.767	58160.1	9.499
6800.	61.215	8.693	69.907	59109.8	9.510
6900.	61.342	8.704	70.046	60060.6	9.521
7000.	61.467	8.716	70.183	61012.4	9.531

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.027424
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.11474
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.027406

Table 1-35. Thermodynamic Functions for ClO (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	34.597	6.944	41.541	347.2	6.957
75.	37.414	6.948	44.362	521.1	6.958
100.	39.413	6.951	46.364	695.1	6.960
125.	40.964	6.953	47.918	869.2	6.970
150.	42.232	6.958	49.191	1043.7	6.997
175.	43.306	6.967	50.273	1219.3	7.050
200.	44.237	6.982	51.219	1396.4	7.126
225.	45.060	7.003	52.064	1575.7	7.220
250.	45.800	7.030	52.830	1757.5	7.326
275.	46.471	7.062	53.533	1942.0	7.437
300.	47.087	7.098	54.185	2129.4	7.548
325.	47.657	7.137	54.793	2319.4	7.656
350.	48.187	7.177	55.365	2512.1	7.759
375.	48.684	7.219	55.903	2707.3	7.854
400.	49.151	7.262	56.413	2904.8	7.943
425.	49.593	7.305	56.897	3104.4	8.025
450.	50.011	7.347	57.358	3306.0	8.101
475.	50.410	7.388	57.798	3509.4	8.169
500.	50.790	7.429	58.218	3714.4	8.232
550.	51.501	7.507	59.008	4128.9	8.343
600.	52.158	7.581	59.738	4548.4	8.435
650.	52.767	7.649	60.417	4972.1	8.513
700.	53.337	7.714	61.050	5399.5	8.579
750.	53.871	7.773	61.644	5829.9	8.636
800.	54.374	7.829	62.203	6263.0	8.686
850.	54.850	7.880	62.731	6698.4	8.729
900.	55.302	7.929	63.231	7135.8	8.767
950.	55.732	7.974	63.706	7574.9	8.800
1000.	56.142	8.016	64.158	8015.7	8.830
1050.	56.534	8.055	64.589	8457.9	8.858
1100.	56.910	8.092	65.002	8901.4	8.882
1150.	57.270	8.127	65.397	9346.1	8.905
1200.	57.617	8.160	65.777	9791.8	8.926
1250.	57.951	8.191	66.141	10238.5	8.945
1300.	58.272	8.220	66.493	10686.2	8.963
1350.	58.583	8.248	66.831	11134.7	8.979
1400.	58.884	8.274	67.158	11584.1	8.995
1450.	59.174	8.299	67.474	12034.2	9.010
1500.	59.456	8.323	67.779	12485.0	9.024
1550.	59.729	8.346	68.075	12936.5	9.038
1600.	59.995	8.368	68.363	13388.7	9.051
1650.	60.252	8.389	68.641	13841.5	9.063
1700.	60.503	8.409	68.912	14294.9	9.075
1750.	60.747	8.428	69.175	14748.9	9.086
1800.	60.985	8.446	69.431	15203.4	9.097
1850.	61.216	8.464	69.680	15658.5	9.108
1900.	61.442	8.481	69.923	16114.1	9.119
1950.	61.663	8.498	70.160	16570.3	9.129
2000.	61.878	8.513	70.392	17026.9	9.139
2050.	62.089	8.529	70.617	17484.0	9.149
2100.	62.294	8.544	70.838	17941.6	9.158
2150.	62.495	8.558	71.053	18399.7	9.168
2200.	62.692	8.572	71.264	18858.3	9.177
2250.	62.885	8.585	71.470	19317.3	9.186
2300.	63.074	8.599	71.672	19776.7	9.195
273.15	46.423	7.059	53.483	1928.3	7.429
298.15	47.043	7.095	54.138	2115.4	7.540

This table has been computed for the ground state of the molecule, which is taken as $^2\Pi$, using the following molecular constants:

B_e = 0.646 cm^{-1}, α_e = 0.007 cm^{-1}, D_e = 2.2 x 10^{-6} cm^{-1},

$\omega_e x_e$ = 7.5 cm^{-1}, ω_e = 868.0 cm^{-1}, and the molecular weight = 51.457 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-35. Thermodynamic Functions for ClO (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2350.	63.259	8.611	71.870	20236.6	9.204
2400.	63.440	8.624	72.064	20696.9	9.212
2450.	63.618	8.636	72.254	21157.6	9.221
2500.	63.793	8.648	72.440	21618.8	9.230
2600.	64.132	8.670	72.802	22542.4	9.246
2700.	64.460	8.692	73.151	23467.6	9.263
2800.	64.776	8.712	73.488	24394.4	9.279
2900.	65.082	8.732	73.814	25322.8	9.295
3000.	65.378	8.751	74.129	26252.7	9.310
3100.	65.665	8.769	74.435	27184.2	9.326
3200.	65.944	8.787	74.731	28117.2	9.341
3300.	66.215	8.804	75.018	29051.7	9.356
3400.	66.477	8.820	75.297	29987.6	9.371
3500.	66.733	8.836	75.569	30925.1	9.386
3600.	66.982	8.851	75.833	31864.0	9.400
3700.	67.225	8.866	76.091	32804.3	9.415
3800.	67.461	8.881	76.342	33746.0	9.429
3900.	67.692	8.895	76.587	34689.2	9.443
4000.	67.917	8.908	76.826	35633.7	9.457
4100.	68.137	8.922	77.059	36579.6	9.471
4200.	68.352	8.935	77.287	37526.9	9.485
4300.	68.563	8.948	77.510	38475.6	9.499
4400.	68.768	8.960	77.729	39425.6	9.513
4500.	68.970	8.973	77.942	40377.0	9.526
4600.	69.167	8.985	78.151	41329.6	9.540
4700.	69.360	8.997	78.356	42283.6	9.553
4800.	69.549	9.008	78.557	43238.9	9.566
4900.	69.735	9.019	78.754	44195.5	9.579
5000.	69.917	9.031	78.948	45153.3	9.592
5100.	70.096	9.042	79.138	46112.4	9.605
5200.	70.271	9.052	79.324	47072.7	9.617
5300.	70.444	9.063	79.507	48034.3	9.630
5400.	70.613	9.074	79.687	48997.1	9.642
5500.	70.779	9.084	79.863	49961.1	9.654
5600.	70.943	9.094	80.037	50926.3	9.666
5700.	71.104	9.104	80.208	51892.6	9.678
5800.	71.262	9.114	80.376	52860.1	9.690
5900.	71.418	9.124	80.541	53828.8	9.701
6000.	71.571	9.133	80.704	54798.6	9.712
6100.	71.722	9.143	80.864	55769.4	9.724
6200.	71.870	9.152	81.022	56741.4	9.734
6300.	72.017	9.161	81.178	57714.4	9.745
6400.	72.161	9.170	81.331	58688.5	9.756
6500.	72.303	9.179	81.482	59663.6	9.766
6600.	72.443	9.188	81.631	60639.8	9.776
6700.	72.581	9.197	81.777	61616.9	9.786
6800.	72.717	9.205	81.922	62595.0	9.796
6900.	72.851	9.214	82.065	63574.0	9.806
7000.	72.984	9.222	82.206	64554.0	9.815

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.019434
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.081312
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.019421

Table 1-36. Thermodynamic Functions for ClF (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	32.460	6.946	39.406	347.3	6.956
75.	35.277	6.950	42.227	521.2	6.957
100.	37.277	6.952	44.229	695.2	6.961
125.	38.829	6.955	45.784	869.4	6.980
150.	40.097	6.963	47.060	1044.4	7.025
175.	41.171	6.977	48.148	1220.9	7.101
200.	42.104	6.998	49.102	1399.6	7.201
225.	42.930	7.027	49.957	1581.1	7.316
250.	43.672	7.062	50.734	1765.5	7.438
275.	44.347	7.102	51.449	1952.9	7.560
300.	44.967	7.145	52.112	2143.4	7.677
325.	45.541	7.190	52.731	2336.7	7.787
350.	46.075	7.236	53.311	2532.7	7.889
375.	46.576	7.283	53.859	2731.1	7.982
400.	47.047	7.329	54.377	2931.7	8.067
425.	47.493	7.375	54.868	3134.4	8.145
450.	47.916	7.420	55.336	3338.9	8.214
475.	48.318	7.463	55.782	3545.1	8.277
500.	48.702	7.505	56.208	3752.7	8.335
550.	49.421	7.585	57.007	4172.0	8.433
600.	50.085	7.660	57.744	4595.8	8.515
650.	50.700	7.728	58.429	5023.3	8.584
700.	51.276	7.791	59.067	5453.9	8.641
750.	51.815	7.850	59.665	5887.3	8.690
800.	52.323	7.904	60.227	6322.9	8.733
850.	52.804	7.953	60.758	6760.4	8.770
900.	53.260	8.000	61.260	7199.7	8.802
950.	53.694	8.043	61.736	7640.5	8.831
1000.	54.107	8.083	62.190	8082.7	8.856
1050.	54.503	8.120	62.623	8526.1	8.879
1100.	54.881	8.155	63.036	8970.6	8.900
1150.	55.244	8.188	63.432	9416.1	8.920
1200.	55.593	8.219	63.812	9862.5	8.937
1250.	55.930	8.248	64.177	10309.7	8.954
1300.	56.254	8.275	64.529	10757.8	8.969
1350.	56.566	8.301	64.867	11206.6	8.983
1400.	56.869	8.326	65.194	11656.1	8.997
1450.	57.161	8.349	65.510	12106.2	9.010
1500.	57.445	8.371	65.816	12557.0	9.022
1550.	57.719	8.392	66.112	13008.3	9.034
1600.	57.986	8.413	66.399	13460.3	9.045
1650.	58.245	8.432	66.677	13912.7	9.055
1700.	58.497	8.450	66.948	14365.7	9.066
1750.	58.743	8.468	67.211	14819.2	9.076
1800.	58.981	8.485	67.466	15273.2	9.085
1850.	59.214	8.501	67.715	15727.7	9.095
1900.	59.441	8.517	67.958	16182.6	9.104
1950.	59.662	8.532	68.195	16638.0	9.113
2000.	59.878	8.547	68.425	17093.8	9.122
2050.	60.090	8.561	68.651	17550.1	9.131
2100.	60.296	8.575	68.871	18006.8	9.139
2150.	60.498	8.588	69.086	18463.9	9.147
2200.	60.696	8.601	69.296	18921.4	9.156
2250.	60.889	8.613	69.502	19379.3	9.164
273.15	44.299	7.099	51.398	1939.0	7.551
298.15	44.923	7.141	52.064	2129.2	7.668

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 0.514012 cm^{-1}, α_e = 0.0043272 cm^{-1}, D_e = 0.869 x 10^{-6} cm^{-1},

$\omega_e x_e$ = 6.20 cm^{-1}, ω_e = 784.43 cm^{-1}, and the molecular weight = 54.457.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-36. Thermodynamic Functions for ClF (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2300.	61.078	8.625	69.703	19837.6	9.172
2350.	61.264	8.637	69.901	20296.3	9.180
2400.	61.446	8.648	70.094	20755.4	9.187
2450.	61.624	8.659	70.283	21214.9	9.195
2500.	61.799	8.670	70.469	21674.8	9.203
2600.	62.140	8.691	70.830	22595.7	9.218
2700.	62.468	8.710	71.178	23518.0	9.233
2800.	62.785	8.729	71.514	24441.8	9.247
2900.	63.092	8.747	71.839	25367.0	9.262
3000.	63.388	8.765	72.153	26293.7	9.276
3100.	63.676	8.781	72.457	27221.8	9.290
3200.	63.955	8.797	72.752	28151.2	9.304
3300.	64.226	8.813	73.038	29082.1	9.318
3400.	64.489	8.828	73.317	30014.3	9.332
3500.	64.745	8.842	73.587	30947.9	9.346
3600.	64.994	8.856	73.851	31882.9	9.359
3700.	65.237	8.870	74.107	32819.2	9.373
3800.	65.474	8.883	74.357	33756.8	9.387
3900.	65.704	8.896	74.601	34695.8	9.400
4000.	65.930	8.909	74.839	35636.1	9.413
4100.	66.150	8.921	75.071	36577.7	9.427
4200.	66.365	8.933	75.298	37520.6	9.440
4300.	66.575	8.945	75.520	38464.8	9.453
4400.	66.781	8.957	75.737	39410.3	9.466
4500.	66.982	8.968	75.950	40357.1	9.479
4600.	67.179	8.979	76.158	41305.2	9.492
4700.	67.372	8.990	76.362	42254.5	9.505
4800.	67.561	9.001	76.562	43205.2	9.518
4900.	67.747	9.012	76.759	44157.0	9.530
5000.	67.929	9.022	76.951	45110.2	9.543
5100.	68.108	9.032	77.140	46064.5	9.556
5200.	68.283	9.042	77.325	47020.1	9.568
5300.	68.455	9.052	77.507	47976.9	9.580
5400.	68.624	9.062	77.686	48935.0	9.593
5500.	68.791	9.072	77.862	49894.2	9.605
5600.	68.954	9.081	78.035	50854.6	9.617
5700.	69.115	9.091	78.205	51816.3	9.629
5800.	69.273	9.100	78.372	52779.0	9.641
5900.	69.428	9.109	78.537	53743.0	9.652
6000.	69.581	9.118	78.699	54708.1	9.664
6100.	69.732	9.127	78.859	55674.3	9.676
6200.	69.880	9.136	79.016	56641.7	9.687
6300.	70.026	9.144	79.171	57610.2	9.698
6400.	70.170	9.153	79.323	58579.8	9.709
6500.	70.312	9.162	79.474	59550.5	9.720
6600.	70.452	9.170	79.622	60522.2	9.731
6700.	70.589	9.178	79.768	61495.0	9.742
6800.	70.725	9.187	79.912	62468.9	9.752
6900.	70.859	9.195	80.054	63443.8	9.763
7000.	70.992	9.203	80.194	64419.7	9.773

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.018363
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.076831
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.018351

Table 1-37. Thermodynamic Functions for B_2 (gas)

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
50.	28.793	6.933	35.726	346.6	6.957
75.	31.606	6.941	38.546	520.6	6.957
100.	33.603	6.945	40.548	694.5	6.958
125.	35.153	6.948	42.101	868.5	6.960
150.	36.420	6.950	43.370	1042.6	6.968
175.	37.492	6.954	44.446	1217.0	6.988
200.	38.421	6.960	45.381	1392.1	7.023
225.	39.241	6.970	46.211	1568.3	7.075
250.	39.976	6.984	46.960	1746.0	7.143
275.	40.643	7.002	47.644	1925.5	7.221
300.	41.253	7.024	48.276	2107.1	7.308
325.	41.816	7.049	48.865	2290.9	7.398
350.	42.339	7.077	49.417	2477.0	7.490
375.	42.829	7.108	49.936	2665.4	7.580
400.	43.288	7.140	50.428	2856.0	7.668
425.	43.722	7.174	50.896	3048.8	7.752
450.	44.133	7.208	51.341	3243.6	7.831
475.	44.524	7.243	51.767	3440.3	7.906
500.	44.896	7.278	52.174	3638.9	7.977
550.	45.593	7.347	52.940	4040.9	8.103
600.	46.235	7.415	53.650	4448.9	8.213
650.	46.831	7.480	54.311	4862.0	8.308
700.	47.388	7.542	54.930	5279.5	8.390
750.	47.910	7.601	55.511	5700.8	8.461
800.	48.403	7.657	56.060	6125.4	8.523
850.	48.869	7.709	56.578	6553.0	8.578
900.	49.311	7.759	57.070	6983.1	8.626
950.	49.731	7.806	57.537	7415.4	8.668
1000.	50.133	7.850	57.983	7849.8	8.706
1050.	50.517	7.891	58.408	8286.0	8.741
1100.	50.885	7.931	58.816	8723.8	8.771
1150.	51.238	7.968	59.206	9163.1	8.799
1200.	51.578	8.003	59.581	9603.7	8.825
1250.	51.905	8.036	59.942	10045.5	8.849
1300.	52.221	8.068	60.289	10488.5	8.870
1350.	52.526	8.098	60.624	10932.5	8.890
1400.	52.821	8.127	60.948	11377.4	8.909
1450.	53.107	8.154	61.261	11823.3	8.926
1500.	53.384	8.180	61.564	12270.0	8.943
1550.	53.652	8.205	61.857	12717.5	8.958
1600.	53.913	8.229	62.142	13165.8	8.973
1650.	54.167	8.251	62.418	13614.7	8.987
1700.	54.414	8.273	62.687	14064.3	9.000
1750.	54.654	8.294	62.948	14514.6	9.012
1800.	54.888	8.314	63.202	14965.5	9.025
1850.	55.116	8.334	63.449	15417.0	9.036
1900.	55.338	8.352	63.690	15869.0	9.047
1950.	55.555	8.370	63.925	16321.6	9.058
2000.	55.767	8.387	64.155	16774.8	9.069
2050.	55.975	8.404	64.379	17228.4	9.079
2100.	56.177	8.420	64.598	17682.5	9.088
2150.	56.376	8.436	64.811	18137.1	9.098
2200.	56.570	8.451	65.021	18592.2	9.107
2250.	56.760	8.466	65.225	19047.7	9.116
2300.	56.946	8.480	65.426	19503.7	9.125
273.15	40.595	7.000	47.596	1912.2	7.215
298.15	41.209	7.022	48.231	2093.6	7.301

This table has been computed for the ground state of the molecule, which is taken as $^3\Sigma$, using the following molecular constants:

B_e = 1.2330 cm^{-1}, α_e = 0.0140 cm^{-1}, D_e = 6.620×10^{-6} cm^{-1},

$\omega_e x_e$ = 9.56 cm^{-1}, ω_e = 1060.5 cm^{-1}, and the molecular weight = 21.64 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-37. Thermodynamic Functions for B_2 (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2350.	57.128	8.494	65.622	19960.1	9.134
2400.	57.307	8.507	65.814	20417.0	9.143
2450.	57.483	8.520	66.003	20874.2	9.151
2500.	57.655	8.533	66.188	21331.9	9.159
2600.	57.990	8.557	66.547	22248.5	9.175
2700.	58.314	8.580	66.894	23166.6	9.191
2800.	58.626	8.602	67.228	24086.3	9.206
2900.	58.928	8.623	67.551	25007.5	9.221
3000.	59.221	8.643	67.864	25930.1	9.236
3100.	59.504	8.663	68.167	26854.1	9.250
3200.	59.780	8.681	68.461	27779.6	9.264
3300.	60.047	8.699	68.746	28706.4	9.278
3400.	60.307	8.716	69.023	29634.6	9.292
3500.	60.560	8.733	69.292	30564.2	9.305
3600.	60.806	8.749	69.554	31495.0	9.318
3700.	61.046	8.764	69.810	32427.2	9.332
3800.	61.279	8.779	70.059	33360.7	9.345
3900.	61.508	8.794	70.301	34295.4	9.358
4000.	61.730	8.808	70.538	35231.4	9.370
4100.	61.948	8.822	70.769	36168.7	9.383
4200.	62.160	8.835	70.995	37107.3	9.396
4300.	62.368	8.848	71.217	38047.0	9.408
4400.	62.572	8.861	71.433	38988.0	9.421
4500.	62.771	8.873	71.644	39930.2	9.433
4600.	62.966	8.886	71.852	40873.7	9.445
4700.	63.157	8.898	72.055	41818.3	9.457
4800.	63.344	8.909	72.254	42764.1	9.469
4900.	63.528	8.921	72.449	43711.1	9.481
5000.	63.708	8.932	72.640	44659.3	9.493
5100.	63.885	8.943	72.828	45608.6	9.505
5200.	64.059	8.954	73.012	46559.1	9.517
5300.	64.229	8.964	73.194	47510.7	9.528
5400.	64.397	8.975	73.372	48463.5	9.540
5500.	64.561	8.985	73.546	49417.4	9.551
5600.	64.723	8.995	73.718	50372.4	9.562
5700.	64.882	9.005	73.888	51328.5	9.574
5800.	65.039	9.015	74.054	52285.8	9.585
5900.	65.193	9.024	74.217	53244.1	9.596
6000.	65.345	9.034	74.379	54203.5	9.607
6100.	65.494	9.043	74.537	55163.9	9.618
6200.	65.641	9.052	74.693	56125.4	9.628
6300.	65.786	9.062	74.847	57088.0	9.639
6400.	65.928	9.071	74.999	58051.6	9.649
6500.	66.069	9.079	75.148	59016.2	9.660
6600.	66.207	9.088	75.295	59981.9	9.670
6700.	66.344	9.097	75.441	60948.5	9.680
6800.	66.479	9.105	75.584	61916.2	9.690
6900.	66.611	9.114	75.725	62884.8	9.700
7000.	66.742	9.122	75.864	63854.4	9.710

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.046211
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.19335
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.046181

Table 1-38. Thermodynamic Functions for BO (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	29.262	6.921	36.184	346.1	6.956
75.	32.071	6.933	39.004	520.0	6.956
100.	34.067	6.939	41.006	693.9	6.957
125.	35.615	6.942	42.558	867.8	6.957
150.	36.881	6.945	43.826	1041.7	6.957
175.	37.952	6.947	44.899	1215.7	6.957
200.	38.880	6.948	45.828	1389.6	6.958
225.	39.698	6.949	46.647	1563.6	6.960
250.	40.430	6.950	47.381	1737.6	6.963
275.	41.093	6.952	48.045	1911.8	6.969
300.	41.698	6.954	48.652	2086.1	6.979
325.	42.255	6.956	49.211	2260.8	6.994
350.	42.770	6.960	49.730	2435.8	7.013
375.	43.251	6.964	50.214	2611.5	7.038
400.	43.700	6.969	50.670	2787.8	7.069
425.	44.123	6.976	51.099	2964.9	7.103
450.	44.522	6.984	51.506	3143.0	7.142
475.	44.900	6.994	51.894	3322.1	7.185
500.	45.259	7.005	52.263	3502.3	7.230
550.	45.928	7.029	52.957	3866.2	7.327
600.	46.540	7.058	53.599	4235.1	7.428
650.	47.107	7.091	54.197	4609.0	7.529
700.	47.633	7.126	54.759	4987.9	7.627
750.	48.126	7.162	55.288	5371.7	7.722
800.	48.590	7.200	55.790	5760.0	7.811
850.	49.027	7.238	56.266	6152.6	7.894
900.	49.442	7.277	56.719	6549.3	7.972
950.	49.837	7.315	57.152	6949.7	8.043
1000.	50.213	7.354	57.566	7353.5	8.109
1050.	50.572	7.391	57.963	7760.5	8.170
1100.	50.917	7.428	58.345	8170.5	8.226
1150.	51.248	7.464	58.712	8583.1	8.278
1200.	51.567	7.498	59.065	8998.2	8.325
1250.	51.873	7.532	59.406	9415.6	8.369
1300.	52.169	7.565	59.735	9835.1	8.410
1350.	52.456	7.597	60.053	10256.5	8.447
1400.	52.732	7.628	60.361	10679.7	8.482
1450.	53.001	7.658	60.659	11104.6	8.514
1500.	53.261	7.687	60.948	11531.0	8.543
1550.	53.513	7.715	61.229	11958.9	8.571
1600.	53.759	7.743	61.501	12388.1	8.597
1650.	53.997	7.769	61.766	12818.5	8.621
1700.	54.230	7.794	62.024	13250.1	8.643
1750.	54.456	7.819	62.275	13682.8	8.664
1800.	54.676	7.842	62.519	14116.5	8.684
1850.	54.892	7.865	62.757	14551.1	8.702
1900.	55.102	7.888	62.989	14986.6	8.720
1950.	55.307	7.909	63.216	15423.0	8.736
2000.	55.507	7.930	63.437	15860.2	8.751
2050.	55.703	7.950	63.654	16298.1	8.766
2100.	55.895	7.970	63.865	16736.8	8.780
2150.	56.083	7.989	64.072	17176.1	8.793
2200.	56.267	8.007	64.274	17616.0	8.806
2250.	56.447	8.025	64.472	18056.6	8.817
273.15	41.046	6.952	47.998	1898.9	6.969
298.15	41.655	6.954	48.608	2073.2	6.978

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

B_e = 1.7986 cm^{-1}, α_e = 0.01648 cm^{-1}, D_e = 6.480 x 10^{-6} cm^{-1}, $\omega_e x_e$ = 11.890cm^{-1}, ω_e = 1895.1 cm^{-1}, and the molecular weight = 26.82 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-38. Thermodynamic Functions for BO (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2300.	56.624	8.043	64.666	18497.8	8.829
2350.	56.797	8.059	64.856	18939.4	8.840
2400.	56.967	8.076	65.042	19381.7	8.850
2450.	57.133	8.092	65.225	19824.4	8.860
2500.	57.297	8.107	65.404	20267.6	8.869
2600.	57.615	8.137	65.752	21155.4	8.887
2700.	57.923	8.165	66.088	22044.9	8.904
2800.	58.220	8.191	66.412	22936.0	8.919
2900.	58.508	8.217	66.725	23828.6	8.933
3000.	58.787	8.241	67.028	24722.6	8.947
3100.	59.058	8.264	67.322	25617.8	8.959
3200.	59.321	8.286	67.606	26514.3	8.971
3300.	59.576	8.307	67.882	27411.9	8.982
3400.	59.824	8.327	68.151	28310.7	8.993
3500.	60.066	8.346	68.412	29210.5	9.004
3600.	60.301	8.364	68.665	30111.2	9.013
3700.	60.530	8.382	68.912	31013.0	9.023
3800.	60.754	8.399	69.153	31915.7	9.032
3900.	60.973	8.415	69.388	32819.2	9.041
4000.	61.186	8.431	69.617	33723.6	9.049
4100.	61.394	8.446	69.840	34628.9	9.057
4200.	61.598	8.461	70.059	35535.0	9.065
4300.	61.797	8.475	70.272	36441.8	9.073
4400.	61.992	8.489	70.481	37349.4	9.081
4500.	62.183	8.502	70.685	38257.8	9.088
4600.	62.370	8.515	70.884	39166.8	9.095
4700.	62.553	8.527	71.080	40076.6	9.103
4800.	62.733	8.539	71.272	40987.1	9.109
4900.	62.909	8.551	71.460	41898.3	9.116
5000.	63.082	8.562	71.644	42810.1	9.123
5100.	63.251	8.573	71.824	43722.6	9.130
5200.	63.418	8.584	72.002	44635.7	9.136
5300.	63.582	8.594	72.176	45549.5	9.142
5400.	63.742	8.604	72.347	46463.9	9.149
5500.	63.900	8.614	72.515	47379.0	9.155
5600.	64.055	8.624	72.679	48294.6	9.161
5700.	64.208	8.633	72.842	49210.9	9.167
5800.	64.358	8.643	73.001	50127.7	9.173
5900.	64.506	8.652	73.158	51045.2	9.179
6000.	64.652	8.661	73.312	51963.2	9.185
6100.	64.795	8.669	73.464	52881.8	9.191
6200.	64.936	8.678	73.613	53801.0	9.197
6300.	65.075	8.686	73.761	54720.8	9.203
6400.	65.211	8.694	73.905	55641.1	9.208
6500.	65.346	8.702	74.048	56562.0	9.214
6600.	65.479	8.710	74.189	57483.4	9.220
6700.	65.610	8.717	74.327	58405.4	9.225
6800.	65.739	8.725	74.464	59328.0	9.231
6900.	65.867	8.732	74.599	60251.1	9.236
7000.	65.992	8.739	74.732	61174.7	9.242

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.037286
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.15600
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.037262

Table 1-39. Thermodynamic Functions for BH (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	21.888	6.726	28.614	336.3	6.963
75.	24.632	6.805	31.437	510.4	6.961
100.	26.596	6.844	33.440	684.4	6.961
125.	28.126	6.867	34.993	858.4	6.962
150.	29.379	6.883	36.262	1032.5	6.963
175.	30.441	6.895	37.336	1206.6	6.964
200.	31.362	6.903	38.266	1380.7	6.965
225.	32.176	6.910	39.086	1554.8	6.966
250.	32.904	6.916	39.820	1729.0	6.968
275.	33.564	6.921	40.485	1903.3	6.971
300.	34.166	6.925	41.091	2077.6	6.974
325.	34.721	6.929	41.650	2252.0	6.980
350.	35.234	6.933	42.167	2426.6	6.988
375.	35.713	6.937	42.650	2601.4	6.999
400.	36.161	6.941	43.102	2776.5	7.013
425.	36.581	6.946	43.528	2952.1	7.031
450.	36.979	6.951	43.930	3128.2	7.053
475.	37.355	6.957	44.312	3304.8	7.079
500.	37.712	6.964	44.676	3482.1	7.107
550.	38.376	6.980	45.356	3839.1	7.174
600.	38.984	6.999	45.984	4199.7	7.251
650.	39.545	7.022	46.567	4564.3	7.334
700.	40.067	7.047	47.114	4933.1	7.421
750.	40.554	7.075	47.629	5306.4	7.510
800.	41.011	7.105	48.117	5684.1	7.598
850.	41.443	7.137	48.580	6066.2	7.685
900.	41.852	7.170	49.022	6452.6	7.769
950.	42.241	7.203	49.444	6843.0	7.850
1000.	42.611	7.237	49.848	7237.4	7.927
1050.	42.965	7.272	50.237	7635.6	8.000
1100.	43.304	7.307	50.611	8037.3	8.069
1150.	43.629	7.341	50.971	8442.4	8.134
1200.	43.943	7.376	51.318	8850.7	8.196
1250.	44.244	7.410	51.654	9261.9	8.254
1300.	44.536	7.443	51.979	9676.0	8.309
1350.	44.817	7.476	52.293	10092.7	8.360
1400.	45.090	7.509	52.598	10511.9	8.409
1450.	45.354	7.540	52.894	10933.5	8.455
1500.	45.610	7.572	53.181	11357.3	8.498
1550.	45.859	7.602	53.461	11783.2	8.539
1600.	46.100	7.632	53.732	12211.1	8.577
1650.	46.336	7.661	53.997	12640.9	8.614
1700.	46.565	7.690	54.254	13072.4	8.649
1750.	46.788	7.718	54.506	13505.7	8.682
1800.	47.006	7.745	54.751	13940.5	8.713
1850.	47.218	7.771	54.990	14376.9	8.743
1900.	47.426	7.797	55.223	14814.7	8.772
1950.	47.629	7.823	55.451	15253.9	8.799
2000.	47.827	7.847	55.674	15694.5	8.825
2050.	48.021	7.871	55.893	16136.3	8.850
2100.	48.211	7.895	56.106	16579.3	8.874
2150.	48.397	7.918	56.315	17023.5	8.897
2200.	48.579	7.940	56.520	17468.9	8.919
2250.	48.758	7.962	56.720	17915.3	8.940
2300.	48.933	7.984	56.917	18362.7	8.961
273.15	33.517	6.921	40.438	1890.4	6.970
298.15	34.123	6.925	41.048	2064.7	6.974

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 12.036 cm^{-1}, α_e = 0.4130 cm^{-1}, $D_e = 0.00122 \times 10^{-6}$ cm^{-1},

$\omega_e x_e$ = 49.0 cm^{-1}, ω_e = 2368.0 cm^{-1}, and the molecular weight = 11.828 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-39. Thermodynamic Functions for BH (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2350.	49.105	8.005	57.110	18811.2	8.981
2400.	49.274	8.025	57.299	19260.6	9.000
2450.	49.440	8.045	57.485	19710.9	9.018
2500.	49.602	8.065	57.667	20162.2	9.036
2600.	49.919	8.103	58.022	21067.3	9.071
2700.	50.226	8.139	58.365	21975.8	9.103
2800.	50.522	8.174	58.696	22887.4	9.134
2900.	50.810	8.208	59.017	23802.0	9.163
3000.	51.088	8.240	59.328	24719.4	9.191
3100.	51.359	8.271	59.630	25639.5	9.218
3200.	51.622	8.301	59.923	26562.2	9.243
3300.	51.878	8.330	60.207	27487.4	9.268
3400.	52.127	8.357	60.484	28415.0	9.292
3500.	52.369	8.384	60.753	29344.9	9.315
3600.	52.606	8.410	61.016	30277.0	9.337
3700.	52.836	8.436	61.272	31211.4	9.359
3800.	53.061	8.460	61.521	32147.8	9.380
3900.	53.281	8.484	61.765	33086.3	9.400
4000.	53.496	8.507	62.003	34026.7	9.420
4100.	53.706	8.529	62.235	34969.1	9.440
4200.	53.912	8.551	62.463	35913.4	9.459
4300.	54.113	8.572	62.685	36859.6	9.477
4400.	54.311	8.593	62.903	37807.5	9.495
4500.	54.504	8.613	63.116	38757.2	9.513
4600.	54.693	8.632	63.325	39708.6	9.530
4700.	54.879	8.651	63.530	40661.7	9.547
4800.	55.061	8.670	63.731	41616.4	9.564
4900.	55.240	8.688	63.928	42572.8	9.580
5000.	55.415	8.706	64.121	43530.7	9.596
5100.	55.588	8.724	64.311	44490.2	9.611
5200.	55.757	8.741	64.497	45451.1	9.627
5300.	55.923	8.757	64.681	46413.6	9.641
5400.	56.087	8.774	64.861	47377.5	9.656
5500.	56.248	8.790	65.037	48342.8	9.670
5600.	56.406	8.805	65.211	49309.5	9.684
5700.	56.562	8.821	65.383	50277.6	9.698
5800.	56.715	8.836	65.551	51247.0	9.711
5900.	56.866	8.850	65.717	52217.7	9.724
6000.	57.015	8.865	65.880	53189.6	9.737
6100.	57.161	8.879	66.040	54162.8	9.750
6200.	57.305	8.893	66.199	55137.2	9.762
6300.	57.448	8.907	66.354	56112.8	9.774
6400.	57.588	8.920	66.508	57089.5	9.785
6500.	57.726	8.933	66.659	58067.4	9.796
6600.	57.862	8.946	66.809	59046.3	9.807
6700.	57.997	8.959	66.956	60026.3	9.818
6800.	58.129	8.972	67.101	61007.3	9.828
6900.	58.260	8.984	67.244	61989.4	9.838
7000.	58.389	8.996	67.385	62972.3	9.848

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.084545
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.35374
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.084490

Table 1-40. Thermodynamic Functions for BF (gas)

T °K	$-\frac{(F^\circ - H^\circ_0)}{T}$	$\frac{H^\circ - H^\circ_0}{T}$	S°	$H^\circ - H^\circ_0$	C°_p
50.	28.522	6.927	35.449	346.3	6.956
75.	31.333	6.937	38.270	520.3	6.957
100.	33.329	6.942	40.271	694.2	6.957
125.	34.879	6.945	41.824	868.1	6.958
150.	36.145	6.947	43.092	1042.1	6.959
175.	37.216	6.949	44.165	1216.0	6.961
200.	38.144	6.951	45.095	1390.2	6.968
225.	38.963	6.953	45.916	1564.5	6.981
250.	39.696	6.957	46.653	1739.3	7.003
275.	40.359	6.963	47.322	1914.8	7.035
300.	40.965	6.970	47.936	2091.1	7.076
325.	41.524	6.980	48.504	2268.6	7.125
350.	42.041	6.993	49.034	2447.4	7.182
375.	42.524	7.007	49.532	2627.7	7.243
400.	42.977	7.024	50.001	2809.6	7.309
425.	43.403	7.043	50.446	2993.2	7.376
450.	43.807	7.063	50.870	3178.5	7.445
475.	44.189	7.085	51.274	3365.5	7.514
500.	44.553	7.108	51.661	3554.2	7.581
550.	45.233	7.157	52.390	3936.5	7.711
600.	45.858	7.209	53.066	4325.1	7.832
650.	46.437	7.261	53.698	4719.5	7.942
700.	46.977	7.313	54.290	5119.2	8.042
750.	47.483	7.365	54.848	5523.6	8.132
800.	47.960	7.415	55.375	5932.2	8.212
850.	48.411	7.464	55.875	6344.7	8.284
900.	48.839	7.512	56.351	6760.5	8.349
950.	49.246	7.557	56.804	7179.4	8.407
1000.	49.635	7.601	57.236	7601.1	8.459
1050.	50.007	7.643	57.650	8025.2	8.506
1100.	50.363	7.683	58.047	8451.6	8.548
1150.	50.706	7.722	58.428	8879.9	8.587
1200.	51.035	7.758	58.794	9310.2	8.622
1250.	51.353	7.794	59.146	9742.1	8.654
1300.	51.659	7.827	59.486	10175.5	8.683
1350.	51.955	7.859	59.815	10610.3	8.710
1400.	52.241	7.890	60.132	11046.4	8.735
1450.	52.519	7.920	60.439	11483.8	8.758
1500.	52.788	7.948	60.736	11922.2	8.780
1550.	53.049	7.975	61.024	12361.7	8.800
1600.	53.302	8.001	61.304	12802.1	8.818
1650.	53.549	8.026	61.575	13243.4	8.836
1700.	53.789	8.050	61.839	13685.6	8.852
1750.	54.023	8.073	62.096	14128.6	8.868
1800.	54.250	8.096	62.346	14572.3	8.882
1850.	54.472	8.117	62.590	15016.7	8.896
1900.	54.689	8.138	62.827	15461.8	8.909
1950.	54.901	8.158	63.058	15907.5	8.922
2000.	55.108	8.177	63.284	16353.8	8.934
2050.	55.310	8.195	63.505	16800.7	8.945
2100.	55.507	8.213	63.721	17248.2	8.956
2150.	55.701	8.231	63.932	17696.2	8.966
2200.	55.890	8.248	64.138	18144.6	8.976
2250.	56.076	8.264	64.339	18593.6	8.986
2300.	56.257	8.280	64.537	19043.1	8.995
273.15	40.312	6.962	47.274	1901.7	7.032
298.15	40.922	6.970	47.892	2078.0	7.073

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 1.5278 cm^{-1}, α_e = 0.01680 cm^{-1}, D_e = 700 x 10^{-6} cm^{-1}, $\omega_e x_e$ = 11.97 cm^{-1}, ω_e = 1410.05 cm^{-1}, and the molecular weight = 29.82 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

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Table 1-40. Thermodynamic Functions for BF (gas) - Continued

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
2350.	56.436	8.295	64.730	19493.0	9.004
2400.	56.610	8.310	64.920	19943.3	9.013
2450.	56.782	8.324	65.106	20394.1	9.021
2500.	56.950	8.338	65.288	20845.2	9.029
2600.	57.278	8.365	65.642	21748.8	9.045
2700.	57.594	8.390	65.984	22653.8	9.060
2800.	57.899	8.414	66.314	23560.3	9.074
2900.	58.195	8.437	66.632	24468.1	9.088
3000.	58.481	8.459	66.940	25377.3	9.101
3100.	58.759	8.480	67.239	26287.7	9.114
3200.	59.028	8.500	67.528	27199.4	9.126
3300.	59.290	8.519	67.809	28112.2	9.138
3400.	59.544	8.537	68.081	29026.2	9.149
3500.	59.792	8.555	68.347	29941.3	9.161
3600.	60.033	8.572	68.605	30857.5	9.172
3700.	60.268	8.588	68.856	31774.8	9.183
3800.	60.497	8.603	69.101	32693.1	9.193
3900.	60.721	8.619	69.339	33612.4	9.204
4000.	60.939	8.633	69.572	34532.8	9.214
4100.	61.152	8.647	69.800	35454.2	9.224
4200.	61.361	8.661	70.022	36376.5	9.234
4300.	61.564	8.674	70.239	37299.8	9.244
4400.	61.764	8.687	70.451	38224.1	9.254
4500.	61.959	8.700	70.659	39149.3	9.264
4600.	62.150	8.712	70.862	40075.5	9.273
4700.	62.338	8.724	71.061	41002.5	9.283
4800.	62.521	8.736	71.257	41930.5	9.292
4900.	62.701	8.747	71.448	42859.4	9.302
5000.	62.878	8.758	71.636	43789.2	9.311
5100.	63.051	8.769	71.820	44719.9	9.320
5200.	63.221	8.779	72.001	45651.5	9.329
5300.	63.389	8.789	72.178	46584.0	9.339
5400.	63.553	8.800	72.352	47517.3	9.348
5500.	63.714	8.809	72.523	48451.5	9.357
5600.	63.873	8.819	72.692	49386.6	9.366
5700.	64.029	8.829	72.857	50322.5	9.375
5800.	64.182	8.838	73.020	51259.3	9.383
5900.	64.333	8.847	73.180	52197.0	9.392
6000.	64.482	8.856	73.338	53135.4	9.401
6100.	64.628	8.865	73.493	54074.8	9.410
6200.	64.772	8.873	73.645	55014.9	9.418
6300.	64.914	8.882	73.796	55955.9	9.427
6400.	65.053	8.890	73.944	56897.7	9.436
6500.	65.191	8.899	74.090	57840.3	9.444
6600.	65.327	8.907	74.233	58783.8	9.453
6700.	65.460	8.915	74.375	59728.0	9.461
6800.	65.592	8.923	74.515	60673.1	9.470
6900.	65.722	8.930	74.653	61619.0	9.478
7000.	65.851	8.938	74.789	62565.7	9.487

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.033535
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.14031
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.033513

Table 1-41. Thermodynamic Functions for BCl (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	31.392	6.943	38.335	347.1	6.956
75.	34.209	6.947	41.156	521.1	6.957
100.	36.208	6.950	43.158	695.0	6.959
125.	37.759	6.953	44.711	869.1	6.971
150.	39.027	6.958	45.985	1043.7	7.002
175.	40.100	6.968	47.068	1219.4	7.059
200.	41.031	6.984	48.016	1396.9	7.141
225.	41.855	7.007	48.862	1576.6	7.240
250.	42.595	7.036	49.631	1758.9	7.349
275.	43.267	7.069	50.337	1944.1	7.463
300.	43.884	7.107	50.991	2132.1	7.575
325.	44.454	7.147	51.601	2322.8	7.684
350.	44.985	7.189	52.175	2516.2	7.786
375.	45.483	7.232	52.715	2712.0	7.881
400.	45.951	7.275	53.226	2910.2	7.968
425.	46.393	7.319	53.712	3110.4	8.048
450.	46.813	7.361	54.174	3312.5	8.121
475.	47.212	7.403	54.615	3516.4	8.188
500.	47.593	7.444	55.037	3721.9	8.249
550.	48.306	7.522	55.828	4137.1	8.355
600.	48.964	7.595	56.559	4557.1	8.443
650.	49.574	7.663	57.238	4981.1	8.517
700.	50.145	7.727	57.871	5408.6	8.580
750.	50.680	7.785	58.465	5839.0	8.634
800.	51.184	7.840	59.024	6271.8	8.680
850.	51.661	7.890	59.551	6706.8	8.719
900.	52.113	7.937	60.050	7143.7	8.754
950.	52.543	7.981	60.525	7582.2	8.785
1000.	52.954	8.022	60.976	8022.1	8.813
1050.	53.346	8.060	61.407	8463.4	8.837
1100.	53.722	8.096	61.818	8905.8	8.860
1150.	54.083	8.130	62.212	9349.3	8.880
1200.	54.429	8.161	62.591	9793.8	8.898
1250.	54.763	8.191	62.954	10239.1	8.915
1300.	55.085	8.219	63.304	10685.2	8.931
1350.	55.396	8.246	63.642	11132.1	8.946
1400.	55.696	8.271	63.967	11579.7	8.959
1450.	55.986	8.295	64.282	12028.0	8.972
1500.	56.268	8.318	64.586	12476.9	8.984
1550.	56.541	8.340	64.881	12926.4	8.996
1600.	56.806	8.360	65.167	13376.4	9.007
1650.	57.064	8.380	65.444	13827.0	9.017
1700.	57.314	8.399	65.713	14278.1	9.027
1750.	57.558	8.417	65.975	14729.7	9.037
1800.	57.795	8.434	66.230	15181.7	9.046
1850.	58.027	8.451	66.477	15634.2	9.055
1900.	58.252	8.467	66.719	16087.1	9.064
1950.	58.472	8.482	66.955	16540.5	9.072
2000.	58.687	8.497	67.184	16994.2	9.080
2050.	58.897	8.511	67.409	17448.4	9.088
2100.	59.102	8.525	67.628	17903.0	9.096
2150.	59.303	8.539	67.842	18357.9	9.104
2200.	59.500	8.551	68.051	18813.2	9.111
2250.	59.692	8.564	68.256	19268.9	9.119
2300.	59.880	8.576	68.456	19724.9	9.126
273.15	43.219	7.067	50.286	1930.3	7.455
298.15	43.840	7.104	50.944	2118.1	7.567

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

$B_e = 0.6907$ cm^{-1}, $\alpha_e = 0.00656$ cm^{-1}, $D_e = 1.790 \times 10^{-6}$ cm^{-1}, $\omega_e x_e = 5.160$ cm^{-1}, $\omega_e = 843.33$ cm^{-1}, and the molecular weight = 46.277.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-41. Thermodynamic Functions for BCl (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2350.	60.065	8.588	68.652	20181.3	9.133
2400.	60.246	8.599	68.845	20638.1	9.140
2450.	60.423	8.610	69.033	21095.1	9.147
2500.	60.597	8.621	69.218	21552.6	9.153
2600.	60.935	8.642	69.577	22468.4	9.167
2700.	61.262	8.661	69.923	23385.5	9.180
2800.	61.577	8.680	70.257	24303.9	9.192
2900.	61.882	8.698	70.580	25223.6	9.205
3000.	62.177	8.715	70.892	26144.4	9.217
3100.	62.463	8.731	71.194	27066.5	9.230
3200.	62.740	8.747	71.487	27989.8	9.242
3300.	63.010	8.762	71.771	28914.2	9.253
3400.	63.271	8.776	72.048	29839.9	9.265
3500.	63.526	8.790	72.316	30766.6	9.277
3600.	63.774	8.804	72.578	31694.5	9.288
3700.	64.015	8.817	72.832	32623.6	9.300
3800.	64.250	8.830	73.080	33553.8	9.311
3900.	64.479	8.842	73.322	34485.1	9.323
4000.	64.703	8.854	73.558	35417.5	9.334
4100.	64.922	8.866	73.788	36351.0	9.345
4200.	65.136	8.878	74.013	37285.6	9.356
4300.	65.345	8.889	74.233	38221.2	9.367
4400.	65.549	8.900	74.448	39158.0	9.378
4500.	65.749	8.910	74.659	40095.9	9.389
4600.	65.945	8.921	74.865	41034.8	9.400
4700.	66.137	8.931	75.067	41974.8	9.411
4800.	66.325	8.941	75.265	42915.8	9.422
4900.	66.509	8.951	75.459	43857.9	9.432
5000.	66.690	8.960	75.650	44801.0	9.443
5100.	66.867	8.970	75.837	45745.2	9.454
5200.	67.041	8.979	76.020	46690.4	9.464
5300.	67.212	8.988	76.200	47636.7	9.475
5400.	67.380	8.997	76.377	48584.0	9.485
5500.	67.545	9.006	76.551	49532.3	9.496
5600.	67.707	9.015	76.722	50481.6	9.506
5700.	67.867	9.023	76.890	51431.9	9.516
5800.	68.024	9.032	77.055	52383.2	9.526
5900.	68.178	9.040	77.218	53335.5	9.537
6000.	68.330	9.048	77.378	54288.8	9.547
6100.	68.479	9.056	77.535	55243.1	9.557
6200.	68.626	9.064	77.690	56198.4	9.567
6300.	68.771	9.072	77.843	57154.6	9.577
6400.	68.914	9.080	77.994	58111.8	9.586
6500.	69.055	9.088	78.142	59070.0	9.596
6600.	69.193	9.095	78.288	60029.0	9.606
6700.	69.330	9.103	78.433	60989.1	9.615
6800.	69.465	9.110	78.575	61950.0	9.625
6900.	69.597	9.118	78.715	62911.9	9.634
7000.	69.728	9.125	78.853	63874.8	9.644

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.021609
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.090412
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.021595

Table 1-42. Thermodynamic Functions for BBr (gas)

T °K	$-\frac{(F^\circ-H_0^\circ)}{T}$	$\frac{H^\circ-H_0^\circ}{T}$	S°	$H^\circ-H_0^\circ$	C_p°
50.	34.048	6.947	40.994	347.3	6.957
75.	36.865	6.950	43.815	521.3	6.958
100.	38.865	6.953	45.818	695.3	6.968
125.	40.417	6.959	47.376	869.9	7.006
150.	41.687	6.973	48.660	1045.9	7.083
175.	42.763	6.996	49.759	1224.3	7.192
200.	43.699	7.029	50.728	1405.7	7.322
225.	44.529	7.069	51.598	1590.5	7.460
250.	45.277	7.115	52.391	1778.7	7.597
275.	45.957	7.165	53.122	1970.3	7.726
300.	46.583	7.216	53.799	2164.9	7.845
325.	47.162	7.269	54.431	2362.4	7.954
350.	47.703	7.321	55.024	2562.5	8.051
375.	48.210	7.373	55.583	2764.9	8.138
400.	48.687	7.423	56.111	2969.3	8.216
425.	49.139	7.472	56.611	3175.6	8.285
450.	49.567	7.519	57.086	3383.5	8.347
475.	49.975	7.564	57.539	3592.9	8.402
500.	50.364	7.607	57.971	3803.6	8.452
550.	51.093	7.688	58.781	4228.3	8.536
600.	51.765	7.762	59.527	4656.9	8.605
650.	52.389	7.829	60.218	5088.6	8.662
700.	52.971	7.890	60.861	5522.9	8.710
750.	53.518	7.946	61.464	5959.5	8.750
800.	54.032	7.997	62.030	6397.8	8.785
850.	54.518	8.044	62.563	6837.8	8.815
900.	54.980	8.088	63.068	7279.2	8.841
950.	55.418	8.128	63.546	7721.8	8.864
1000.	55.836	8.166	64.001	8165.6	8.885
1050.	56.235	8.200	64.435	8610.3	8.904
1100.	56.617	8.233	64.850	9055.9	8.921
1150.	56.984	8.263	65.247	9502.3	8.936
1200.	57.336	8.291	65.627	9949.5	8.951
1250.	57.675	8.318	65.993	10397.3	8.964
1300.	58.002	8.343	66.345	10845.8	8.976
1350.	58.317	8.367	66.684	11294.9	8.988
1400.	58.622	8.389	67.011	11744.6	8.999
1450.	58.917	8.410	67.327	12194.8	9.009
1500.	59.202	8.430	67.632	12645.5	9.019
1550.	59.479	8.449	67.928	13096.6	9.029
1600.	59.747	8.468	68.215	13548.3	9.038
1650.	60.008	8.485	68.493	14000.4	9.047
1700.	60.262	8.502	68.763	14452.9	9.055
1750.	60.508	8.518	69.026	14905.8	9.063
1800.	60.748	8.533	69.281	15359.1	9.071
1850.	60.982	8.547	69.530	15812.8	9.079
1900.	61.210	8.562	69.772	16266.9	9.087
1950.	61.433	8.575	70.008	16721.4	9.094
2000.	61.650	8.588	70.238	17176.2	9.101
2050.	61.862	8.601	70.463	17631.4	9.108
2100.	62.070	8.613	70.683	18087.0	9.115
2150.	62.273	8.625	70.897	18542.8	9.122
2200.	62.471	8.636	71.107	18999.0	9.129
2250.	62.665	8.647	71.312	19455.6	9.135
2300.	62.855	8.658	71.513	19912.4	9.142
273.15	45.909	7.161	53.070	1956.0	7.717
298.15	46.538	7.213	53.751	2150.4	7.837

This table has been computed for the ground state of the molecule, which is taken as $^1\Sigma$, using the following molecular constants:

B_e = 0.497 cm^{-1}, α_e = 0.0036 cm^{-1}, D_e = 1.0 x 10^{-6} cm^{-1},

$\omega_e x_e$ = 3.57 cm^{-1}, ω_e = 689.04 cm^{-1}, and the molecular weight = 90.736 .

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-42. Thermodynamic Functions for BBr (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2350.	63.042	8.668	71.710	20369.6	9.148
2400.	63.224	8.678	71.902	20827.1	9.155
2450.	63.403	8.688	72.091	21285.0	9.161
2500.	63.579	8.697	72.276	21743.1	9.167
2600.	63.920	8.715	72.636	22660.3	9.180
2700.	64.249	8.733	72.982	23578.7	9.192
2800.	64.567	8.749	73.317	24498.3	9.204
2900.	64.874	8.765	73.640	25419.0	9.216
3000.	65.172	8.780	73.952	26341.0	9.227
3100.	65.460	8.795	74.255	27264.1	9.239
3200.	65.739	8.809	74.548	28188.3	9.251
3300.	66.010	8.822	74.833	29113.7	9.262
3400.	66.274	8.835	75.109	30040.2	9.273
3500.	66.530	8.848	75.378	30967.8	9.285
3600.	66.779	8.860	75.640	31896.5	9.296
3700.	67.022	8.872	75.894	32826.3	9.307
3800.	67.259	8.883	76.142	33757.2	9.318
3900.	67.490	8.895	76.384	34689.2	9.329
4000.	67.715	8.906	76.620	35622.2	9.340
4100.	67.935	8.916	76.851	36556.4	9.351
4200.	68.150	8.927	77.076	37491.6	9.362
4300.	68.360	8.937	77.296	38427.9	9.373
4400.	68.565	8.947	77.512	39365.3	9.383
4500.	68.766	8.956	77.723	40303.7	9.394
4600.	68.963	8.966	77.929	41243.1	9.405
4700.	69.156	8.975	78.131	42183.6	9.415
4800.	69.345	8.984	78.329	43125.2	9.426
4900.	69.530	8.993	78.523	44067.7	9.436
5000.	69.712	9.002	78.714	45011.4	9.447
5100.	69.890	9.011	78.901	45956.0	9.457
5200.	70.065	9.020	79.084	46901.7	9.468
5300.	70.237	9.028	79.265	47848.3	9.478
5400.	70.405	9.036	79.442	48796.0	9.488
5500.	70.571	9.044	79.616	49744.7	9.499
5600.	70.734	9.053	79.786	50694.4	9.509
5700.	70.894	9.061	79.955	51645.1	9.519
5800.	71.052	9.068	80.120	52596.7	9.529
5900.	71.207	9.076	80.283	53549.4	9.539
6000.	71.359	9.084	80.443	54503.0	9.549
6100.	71.509	9.091	80.600	55457.6	9.558
6200.	71.657	9.099	80.756	56413.1	9.568
6300.	71.802	9.106	80.909	57369.6	9.578
6400.	71.946	9.114	81.059	58327.1	9.588
6500.	72.087	9.121	81.208	59285.5	9.597
6600.	72.226	9.128	81.354	60244.8	9.607
6700.	72.363	9.135	81.498	61205.0	9.616
6800.	72.498	9.142	81.640	62166.2	9.625
6900.	72.632	9.149	81.781	63128.3	9.635
7000.	72.763	9.156	81.919	64091.3	9.644

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.011021
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.046112
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.011014

Table 1-43. Thermodynamic Functions for BS (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	32.239	6.940	39.180	347.0	6.956
75.	35.055	6.946	42.000	520.9	6.956
100.	37.053	6.948	44.002	694.8	6.957
125.	38.604	6.950	45.554	868.8	6.957
150.	39.871	6.952	46.823	1042.7	6.961
175.	40.943	6.953	47.896	1216.8	6.970
200.	41.872	6.956	48.828	1391.3	6.989
225.	42.691	6.962	49.653	1566.4	7.020
250.	43.425	6.970	50.395	1742.4	7.065
275.	44.090	6.981	51.071	1919.7	7.122
300.	44.698	6.995	51.693	2098.6	7.188
325.	45.259	7.013	52.271	2279.2	7.262
350.	45.779	7.033	52.812	2461.7	7.340
375.	46.265	7.057	53.322	2646.2	7.420
400.	46.721	7.082	53.803	2832.7	7.500
425.	47.151	7.109	54.260	3021.2	7.579
450.	47.558	7.137	54.695	3211.6	7.656
475.	47.945	7.166	55.111	3404.0	7.730
500.	48.313	7.196	55.510	3598.1	7.800
550.	49.002	7.257	56.259	3991.4	7.930
600.	49.636	7.318	56.954	4390.9	8.045
650.	50.224	7.378	57.602	4795.7	8.146
700.	50.773	7.436	58.209	5205.3	8.235
750.	51.288	7.492	58.780	5619.0	8.312
800.	51.773	7.545	59.319	6036.3	8.380
850.	52.232	7.596	59.829	6456.9	8.440
900.	52.668	7.645	60.313	6880.2	8.493
950.	53.083	7.691	60.773	7306.0	8.539
1000.	53.478	7.734	61.212	7734.0	8.581
1050.	53.857	7.775	61.632	8164.0	8.618
1100.	54.219	7.814	62.033	8595.7	8.651
1150.	54.567	7.851	62.419	9029.0	8.681
1200.	54.902	7.886	62.789	9463.8	8.708
1250.	55.225	7.920	63.145	9899.8	8.733
1300.	55.536	7.952	63.488	10337.0	8.755
1350.	55.837	7.982	63.818	10775.2	8.775
1400.	56.128	8.010	64.138	11214.5	8.794
1450.	56.409	8.038	64.447	11654.6	8.812
1500.	56.682	8.064	64.746	12095.6	8.828
1550.	56.947	8.089	65.035	12537.4	8.843
1600.	57.204	8.112	65.316	12979.8	8.857
1650.	57.454	8.135	65.589	13423.0	8.870
1700.	57.697	8.157	65.854	13866.8	8.882
1750.	57.934	8.178	66.112	14311.2	8.893
1800.	58.165	8.198	66.362	14756.1	8.904
1850.	58.389	8.217	66.606	15201.5	8.915
1900.	58.609	8.236	66.844	15647.5	8.924
1950.	58.823	8.253	67.076	16093.9	8.933
2000.	59.032	8.270	67.303	16540.8	8.942
2050.	59.237	8.287	67.523	16988.1	8.951
2100.	59.436	8.303	67.739	17435.8	8.959
2150.	59.632	8.318	67.950	17884.0	8.966
2200.	59.823	8.333	68.156	18332.4	8.974
2250.	60.011	8.347	68.358	18781.3	8.981
2300.	60.194	8.361	68.555	19230.5	8.988
273.15	44.043	6.980	51.023	1906.6	7.117
298.15	44.655	6.994	51.649	2085.3	7.183

This table has been computed for the ground state of the molecule, which is taken as $^2\Sigma$, using the following molecular constants:

B_e = 0.80467 cm^{-1}, α_e = 0.00603 cm^{-1}, $D_e = 1.480 \times 10^{-6}$ cm^{-1},

$\omega_e x_e$ = 6.39 cm^{-1}, ω_e = 1187.41 cm^{-1}, and the molecular weight = 42.886

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-43. Thermodynamic Functions for BS (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2350.	60.374	8.374	68.749	19680.0	8.995
2400.	60.551	8.387	68.938	20129.9	9.001
2450.	60.724	8.400	69.124	20580.1	9.007
2500.	60.894	8.412	69.306	21030.6	9.013
2600.	61.224	8.436	69.660	21932.4	9.025
2700.	61.543	8.458	70.000	22835.4	9.036
2800.	61.851	8.478	70.329	23739.5	9.047
2900.	62.149	8.498	70.647	24644.6	9.057
3000.	62.437	8.517	70.954	25550.7	9.066
3100.	62.716	8.535	71.251	26457.7	9.076
3200.	62.988	8.552	71.539	27365.6	9.085
3300.	63.251	8.568	71.819	28274.5	9.094
3400.	63.507	8.584	72.091	29184.2	9.103
3500.	63.756	8.599	72.355	30094.8	9.111
3600.	63.998	8.613	72.611	31006.2	9.119
3700.	64.235	8.627	72.861	31918.4	9.127
3800.	64.465	8.640	73.105	32831.4	9.135
3900.	64.689	8.653	73.342	33745.2	9.143
4000.	64.909	8.665	73.573	34659.8	9.151
4100.	65.123	8.677	73.799	35575.1	9.159
4200.	65.332	8.688	74.020	36491.2	9.166
4300.	65.536	8.700	74.236	37408.0	9.174
4400.	65.736	8.710	74.447	38325.6	9.181
4500.	65.932	8.721	74.653	39243.9	9.188
4600.	66.124	8.731	74.855	40162.9	9.196
4700.	66.312	8.741	75.053	41082.6	9.203
4800.	66.496	8.751	75.247	42003.1	9.210
4900.	66.676	8.760	75.436	42924.2	9.217
5000.	66.853	8.769	75.623	43846.0	9.224
5100.	67.027	8.778	75.805	44768.6	9.231
5200.	67.198	8.787	75.985	45691.8	9.238
5300.	67.365	8.795	76.160	46615.7	9.245
5400.	67.529	8.804	76.333	47540.3	9.252
5500.	67.691	8.812	76.503	48465.6	9.259
5600.	67.850	8.820	76.670	49391.5	9.266
5700.	68.006	8.828	76.834	50318.1	9.272
5800.	68.160	8.835	76.995	51245.4	9.279
5900.	68.311	8.843	77.153	52173.4	9.286
6000.	68.459	8.850	77.310	53102.0	9.293
6100.	68.605	8.858	77.463	54031.3	9.299
6200.	68.750	8.865	77.614	54961.3	9.306
6300.	68.891	8.872	77.763	55891.9	9.313
6400.	69.031	8.879	77.910	56823.1	9.319
6500.	69.169	8.885	78.054	57755.1	9.326
6600.	69.304	8.892	78.196	58687.6	9.333
6700.	69.438	8.899	78.337	59620.8	9.339
6800.	69.570	8.905	78.475	60554.7	9.346
6900.	69.700	8.911	78.611	61489.2	9.352
7000.	69.828	8.918	78.746	62424.4	9.359

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.023318
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.097561
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.023302

Table 1-44. Thermodynamic Functions for BN (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	31.352	6.924	38.276	346.2	6.956
75.	34.162	6.935	41.097	520.1	6.957
100.	36.158	6.940	43.098	694.0	6.957
125.	37.707	6.944	44.651	868.0	6.957
150.	38.973	6.946	45.919	1041.9	6.958
175.	40.044	6.948	46.992	1215.9	6.960
200.	40.972	6.950	47.922	1389.9	6.964
225.	41.791	6.951	48.742	1564.1	6.972
250.	42.523	6.954	49.477	1738.6	6.987
275.	43.186	6.958	50.144	1913.5	7.009
300.	43.792	6.964	50.755	2089.1	7.040
325.	44.349	6.971	51.320	2265.5	7.078
350.	44.866	6.980	51.847	2443.0	7.124
375.	45.348	6.991	52.340	2621.8	7.176
400.	45.800	7.005	52.805	2801.9	7.233
425.	46.225	7.020	53.245	2983.5	7.293
450.	46.627	7.037	53.664	3166.6	7.356
475.	47.008	7.055	54.063	3351.2	7.419
500.	47.370	7.075	54.445	3537.5	7.483
550.	48.046	7.118	55.164	3914.8	7.609
600.	48.668	7.164	55.832	4298.3	7.729
650.	49.243	7.212	56.455	4687.6	7.840
700.	49.779	7.260	57.040	5082.2	7.943
750.	50.282	7.309	57.591	5481.7	8.037
800.	50.755	7.357	58.112	5885.7	8.121
850.	51.203	7.404	58.607	6293.7	8.198
900.	51.627	7.450	59.077	6705.4	8.267
950.	52.031	7.495	59.526	7120.3	8.330
1000.	52.417	7.538	59.955	7538.3	8.387
1050.	52.785	7.580	60.365	7958.9	8.438
1100.	53.139	7.620	60.759	8382.0	8.485
1150.	53.479	7.658	61.137	8807.3	8.527
1200.	53.805	7.695	61.501	9234.6	8.566
1250.	54.120	7.731	61.851	9663.8	8.601
1300.	54.424	7.765	62.189	10094.7	8.634
1350.	54.718	7.798	62.516	10527.1	8.664
1400.	55.002	7.829	62.831	10961.0	8.692
1450.	55.277	7.859	63.137	11396.2	8.717
1500.	55.544	7.888	63.432	11832.6	8.741
1550.	55.803	7.916	63.719	12270.2	8.763
1600.	56.055	7.943	63.998	12708.9	8.784
1650.	56.300	7.969	64.269	13148.6	8.803
1700.	56.538	7.994	64.532	13589.2	8.822
1750.	56.770	8.018	64.787	14030.6	8.839
1800.	56.996	8.041	65.037	14473.0	8.855
1850.	57.217	8.063	65.279	14916.1	8.870
1900.	57.432	8.084	65.516	15359.9	8.885
1950.	57.642	8.105	65.747	15804.5	8.898
2000.	57.848	8.125	65.973	16249.7	8.912
2050.	58.049	8.144	66.193	16695.5	8.924
2100.	58.245	8.163	66.408	17142.0	8.936
2150.	58.437	8.181	66.618	17589.1	8.948
2200.	58.626	8.198	66.824	18036.7	8.959
2250.	58.810	8.215	67.025	18484.8	8.969
2300.	58.991	8.232	67.223	18933.5	8.979
273.15	43.139	6.958	50.097	1900.5	7.007
298.15	43.749	6.963	50.712	2076.0	7.037

This table has been computed for the ground state of the molecule, which is taken as $^3\pi$, using the following molecular constants:

$B_e = 1.682$ cm^{-1}, $\alpha_e = 0.025$ cm^{-1}, $D_e = 8.220 \times 10^{-6}$ cm^{-1},

$\omega_e x_e = 12.4$ cm^{-1}, $\omega_e = 1522.0$ cm^{-1}, and the molecular weight = 24.828.

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-44. Thermodynamic Functions for BN (gas) - Continued

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
2350.	59.168	8.248	67.416	19382.7	8.989
2400.	59.342	8.263	67.605	19832.3	8.999
2450.	59.512	8.279	67.791	20282.4	9.008
2500.	59.680	8.293	67.973	20733.0	9.017
2600.	60.005	8.321	68.327	21635.4	9.034
2700.	60.320	8.348	68.668	22539.5	9.050
2800.	60.624	8.373	68.997	23445.1	9.065
2900.	60.918	8.397	69.315	24352.2	9.080
3000.	61.203	8.420	69.623	25260.8	9.094
3100.	61.480	8.442	69.922	26170.7	9.108
3200.	61.748	8.463	70.211	27081.9	9.121
3300.	62.009	8.483	70.492	27994.4	9.134
3400.	62.262	8.502	70.764	28908.2	9.146
3500.	62.509	8.521	71.030	29823.2	9.158
3600.	62.749	8.539	71.288	30739.3	9.170
3700.	62.983	8.556	71.539	31656.6	9.181
3800.	63.211	8.572	71.784	32575.0	9.192
3900.	63.434	8.588	72.022	33494.5	9.203
4000.	63.652	8.604	72.255	34415.0	9.214
4100.	63.864	8.619	72.483	35336.7	9.225
4200.	64.072	8.633	72.705	36259.3	9.235
4300.	64.275	8.647	72.922	37183.0	9.246
4400.	64.474	8.661	73.135	38107.7	9.256
4500.	64.669	8.674	73.343	39033.4	9.266
4600.	64.859	8.687	73.546	39960.1	9.276
4700.	65.046	8.700	73.746	40887.8	9.286
4800.	65.230	8.712	73.941	41816.5	9.296
4900.	65.409	8.724	74.133	42746.1	9.306
5000.	65.585	8.735	74.321	43676.6	9.315
5100.	65.758	8.747	74.505	44608.1	9.325
5200.	65.928	8.758	74.686	45540.5	9.334
5300.	66.095	8.769	74.864	46473.9	9.344
5400.	66.259	8.779	75.038	47408.1	9.353
5500.	66.420	8.790	75.210	48343.3	9.362
5600.	66.578	8.800	75.378	49279.4	9.372
5700.	66.734	8.810	75.544	50216.4	9.381
5800.	66.887	8.820	75.707	51154.2	9.390
5900.	67.038	8.829	75.867	52093.0	9.399
6000.	67.186	8.839	76.025	53032.6	9.408
6100.	67.332	8.848	76.181	53973.2	9.417
6200.	67.476	8.857	76.333	54914.5	9.426
6300.	67.618	8.866	76.484	55856.8	9.434
6400.	67.757	8.875	76.632	56799.9	9.443
6500.	67.895	8.884	76.779	57743.9	9.452
6600.	68.031	8.892	76.923	58688.7	9.461
6700.	68.164	8.901	77.065	59634.4	9.469
6800.	68.296	8.909	77.205	60580.9	9.478
6900.	68.426	8.917	77.343	61528.2	9.487
7000.	68.554	8.925	77.479	62476.4	9.495

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.040277
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.16852
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.040251

Table 1-45. Thermodynamic Functions for $(LiF)_2$ (gas)

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
50.	35.755	7.952	43.707	397.6	7.976
75.	38.984	7.987	46.972	599.1	8.180
100.	41.294	8.085	49.379	808.5	8.613
125.	43.115	8.250	51.365	1031.2	9.230
150.	44.638	8.473	53.111	1270.9	9.959
175.	45.963	8.741	54.704	1529.6	10.736
200.	47.150	9.039	56.188	1807.7	11.510
225.	48.233	9.355	57.587	2104.8	12.251
250.	49.235	9.679	58.914	2419.9	12.944
275.	50.173	10.006	60.178	2751.5	13.579
300.	51.057	10.328	61.385	3098.3	14.155
325.	51.896	10.642	62.539	3458.8	14.674
350.	52.696	10.947	63.644	3831.6	15.139
375.	53.462	11.241	64.703	4215.3	15.554
400.	54.196	11.522	65.718	4608.9	15.925
425.	54.903	11.791	66.694	5011.3	16.256
450.	55.584	12.048	67.632	5421.4	16.552
475.	56.242	12.292	68.534	5838.6	16.816
500.	56.879	12.524	69.403	6262.0	17.053
550.	58.093	12.955	71.047	7125.1	17.456
600.	59.237	13.344	72.581	8006.3	17.783
650.	60.319	13.696	74.015	8902.4	18.052
700.	61.346	14.015	75.361	9810.7	18.274
750.	62.323	14.306	76.629	10729.2	18.459
800.	63.255	14.570	77.825	11656.1	18.614
850.	64.146	14.812	78.958	12590.2	18.746
900.	64.999	15.034	80.032	13530.4	18.859
950.	65.817	15.238	81.055	14475.9	18.956
1000.	66.603	15.426	82.029	15425.8	19.040
1050.	67.360	15.600	82.960	16379.7	19.113
1100.	68.090	15.761	83.851	17337.0	19.177
1150.	68.794	15.911	84.704	18297.3	19.234
1200.	69.474	16.050	85.524	19260.3	19.284
1250.	70.132	16.180	86.312	20225.6	19.328
1300.	70.769	16.302	87.071	21193.0	19.368
1350.	71.386	16.417	87.803	22162.3	19.403
1400.	71.985	16.524	88.509	23133.3	19.435
1450.	72.567	16.625	89.191	24105.8	19.464
1500.	73.132	16.720	89.852	25079.6	19.490
1550.	73.682	16.809	90.491	26054.7	19.514
1600.	74.217	16.894	91.111	27030.9	19.535
1650.	74.738	16.975	91.712	28008.2	19.555
1700.	75.246	17.051	92.296	28986.4	19.573
1750.	75.741	17.123	92.864	29965.5	19.589
1800.	76.224	17.192	93.416	30945.3	19.605
1850.	76.696	17.257	93.953	31925.9	19.619
1900.	77.157	17.320	94.477	32907.2	19.632
1950.	77.608	17.379	94.987	33889.1	19.644
2000.	78.049	17.436	95.484	34871.5	19.655
2050.	78.480	17.490	95.970	35854.5	19.665
2100.	78.902	17.542	96.444	36838.0	19.675
2150.	79.315	17.592	96.907	37822.0	19.684
2200.	79.720	17.639	97.360	38806.4	19.692
2250.	80.117	17.685	97.802	39791.2	19.700
2300.	80.506	17.729	98.235	40776.4	19.707
2350.	80.888	17.771	98.659	41761.9	19.714
273.15	50.105	9.981	60.087	2726.4	13.534
298.15	50.993	10.304	61.298	3072.2	14.114

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

51.88, 11.51, 2.455, 13.97, 4.

The frequencies and their degeneracies were taken as:

900. (1), 555. (1), 531. (1), 900. (1), 531. (1), 300. (1).

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-45. Thermodynamic Functions for $(LiF)_2$ (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2400.	81.263	17.812	99.074	42747.8	19.721
2450.	81.630	17.851	99.481	43733.9	19.727
2500.	81.991	17.888	99.880	44720.4	19.732
2600.	82.694	17.959	100.654	46694.2	19.743
2700.	83.373	18.026	101.399	48669.0	19.752
2800.	84.030	18.087	102.117	50644.6	19.761
2900.	84.666	18.145	102.811	52621.1	19.768
3000.	85.282	18.199	103.481	54598.2	19.775
3100.	85.879	18.250	104.130	56576.0	19.781
3200.	86.460	18.298	104.758	58554.4	19.787
3300.	87.023	18.343	105.367	60533.3	19.792
3400.	87.572	18.386	105.958	62512.8	19.796
3500.	88.105	18.426	106.532	64492.6	19.801
3600.	88.625	18.465	107.090	66472.9	19.805
3700.	89.131	18.501	107.632	68453.5	19.808
3800.	89.625	18.535	108.161	70434.5	19.812
3900.	90.107	18.568	108.675	72415.8	19.815
4000.	90.578	18.599	109.177	74397.4	19.817
4100.	91.037	18.629	109.666	76379.3	19.820
4200.	91.486	18.657	110.144	78361.5	19.823
4300.	91.926	18.685	110.610	80343.8	19.825
4400.	92.356	18.711	111.066	82326.4	19.827
4500.	92.776	18.735	111.512	84309.2	19.829
4600.	93.188	18.759	111.948	86292.2	19.831
4700.	93.592	18.782	112.374	88275.4	19.833
4800.	93.988	18.804	112.792	90258.8	19.834
4900.	94.376	18.825	113.201	92242.3	19.836
5000.	94.756	18.845	113.601	94225.9	19.837
5100.	95.130	18.865	113.994	96209.7	19.839
5200.	95.496	18.883	114.380	98193.7	19.840
5300.	95.856	18.901	114.757	100177.7	19.841
5400.	96.209	18.919	115.128	102161.9	19.842
5500.	96.557	18.936	115.492	104146.2	19.843
5600.	96.898	18.952	115.850	106130.6	19.844
5700.	97.234	18.968	116.201	108115.1	19.845
5800.	97.564	18.983	116.546	110099.6	19.846
5900.	97.888	18.997	116.886	112084.3	19.847
6000.	98.208	19.012	117.219	114069.1	19.848
6100.	98.522	19.025	117.547	116053.9	19.849
6200.	98.832	19.039	117.870	118038.9	19.850
6300.	99.136	19.051	118.188	120023.9	19.850
6400.	99.436	19.064	118.500	122008.9	19.851
6500.	99.732	19.076	118.808	123994.1	19.852
6600.	100.023	19.088	119.111	125979.3	19.852
6700.	100.311	19.099	119.410	127964.5	19.853
6800.	100.594	19.110	119.704	129949.8	19.853
6900.	100.873	19.121	119.994	131935.2	19.854
7000.	101.148	19.132	120.279	133920.6	19.855

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.019275
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.080647
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.019262

Table 1-46. Thermodynamic Functions for $(LiCl)_2$ (gas)

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
50.	39.858	7.954	47.812	397.7	7.996
75.	43.093	8.030	51.123	602.3	8.472
100.	45.431	8.258	53.688	825.8	9.467
125.	47.310	8.617	55.927	1077.1	10.649
150.	48.919	9.053	57.971	1357.9	11.800
175.	50.349	9.521	59.870	1666.1	12.839
200.	51.651	9.994	61.645	1998.7	13.746
225.	52.855	10.455	63.310	2352.4	14.527
250.	53.980	10.896	64.876	2724.1	15.192
275.	55.038	11.313	66.351	3111.2	15.758
300.	56.039	11.704	67.744	3511.3	16.240
325.	56.991	12.069	69.060	3922.6	16.649
350.	57.898	12.409	70.307	4343.3	16.999
375.	58.765	12.726	71.491	4772.1	17.299
400.	59.596	13.020	72.615	5207.9	17.558
425.	60.393	13.293	73.687	5649.7	17.782
450.	61.160	13.548	74.709	6096.8	17.976
475.	61.899	13.786	75.685	6548.3	18.146
500.	62.612	14.008	76.620	7003.9	18.295
550.	63.967	14.409	78.376	7925.0	18.542
600.	65.236	14.762	79.998	8857.2	18.737
650.	66.430	15.074	81.504	9798.0	18.893
700.	67.557	15.351	82.909	10745.9	19.019
750.	68.625	15.599	84.225	11699.6	19.123
800.	69.639	15.822	85.462	12657.9	19.209
850.	70.605	16.024	86.628	13620.3	19.282
900.	71.526	16.207	87.732	14585.9	19.343
950.	72.406	16.373	88.780	15554.4	19.396
1000.	73.250	16.525	89.776	16525.4	19.441
1050.	74.060	16.665	90.725	17498.4	19.480
1100.	74.838	16.794	91.632	18473.3	19.514
1150.	75.587	16.913	92.500	19449.7	19.543
1200.	76.310	17.023	93.332	20427.5	19.570
1250.	77.007	17.125	94.132	21406.6	19.593
1300.	77.680	17.221	94.901	22386.8	19.614
1350.	78.332	17.310	95.641	23367.9	19.632
1400.	78.963	17.393	96.356	24350.0	19.649
1450.	79.574	17.471	97.045	25332.8	19.664
1500.	80.168	17.544	97.712	26316.3	19.677
1550.	80.744	17.613	98.358	27300.5	19.689
1600.	81.305	17.678	98.983	28285.2	19.701
1650.	81.850	17.740	99.589	29270.5	19.711
1700.	82.380	17.798	100.178	30256.3	19.720
1750.	82.897	17.853	100.750	31242.5	19.728
1800.	83.400	17.905	101.305	32229.1	19.736
1850.	83.892	17.955	101.846	33216.1	19.743
1900.	84.371	18.002	102.373	34203.5	19.750
1950.	84.839	18.047	102.886	35191.1	19.756
2000.	85.297	18.090	103.386	36179.1	19.762
2050.	85.744	18.130	103.874	37167.3	19.767
2100.	86.181	18.169	104.351	38155.8	19.772
2150.	86.609	18.207	104.816	39144.5	19.777
2200.	87.028	18.242	105.271	40133.5	19.781
2250.	87.439	18.277	105.715	41122.6	19.785
2300.	87.841	18.310	106.150	42112.0	19.789
2350.	88.235	18.341	106.576	43101.5	19.792
273.15	54.962	11.283	66.245	3082.1	15.720
298.15	55.967	11.676	67.643	3481.3	16.207

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

84.794, 39.54, 3.314, 42.85, 4.

The frequencies and their degeneracies were taken as:

650. (1), 318. (1), 344. (1), 650. (1), 344. (1), 344. (1)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-46. Thermodynamic Functions for $(LiCl)_2$ (gas) - Continued

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
2400.	88.621	18.371	106.993	44091.2	19.796
2450.	89.000	18.400	107.401	45081.1	19.799
2500.	89.372	18.428	107.801	46071.1	19.802
2600.	90.096	18.481	108.578	48051.5	19.807
2700.	90.795	18.531	109.325	50032.4	19.812
2800.	91.469	18.576	110.046	52013.8	19.816
2900.	92.122	18.619	110.741	53995.6	19.820
3000.	92.754	18.659	111.413	55977.8	19.823
3100.	93.366	18.697	112.063	57960.3	19.826
3200.	93.960	18.732	112.693	59943.0	19.829
3300.	94.537	18.765	113.303	61926.1	19.832
3400.	95.098	18.797	113.895	63909.4	19.834
3500.	95.643	18.827	114.470	65892.9	19.836
3600.	96.174	18.855	115.029	67876.6	19.838
3700.	96.691	18.881	115.572	69860.5	19.840
3800.	97.195	18.906	116.101	71844.6	19.842
3900.	97.686	18.930	116.617	73828.9	19.843
4000.	98.166	18.953	117.119	75813.3	19.845
4100.	98.634	18.975	117.609	77797.9	19.846
4200.	99.092	18.996	118.088	79782.5	19.847
4300.	99.539	19.016	118.555	81767.3	19.849
4400.	99.976	19.035	119.011	83752.2	19.850
4500.	100.404	19.053	119.457	85737.2	19.851
4600.	100.823	19.070	119.893	87722.3	19.852
4700.	101.234	19.087	120.320	89707.5	19.852
4800.	101.636	19.103	120.738	91692.8	19.853
4900.	102.030	19.118	121.148	93678.2	19.854
5000.	102.416	19.133	121.549	95663.6	19.855
5100.	102.795	19.147	121.942	97649.2	19.855
5200.	103.167	19.161	122.327	99634.7	19.856
5300.	103.532	19.174	122.706	101620.4	19.857
5400.	103.891	19.186	123.077	103606.1	19.857
5500.	104.243	19.199	123.441	105591.8	19.858
5600.	104.589	19.210	123.799	107577.7	19.858
5700.	104.929	19.222	124.151	109563.5	19.859
5800.	105.263	19.233	124.496	111549.4	19.859
5900.	105.592	19.243	124.835	113535.4	19.860
6000.	105.916	19.254	125.169	115521.4	19.860
6100.	106.234	19.264	125.497	117507.4	19.861
6200.	106.547	19.273	125.820	119493.5	19.861
6300.	106.856	19.282	126.138	121479.6	19.861
6400.	107.159	19.292	126.451	123465.8	19.862
6500.	107.459	19.300	126.759	125452.0	19.862
6600.	107.753	19.309	127.062	127438.2	19.862
6700.	108.044	19.317	127.361	129424.4	19.863
6800.	108.330	19.325	127.655	131410.7	19.863
6900.	108.612	19.333	127.945	133397.0	19.863
7000.	108.890	19.340	128.231	135383.4	19.864

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.011793
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.049342
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.011785

Table 1-47. Thermodynamic Functions for BeF_2 (gas)

T °K	$-\frac{(F^o-H_0^o)}{RT}$	$\frac{H^o-H_0^o}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H_0^o}{R}$	$\frac{C_p^o}{R}$
50.	16.23	3.50	19.73	175.	3.50
75.	17.65	3.50	21.15	263.	3.50
100.	18.66	3.50	22.16	350.	3.50
125.	19.44	3.50	22.94	438.	3.53
150.	20.08	3.51	23.59	527.	3.58
175.	20.62	3.53	24.15	617.	3.69
200.	21.09	3.56	24.65	711.	3.82
225.	21.51	3.59	25.11	809.	3.99
250.	21.89	3.64	25.54	911.	4.17
275.	22.24	3.70	25.94	1017.	4.35
300.	22.57	3.76	26.33	1128.	4.53
325.	22.87	3.83	26.70	1244.	4.71
350.	23.16	3.90	27.06	1364.	4.88
375.	23.43	3.97	27.40	1488.	5.05
400.	23.69	4.04	27.73	1616.	5.20
425.	23.94	4.11	28.05	1748.	5.34
450.	24.17	4.18	28.36	1883.	5.47
475.	24.40	4.26	28.66	2021.	5.60
500.	24.62	4.33	28.95	2163.	5.71
550.	25.04	4.46	29.50	2453.	5.92
600.	25.43	4.59	30.02	2754.	6.09
650.	25.81	4.71	30.52	3062.	6.24
700.	26.16	4.83	30.98	3378.	6.38
750.	26.50	4.93	31.43	3700.	6.49
800.	26.82	5.03	31.85	4026.	6.59
850.	27.12	5.13	32.25	4358.	6.67
900.	27.42	5.22	32.64	4694.	6.75
950.	27.70	5.30	33.00	5033.	6.81
1000.	27.98	5.37	33.35	5375.	6.87
1050.	28.24	5.45	33.69	5720.	6.92
1100.	28.50	5.52	34.01	6067.	6.97
1150.	28.74	5.58	34.32	6416.	7.01
1200.	28.98	5.64	34.62	6767.	7.04
1250.	29.21	5.70	34.91	7120.	7.08
1300.	29.44	5.75	35.19	7475.	7.11
1350.	29.66	5.80	35.46	7831.	7.13
1400.	29.87	5.85	35.72	8188.	7.16
1450.	30.07	5.89	35.97	8546.	7.18
1500.	30.28	5.94	36.21	8906.	7.20
1550.	30.47	5.98	36.45	9266.	7.22
1600.	30.66	6.02	36.68	9627.	7.23
1650.	30.85	6.05	36.90	9989.	7.25
1700.	31.03	6.09	37.12	10352.	7.26
1750.	31.20	6.12	37.33	10715.	7.27
1800.	31.38	6.16	37.53	11079.	7.29
1850.	31.55	6.19	37.73	11444.	7.30
1900.	31.71	6.22	37.93	11809.	7.31
1950.	31.87	6.24	38.12	12174.	7.32
2000.	32.03	6.27	38.30	12540.	7.32
2050.	32.19	6.30	38.48	12907.	7.33
2100.	32.34	6.32	38.66	13274.	7.34
2150.	32.49	6.34	38.83	13641.	7.35
2200.	32.63	6.37	39.00	14008.	7.35
2250.	32.78	6.39	39.17	14376.	7.36
2300.	32.92	6.41	39.33	14744.	7.37
2350.	33.06	6.43	39.49	15113.	7.37

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

47.013, 12.36, 2, 1.

The frequencies and their degeneracies were taken as:

1520. (1), 825. (2), 750. (1).

Table 1-47. Thermodynamic Functions for BeF_2 (gas) - Continued

T °K	$\frac{-(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
2400.	33.19	6.45	39.64	15482.	7.38
2450.	33.33	6.47	39.80	15850.	7.38
2500.	33.46	6.49	39.94	16220.	7.39
2550.	33.59	6.51	40.09	16589.	7.39
2600.	33.71	6.52	40.23	16959.	7.39
2650.	33.84	6.54	40.38	17329.	7.40
2700.	33.96	6.56	40.51	17699.	7.40
2750.	34.08	6.57	40.65	18069.	7.41
2800.	34.20	6.59	40.78	18439.	7.41
2850.	34.31	6.60	40.91	18810.	7.41
2900.	34.43	6.61	41.04	19180.	7.41
2950.	34.54	6.63	41.17	19551.	7.42
3000.	34.65	6.64	41.29	19922.	7.42
3100.	34.87	6.67	41.54	20664.	7.43
3200.	35.08	6.69	41.77	21407.	7.43
3300.	35.29	6.71	42.00	22150.	7.43
3400.	35.49	6.73	42.22	22894.	7.44
3500.	35.69	6.75	42.44	23638.	7.44
3600.	35.88	6.77	42.65	24382.	7.44
3700.	36.06	6.79	42.85	25127.	7.45
3800.	36.24	6.81	43.05	25871.	7.45
3900.	36.42	6.82	43.25	26617.	7.45
4000.	36.59	6.84	43.43	27362.	7.45
4100.	36.76	6.86	43.62	28108.	7.46
4200.	36.93	6.87	43.80	28853.	7.46
4300.	37.09	6.88	43.97	29599.	7.46
4400.	37.25	6.90	44.15	30346.	7.46
4500.	37.40	6.91	44.31	31092.	7.46
4600.	37.56	6.92	44.48	31838.	7.47
4700.	37.70	6.93	44.64	32585.	7.47
4800.	37.85	6.94	44.79	33332.	7.47
4900.	37.99	6.95	44.95	34079.	7.47
5000.	38.13	6.97	45.10	34826.	7.47
5100.	38.27	6.98	45.25	35573.	7.47
5200.	38.41	6.98	45.39	36320.	7.47
5300.	38.54	6.99	45.54	37068.	7.47
5400.	38.67	7.00	45.67	37815.	7.48
5500.	38.80	7.01	45.81	38563.	7.48
5600.	38.93	7.02	45.95	39310.	7.48
5700.	39.05	7.03	46.08	40058.	7.48
5800.	39.17	7.04	46.21	40806.	7.48
5900.	39.29	7.04	46.34	41554.	7.48
6000.	39.41	7.05	46.46	42302.	7.48
6200.	39.64	7.06	46.71	43798.	7.48
6400.	39.87	7.08	46.95	45294.	7.48
273.15	22.22	3.69	25.91	1009.	4.34
298.15	22.55	3.76	26.30	1120.	4.52

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.042270
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.17686
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.042243

Table 1-48. Thermodynamic Functions for $BeCl_2$ (gas)

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
50.	18.10	3.50	21.60	175.	3.50
75.	19.52	3.50	23.02	263.	3.52
100.	20.53	3.52	24.04	352.	3.62
125.	21.31	3.55	24.87	444.	3.81
150.	21.97	3.62	25.59	543.	4.07
175.	22.53	3.70	26.24	648.	4.36
200.	23.03	3.80	26.84	761.	4.63
225.	23.49	3.91	27.40	880.	4.89
250.	23.90	4.02	27.92	1005.	5.12
275.	24.29	4.13	28.42	1136.	5.33
300.	24.66	4.24	28.89	1271.	5.52
325.	25.00	4.34	29.34	1411.	5.69
350.	25.33	4.44	29.77	1556.	5.84
375.	25.64	4.54	30.18	1703.	5.98
400.	25.93	4.64	30.57	1854.	6.10
425.	26.22	4.73	30.94	2008.	6.21
450.	26.49	4.81	31.30	2165.	6.31
475.	26.75	4.89	31.64	2323.	6.40
500.	27.00	4.97	31.97	2484.	6.48
550.	27.48	5.11	32.60	2812.	6.61
600.	27.93	5.24	33.18	3145.	6.73
650.	28.36	5.36	33.72	3484.	6.82
700.	28.76	5.47	34.23	3827.	6.90
750.	29.14	5.57	34.71	4174.	6.97
800.	29.50	5.66	35.16	4524.	7.03
850.	29.85	5.74	35.58	4877.	7.07
900.	30.18	5.81	35.99	5231.	7.12
950.	30.49	5.88	36.38	5588.	7.15
1000.	30.80	5.95	36.74	5946.	7.18
1050.	31.09	6.01	37.09	6306.	7.21
1100.	31.37	6.06	37.43	6667.	7.23
1150.	31.64	6.11	37.75	7030.	7.25
1200.	31.90	6.16	38.06	7393.	7.27
1250.	32.15	6.21	38.36	7757.	7.29
1300.	32.40	6.25	38.65	8122.	7.31
1350.	32.63	6.29	38.92	8487.	7.32
1400.	32.86	6.32	39.19	8854.	7.33
1450.	33.09	6.36	39.45	9220.	7.34
1500.	33.30	6.39	39.69	9588.	7.35
1550.	33.51	6.42	39.94	9956.	7.36
1600.	33.72	6.45	40.17	10324.	7.37
1650.	33.92	6.48	40.40	10693.	7.38
1700.	34.11	6.51	40.62	11062.	7.38
1750.	34.30	6.53	40.83	11431.	7.39
1800.	34.48	6.56	41.04	11801.	7.40
1850.	34.66	6.58	41.24	12171.	7.40
1900.	34.84	6.60	41.44	12541.	7.41
1950.	35.01	6.62	41.63	12911.	7.41
2000.	35.18	6.64	41.82	13282.	7.42
2050.	35.34	6.66	42.00	13653.	7.42
2100.	35.50	6.68	42.18	14024.	7.42
2150.	35.66	6.70	42.36	14395.	7.43
2200.	35.81	6.71	42.53	14766.	7.43
2250.	35.97	6.73	42.69	15138.	7.43
2300.	36.11	6.74	42.86	15510.	7.44
2350.	36.26	6.76	43.02	15882.	7.44

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

79.927, 36.06, 2, 1.

The frequencies and their degeneracies were taken as:

1113. (1), 482. (2), 550. (1).

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Table 1-48. Thermodynamic Functions for $BeCl_2$ (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
2400.	36.40	6.77	43.17	16254.	7.44
2450.	36.54	6.79	43.33	16626.	7.44
2500.	36.68	6.80	43.48	16998.	7.45
2550.	36.81	6.81	43.62	17370.	7.45
2600.	36.95	6.82	43.77	17743.	7.45
2650.	37.08	6.84	43.91	18115.	7.45
2700.	37.20	6.85	44.05	18488.	7.45
2750.	37.33	6.86	44.19	18860.	7.45
2800.	37.45	6.87	44.32	19233.	7.46
2850.	37.57	6.88	44.45	19606.	7.46
2900.	37.69	6.89	44.58	19979.	7.46
2950.	37.81	6.90	44.71	20352.	7.46
3000.	37.93	6.91	44.84	20725.	7.46
3100.	38.16	6.93	45.08	21471.	7.46
3200.	38.38	6.94	45.32	22218.	7.47
3300.	38.59	6.96	45.55	22965.	7.47
3400.	38.80	6.97	45.77	23712.	7.47
3500.	39.00	6.99	45.99	24459.	7.47
3600.	39.20	7.00	46.20	25206.	7.47
3700.	39.39	7.01	46.40	25953.	7.47
3800.	39.58	7.03	46.60	26701.	7.48
3900.	39.76	7.04	46.80	27449.	7.48
4000.	39.94	7.05	46.99	28196.	7.48
4100.	40.11	7.06	47.17	28944.	7.48
4200.	40.28	7.07	47.35	29692.	7.48
4300.	40.45	7.08	47.53	30440.	7.48
4400.	40.61	7.09	47.70	31189.	7.48
4500.	40.77	7.10	47.87	31937.	7.48
4600.	40.93	7.11	48.03	32685.	7.48
4700.	41.08	7.11	48.19	33434.	7.48
4800.	41.23	7.12	48.35	34182.	7.49
4900.	41.38	7.13	48.50	34931.	7.49
5000.	41.52	7.14	48.66	35679.	7.49
5100.	41.66	7.14	48.80	36428.	7.49
5200.	41.80	7.15	48.95	37177.	7.49
5300.	41.94	7.16	49.09	37925.	7.49
5400.	42.07	7.16	49.23	38674.	7.49
5500.	42.20	7.17	49.37	39423.	7.49
5600.	42.33	7.17	49.50	40172.	7.49
5700.	42.46	7.18	49.64	40921.	7.49
5800.	42.58	7.18	49.77	41670.	7.49
5900.	42.71	7.19	49.89	42419.	7.49
6000.	42.83	7.19	50.02	43168.	7.49
6200.	43.06	7.20	50.27	44666.	7.49
6400.	43.29	7.21	50.50	46164.	7.49
273.15	24.26	4.12	28.39	1126.	5.32
298.15	24.63	4.23	28.86	1261.	5.51

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.024863
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.10403
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.024847

Table 1-49. Thermodynamic Functions for BeFCl (gas)

T °K	$-(F^o-H_0^o)/RT$	$(H^o-H_0^o)/RT$	S^o/R	$(H^o-H_0^o)/R$	C_p^o/R
50.	17.90	3.50	21.40	175.	3.50
75.	19.32	3.50	22.82	263.	3.50
100.	20.33	3.50	23.83	350.	3.52
125.	21.11	3.51	24.62	439.	3.57
150.	21.75	3.53	25.28	529.	3.68
175.	22.30	3.56	25.86	623.	3.84
200.	22.77	3.61	26.38	722.	4.03
225.	23.20	3.67	26.87	825.	4.24
250.	23.59	3.74	27.33	934.	4.46
275.	23.95	3.81	27.76	1048.	4.67
300.	24.29	3.89	28.18	1167.	4.88
325.	24.60	3.98	28.58	1292.	5.07
350.	24.90	4.06	28.96	1421.	5.25
375.	25.18	4.15	29.33	1554.	5.42
400.	25.45	4.23	29.68	1692.	5.57
425.	25.71	4.31	30.02	1833.	5.71
450.	25.96	4.39	30.35	1977.	5.84
475.	26.20	4.47	30.67	2125.	5.96
500.	26.43	4.55	30.98	2275.	6.06
550.	26.87	4.70	31.57	2583.	6.25
600.	27.29	4.83	32.12	2899.	6.41
650.	27.68	4.96	32.64	3223.	6.54
700.	28.05	5.08	33.13	3553.	6.65
750.	28.40	5.18	33.59	3887.	6.74
800.	28.74	5.28	34.02	4226.	6.82
850.	29.06	5.38	34.44	4569.	6.89
900.	29.37	5.46	34.84	4915.	6.95
950.	29.67	5.54	35.21	5264.	7.00
1000.	29.96	5.61	35.57	5615.	7.04
1050.	30.23	5.68	35.92	5968.	7.08
1100.	30.50	5.75	36.25	6323.	7.12
1150.	30.76	5.81	36.56	6679.	7.15
1200.	31.00	5.86	36.87	7037.	7.17
1250.	31.25	5.92	37.16	7396.	7.20
1300.	31.48	5.97	37.44	7757.	7.22
1350.	31.70	6.01	37.72	8118.	7.24
1400.	31.92	6.06	37.98	8480.	7.26
1450.	32.14	6.10	38.24	8844.	7.27
1500.	32.34	6.14	38.48	9207.	7.29
1550.	32.55	6.18	38.72	9572.	7.30
1600.	32.74	6.21	38.95	9937.	7.31
1650.	32.93	6.24	39.18	10303.	7.32
1700.	33.12	6.28	39.40	10669.	7.33
1750.	33.30	6.31	39.61	11036.	7.34
1800.	33.48	6.34	39.82	11403.	7.35
1850.	33.66	6.36	40.02	11771.	7.36
1900.	33.83	6.39	40.22	12139.	7.36
1950.	33.99	6.41	40.41	12508.	7.37
2000.	34.16	6.44	40.59	12876.	7.38
2050.	34.31	6.46	40.78	13245.	7.38
2100.	34.47	6.48	40.95	13614.	7.39
2150.	34.62	6.50	41.13	13984.	7.39
2200.	34.77	6.52	41.30	14354.	7.40
2250.	34.92	6.54	41.46	14724.	7.40
2300.	35.06	6.56	41.63	15094.	7.41
2350.	35.21	6.58	41.79	15464.	7.41

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

63.47, 20.91, 1, 1.

The frequencies and their degeneracies were taken as:

1200. (1), 800. (1), 650. (2).

Table 1-49. Thermodynamic Functions for BeFCl (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
2400.	35.34	6.60	41.94	15835.	7.41
2450.	35.48	6.61	42.09	16206.	7.42
2500.	35.61	6.63	42.24	16577.	7.42
2550.	35.75	6.65	42.39	16948.	7.42
2600.	35.87	6.66	42.54	17319.	7.43
2650.	36.00	6.68	42.68	17690.	7.43
2700.	36.13	6.69	42.82	18062.	7.43
2750.	36.25	6.70	42.95	18434.	7.43
2800.	36.37	6.72	43.09	18805.	7.44
2850.	36.49	6.73	43.22	19177.	7.44
2900.	36.61	6.74	43.35	19549.	7.44
2950.	36.72	6.75	43.47	19921.	7.44
3000.	36.84	6.76	43.60	20294.	7.44
3100.	37.06	6.79	43.84	21038.	7.45
3200.	37.27	6.81	44.08	21783.	7.45
3300.	37.48	6.83	44.31	22528.	7.45
3400.	37.69	6.85	44.53	23274.	7.46
3500.	37.89	6.86	44.75	24020.	7.46
3600.	38.08	6.88	44.96	24766.	7.46
3700.	38.27	6.90	45.16	25512.	7.46
3800.	38.45	6.91	45.36	26258.	7.47
3900.	38.63	6.92	45.56	27005.	7.47
4000.	38.81	6.94	45.75	27752.	7.47
4100.	38.98	6.95	45.93	28499.	7.47
4200.	39.15	6.96	46.11	29246.	7.47
4300.	39.31	6.98	46.29	29993.	7.47
4400.	39.47	6.99	46.46	30740.	7.47
4500.	39.63	7.00	46.63	31488.	7.48
4600.	39.78	7.01	46.79	32236.	7.48
4700.	39.93	7.02	46.95	32983.	7.48
4800.	40.08	7.03	47.11	33731.	7.48
4900.	40.23	7.04	47.26	34479.	7.48
5000.	40.37	7.05	47.41	35227.	7.48
5100.	40.51	7.05	47.56	35975.	7.48
5200.	40.64	7.06	47.71	36723.	7.48
5300.	40.78	7.07	47.85	37471.	7.48
5400.	40.91	7.08	47.99	38219.	7.48
5500.	41.04	7.09	48.13	38968.	7.48
5600.	41.17	7.09	48.26	39716.	7.48
5700.	41.29	7.10	48.39	40464.	7.48
5800.	41.42	7.11	48.52	41213.	7.49
5900.	41.54	7.11	48.65	41961.	7.49
6000.	41.66	7.12	48.78	42710.	7.49
6200.	41.89	7.13	49.02	44207.	7.49
6400.	42.12	7.14	49.26	45705.	7.49
273.15	23.93	3.81	27.73	1039.	4.66
298.15	24.26	3.89	28.15	1158.	4.86

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal mole^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.031310
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.13100
Btu (lb mole)$^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.031290

Table 1-50. Thermodynamic Functions for MgF_2 (gas)

T K	$-(F^o-H^o_0)/RT$	$(H^o-H^o_0)/RT$	S^o/R	$(H^o-H^o_0)/R$	C^o_p/R
50.	17.12	3.50	20.62	175.	3.50
75.	18.54	3.50	22.05	263.	3.54
100.	19.55	3.53	23.08	353.	3.68
125.	20.35	3.58	23.93	448.	3.94
150.	21.01	3.67	24.67	550.	4.25
175.	21.58	3.77	25.35	660.	4.57
200.	22.09	3.89	25.98	779.	4.88
225.	22.56	4.02	26.58	904.	5.16
250.	22.99	4.15	27.13	1036.	5.42
275.	23.39	4.27	27.66	1175.	5.64
300.	23.77	4.39	28.16	1318.	5.84
325.	24.12	4.51	28.63	1466.	6.01
350.	24.46	4.62	29.08	1619.	6.16
375.	24.78	4.73	29.51	1774.	6.29
400.	25.09	4.83	29.92	1933.	6.41
425.	25.39	4.93	30.32	2094.	6.51
450.	25.67	5.02	30.69	2258.	6.59
475.	25.95	5.10	31.05	2424.	6.67
500.	26.21	5.18	31.39	2592.	6.74
550.	26.71	5.33	32.04	2932.	6.85
600.	27.18	5.46	32.64	3277.	6.95
650.	27.62	5.58	33.20	3626.	7.02
700.	28.04	5.68	33.72	3978.	7.08
750.	28.43	5.78	34.21	4334.	7.13
800.	28.81	5.86	34.67	4691.	7.17
850.	29.17	5.94	35.11	5051.	7.21
900.	29.51	6.01	35.52	5412.	7.24
950.	29.84	6.08	35.91	5775.	7.26
1000.	30.15	6.14	36.29	6138.	7.29
1050.	30.45	6.19	36.64	6503.	7.30
1100.	30.74	6.24	36.98	6869.	7.32
1150.	31.02	6.29	37.31	7235.	7.34
1200.	31.29	6.34	37.62	7602.	7.35
1250.	31.55	6.38	37.92	7970.	7.36
1300.	31.80	6.41	38.21	8338.	7.37
1350.	32.04	6.45	38.49	8707.	7.38
1400.	32.28	6.48	38.76	9076.	7.39
1450.	32.50	6.51	39.02	9446.	7.40
1500.	32.72	6.54	39.27	9816.	7.40
1550.	32.94	6.57	39.51	10186.	7.41
1600.	33.15	6.60	39.75	10557.	7.41
1650.	33.35	6.62	39.98	10928.	7.42
1700.	33.55	6.65	40.20	11299.	7.42
1750.	33.74	6.67	40.41	11670.	7.43
1800.	33.93	6.69	40.62	12041.	7.43
1850.	34.12	6.71	40.82	12413.	7.44
1900.	34.29	6.73	41.02	12785.	7.44
1950.	34.47	6.75	41.22	13157.	7.44
2000.	34.64	6.76	41.40	13529.	7.44
2050.	34.81	6.78	41.59	13901.	7.45
2100.	34.97	6.80	41.77	14274.	7.45
2150.	35.13	6.81	41.94	14646.	7.45
2200.	35.29	6.83	42.11	15019.	7.45
2250.	35.44	6.84	42.28	15392.	7.46
2300.	35.59	6.85	42.45	15765.	7.46
2350.	35.74	6.87	42.61	16137.	7.46

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

62.32, 19.76, 2, 1.

The frequencies and their degeneracies were taken as:

800. (1), 400. (1), 500. (2).

Table 1-50. Thermodynamic Functions for MgF_2 (gas) - Continued

T °K	$-(F^o-H^o_0)/RT$	$H^o-H^o_0/RT$	S^o/R	$H^o-H^o_0/R$	C^o_p/R
2400.	35.88	6.88	42.76	16511.	7.46
2450.	36.03	6.89	42.92	16884.	7.46
2500.	36.17	6.90	43.07	17257.	7.46
2550.	36.30	6.91	43.22	17630.	7.47
2600.	36.44	6.92	43.36	18003.	7.47
2650.	36.57	6.93	43.50	18377.	7.47
2700.	36.70	6.94	43.64	18750.	7.47
2750.	36.83	6.95	43.78	19124.	7.47
2800.	36.95	6.96	43.91	19497.	7.47
2850.	37.07	6.97	44.05	19871.	7.47
2900.	37.20	6.98	44.18	20245.	7.47
2950.	37.32	6.99	44.30	20618.	7.47
3000.	37.43	7.00	44.43	20992.	7.48
3100.	37.66	7.01	44.68	21740.	7.48
3200.	37.89	7.03	44.91	22487.	7.48
3300.	38.10	7.04	45.14	23235.	7.48
3400.	38.31	7.05	45.37	23983.	7.48
3500.	38.52	7.07	45.58	24731.	7.48
3600.	38.72	7.08	45.79	25480.	7.48
3700.	38.91	7.09	46.00	26228.	7.48
3800.	39.10	7.10	46.20	26976.	7.48
3900.	39.28	7.11	46.39	27725.	7.49
4000.	39.46	7.12	46.58	28473.	7.49
4100.	39.64	7.13	46.77	29222.	7.49
4200.	39.81	7.14	46.95	29971.	7.49
4300.	39.98	7.14	47.12	30719.	7.49
4400.	40.14	7.15	47.30	31468.	7.49
4500.	40.31	7.16	47.46	32217.	7.49
4600.	40.46	7.17	47.63	32966.	7.49
4700.	40.62	7.17	47.79	33715.	7.49
4800.	40.77	7.18	47.95	34464.	7.49
4900.	40.92	7.19	48.10	35213.	7.49
5000.	41.06	7.19	48.25	35962.	7.49
5100.	41.20	7.20	48.40	36711.	7.49
5200.	41.34	7.20	48.55	37460.	7.49
5300.	41.48	7.21	48.69	38210.	7.49
5400.	41.62	7.21	48.83	38959.	7.49
5500.	41.75	7.22	48.97	39708.	7.49
5600.	41.88	7.22	49.10	40457.	7.49
5700.	42.01	7.23	49.24	41207.	7.49
5800.	42.13	7.23	49.37	41956.	7.49
5900.	42.26	7.24	49.49	42705.	7.49
6000.	42.38	7.24	49.62	43455.	7.49
6200.	42.61	7.25	49.87	44953.	7.49
6400.	42.85	7.26	50.10	46452.	7.49
273.15	23.36	4.26	27.62	1164.	5.63
298.15	23.74	4.39	28.12	1307.	5.83

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.031888
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.13342
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.031867

Table 1-51. Thermodynamic Functions for $MgCl_2$ (gas)

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
50.	18.80	3.51	22.31	175.	3.54
75.	20.23	3.56	23.79	267.	3.83
100.	21.27	3.68	24.95	368.	4.30
125.	22.11	3.86	25.96	482.	4.78
150.	22.83	4.05	26.87	607.	5.20
175.	23.47	4.24	27.70	741.	5.55
200.	24.04	4.42	28.46	884.	5.84
225.	24.57	4.59	29.16	1033.	6.08
250.	25.07	4.75	29.81	1187.	6.27
275.	25.53	4.89	30.42	1346.	6.43
300.	25.96	5.03	30.99	1509.	6.57
325.	26.36	5.15	31.52	1674.	6.68
350.	26.75	5.26	32.02	1843.	6.77
375.	27.12	5.37	32.49	2013.	6.85
400.	27.47	5.46	32.93	2185.	6.92
425.	27.80	5.55	33.35	2359.	6.98
450.	28.12	5.63	33.75	2534.	7.03
475.	28.43	5.71	34.13	2710.	7.07
500.	28.72	5.78	34.50	2888.	7.11
550.	29.28	5.90	35.18	3245.	7.17
600.	29.80	6.01	35.80	3605.	7.22
650.	30.28	6.10	36.38	3967.	7.26
700.	30.74	6.19	36.92	4331.	7.29
750.	31.17	6.26	37.43	4696.	7.32
800.	31.57	6.33	37.90	5062.	7.34
850.	31.96	6.39	38.35	5430.	7.36
900.	32.32	6.44	38.77	5798.	7.37
950.	32.67	6.49	39.16	6167.	7.38
1000.	33.01	6.54	39.54	6536.	7.40
1050.	33.33	6.58	39.91	6906.	7.41
1100.	33.63	6.62	40.25	7277.	7.41
1150.	33.93	6.65	40.58	7648.	7.42
1200.	34.21	6.68	40.90	8019.	7.43
1250.	34.49	6.71	41.20	8390.	7.43
1300.	34.75	6.74	41.49	8762.	7.44
1350.	35.01	6.77	41.77	9134.	7.44
1400.	35.25	6.79	42.04	9506.	7.45
1450.	35.49	6.81	42.30	9879.	7.45
1500.	35.72	6.83	42.56	10251.	7.45
1550.	35.95	6.85	42.80	10624.	7.46
1600.	36.16	6.87	43.04	10997.	7.46
1650.	36.38	6.89	43.27	11370.	7.46
1700.	36.58	6.91	43.49	11743.	7.46
1750.	36.78	6.92	43.71	12116.	7.47
1800.	36.98	6.94	43.92	12490.	7.47
1850.	37.17	6.95	44.12	12863.	7.47
1900.	37.35	6.97	44.32	13236.	7.47
1950.	37.53	6.98	44.51	13610.	7.47
2000.	37.71	6.99	44.70	13984.	7.47
2050.	37.88	7.00	44.89	14357.	7.47
2100.	38.05	7.01	45.07	14731.	7.48
2150.	38.22	7.03	45.24	15105.	7.48
2200.	38.38	7.04	45.42	15479.	7.48
2250.	38.54	7.05	45.58	15853.	7.48
2300.	38.69	7.06	45.75	16227.	7.48
2350.	38.84	7.06	45.91	16601.	7.48

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

95.234, 55.96, 2, 1.

The frequencies and their degeneracies were taken as:

597. (1), 300. (1), 295. (2).

Table 1-51. Thermodynamic Functions for $MgCl_2$ (gas) - Continued

T °K	$-(F^o-H^o_0)/RT$	$H^o-H^o_0/RT$	S^o/R	$H^o-H^o_0/R$	C^o_p/R
2400.	38.99	7.07	46.07	16975.	7.48
2450.	39.14	7.08	46.22	17349.	7.48
2500.	39.28	7.09	46.37	17723.	7.48
2550.	39.42	7.10	46.52	18097.	7.48
2600.	39.56	7.10	46.67	18471.	7.48
2650.	39.70	7.11	46.81	18846.	7.48
2700.	39.83	7.12	46.95	19220.	7.49
2750.	39.96	7.13	47.09	19594.	7.49
2800.	40.09	7.13	47.22	19968.	7.49
2850.	40.21	7.14	47.35	20343.	7.49
2900.	40.34	7.14	47.48	20717.	7.49
2950.	40.46	7.15	47.61	21092.	7.49
3000.	40.58	7.16	47.74	21466.	7.49
3100.	40.82	7.17	47.98	22215.	7.49
3200.	41.04	7.18	48.22	22964.	7.49
3300.	41.26	7.19	48.45	23713.	7.49
3400.	41.48	7.19	48.67	24462.	7.49
3500.	41.69	7.20	48.89	25211.	7.49
3600.	41.89	7.21	49.10	25960.	7.49
3700.	42.09	7.22	49.31	26709.	7.49
3800.	42.28	7.23	49.51	27458.	7.49
3900.	42.47	7.23	49.70	28208.	7.49
4000.	42.65	7.24	49.89	28957.	7.49
4100.	42.83	7.25	50.08	29706.	7.49
4200.	43.01	7.25	50.26	30456.	7.49
4300.	43.18	7.26	50.43	31205.	7.49
4400.	43.34	7.26	50.61	31955.	7.49
4500.	43.51	7.27	50.77	32704.	7.49
4600.	43.67	7.27	50.94	33454.	7.49
4700.	43.82	7.28	51.10	34203.	7.50
4800.	43.98	7.28	51.26	34953.	7.50
4900.	44.13	7.29	51.41	35702.	7.50
5000.	44.27	7.29	51.56	36452.	7.50
5100.	44.42	7.29	51.71	37201.	7.50
5200.	44.56	7.30	51.86	37951.	7.50
5300.	44.70	7.30	52.00	38700.	7.50
5400.	44.84	7.31	52.14	39450.	7.50
5500.	44.97	7.31	52.28	40200.	7.50
5600.	45.10	7.31	52.41	40949.	7.50
5700.	45.23	7.32	52.55	41699.	7.50
5800.	45.36	7.32	52.68	42449.	7.50
5900.	45.48	7.32	52.80	43198.	7.50
6000.	45.61	7.32	52.93	43948.	7.50
6200.	45.85	7.33	53.18	45448.	7.50
6400.	46.08	7.34	53.41	46947.	7.50
273.15	25.49	4.88	30.38	1334.	6.42
298.15	25.93	5.02	30.95	1497.	6.56

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.020867
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.087308
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.020853

Table 1-52. Thermodynamic Functions for MgFCl (gas)

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
50.	18.71	3.50	22.21	175.	3.50
75.	20.13	3.51	23.64	263.	3.57
100.	21.14	3.55	24.69	355.	3.78
125.	21.94	3.63	25.57	453.	4.12
150.	22.61	3.74	26.35	561.	4.50
175.	23.20	3.87	27.07	678.	4.86
200.	23.72	4.02	27.74	804.	5.20
225.	24.21	4.17	28.37	938.	5.49
250.	24.65	4.31	28.96	1078.	5.75
275.	25.07	4.45	29.52	1225.	5.96
300.	25.46	4.59	30.05	1376.	6.14
325.	25.84	4.71	30.55	1532.	6.30
350.	26.19	4.83	31.02	1691.	6.43
375.	26.53	4.94	31.47	1853.	6.54
400.	26.85	5.04	31.89	2018.	6.64
425.	27.16	5.14	32.30	2185.	6.73
450.	27.45	5.23	32.68	2354.	6.80
475.	27.74	5.32	33.05	2525.	6.86
500.	28.01	5.39	33.41	2697.	6.92
550.	28.53	5.54	34.07	3045.	7.01
600.	29.02	5.66	34.68	3398.	7.08
650.	29.48	5.77	35.25	3753.	7.14
700.	29.91	5.87	35.78	4111.	7.19
750.	30.32	5.96	36.28	4472.	7.22
800.	30.71	6.04	36.75	4834.	7.26
850.	31.07	6.11	37.19	5197.	7.28
900.	31.43	6.18	37.61	5562.	7.31
950.	31.76	6.24	38.00	5928.	7.33
1000.	32.08	6.29	38.38	6295.	7.34
1050.	32.39	6.34	38.74	6662.	7.36
1100.	32.69	6.39	39.08	7030.	7.37
1150.	32.97	6.43	39.41	7399.	7.38
1200.	33.25	6.47	39.72	7768.	7.39
1250.	33.51	6.51	40.02	8138.	7.40
1300.	33.77	6.54	40.31	8508.	7.41
1350.	34.02	6.58	40.59	8878.	7.41
1400.	34.26	6.61	40.86	9249.	7.42
1450.	34.49	6.63	41.12	9620.	7.42
1500.	34.71	6.66	41.37	9991.	7.43
1550.	34.93	6.69	41.62	10363.	7.43
1600.	35.15	6.71	41.85	10735.	7.44
1650.	35.35	6.73	42.08	11107.	7.44
1700.	35.55	6.75	42.31	11479.	7.44
1750.	35.75	6.77	42.52	11851.	7.45
1800.	35.94	6.79	42.73	12223.	7.45
1850.	36.13	6.81	42.94	12596.	7.45
1900.	36.31	6.83	43.13	12969.	7.46
1950.	36.49	6.84	43.33	13342.	7.46
2000.	36.66	6.86	43.52	13714.	7.46
2050.	36.83	6.87	43.70	14087.	7.46
2100.	36.99	6.89	43.88	14461.	7.46
2150.	37.16	6.90	44.06	14834.	7.46
2200.	37.32	6.91	44.23	15207.	7.47
2250.	37.47	6.92	44.40	15580.	7.47
2300.	37.62	6.94	44.56	15954.	7.47
2350.	37.77	6.95	44.72	16327.	7.47

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

78.777, 33.86, 1, 1.

The frequencies and their degeneracies were taken as:

650. (1), 450. (1), 400. (2).

Table 1-52. Thermodynamic Functions for MgFCℓ (gas) - Continued

T °K	$-(F^o-H^o_0)/RT$	$H^o-H^o_0/RT$	S^o/R	$H^o-H^o_0/R$	C^o_p/R
2400.	37.92	6.96	44.88	16701.	7.47
2450.	38.06	6.97	45.03	17075.	7.47
2500.	38.20	6.98	45.18	17448.	7.47
2550.	38.34	6.99	45.33	17822.	7.48
2600.	38.48	7.00	45.48	18196.	7.48
2650.	38.61	7.01	45.62	18570.	7.48
2700.	38.74	7.02	45.76	18943.	7.48
2750.	38.87	7.02	45.90	19317.	7.48
2800.	39.00	7.03	46.03	19691.	7.48
2850.	39.12	7.04	46.16	20065.	7.48
2900.	39.24	7.05	46.29	20439.	7.48
2950.	39.37	7.06	46.42	20813.	7.48
3000.	39.48	7.06	46.55	21187.	7.48
3100.	39.72	7.08	46.79	21936.	7.48
3200.	39.94	7.09	47.03	22684.	7.48
3300.	40.16	7.10	47.26	23432.	7.49
3400.	40.37	7.11	47.48	24181.	7.49
3500.	40.58	7.12	47.70	24930.	7.49
3600.	40.78	7.13	47.91	25678.	7.49
3700.	40.97	7.14	48.12	26427.	7.49
3800.	41.16	7.15	48.32	27176.	7.49
3900.	41.35	7.16	48.51	27925.	7.49
4000.	41.53	7.17	48.70	28674.	7.49
4100.	41.71	7.18	48.89	29423.	7.49
4200.	41.88	7.18	49.07	30172.	7.49
4300.	42.05	7.19	49.24	30921.	7.49
4400.	42.22	7.20	49.41	31670.	7.49
4500.	42.38	7.20	49.58	32419.	7.49
4600.	42.54	7.21	49.75	33169.	7.49
4700.	42.69	7.22	49.91	33918.	7.49
4800.	42.84	7.22	50.07	34667.	7.49
4900.	42.99	7.23	50.22	35416.	7.49
5000.	43.14	7.23	50.37	36166.	7.49
5100.	43.28	7.24	50.52	36915.	7.49
5200.	43.42	7.24	50.67	37664.	7.49
5300.	43.56	7.25	50.81	38414.	7.49
5400.	43.70	7.25	50.95	39163.	7.49
5500.	43.83	7.26	51.09	39913.	7.49
5600.	43.96	7.26	51.22	40662.	7.49
5700.	44.09	7.27	51.35	41412.	7.49
5800.	44.21	7.27	51.48	42161.	7.50
5900.	44.34	7.27	51.61	42911.	7.50
6000.	44.46	7.28	51.74	43660.	7.50
6200.	44.70	7.28	51.98	45159.	7.50
6400.	44.93	7.29	52.22	46659.	7.50
273.15	25.04	4.44	29.48	1214.	5.95
298.15	25.43	4.58	30.01	1365.	6.13

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.025226
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.10555
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.025210

Table 1-53. Thermodynamic Functions for Al_2O (gas)

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
50.	38.515	7.949	46.464	397.5	7.950
75.	41.738	7.952	49.690	596.4	7.975
100.	44.028	7.969	51.997	796.9	8.078
125.	45.810	8.008	53.817	1001.0	8.258
150.	47.275	8.068	55.342	1210.2	8.482
175.	48.524	8.144	56.668	1425.2	8.729
200.	49.617	8.233	57.851	1646.7	8.990
225.	50.593	8.333	58.925	1874.8	9.261
250.	51.476	8.439	59.915	2109.8	9.537
275.	52.285	8.552	60.837	2351.7	9.814
300.	53.035	8.668	61.703	2600.4	10.084
325.	53.733	8.787	62.520	2855.8	10.345
350.	54.389	8.907	63.296	3117.6	10.593
375.	55.007	9.028	64.035	3385.3	10.826
400.	55.594	9.147	64.741	3658.7	11.044
425.	56.152	9.264	65.416	3937.4	11.245
450.	56.685	9.380	66.064	4220.9	11.431
475.	57.195	9.492	66.687	4508.8	11.603
500.	57.684	9.602	67.286	4800.9	11.760
550.	58.610	9.811	68.420	5396.0	12.036
600.	59.472	10.006	69.478	6003.8	12.268
650.	60.280	10.188	70.468	6622.2	12.463
700.	61.041	10.357	71.398	7249.6	12.628
750.	61.761	10.513	72.274	7884.6	12.768
800.	62.444	10.658	73.102	8526.0	12.888
850.	63.094	10.792	73.886	9173.1	12.990
900.	63.715	10.917	74.631	9824.9	13.079
950.	64.308	11.032	75.341	10480.8	13.156
1000.	64.877	11.140	76.017	11140.3	13.223
1050.	65.423	11.241	76.664	11802.9	13.281
1100.	65.948	11.335	77.283	12468.3	13.333
1150.	66.454	11.423	77.876	13136.1	13.379
1200.	66.942	11.505	78.447	13806.1	13.420
1250.	67.413	11.582	78.995	14478.0	13.456
1300.	67.869	11.655	79.524	15151.6	13.488
1350.	68.310	11.724	80.033	15826.8	13.517
1400.	68.737	11.788	80.525	16503.3	13.544
1450.	69.152	11.849	81.001	17181.1	13.567
1500.	69.555	11.907	81.461	17860.0	13.589
1550.	69.946	11.961	81.907	18540.0	13.609
1600.	70.327	12.013	82.340	19220.8	13.627
1650.	70.697	12.062	82.759	19902.6	13.643
1700.	71.058	12.109	83.167	20585.1	13.658
1750.	71.409	12.153	83.563	21268.4	13.672
1800.	71.752	12.196	83.948	21952.3	13.685
1850.	72.087	12.236	84.323	22636.8	13.696
1900.	72.414	12.275	84.689	23321.9	13.707
1950.	72.733	12.312	85.045	24007.5	13.717
2000.	73.045	12.347	85.392	24693.6	13.726
2050.	73.351	12.381	85.731	25380.1	13.735
2100.	73.649	12.413	86.062	26067.1	13.743
2150.	73.942	12.444	86.386	26754.5	13.751
2200.	74.228	12.474	86.702	27442.2	13.758
2250.	74.509	12.502	87.011	28130.2	13.764
2300.	74.784	12.530	87.314	28818.6	13.771
2350.	75.054	12.556	87.610	29507.3	13.776
273.15	52.228	8.543	60.771	2333.6	9.793
298.15	52.981	8.659	61.640	2581.8	10.064

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

69.96, 5.1, 9.0, 14.1, 2.

The frequencies and their degeneracies were taken as:

450. (1), 1000. (2)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-53. Thermodynamic Functions for Al_2O (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2400.	75.318	12.582	87.900	30196.2	13.782
2450.	75.578	12.606	88.184	30885.5	13.787
2500.	75.833	12.630	88.463	31574.9	13.792
2600.	76.329	12.675	89.004	32954.6	13.801
2700.	76.808	12.717	89.525	34335.0	13.809
2800.	77.272	12.756	90.027	35716.3	13.816
2900.	77.720	12.792	90.512	37098.2	13.822
3000.	78.154	12.827	90.981	38480.7	13.828
3100.	78.575	12.859	91.435	39863.7	13.833
3200.	78.984	12.890	91.874	41247.2	13.838
3300.	79.381	12.919	92.300	42631.2	13.842
3400.	79.767	12.946	92.713	44015.7	13.846
3500.	80.143	12.972	93.114	45400.4	13.850
3600.	80.509	12.996	93.505	46785.6	13.853
3700.	80.865	13.019	93.884	48171.0	13.856
3800.	81.212	13.041	94.254	49556.8	13.859
3900.	81.551	13.062	94.614	50942.8	13.861
4000.	81.882	13.082	94.965	52329.1	13.864
4100.	82.206	13.101	95.307	53715.6	13.866
4200.	82.522	13.120	95.641	55102.3	13.868
4300.	82.831	13.137	95.968	56489.2	13.870
4400.	83.133	13.154	96.286	57876.3	13.872
4500.	83.429	13.170	96.598	59263.6	13.874
4600.	83.718	13.185	96.903	60651.1	13.875
4700.	84.002	13.200	97.202	62038.7	13.877
4800.	84.280	13.214	97.494	63426.4	13.878
4900.	84.553	13.227	97.780	64814.3	13.879
5000.	84.820	13.240	98.060	66202.3	13.881
5100.	85.082	13.253	98.335	67590.4	13.882
5200.	85.340	13.265	98.605	68978.7	13.883
5300.	85.592	13.277	98.869	70367.0	13.884
5400.	85.841	13.288	99.129	71755.5	13.885
5500.	86.085	13.299	99.384	73144.0	13.886
5600.	86.324	13.309	99.634	74532.7	13.887
5700.	86.560	13.320	99.880	75921.4	13.888
5800.	86.792	13.329	100.121	77310.2	13.888
5900.	87.020	13.339	100.359	78699.1	13.889
6000.	87.244	13.348	100.592	80088.0	13.890
6100.	87.465	13.357	100.822	81477.1	13.891
6200.	87.682	13.366	101.047	82866.2	13.891
6300.	87.896	13.374	101.270	84255.3	13.892
6400.	88.107	13.382	101.489	85644.5	13.892
6500.	88.314	13.390	101.704	87033.8	13.893
6600.	88.519	13.397	101.916	88423.1	13.894
6700.	88.720	13.405	102.125	89812.5	13.894
6800.	88.919	13.412	102.331	91201.9	13.895
6900.	89.115	13.419	102.534	92591.4	13.895
7000.	89.308	13.426	102.734	93980.9	13.895

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.014294
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.059806
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.014285

Table 1-54. Thermodynamic Functions for Al_2O_2 (gas)

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
50.	18.54	3.50	22.04	175.	3.53
75.	19.96	3.55	23.51	266.	3.79
100.	21.00	3.66	24.66	366.	4.27
125.	21.83	3.84	25.68	480.	4.83
150.	22.55	4.05	26.61	608.	5.38
175.	23.19	4.28	27.47	749.	5.86
200.	23.78	4.50	28.28	900.	6.27
225.	24.32	4.72	29.04	1062.	6.63
250.	24.83	4.93	29.76	1232.	6.95
275.	25.31	5.12	30.43	1409.	7.22
300.	25.76	5.31	31.07	1592.	7.47
325.	26.20	5.48	31.68	1782.	7.69
350.	26.61	5.65	32.26	1977.	7.90
375.	27.00	5.80	32.81	2177.	8.08
400.	27.38	5.95	33.33	2381.	8.25
425.	27.75	6.09	33.84	2589.	8.40
450.	28.10	6.22	34.32	2801.	8.55
475.	28.44	6.35	34.79	3016.	8.68
500.	28.77	6.47	35.24	3235.	8.80
550.	29.39	6.69	36.09	3680.	9.01
600.	29.99	6.89	36.88	4135.	9.19
650.	30.54	7.07	37.62	4598.	9.34
700.	31.08	7.24	38.32	5068.	9.46
750.	31.58	7.39	38.97	5544.	9.57
800.	32.06	7.53	39.59	6025.	9.67
850.	32.52	7.66	40.18	6511.	9.75
900.	32.96	7.78	40.74	7000.	9.82
950.	33.39	7.89	41.27	7493.	9.88
1000.	33.79	7.99	41.78	7988.	9.93
1050.	34.19	8.08	42.27	8486.	9.98
1100.	34.56	8.17	42.73	8986.	10.02
1150.	34.93	8.25	43.18	9488.	10.06
1200.	35.28	8.33	43.61	9992.	10.09
1250.	35.62	8.40	44.02	10498.	10.12
1300.	35.95	8.46	44.42	11004.	10.15
1350.	36.27	8.53	44.80	11512.	10.17
1400.	36.59	8.59	45.17	12022.	10.20
1450.	36.89	8.64	45.53	12532.	10.21
1500.	37.18	8.70	45.88	13043.	10.23
1550.	37.47	8.75	46.21	13555.	10.25
1600.	37.75	8.79	46.54	14068.	10.26
1650.	38.02	8.84	46.85	14582.	10.28
1700.	38.28	8.88	47.16	15096.	10.29
1750.	38.54	8.92	47.46	15610.	10.30
1800.	38.79	8.96	47.75	16126.	10.31
1850.	39.04	9.00	48.03	16642.	10.32
1900.	39.28	9.03	48.31	17158.	10.33
1950.	39.51	9.06	48.58	17675.	10.34
2000.	39.74	9.10	48.84	18192.	10.35
2050.	39.97	9.13	49.09	18709.	10.35
2100.	40.19	9.16	49.34	19227.	10.36
2150.	40.40	9.18	49.59	19745.	10.37
2200.	40.62	9.21	49.83	20264.	10.37
2250.	40.82	9.24	50.06	20782.	10.38
2300.	41.03	9.26	50.29	21301.	10.38
2350.	41.23	9.29	50.51	21821.	10.39
273.15	25.27	5.11	30.38	1395.	7.20
298.15	25.73	5.29	31.03	1579.	7.45

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

85.96, 50.10, 2, 1.

The frequencies and their degeneracies were taken as:

300. (2), 500. (2), 1200. (1), 340. (1), 1200. (1).

Table 1-54. Thermodynamic Functions for Al_2O_2 (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
2400.	41.42	9.31	50.73	22340.	10.39
2450.	41.61	9.33	50.94	22860.	10.40
2500.	41.80	9.35	51.15	23380.	10.40
2550.	41.99	9.37	51.36	23900.	10.40
2600.	42.17	9.39	51.56	24420.	10.41
2650.	42.35	9.41	51.76	24941.	10.41
2700.	42.52	9.43	51.95	25461.	10.41
2750.	42.70	9.45	52.15	25982.	10.42
2800.	42.87	9.47	52.33	26503.	10.42
2850.	43.04	9.48	52.52	27024.	10.42
2900.	43.20	9.50	52.70	27545.	10.43
2950.	43.36	9.51	52.88	28067.	10.43
3000.	43.52	9.53	53.05	28588.	10.43
3100.	43.84	9.56	53.39	29631.	10.43
3200.	44.14	9.59	53.73	30675.	10.44
3300.	44.44	9.61	54.05	31719.	10.44
3400.	44.72	9.64	54.36	32764.	10.45
3500.	45.00	9.66	54.66	33808.	10.45
3600.	45.28	9.68	54.96	34853.	10.45
3700.	45.54	9.70	55.24	35899.	10.45
3800.	45.80	9.72	55.52	36944.	10.46
3900.	46.05	9.74	55.79	37990.	10.46
4000.	46.30	9.76	56.06	39036.	10.46
4100.	46.54	9.78	56.32	40082.	10.46
4200.	46.78	9.79	56.57	41128.	10.46
4300.	47.01	9.81	56.81	42175.	10.47
4400.	47.23	9.82	57.06	43222.	10.47
4500.	47.45	9.84	57.29	44268.	10.47
4600.	47.67	9.85	57.52	45315.	10.47
4700.	47.88	9.86	57.75	46362.	10.47
4800.	48.09	9.88	57.97	47410.	10.47
4900.	48.29	9.89	58.18	48457.	10.47
5000.	48.49	9.90	58.39	49504.	10.47
5100.	48.69	9.91	58.60	50552.	10.48
5200.	48.88	9.92	58.81	51600.	10.48
5300.	49.07	9.93	59.00	52647.	10.48
5400.	49.26	9.94	59.20	53695.	10.48
5500.	49.44	9.95	59.39	54743.	10.48
5600.	49.62	9.96	59.58	55791.	10.48
5700.	49.80	9.97	59.77	56839.	10.48
5800.	49.97	9.98	59.95	57887.	10.48
5900.	50.14	9.99	60.13	58935.	10.48
6000.	50.31	10.00	60.30	59983.	10.48
6200.	50.64	10.01	60.65	62080.	10.48
6400.	50.95	10.03	60.98	64177.	10.48

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.023118
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.096726
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.023103

Table 1-55. Thermodynamic Functions for O = AlH (gas)

T °K	$-(F^o-H^o_0)/RT$	$H^o-H^o_0/RT$	S^o/R	$H^o-H^o_0/R$	C^o_p/R
50.	15.98	3.50	19.48	175.	3.50
75.	17.40	3.50	20.90	263.	3.50
100.	18.41	3.50	21.91	350.	3.50
125.	19.19	3.50	22.69	438.	3.51
150.	19.82	3.50	23.33	525.	3.53
175.	20.37	3.51	23.87	614.	3.57
200.	20.83	3.52	24.36	704.	3.64
225.	21.25	3.54	24.79	797.	3.75
250.	21.62	3.57	25.19	892.	3.87
275.	21.97	3.60	25.57	990.	4.02
300.	22.28	3.64	25.92	1093.	4.17
325.	22.57	3.69	26.26	1199.	4.33
350.	22.85	3.74	26.59	1309.	4.49
375.	23.11	3.80	26.90	1423.	4.65
400.	23.36	3.85	27.21	1541.	4.80
425.	23.59	3.91	27.51	1663.	4.95
450.	23.82	3.97	27.79	1789.	5.09
475.	24.03	4.04	28.07	1918.	5.22
500.	24.24	4.10	28.34	2050.	5.35
550.	24.64	4.22	28.86	2323.	5.58
600.	25.01	4.35	29.36	2608.	5.78
650.	25.36	4.46	29.83	2901.	5.96
700.	25.70	4.58	30.28	3203.	6.12
750.	26.02	4.68	30.70	3513.	6.25
800.	26.32	4.79	31.11	3828.	6.37
850.	26.62	4.88	31.50	4149.	6.47
900.	26.90	4.97	31.87	4475.	6.56
950.	27.17	5.06	32.23	4805.	6.64
1000.	27.43	5.14	32.57	5139.	6.71
1050.	27.68	5.22	32.90	5477.	6.78
1100.	27.93	5.29	33.22	5817.	6.83
1150.	28.17	5.36	33.52	6160.	6.88
1200.	28.39	5.42	33.82	6505.	6.93
1250.	28.62	5.48	34.10	6852.	6.97
1300.	28.83	5.54	34.37	7202.	7.00
1350.	29.04	5.59	34.64	7553.	7.04
1400.	29.25	5.65	34.89	7905.	7.07
1450.	29.45	5.70	35.14	8259.	7.09
1500.	29.64	5.74	35.38	8615.	7.12
1550.	29.83	5.79	35.62	8971.	7.14
1600.	30.01	5.83	35.84	9329.	7.16
1650.	30.19	5.87	36.07	9687.	7.18
1700.	30.37	5.91	36.28	10047.	7.20
1750.	30.54	5.95	36.49	10407.	7.21
1800.	30.71	5.98	36.69	10768.	7.23
1850.	30.87	6.02	36.89	11130.	7.24
1900.	31.04	6.05	37.08	11493.	7.26
1950.	31.19	6.08	37.27	11856.	7.27
2000.	31.35	6.11	37.46	12219.	7.28
2050.	31.50	6.14	37.64	12583.	7.29
2100.	31.65	6.17	37.81	12948.	7.30
2150.	31.79	6.19	37.98	13313.	7.31
2200.	31.93	6.22	38.15	13679.	7.32
2250.	32.07	6.24	38.32	14045.	7.32
2300.	32.21	6.27	38.48	14411.	7.33
2350.	32.35	6.29	38.64	14778.	7.34

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

43.988, 5.31, 1, 1.

The frequencies and their degeneracies were taken as:

1600. (1), 900. (1), 1000. (2).

Table 1-55. Thermodynamic Functions for O = AℓH (gas) - Continued

T °K	$-(F^o-H^o_0)/RT$	$(H^o-H^o_0)/RT$	S^o/R	$(H^o-H^o_0)/R$	C^o_p/R
2400.	32.48	6.31	38.79	15145.	7.34
2450.	32.61	6.33	38.94	15512.	7.35
2500.	32.74	6.35	39.09	15880.	7.36
2550.	32.86	6.37	39.24	16248.	7.36
2600.	32.99	6.39	39.38	16616.	7.37
2650.	33.11	6.41	39.52	16984.	7.37
2700.	33.23	6.43	39.66	17353.	7.38
2750.	33.35	6.44	39.79	17722.	7.38
2800.	33.46	6.46	39.93	18091.	7.38
2850.	33.58	6.48	40.06	18460.	7.39
2900.	33.69	6.49	40.18	18830.	7.39
2950.	33.80	6.51	40.31	19200.	7.40
3000.	33.91	6.52	40.44	19569.	7.40
3100.	34.13	6.55	40.68	20310.	7.41
3200.	34.33	6.58	40.91	21051.	7.41
3300.	34.54	6.60	41.14	21792.	7.42
3400.	34.74	6.63	41.36	22534.	7.42
3500.	34.93	6.65	41.58	23276.	7.43
3600.	35.12	6.67	41.79	24019.	7.43
3700.	35.30	6.69	41.99	24762.	7.43
3800.	35.48	6.71	42.19	25505.	7.44
3900.	35.65	6.73	42.38	26249.	7.44
4000.	35.82	6.75	42.57	26993.	7.44
4100.	35.99	6.77	42.75	27738.	7.45
4200.	36.15	6.78	42.93	28483.	7.45
4300.	36.31	6.80	43.11	29227.	7.45
4400.	36.47	6.81	43.28	29973.	7.45
4500.	36.62	6.83	43.45	30718.	7.45
4600.	36.77	6.84	43.61	31464.	7.46
4700.	36.92	6.85	43.77	32209.	7.46
4800.	37.06	6.87	43.93	32955.	7.46
4900.	37.21	6.88	44.08	33701.	7.46
5000.	37.34	6.89	44.23	34448.	7.46
5100.	37.48	6.90	44.38	35194.	7.46
5200.	37.61	6.91	44.53	35940.	7.47
5300.	37.75	6.92	44.67	36687.	7.47
5400.	37.88	6.93	44.81	37434.	7.47
5500.	38.00	6.94	44.95	38181.	7.47
5600.	38.13	6.95	45.08	38928.	7.47
5700.	38.25	6.96	45.21	39675.	7.47
5800.	38.37	6.97	45.34	40422.	7.47
5900.	38.49	6.98	45.47	41169.	7.47
6000.	38.61	6.99	45.60	41917.	7.47
6200.	38.84	7.00	45.84	43412.	7.48
6400.	39.06	7.02	46.08	44907.	7.48
273.15	21.94	3.60	25.54	983.	4.00
298.15	22.26	3.64	25.90	1085.	4.16

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.045177
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.18902
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.045148

Table 1-56. Thermodynamic Functions for O = AlOH (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	36.600	7.949	44.549	397.5	7.952
75.	39.824	7.957	47.781	596.8	8.017
100.	42.117	7.997	50.114	799.7	8.245
125.	43.910	8.083	51.993	1010.4	8.631
150.	45.395	8.213	53.608	1232.0	9.109
175.	46.673	8.378	55.051	1466.1	9.622
200.	47.804	8.566	56.369	1713.1	10.138
225.	48.824	8.768	57.593	1972.9	10.640
250.	49.759	8.980	58.739	2245.0	11.122
275.	50.625	9.196	59.821	2528.8	11.581
300.	51.434	9.413	60.847	2823.8	12.014
325.	52.196	9.629	61.825	3129.3	12.422
350.	52.918	9.842	62.760	3444.7	12.802
375.	53.604	10.051	63.655	3769.2	13.156
400.	54.259	10.256	64.515	4102.2	13.484
425.	54.887	10.455	65.341	4443.2	13.788
450.	55.490	10.648	66.138	4791.4	14.068
475.	56.071	10.835	66.905	5146.4	14.327
500.	56.631	11.015	67.646	5507.6	14.567
550.	57.697	11.358	69.055	6246.9	14.993
600.	58.699	11.677	70.376	7006.0	15.361
650.	59.646	11.973	71.618	7782.2	15.680
700.	60.543	12.248	72.791	8573.3	15.961
750.	61.397	12.504	73.901	9377.8	16.212
800.	62.212	12.743	74.954	10194.1	16.436
850.	62.991	12.966	75.957	11021.1	16.640
900.	63.738	13.175	76.913	11857.8	16.826
950.	64.456	13.372	77.828	12703.4	16.997
1000.	65.146	13.557	78.704	13557.3	17.155
1050.	65.812	13.732	79.544	14418.7	17.301
1100.	66.455	13.897	80.352	15287.2	17.437
1150.	67.076	14.054	81.130	16162.3	17.564
1200.	67.677	14.203	81.880	17043.4	17.682
1250.	68.260	14.344	82.604	17930.3	17.792
1300.	68.825	14.479	83.304	18822.5	17.895
1350.	69.374	14.607	83.981	19719.7	17.992
1400.	69.908	14.730	84.637	20621.6	18.082
1450.	70.427	14.847	85.273	21527.8	18.167
1500.	70.932	14.959	85.891	22438.2	18.247
1550.	71.424	15.066	86.490	23352.4	18.321
1600.	71.904	15.169	87.073	24270.2	18.392
1650.	72.372	15.268	87.640	25191.5	18.458
1700.	72.830	15.362	88.192	26115.9	18.520
1750.	73.276	15.453	88.730	27043.4	18.578
1800.	73.713	15.541	89.254	27973.7	18.633
1850.	74.140	15.625	89.765	28906.7	18.685
1900.	74.557	15.706	90.264	29842.2	18.734
1950.	74.966	15.785	90.751	30780.1	18.781
2000.	75.367	15.860	91.227	31720.2	18.824
2050.	75.760	15.933	91.693	32662.5	18.866
2100.	76.144	16.003	92.148	33606.7	18.905
2150.	76.522	16.071	92.593	34552.9	18.942
2200.	76.892	16.137	93.029	35500.8	18.977
2250.	77.255	16.200	93.456	36450.5	19.010
2300.	77.612	16.262	93.874	37401.8	19.041
2350.	77.962	16.321	94.284	38354.6	19.071
273.15	50.563	9.180	59.743	2507.4	11.548
298.15	51.376	9.397	60.773	2801.6	11.983

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

59.988, 0.13, 16.9, 17.0, 1

The frequencies and their degeneracies were taken as:

3400. (1), 1200. (1), 1100. (1), 700. (1), 500. (1), 400. (1).

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

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Table 1-56. Thermodynamic Functions for O = AlOH (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2400.	78.307	16.379	94.685	39308.9	19.100
2450.	78.645	16.435	95.079	40264.6	19.127
2500.	78.978	16.489	95.466	41221.6	19.152
2600.	79.626	16.592	96.218	43139.2	19.200
2700.	80.254	16.689	96.944	45061.4	19.243
2800.	80.863	16.781	97.644	46987.8	19.283
2900.	81.453	16.868	98.322	48917.9	19.319
3000.	82.027	16.950	98.977	50851.4	19.352
3100.	82.584	17.028	99.612	52788.1	19.382
3200.	83.125	17.102	100.228	54727.7	19.409
3300.	83.653	17.173	100.826	56669.9	19.435
3400.	84.166	17.240	101.406	58614.6	19.458
3500.	84.667	17.303	101.970	60561.5	19.480
3600.	85.155	17.364	102.519	62510.5	19.500
3700.	85.632	17.422	103.054	64461.5	19.519
3800.	86.097	17.477	103.575	66414.2	19.536
3900.	86.552	17.530	104.082	68368.6	19.552
4000.	86.997	17.581	104.578	70324.5	19.567
4100.	87.431	17.630	105.061	72281.9	19.581
4200.	87.857	17.676	105.533	74240.7	19.594
4300.	88.273	17.721	105.994	76200.7	19.606
4400.	88.681	17.764	106.445	78161.8	19.617
4500.	89.081	17.805	106.886	80124.1	19.628
4600.	89.472	17.845	107.318	82087.5	19.638
4700.	89.857	17.883	107.740	84051.8	19.648
4800.	90.234	17.920	108.154	86017.0	19.657
4900.	90.603	17.956	108.559	87983.1	19.665
5000.	90.967	17.990	108.956	89950.0	19.673
5100.	91.323	18.023	109.346	91917.6	19.680
5200.	91.673	18.055	109.728	93886.0	19.687
5300.	92.018	18.086	110.103	95855.1	19.694
5400.	92.356	18.116	110.472	97824.8	19.701
5500.	92.689	18.145	110.833	99795.2	19.707
5600.	93.016	18.173	111.188	101766.1	19.712
5700.	93.338	18.200	111.537	103737.6	19.718
5800.	93.654	18.226	111.880	105709.7	19.723
5900.	93.966	18.251	112.217	107682.2	19.728
6000.	94.273	18.276	112.549	109655.2	19.732
6100.	94.575	18.300	112.875	111628.7	19.737
6200.	94.873	18.323	113.196	113602.6	19.741
6300.	95.167	18.346	113.512	115576.9	19.745
6400.	95.456	18.367	113.823	117551.6	19.749
6500.	95.741	18.389	114.129	119526.7	19.753
6600.	96.021	18.409	114.431	121502.1	19.756
6700.	96.298	18.430	114.728	123477.9	19.760
6800.	96.572	18.449	115.021	125454.0	19.763
6900.	96.841	18.468	115.309	127430.5	19.766
7000.	97.107	18.487	115.594	129407.2	19.769

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.016670
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.069747
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.016659

Table 1-57. Thermodynamic Functions for OAlF (gas)

T °K	$-(F^o-H_0^o)/RT$	$(H^o-H_0^o)/RT$	S^o/R	$(H^o-H_0^o)/R$	C_p^o/R
50.	17.56	3.50	21.06	175.	3.50
75.	18.98	3.50	22.48	263.	3.51
100.	19.99	3.51	23.50	351.	3.58
125.	20.78	3.54	24.32	442.	3.73
150.	21.43	3.59	25.01	538.	3.94
175.	21.98	3.65	25.64	640.	4.19
200.	22.48	3.74	26.21	747.	4.45
225.	22.92	3.83	26.75	862.	4.71
250.	23.33	3.93	27.26	983.	4.95
275.	23.71	4.03	27.75	1109.	5.18
300.	24.07	4.14	28.21	1242.	5.40
325.	24.40	4.24	28.65	1379.	5.59
350.	24.72	4.35	29.07	1521.	5.76
375.	25.02	4.44	29.47	1667.	5.91
400.	25.31	4.54	29.85	1816.	6.05
425.	25.59	4.63	30.22	1969.	6.17
450.	25.86	4.72	30.58	2125.	6.28
475.	26.12	4.81	30.92	2283.	6.38
500.	26.37	4.89	31.25	2443.	6.46
550.	26.84	5.04	31.88	2770.	6.61
600.	27.28	5.17	32.46	3104.	6.73
650.	27.70	5.30	33.00	3443.	6.83
700.	28.10	5.41	33.51	3787.	6.91
750.	28.47	5.51	33.99	4135.	6.98
800.	28.83	5.61	34.44	4485.	7.04
850.	29.18	5.69	34.87	4838.	7.09
900.	29.50	5.77	35.27	5194.	7.13
950.	29.82	5.84	35.66	5551.	7.16
1000.	30.12	5.91	36.03	5910.	7.20
1050.	30.41	5.97	36.38	6271.	7.22
1100.	30.69	6.03	36.72	6632.	7.25
1150.	30.96	6.08	37.04	6995.	7.27
1200.	31.22	6.13	37.35	7359.	7.28
1250.	31.47	6.18	37.65	7724.	7.30
1300.	31.71	6.22	37.93	8089.	7.32
1350.	31.95	6.26	38.21	8455.	7.33
1400.	32.18	6.30	38.48	8822.	7.34
1450.	32.40	6.34	38.74	9189.	7.35
1500.	32.61	6.37	38.98	9557.	7.36
1550.	32.82	6.40	39.23	9925.	7.37
1600.	33.03	6.43	39.46	10294.	7.38
1650.	33.22	6.46	39.69	10663.	7.38
1700.	33.42	6.49	39.91	11032.	7.39
1750.	33.61	6.52	40.12	11402.	7.40
1800.	33.79	6.54	40.33	11772.	7.40
1850.	33.97	6.56	40.53	12142.	7.41
1900.	34.15	6.59	40.73	12513.	7.41
1950.	34.32	6.61	40.92	12883.	7.42
2000.	34.48	6.63	41.11	13254.	7.42
2050.	34.65	6.65	41.29	13625.	7.42
2100.	34.81	6.67	41.47	13997.	7.43
2150.	34.97	6.68	41.65	14368.	7.43
2200.	35.12	6.70	41.82	14740.	7.43
2250.	35.27	6.72	41.99	15112.	7.44
2300.	35.42	6.73	42.15	15484.	7.44
2350.	35.56	6.75	42.31	15856.	7.44

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

61.98, 15.48, 1, 1.

The frequencies and their degeneracies were taken as:

900. (1), 500. (2), 750. (1).

Table 1-57. Thermodynamic Functions for OAlF (gas) - Continued

T °K	$-(F^o-H_0^o)/RT$	$(H^o-H_0^o)/RT$	S^o/R	$(H^o-H_0^o)/R$	C_p^o/R
2400.	35.71	6.76	42.47	16228.	7.44
2450.	35.84	6.78	42.62	16600.	7.45
2500.	35.98	6.79	42.77	16972.	7.45
2550.	36.12	6.80	42.92	17345.	7.45
2600.	36.25	6.81	43.06	17717.	7.45
2650.	36.38	6.83	43.20	18090.	7.45
2700.	36.51	6.84	43.34	18463.	7.46
2750.	36.63	6.85	43.48	18836.	7.46
2800.	36.76	6.86	43.62	19209.	7.46
2850.	36.88	6.87	43.75	19582.	7.46
2900.	37.00	6.88	43.88	19955.	7.46
2950.	37.11	6.89	44.00	20328.	7.46
3000.	37.23	6.90	44.13	20701.	7.46
3100.	37.46	6.92	44.38	21448.	7.47
3200.	37.68	6.94	44.61	22194.	7.47
3300.	37.89	6.95	44.84	22941.	7.47
3400.	38.10	6.97	45.07	23688.	7.47
3500.	38.30	6.98	45.28	24436.	7.47
3600.	38.50	7.00	45.49	25183.	7.48
3700.	38.69	7.01	45.70	25931.	7.48
3800.	38.88	7.02	45.90	26678.	7.48
3900.	39.06	7.03	46.09	27426.	7.48
4000.	39.24	7.04	46.28	28174.	7.48
4100.	39.41	7.05	46.46	28922.	7.48
4200.	39.58	7.06	46.65	29670.	7.48
4300.	39.75	7.07	46.82	30419.	7.48
4400.	39.91	7.08	46.99	31167.	7.48
4500.	40.07	7.09	47.16	31915.	7.48
4600.	40.23	7.10	47.33	32664.	7.48
4700.	40.38	7.11	47.49	33412.	7.49
4800.	40.53	7.12	47.64	34161.	7.49
4900.	40.67	7.12	47.80	34909.	7.49
5000.	40.82	7.13	47.95	35658.	7.49
5100.	40.96	7.14	48.10	36407.	7.49
5200.	41.10	7.15	48.24	37156.	7.49
5300.	41.23	7.15	48.39	37904.	7.49
5400.	41.37	7.16	48.53	38653.	7.49
5500.	41.50	7.16	48.66	39402.	7.49
5600.	41.63	7.17	48.80	40151.	7.49
5700.	41.76	7.18	48.93	40900.	7.49
5800.	41.88	7.18	49.06	41649.	7.49
5900.	42.00	7.19	49.19	42398.	7.49
6000.	42.12	7.19	49.32	43147.	7.49
6200.	42.36	7.20	49.56	44646.	7.49
6400.	42.59	7.21	49.80	46144.	7.49
273.15	23.68	4.03	27.71	1100.	5.17
298.15	24.04	4.13	28.17	1232.	5.38

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal mole^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.032063
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.13300
Btu (lb mole)$^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.032042

Table 1-58. Thermodynamic Functions for OAlCl (gas)

T °K	$-\frac{(F^o-H_0^o)}{RT}$	$\frac{H^o-H_0^o}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H_0^o}{R}$	$\frac{C_p^o}{R}$
50.	18.53	3.50	22.03	175.	3.51
75.	19.95	3.52	23.47	264.	3.62
100.	20.97	3.58	24.55	358.	3.90
125.	21.78	3.68	25.46	459.	4.26
150.	22.46	3.80	26.26	570.	4.61
175.	23.06	3.94	27.00	690.	4.94
200.	23.59	4.08	27.68	817.	5.22
225.	24.08	4.22	28.31	950.	5.47
250.	24.54	4.36	28.90	1090.	5.68
275.	24.96	4.49	29.45	1234.	5.87
300.	25.35	4.61	29.96	1383.	6.03
325.	25.73	4.73	30.45	1536.	6.18
350.	26.08	4.83	30.91	1692.	6.30
375.	26.42	4.94	31.35	1851.	6.41
400.	26.74	5.03	31.77	2012.	6.51
425.	27.05	5.12	32.17	2176.	6.59
450.	27.34	5.20	32.55	2342.	6.67
475.	27.63	5.28	32.91	2510.	6.74
500.	27.90	5.36	33.26	2679.	6.80
550.	28.42	5.49	33.91	3021.	6.90
600.	28.90	5.61	34.51	3369.	6.98
650.	29.35	5.72	35.08	3719.	7.05
700.	29.78	5.82	35.60	4073.	7.11
750.	30.19	5.91	36.09	4430.	7.15
800.	30.57	5.99	36.55	4788.	7.19
850.	30.93	6.06	36.99	5149.	7.22
900.	31.28	6.12	37.40	5511.	7.25
950.	31.61	6.18	37.80	5874.	7.27
1000.	31.93	6.24	38.17	6238.	7.30
1050.	32.24	6.29	38.53	6603.	7.31
1100.	32.53	6.34	38.87	6969.	7.33
1150.	32.82	6.38	39.19	7336.	7.34
1200.	33.09	6.42	39.51	7704.	7.36
1250.	33.35	6.46	39.81	8072.	7.37
1300.	33.60	6.49	40.10	8440.	7.38
1350.	33.85	6.53	40.38	8809.	7.38
1400.	34.09	6.56	40.64	9179.	7.39
1450.	34.32	6.59	40.90	9548.	7.40
1500.	34.54	6.61	41.15	9919.	7.41
1550.	34.76	6.64	41.40	10289.	7.41
1600.	34.97	6.66	41.63	10660.	7.42
1650.	35.18	6.69	41.86	11031.	7.42
1700.	35.38	6.71	42.08	11402.	7.43
1750.	35.57	6.73	42.30	11773.	7.43
1800.	35.76	6.75	42.51	12145.	7.43
1850.	35.95	6.77	42.71	12517.	7.44
1900.	36.13	6.78	42.91	12889.	7.44
1950.	36.30	6.80	43.10	13261.	7.44
2000.	36.47	6.82	43.29	13633.	7.45
2050.	36.64	6.83	43.48	14006.	7.45
2100.	36.81	6.85	43.65	14378.	7.45
2150.	36.97	6.86	43.83	14751.	7.45
2200.	37.13	6.87	44.00	15123.	7.46
2250.	37.28	6.89	44.17	15496.	7.46
2300.	37.43	6.90	44.33	15869.	7.46
2350.	37.58	6.91	44.49	16242.	7.46

This table has been computed for the harmonic oscillator-rigid rotator approximation for linear polyatomic molecules using the following data for molecular weight, moment of inertia (in units of 10^{-39} gm cm^2), symmetry, and electronic multiplicity:

78.437, 28.65, 1, 1.

The frequencies and their degeneracies were taken as:

900. (1), 350. (2), 450. (1).

Table 1-58. Thermodynamic Functions for OAlCl (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{RT}$	$\frac{H^o-H^o_0}{RT}$	$\frac{S^o}{R}$	$\frac{H^o-H^o_0}{R}$	$\frac{C^o_p}{R}$
2400.	37.73	6.92	44.65	16615.	7.46
2450.	37.87	6.93	44.80	16988.	7.46
2500.	38.01	6.94	44.96	17362.	7.47
2550.	38.15	6.95	45.10	17735.	7.47
2600.	38.28	6.96	45.25	18108.	7.47
2650.	38.42	6.97	45.39	18482.	7.47
2700.	38.55	6.98	45.53	18855.	7.47
2750.	38.67	6.99	45.67	19229.	7.47
2800.	38.80	7.00	45.80	19603.	7.47
2850.	38.92	7.01	45.93	19976.	7.47
2900.	39.05	7.02	46.06	20350.	7.47
2950.	39.17	7.02	46.19	20724.	7.48
3000.	39.29	7.03	46.32	21097.	7.48
3100.	39.52	7.05	46.56	21845.	7.48
3200.	39.74	7.06	46.80	22593.	7.48
3300.	39.96	7.07	47.03	23341.	7.48
3400.	40.17	7.08	47.25	24089.	7.48
3500.	40.37	7.10	47.47	24837.	7.48
3600.	40.57	7.11	47.68	25585.	7.48
3700.	40.77	7.12	47.89	26334.	7.48
3800.	40.96	7.13	48.09	27082.	7.49
3900.	41.14	7.14	48.28	27831.	7.49
4000.	41.32	7.14	48.47	28579.	7.49
4100.	41.50	7.15	48.65	29328.	7.49
4200.	41.67	7.16	48.84	30077.	7.49
4300.	41.84	7.17	49.01	30826.	7.49
4400.	42.01	7.18	49.18	31574.	7.49
4500.	42.17	7.18	49.35	32323.	7.49
4600.	42.33	7.19	49.52	33072.	7.49
4700.	42.48	7.20	49.68	33821.	7.49
4800.	42.63	7.20	49.84	34570.	7.49
4900.	42.78	7.21	49.99	35319.	7.49
5000.	42.93	7.21	50.14	36069.	7.49
5100.	43.07	7.22	50.29	36818.	7.49
5200.	43.21	7.22	50.43	37567.	7.49
5300.	43.35	7.23	50.58	38316.	7.49
5400.	43.48	7.23	50.72	39065.	7.49
5500.	43.62	7.24	50.86	39815.	7.49
5600.	43.75	7.24	50.99	40564.	7.49
5700.	43.87	7.25	51.12	41313.	7.49
5800.	44.00	7.25	51.25	42063.	7.49
5900.	44.12	7.26	51.38	42812.	7.49
6000.	44.25	7.26	51.51	43561.	7.49
6200.	44.49	7.27	51.75	45060.	7.49
6400.	44.72	7.27	51.99	46559.	7.49
273.15	24.93	4.48	29.41	1224.	5.86
298.15	25.32	4.60	29.93	1372.	6.02

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal $mole^{-1}$ $^oK^{-1}$ (or $^oC^{-1}$)	1.98726
cal g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.025336
joules g^{-1} $^oK^{-1}$ (or $^oC^{-1}$)	0.10601
Btu $(lb\ mole)^{-1}$ $^oR^{-1}$ (or $^oF^{-1}$)	1.98595
Btu lb^{-1} $^oR^{-1}$ (or $^oF^{-1}$)	0.025319

Table 1-59. Thermodynamic Functions for AlF_2 (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	37.822	7.952	45.774	397.6	7.975
75.	41.051	7.985	49.036	598.9	8.159
100.	43.358	8.066	51.424	806.6	8.466
125.	45.170	8.179	53.349	1022.4	8.796
150.	46.672	8.309	54.982	1246.4	9.124
175.	47.964	8.449	56.413	1478.6	9.451
200.	49.101	8.595	57.696	1718.9	9.777
225.	50.122	8.744	58.866	1967.4	10.098
250.	51.051	8.895	59.946	2223.7	10.407
275.	51.906	9.046	60.952	2487.6	10.699
300.	52.700	9.195	61.895	2758.5	10.971
325.	53.441	9.341	62.783	3036.0	11.222
350.	54.139	9.484	63.623	3319.4	11.449
375.	54.798	9.622	64.420	3608.3	11.656
400.	55.423	9.755	65.178	3902.0	11.842
425.	56.018	9.883	65.901	4200.2	12.010
450.	56.587	10.005	66.592	4502.4	12.161
475.	57.131	10.122	67.253	4808.1	12.297
500.	57.653	10.234	67.887	5117.1	12.419
550.	58.638	10.443	69.081	5743.4	12.628
600.	59.555	10.632	70.187	6379.3	12.799
650.	60.413	10.804	71.218	7022.9	12.940
700.	61.220	10.961	72.181	7672.9	13.057
750.	61.981	11.104	73.085	8328.3	13.155
800.	62.702	11.235	73.937	8988.2	13.238
850.	63.387	11.355	74.742	9651.9	13.308
900.	64.039	11.465	75.504	10318.8	13.368
950.	64.662	11.567	76.228	10988.6	13.420
1000.	65.257	11.661	76.918	11660.7	13.465
1050.	65.828	11.748	77.576	12334.9	13.504
1100.	66.377	11.828	78.205	13011.0	13.538
1150.	66.904	11.903	78.807	13688.7	13.568
1200.	67.412	11.973	79.385	14367.7	13.595
1250.	67.902	12.038	79.941	15048.1	13.619
1300.	68.376	12.100	80.475	15729.6	13.640
1350.	68.833	12.157	80.990	16412.0	13.659
1400.	69.277	12.211	81.488	17095.4	13.676
1450.	69.706	12.262	81.968	17779.6	13.691
1500.	70.122	12.310	82.432	18464.5	13.705
1550.	70.527	12.355	82.882	19150.1	13.718
1600.	70.920	12.398	83.317	19836.3	13.729
1650.	71.302	12.438	83.740	20523.0	13.740
1700.	71.674	12.477	84.150	21210.2	13.750
1750.	72.036	12.513	84.549	21898.0	13.759
1800.	72.389	12.548	84.937	22586.1	13.767
1850.	72.733	12.581	85.314	23274.6	13.774
1900.	73.069	12.612	85.682	23963.5	13.781
1950.	73.397	12.642	86.040	24652.7	13.788
2000.	73.718	12.671	86.389	25342.3	13.794
2050.	74.031	12.699	86.729	26032.1	13.799
2100.	74.337	12.725	87.062	26722.2	13.804
2150.	74.637	12.750	87.387	27412.5	13.809
2200.	74.930	12.774	87.704	28103.1	13.814
2250.	75.218	12.797	88.015	28793.9	13.818
2300.	75.499	12.820	88.319	29484.9	13.822
2350.	75.775	12.841	88.616	30176.1	13.826
273.15	51.845	9.035	60.880	2467.8	10.678
298.15	52.643	9.184	61.827	2738.2	10.952

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

64.98, 1.89, 13.67, 15.56, 2.

The frequencies and their degeneracies were taken as:

900. (1), 700. (1), 300. (1)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-59. Thermodynamic Functions for AlF_2 (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2400.	76.046	12.861	88.907	30867.4	13.829
2450.	76.311	12.881	89.192	31559.0	13.832
2500.	76.571	12.900	89.472	32250.7	13.835
2600.	77.078	12.936	90.014	33634.5	13.841
2700.	77.567	12.970	90.537	35018.9	13.846
2800.	78.039	13.001	91.041	36403.7	13.851
2900.	78.496	13.031	91.527	37789.0	13.855
3000.	78.938	13.058	91.996	39174.6	13.858
3100.	79.367	13.084	92.451	40560.6	13.862
3200.	79.783	13.108	92.891	41946.9	13.865
3300.	80.186	13.131	93.318	43333.5	13.867
3400.	80.579	13.153	93.732	44720.4	13.870
3500.	80.960	13.174	94.134	46107.5	13.872
3600.	81.332	13.193	94.525	47494.8	13.874
3700.	81.693	13.211	94.905	48882.3	13.876
3800.	82.046	13.229	95.275	50270.0	13.878
3900.	82.390	13.246	95.635	51657.9	13.880
4000.	82.725	13.261	95.987	53045.9	13.881
4100.	83.053	13.277	96.330	54434.1	13.883
4200.	83.373	13.291	96.664	55822.5	13.884
4300.	83.686	13.305	96.991	57210.9	13.885
4400.	83.992	13.318	97.310	58599.5	13.886
4500.	84.291	13.331	97.622	59988.2	13.887
4600.	84.585	13.343	97.927	61377.0	13.888
4700.	84.872	13.354	98.226	62765.8	13.889
4800.	85.153	13.366	98.518	64154.8	13.890
4900.	85.429	13.376	98.805	65543.9	13.891
5000.	85.699	13.387	99.086	66933.0	13.892
5100.	85.964	13.397	99.361	68322.2	13.893
5200.	86.224	13.406	99.630	69711.5	13.893
5300.	86.480	13.415	99.895	71100.9	13.894
5400.	86.731	13.424	100.155	72490.3	13.895
5500.	86.977	13.433	100.410	73879.8	13.895
5600.	87.219	13.441	100.660	75269.3	13.896
5700.	87.457	13.449	100.906	76658.9	13.896
5800.	87.691	13.457	101.148	78048.6	13.897
5900.	87.921	13.464	101.385	79438.2	13.897
6000.	88.148	13.471	101.619	80828.0	13.898
6100.	88.370	13.478	101.849	82217.8	13.898
6200.	88.589	13.485	102.075	83607.6	13.898
6300.	88.805	13.492	102.297	84997.5	13.899
6400.	89.018	13.498	102.516	86387.4	13.899
6500.	89.227	13.504	102.731	87777.3	13.900
6600.	89.433	13.510	102.944	89167.3	13.900
6700.	89.637	13.516	103.153	90557.3	13.900
6800.	89.837	13.522	103.359	91947.3	13.901
6900.	90.034	13.527	103.561	93337.4	13.901
7000.	90.229	13.532	103.761	94727.5	13.901

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.015389
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.064388
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.015379

Table 1-60. Thermodynamic Functions for AlF_3 (gas)

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
50.	38.930	7.955	46.885	397.8	8.004
75.	42.166	8.029	50.194	602.2	8.424
100.	44.499	8.218	52.717	821.8	9.184
125.	46.361	8.496	54.858	1062.1	10.033
150.	47.939	8.821	56.760	1323.2	10.849
175.	49.324	9.166	58.490	1604.[illegible]	11.608
200.	50.571	9.516	60.087	1903.1	12.312
225.	51.712	9.863	61.575	2219.2	12.966
250.	52.769	10.204	62.973	2551.0	13.571
275.	53.757	10.536	64.293	2897.4	14.126
300.	54.687	10.856	65.544	3256.9	14.632
325.	55.569	11.165	66.733	3628.6	15.090
350.	56.407	11.460	67.867	4011.1	15.504
375.	57.207	11.742	68.950	4403.4	15.876
400.	57.974	12.011	69.985	4804.6	16.211
425.	58.710	12.267	70.977	5213.7	16.510
450.	59.418	12.511	71.929	5629.8	16.779
475.	60.101	12.742	72.842	6052.4	17.021
500.	60.760	12.961	73.721	6480.7	17.238
550.	62.015	13.368	75.382	7352.1	17.609
600.	63.194	13.734	76.928	8240.4	17.912
650.	64.306	14.065	78.372	9142.4	18.161
700.	65.360	14.365	79.725	10055.8	18.368
750.	66.360	14.638	80.999	10978.7	18.541
800.	67.313	14.887	82.200	11909.4	18.686
850.	68.223	15.114	83.337	12846.9	18.810
900.	69.092	15.322	84.415	13790.1	18.916
950.	69.926	15.514	85.440	14738.2	19.007
1000.	70.726	15.691	86.417	15690.6	19.086
1050.	71.496	15.854	87.350	16646.7	19.155
1100.	72.237	16.005	88.242	17606.0	19.215
1150.	72.952	16.146	89.098	18568.1	19.268
1200.	73.642	16.277	89.919	19532.7	19.315
1250.	74.309	16.400	90.708	20499.5	19.357
1300.	74.954	16.514	91.468	21468.4	19.395
1350.	75.579	16.621	92.201	22438.9	19.428
1400.	76.186	16.722	92.908	23411.1	19.458
1450.	76.774	16.817	93.591	24384.7	19.486
1500.	77.346	16.906	94.252	25359.6	19.510
1550.	77.901	16.991	94.892	26335.7	19.533
1600.	78.442	17.071	95.513	27312.9	19.553
1650.	78.969	17.146	96.115	28291.0	19.572
1700.	79.482	17.218	96.699	29270.0	19.589
1750.	79.982	17.286	97.267	30249.8	19.604
1800.	80.470	17.350	97.820	31230.4	19.619
1850.	80.946	17.412	98.357	32211.7	19.632
1900.	81.411	17.470	98.881	33193.6	19.644
1950.	81.865	17.526	99.392	34176.1	19.656
2000.	82.310	17.580	99.889	35159.1	19.666
2050.	82.745	17.631	100.375	36142.7	19.676
2100.	83.170	17.679	100.849	37126.7	19.685
2150.	83.586	17.726	101.313	38111.1	19.694
2200.	83.995	17.771	101.765	39096.0	19.701
2250.	84.394	17.814	102.208	40081.3	19.709
2300.	84.786	17.855	102.642	41066.9	19.716
2350.	85.171	17.895	103.066	42052.9	19.722
273.15	53.686	10.512	64.198	2871.3	14.086
298.15	54.620	10.833	65.453	3229.9	14.596

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

83.98, 13.67, 13.67, 27.34, 6.

The frequencies and their degeneracies were taken as:

700. (1), 400. (1), 900. (2), 300. (2)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-60. Thermodynamic Functions for AlF_3 (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2400.	85.548	17.933	103.481	43039.1	19.728
2450.	85.918	17.970	103.888	44025.7	19.734
2500.	86.281	18.005	104.286	45012.5	19.740
2600.	86.989	18.072	105.061	46987.0	19.750
2700.	87.672	18.134	105.806	48962.4	19.758
2800.	88.333	18.192	106.525	50938.7	19.766
2900.	88.972	18.247	107.219	52915.7	19.774
3000.	89.592	18.298	107.889	54893.4	19.780
3100.	90.192	18.346	108.538	56871.7	19.786
3200.	90.776	18.391	109.166	58850.5	19.791
3300.	91.342	18.433	109.775	60829.9	19.796
3400.	91.893	18.473	110.366	62809.7	19.800
3500.	92.429	18.511	110.940	64789.9	19.804
3600.	92.951	18.547	111.498	66770.5	19.808
3700.	93.460	18.581	112.041	68751.5	19.812
3800.	93.956	18.614	112.570	70732.8	19.815
3900.	94.440	18.645	113.084	72714.5	19.818
4000.	94.912	18.674	113.586	74696.4	19.820
4100.	95.373	18.702	114.075	76678.5	19.823
4200.	95.824	18.729	114.553	78660.9	19.825
4300.	96.265	18.754	115.020	80643.6	19.827
4400.	96.697	18.779	115.476	82626.4	19.829
4500.	97.119	18.802	115.921	84609.4	19.831
4600.	97.533	18.824	116.357	86592.6	19.833
4700.	97.938	18.846	116.784	88576.0	19.835
4800.	98.335	18.867	117.201	90559.6	19.836
4900.	98.724	18.886	117.610	92543.3	19.838
5000.	99.106	18.905	118.011	94527.1	19.839
5100.	99.480	18.924	118.404	96511.1	19.840
5200.	99.848	18.941	118.789	98495.2	19.842
5300.	100.209	18.958	119.167	100479.4	19.843
5400.	100.563	18.975	119.538	102463.7	19.844
5500.	100.912	18.991	119.902	104448.2	19.845
5600.	101.254	19.006	120.260	106432.7	19.846
5700.	101.590	19.021	120.611	108417.4	19.847
5800.	101.921	19.035	120.956	110402.1	19.848
5900.	102.247	19.049	121.296	112386.9	19.849
6000.	102.567	19.062	121.629	114371.8	19.849
6100.	102.882	19.075	121.957	116356.7	19.850
6200.	103.193	19.087	122.280	118341.8	19.851
6300.	103.498	19.100	122.598	120326.9	19.851
6400.	103.799	19.111	122.910	122312.1	19.852
6500.	104.095	19.123	123.218	124297.3	19.853
6600.	104.387	19.134	123.521	126282.6	19.853
6700.	104.675	19.144	123.820	128268.0	19.854
6800.	104.959	19.155	124.114	130253.4	19.854
6900.	105.239	19.165	124.404	132238.9	19.855
7000.	105.515	19.175	124.689	134224.4	19.855

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.011908
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.049823
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.011900

Table 1-61. Thermodynamic Functions for AlF_2Cl (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	42.761	7.997	50.758	399.8	8.245
75.	46.038	8.213	54.252	616.0	9.107
100.	48.447	8.563	57.010	856.3	10.117
125.	50.401	8.970	59.371	1121.3	11.064
150.	52.074	9.392	61.465	1408.8	11.920
175.	53.553	9.809	63.362	1716.6	12.697
200.	54.889	10.215	65.105	2043.0	13.405
225.	56.115	10.606	66.721	2386.3	14.047
250.	57.252	10.979	68.232	2744.9	14.626
275.	58.315	11.335	69.650	3117.1	15.145
300.	59.316	11.672	70.988	3501.7	15.608
325.	60.263	11.991	72.254	3897.1	16.018
350.	61.163	12.292	73.455	4302.2	16.381
375.	62.021	12.575	74.596	4715.8	16.702
400.	62.841	12.842	75.683	5136.9	16.986
425.	63.627	13.094	76.721	5564.8	17.237
450.	64.382	13.330	77.713	5998.6	17.460
475.	65.109	13.553	78.662	6437.6	17.659
500.	65.810	13.763	79.572	6881.3	17.835
550.	67.140	14.147	81.287	7780.8	18.134
600.	68.386	14.490	82.875	8693.7	18.375
650.	69.558	14.796	84.354	9617.5	18.571
700.	70.665	15.072	85.736	10550.2	18.732
750.	71.713	15.320	87.033	11490.2	18.866
800.	72.709	15.546	88.255	12436.4	18.978
850.	73.658	15.750	89.408	13387.7	19.073
900.	74.563	15.937	90.501	14343.5	19.154
950.	75.430	16.108	91.538	15302.9	19.223
1000.	76.260	16.266	92.526	16265.6	19.283
1050.	77.057	16.411	93.468	17231.1	19.336
1100.	77.824	16.545	94.368	18199.1	19.381
1150.	78.562	16.669	95.231	19169.2	19.421
1200.	79.274	16.784	96.058	20141.1	19.457
1250.	79.961	16.892	96.853	21114.8	19.488
1300.	80.626	16.992	97.618	22089.9	19.516
1350.	81.269	17.086	98.355	23066.4	19.542
1400.	81.892	17.174	99.066	24044.0	19.564
1450.	82.496	17.257	99.753	25022.7	19.585
1500.	83.082	17.335	100.417	26002.4	19.603
1550.	83.652	17.408	101.060	26983.0	19.620
1600.	84.206	17.478	101.683	27964.4	19.635
1650.	84.745	17.543	102.288	28946.5	19.649
1700.	85.269	17.605	102.875	29929.2	19.662
1750.	85.780	17.664	103.445	30912.6	19.673
1800.	86.279	17.720	103.999	31896.6	19.684
1850.	86.765	17.774	104.539	32881.0	19.694
1900.	87.240	17.824	105.064	33865.9	19.703
1950.	87.703	17.872	105.576	34851.3	19.711
2000.	88.156	17.919	106.075	35837.1	19.719
2050.	88.599	17.963	106.562	36823.2	19.727
2100.	89.033	18.005	107.037	37809.7	19.733
2150.	89.457	18.045	107.502	38796.6	19.740
2200.	89.872	18.083	107.956	39783.7	19.746
2250.	90.279	18.120	108.399	40771.1	19.751
2300.	90.678	18.156	108.834	41758.8	19.756
2350.	91.068	18.190	109.259	42746.7	19.761
273.15	58.239	11.309	69.548	3089.1	15.109
298.15	59.244	11.648	70.892	3472.8	15.575

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

100.437, 13.67, 27.6, 41.27, 2.

The frequencies and their degeneracies were taken as:

850. (1), 750. (1), 550. (1), 350. (1), 250. (1), 200. (1)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-61. Thermodynamic Functions for AlF_2Cl (gas) - Continued

T °K	$-(F^o-H_0^o)/T$	$(H^o-H_0^o)/T$	S^o	$H^o-H_0^o$	C_p^o
2400.	91.452	18.223	109.675	43734.9	19.766
2450.	91.828	18.254	110.082	44723.3	19.770
2500.	92.197	18.285	110.482	45711.9	19.774
2600.	92.915	18.342	111.257	47689.7	19.781
2700.	93.608	18.396	112.004	49668.2	19.788
2800.	94.278	18.445	112.724	51647.3	19.794
2900.	94.927	18.492	113.419	53626.9	19.799
3000.	95.554	18.536	114.090	55607.1	19.804
3100.	96.163	18.577	114.739	57587.7	19.808
3200.	96.753	18.615	115.368	59568.7	19.812
3300.	97.326	18.652	115.978	61550.1	19.816
3400.	97.884	18.686	116.570	63531.9	19.819
3500.	98.426	18.718	117.144	65514.0	19.822
3600.	98.954	18.749	117.703	67496.3	19.825
3700.	99.468	18.778	118.246	69478.9	19.827
3800.	99.969	18.806	118.775	71461.8	19.830
3900.	100.458	18.832	119.290	73444.9	19.832
4000.	100.935	18.857	119.792	75428.1	19.834
4100.	101.401	18.881	120.282	77411.6	19.836
4200.	101.856	18.904	120.760	79395.3	19.837
4300.	102.301	18.925	121.226	81379.1	19.839
4400.	102.736	18.946	121.683	83363.1	19.841
4500.	103.162	18.966	122.128	85347.2	19.842
4600.	103.579	18.985	122.565	87331.5	19.843
4700.	103.988	19.003	122.991	89315.9	19.845
4800.	104.388	19.021	123.409	91300.4	19.846
4900.	104.781	19.038	123.818	93285.0	19.847
5000.	105.165	19.054	124.219	95269.8	19.848
5100.	105.543	19.070	124.612	97254.6	19.849
5200.	105.913	19.085	124.998	99239.5	19.850
5300.	106.277	19.099	125.376	101224.5	19.851
5400.	106.634	19.113	125.747	103209.6	19.851
5500.	106.985	19.126	126.111	105194.8	19.852
5600.	107.330	19.139	126.469	107180.0	19.853
5700.	107.668	19.152	126.820	109165.3	19.854
5800.	108.002	19.164	127.166	111150.7	19.854
5900.	108.329	19.176	127.505	113136.2	19.855
6000.	108.652	19.187	127.839	115121.7	19.855
6100.	108.969	19.198	128.167	117107.3	19.856
6200.	109.281	19.209	128.490	119092.9	19.856
6300.	109.589	19.219	128.807	121078.5	19.857
6400.	109.891	19.229	129.120	123064.3	19.857
6500.	110.190	19.238	129.428	125050.0	19.858
6600.	110.483	19.248	129.731	127035.8	19.858
6700.	110.773	19.257	130.030	129021.7	19.859
6800.	111.058	19.266	130.324	131007.6	19.859
6900.	111.340	19.274	130.614	132993.5	19.860
7000.	111.617	19.283	130.900	134979.5	19.860

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0099565
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.041658
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.0099500

Table 1-62. Thermodynamic Functions $AlFCl_2$ (gas)

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
50.	44.284	8.105	52.389	405.2	8.694
75.	47.639	8.498	56.136	637.3	9.885
100.	50.150	8.988	59.138	898.8	11.012
125.	52.210	9.494	61.704	1186.8	12.002
150.	53.984	9.986	63.971	1498.0	12.878
175.	55.559	10.457	66.016	1829.9	13.662
200.	56.985	10.902	67.887	2180.4	14.362
225.	58.294	11.321	69.615	2547.3	14.982
250.	59.507	11.715	71.223	2928.9	15.527
275.	60.641	12.084	72.725	3323.1	16.004
300.	61.708	12.429	74.136	3728.6	16.420
325.	62.715	12.750	75.465	4143.7	16.781
350.	63.671	13.049	76.720	4567.2	17.095
375.	64.581	13.328	77.909	4998.1	17.368
400.	65.450	13.588	79.038	5435.3	17.607
425.	66.281	13.831	80.112	5878.2	17.816
450.	67.078	14.058	81.135	6325.9	17.999
475.	67.844	14.269	82.113	6777.9	18.160
500.	68.581	14.467	83.048	7233.7	18.302
550.	69.977	14.827	84.804	8155.1	18.541
600.	71.281	15.145	86.426	9087.0	18.731
650.	72.504	15.427	87.932	10027.6	18.885
700.	73.657	15.679	89.336	10975.0	19.010
750.	74.747	15.904	90.651	11928.2	19.113
800.	75.780	16.108	91.887	12886.1	19.199
850.	76.762	16.292	93.053	13847.9	19.272
900.	77.698	16.459	94.157	14813.1	19.334
950.	78.592	16.612	95.204	15781.1	19.386
1000.	79.448	16.752	96.199	16751.6	19.432
1050.	80.268	16.880	97.148	17724.2	19.471
1100.	81.056	16.999	98.055	18698.6	19.506
1150.	81.814	17.108	98.923	19674.7	19.536
1200.	82.544	17.210	99.755	20652.2	19.563
1250.	83.249	17.305	100.554	21630.9	19.586
1300.	83.929	17.393	101.322	22610.8	19.607
1350.	84.587	17.475	102.063	23591.6	19.626
1400.	85.224	17.552	102.777	24573.4	19.643
1450.	85.842	17.625	103.466	25555.9	19.658
1500.	86.440	17.693	104.133	26539.2	19.672
1550.	87.021	17.757	104.778	27523.1	19.685
1600.	87.586	17.817	105.403	28507.6	19.696
1650.	88.135	17.874	106.010	29492.7	19.706
1700.	88.670	17.928	106.598	30478.3	19.716
1750.	89.190	17.980	107.170	31464.3	19.725
1800.	89.697	18.028	107.725	32450.7	19.733
1850.	90.192	18.074	108.266	33437.5	19.740
1900.	90.675	18.118	108.793	34424.7	19.747
1950.	91.146	18.160	109.306	35412.2	19.753
2000.	91.606	18.200	109.806	36400.0	19.759
2050.	92.056	18.238	110.294	37388.1	19.764
2100.	92.496	18.274	110.770	38376.4	19.769
2150.	92.926	18.309	111.236	39365.0	19.774
2200.	93.347	18.343	111.690	40353.8	19.779
2250.	93.760	18.375	112.135	41342.9	19.783
2300.	94.164	18.405	112.570	42332.1	19.786
2350.	94.560	18.435	112.995	43321.5	19.790
273.15	60.560	12.058	72.617	3293.6	15.971
298.15	61.631	12.404	74.035	3698.2	16.391

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

116.894, 19.57, 38.94, 58.51, 2.

The frequencies and their degeneracies were taken as:

750. (1), 650. (1), 450. (1), 300. (1), 200. (1), 150. (1)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-62. Thermodynamic Functions $AlFCl_2$ (gas) - Continued

T °K	$-\frac{(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2400.	94.949	18.463	113.412	44311.1	19.793
2450.	95.330	18.490	113.820	45300.8	19.797
2500.	95.704	18.516	114.220	46290.8	19.800
2600.	96.431	18.566	114.997	48271.0	19.805
2700.	97.132	18.612	115.744	50251.7	19.810
2800.	97.810	18.655	116.465	52233.0	19.814
2900.	98.465	18.695	117.160	54214.6	19.818
3000.	99.100	18.732	117.832	56196.6	19.822
3100.	99.715	18.767	118.482	58178.9	19.825
3200.	100.311	18.800	119.111	60161.6	19.828
3300.	100.890	18.832	119.722	62144.5	19.831
3400.	101.453	18.861	120.314	64127.7	19.833
3500.	102.000	18.889	120.889	66111.1	19.835
3600.	102.532	18.915	121.447	68094.7	19.837
3700.	103.051	18.940	121.991	70078.6	19.839
3800.	103.556	18.964	122.520	72062.6	19.841
3900.	104.049	18.986	123.035	74046.7	19.842
4000.	104.530	19.008	123.538	76031.1	19.844
4100.	105.000	19.028	124.028	78015.5	19.845
4200.	105.458	19.048	124.506	80000.1	19.847
4300.	105.907	19.066	124.973	81984.8	19.848
4400.	106.345	19.084	125.429	83969.7	19.849
4500.	106.774	19.101	125.875	85954.6	19.850
4600.	107.194	19.117	126.312	87939.7	19.851
4700.	107.606	19.133	126.739	89924.8	19.852
4800.	108.009	19.148	127.157	91910.0	19.853
4900.	108.404	19.162	127.566	93895.4	19.854
5000.	108.791	19.176	127.967	95880.7	19.854
5100.	109.171	19.189	128.360	97866.2	19.855
5200.	109.544	19.202	128.746	99851.7	19.856
5300.	109.909	19.215	129.124	101837.3	19.856
5400.	110.269	19.226	129.495	103823.0	19.857
5500.	110.622	19.238	129.860	105808.7	19.857
5600.	110.968	19.249	130.217	107794.5	19.858
5700.	111.309	19.260	130.569	109780.3	19.858
5800.	111.644	19.270	130.914	111766.2	19.859
5900.	111.974	19.280	131.254	113752.1	19.859
6000.	112.298	19.290	131.587	115738.1	19.860
6100.	112.617	19.299	131.916	117724.1	19.860
6200.	112.931	19.308	132.239	119710.1	19.861
6300.	113.240	19.317	132.556	121696.2	19.861
6400.	113.544	19.325	132.869	123682.3	19.861
6500.	113.844	19.334	133.177	125668.5	19.862
6600.	114.139	19.342	133.480	127654.7	19.862
6700.	114.430	19.349	133.779	129640.9	19.862
6800.	114.716	19.357	134.073	131627.1	19.863
6900.	114.999	19.364	134.363	133613.4	19.863
7000.	115.278	19.371	134.649	135599.7	19.863

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0085548
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0357931
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.0085492

Table 1-63. Thermodynamic Functions for $AlCl_2$ (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	41.744	8.066	49.810	403.3	8.465
75.	45.058	8.306	53.364	623.0	9.100
100.	47.484	8.578	56.062	857.8	9.674
125.	49.428	8.850	58.278	1106.3	10.199
150.	51.065	9.115	60.180	1367.3	10.673
175.	52.489	9.369	61.858	1639.5	11.096
200.	53.756	9.608	63.364	1921.6	11.464
225.	54.901	9.832	64.733	2212.3	11.780
250.	55.948	10.041	65.989	2510.2	12.050
275.	56.914	10.234	67.148	2814.4	12.278
300.	57.812	10.413	68.225	3123.9	12.472
325.	58.652	10.578	69.230	3437.8	12.637
350.	59.442	10.730	70.172	3755.5	12.777
375.	60.187	10.871	71.057	4076.5	12.897
400.	60.893	11.001	71.893	4400.2	13.000
425.	61.563	11.121	72.684	4726.4	13.089
450.	62.202	11.232	73.434	5054.6	13.166
475.	62.812	11.336	74.148	5384.6	13.234
500.	63.396	11.432	74.828	5716.2	13.292
550.	64.494	11.606	76.100	6383.3	13.390
600.	65.511	11.758	77.269	7054.8	13.467
650.	66.457	11.892	78.349	7729.8	13.528
700.	67.343	12.011	79.354	8407.5	13.578
750.	68.175	12.117	80.292	9087.4	13.619
800.	68.960	12.211	81.172	9769.2	13.652
850.	69.703	12.297	82.000	10452.5	13.681
900.	70.408	12.375	82.783	11137.2	13.705
950.	71.079	12.445	83.525	11823.0	13.725
1000.	71.719	12.510	84.229	12509.7	13.743
1050.	72.331	12.569	84.900	13197.2	13.758
1100.	72.917	12.623	85.540	13885.4	13.771
1150.	73.479	12.673	86.153	14574.3	13.783
1200.	74.020	12.720	86.739	15263.7	13.793
1250.	74.540	12.763	87.303	15953.6	13.802
1300.	75.041	12.803	87.844	16643.9	13.810
1350.	75.525	12.840	88.365	17334.6	13.817
1400.	75.993	12.875	88.868	18025.6	13.824
1450.	76.445	12.908	89.353	18716.9	13.830
1500.	76.883	12.939	89.822	19408.5	13.835
1550.	77.308	12.968	90.276	20100.4	13.840
1600.	77.720	12.995	90.715	20792.5	13.844
1650.	78.120	13.021	91.141	21484.8	13.848
1700.	78.509	13.045	91.555	22177.3	13.852
1750.	78.888	13.069	91.957	22869.9	13.855
1800.	79.256	13.090	92.347	23562.8	13.858
1850.	79.615	13.111	92.727	24255.7	13.861
1900.	79.965	13.131	93.096	24948.8	13.863
1950.	80.307	13.150	93.456	25642.1	13.866
2000.	80.640	13.168	93.807	26335.4	13.868
2050.	80.965	13.185	94.150	27028.8	13.870
2100.	81.283	13.201	94.484	27722.4	13.872
2150.	81.594	13.217	94.811	28416.0	13.874
2200.	81.898	13.232	95.130	29109.7	13.875
2250.	82.195	13.246	95.441	29803.5	13.877
2300.	82.487	13.260	95.746	30497.4	13.878
2350.	82.772	13.273	96.045	31191.4	13.880
273.15	56.845	10.220	67.065	2791.7	12.263
298.15	57.748	10.400	68.148	3100.8	12.459

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

97.894, 3.58, 38.95, 42.52, 2.

The frequencies and their degeneracies were taken as:

600. (1), 350. (1), 150. (1)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-63. Thermodynamic Functions for $AlCl_2$ (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2400.	83.052	13.286	96.337	31885.4	13.881
2450.	83.326	13.298	96.623	32579.5	13.882
2500.	83.594	13.309	96.904	33273.6	13.883
2600.	84.117	13.332	97.448	34662.0	13.885
2700.	84.620	13.352	97.972	36050.6	13.887
2800.	85.106	13.371	98.478	37439.5	13.889
2900.	85.576	13.389	98.965	38828.4	13.890
3000.	86.030	13.406	99.436	40217.5	13.892
3100.	86.470	13.422	99.891	41606.7	13.893
3200.	86.896	13.436	100.333	42996.1	13.894
3300.	87.310	13.450	100.760	44385.5	13.895
3400.	87.712	13.463	101.175	45775.1	13.896
3500.	88.102	13.476	101.578	47164.7	13.897
3600.	88.482	13.487	101.969	48554.4	13.897
3700.	88.852	13.498	102.350	49944.2	13.898
3800.	89.212	13.509	102.721	51334.0	13.899
3900.	89.563	13.519	103.082	52724.0	13.899
4000.	89.905	13.528	103.434	54113.9	13.900
4100.	90.239	13.538	103.777	55504.0	13.901
4200.	90.566	13.546	104.112	56894.0	13.901
4300.	90.884	13.554	104.439	58284.2	13.901
4400.	91.196	13.562	104.758	59674.3	13.902
4500.	91.501	13.570	105.071	61064.5	13.902
4600.	91.799	13.577	105.376	62454.8	13.903
4700.	92.091	13.584	105.675	63845.1	13.903
4800.	92.377	13.591	105.968	65235.4	13.903
4900.	92.658	13.597	106.255	66625.7	13.904
5000.	92.933	13.603	106.536	68016.1	13.904
5100.	93.202	13.609	106.811	69406.5	13.904
5200.	93.466	13.615	107.081	70797.0	13.904
5300.	93.726	13.620	107.346	72187.4	13.905
5400.	93.980	13.626	107.606	73577.9	13.905
5500.	94.230	13.631	107.861	74968.4	13.905
5600.	94.476	13.636	108.112	76358.9	13.905
5700.	94.717	13.640	108.358	77749.4	13.905
5800.	94.955	13.645	108.599	79140.0	13.906
5900.	95.188	13.649	108.837	80530.6	13.906
6000.	95.417	13.654	109.071	81921.2	13.906
6100.	95.643	13.658	109.301	83311.8	13.906
6200.	95.865	13.662	109.527	84702.4	13.906
6300.	96.084	13.666	109.749	86093.0	13.906
6400.	96.299	13.669	109.968	87483.7	13.907
6500.	96.511	13.673	110.184	88874.4	13.907
6600.	96.720	13.677	110.396	90265.0	13.907
6700.	96.926	13.680	110.605	91655.7	13.907
6800.	97.128	13.683	110.812	93046.4	13.907
6900.	97.328	13.687	111.015	94437.1	13.907
7000.	97.525	13.690	111.215	95827.9	13.907

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0102151
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0427400
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.0102084

Table 1-64. Thermodynamic Functions for $AlCl_3$ (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	43.513	8.292	51.805	414.6	9.360
75.	46.988	8.910	55.898	668.2	10.889
100.	49.641	9.565	59.207	956.5	12.129
125.	51.843	10.183	62.025	1272.8	13.144
150.	53.750	10.750	64.500	1612.5	14.007
175.	55.447	11.270	66.717	1972.2	14.757
200.	56.984	11.748	68.731	2349.5	15.408
225.	58.393	12.186	70.579	2741.9	15.970
250.	59.698	12.589	72.287	3147.3	16.451
275.	60.916	12.959	73.875	3563.9	16.862
300.	62.058	13.300	75.358	3989.9	17.212
325.	63.135	13.612	76.747	4424.0	17.511
350.	64.154	13.900	78.055	4865.1	17.767
375.	65.123	14.166	79.288	5312.1	17.987
400.	66.045	14.410	80.455	5764.2	18.176
425.	66.925	14.637	81.562	6220.7	18.340
450.	67.768	14.847	82.615	6681.0	18.482
475.	68.576	15.041	83.617	7144.6	18.607
500.	69.352	15.222	84.574	7611.2	18.716
550.	70.819	15.549	86.367	8551.7	18.897
600.	72.184	15.834	88.018	9500.3	19.040
650.	73.461	16.085	89.546	10455.2	19.154
700.	74.662	16.308	90.969	11415.3	19.247
750.	75.794	16.506	92.300	12379.7	19.323
800.	76.865	16.684	93.549	13347.5	19.387
850.	77.881	16.845	94.726	14318.2	19.440
900.	78.848	16.990	95.839	15291.3	19.485
950.	79.771	17.123	96.893	16266.5	19.523
1000.	80.652	17.244	97.895	17243.5	19.556
1050.	81.496	17.354	98.850	18222.1	19.585
1100.	82.306	17.456	99.762	19202.0	19.610
1150.	83.084	17.550	100.634	20183.0	19.632
1200.	83.833	17.638	101.470	21165.1	19.651
1250.	84.554	17.718	102.273	22148.0	19.668
1300.	85.251	17.794	103.044	23131.8	19.683
1350.	85.923	17.864	103.787	24116.3	19.697
1400.	86.574	17.930	104.504	25101.4	19.709
1450.	87.205	17.991	105.196	26087.2	19.720
1500.	87.816	18.049	105.864	27073.4	19.729
1550.	88.408	18.103	106.512	28060.1	19.738
1600.	88.984	18.155	107.138	29047.2	19.747
1650.	89.543	18.203	107.746	30034.7	19.754
1700.	90.087	18.249	108.336	31022.6	19.761
1750.	90.617	18.292	108.909	32010.8	19.767
1800.	91.133	18.333	109.466	32999.3	19.773
1850.	91.636	18.372	110.008	33988.1	19.778
1900.	92.126	18.409	110.535	34977.1	19.783
1950.	92.605	18.444	111.049	35966.4	19.787
2000.	93.072	18.478	111.550	36955.9	19.792
2050.	93.529	18.510	112.039	37945.5	19.795
2100.	93.975	18.541	112.516	38935.4	19.799
2150.	94.412	18.570	112.982	39925.4	19.802
2200.	94.839	18.598	113.437	40915.6	19.806
2250.	95.257	18.625	113.882	41906.0	19.808
2300.	95.667	18.651	114.318	42896.5	19.811
2350.	96.068	18.675	114.744	43887.1	19.814
273.15	60.828	12.933	73.761	3532.7	16.833
298.15	61.976	13.275	75.251	3958.1	17.188

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

133.351, 38.9406, 38.9406, 77.8812, 6.

The frequencies and their degeneracies were taken as:

345. (1), 230. (1), 610. (2), 135. (2)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

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Table 1-64. Thermodynamic Functions for $AlCl_3$ (gas) - Continued

T °K	$-(F^o-H^o_0)/T$	$(H^o-H^o_0)/T$	S^o	$H^o-H^o_0$	C^o_p
2400.	96.462	18.699	115.161	44877.9	19.816
2450.	96.848	18.722	115.569	45868.7	19.818
2500.	97.226	18.744	115.970	46859.7	19.821
2600.	97.962	18.785	116.747	48842.0	19.825
2700.	98.672	18.824	117.496	50824.6	19.828
2800.	99.357	18.860	118.217	52807.6	19.831
2900.	100.019	18.893	118.913	54790.8	19.834
3000.	100.660	18.925	119.585	56774.3	19.836
3100.	101.281	18.954	120.236	58758.1	19.839
3200.	101.884	18.982	120.866	60742.1	19.841
3300.	102.468	19.008	121.476	62726.3	19.843
3400.	103.036	19.033	122.068	64710.6	19.844
3500.	103.588	19.056	122.644	66695.1	19.846
3600.	104.125	19.078	123.203	68679.8	19.847
3700.	104.648	19.099	123.747	70664.6	19.849
3800.	105.158	19.118	124.276	72649.6	19.850
3900.	105.655	19.137	124.792	74634.6	19.851
4000.	106.139	19.155	125.294	76619.8	19.852
4100.	106.612	19.172	125.784	78605.1	19.853
4200.	107.075	19.188	126.263	80590.4	19.854
4300.	107.526	19.204	126.730	82575.9	19.855
4400.	107.968	19.219	127.187	84561.4	19.856
4500.	108.400	19.233	127.633	86547.0	19.857
4600.	108.823	19.246	128.069	88532.7	19.857
4700.	109.237	19.259	128.496	90518.5	19.858
4800.	109.643	19.272	128.914	92504.3	19.858
4900.	110.040	19.284	129.324	94490.2	19.859
5000.	110.430	19.295	129.725	96476.1	19.860
5100.	110.812	19.306	130.118	98462.1	19.860
5200.	111.187	19.317	130.504	100448.1	19.861
5300.	111.555	19.327	130.882	102434.2	19.861
5400.	111.916	19.337	131.253	104420.3	19.861
5500.	112.271	19.347	131.618	106406.5	19.862
5600.	112.620	19.356	131.976	108392.7	19.862
5700.	112.963	19.365	132.327	110378.9	19.863
5800.	113.300	19.373	132.673	112365.2	19.863
5900.	113.631	19.382	133.012	114351.5	19.863
6000.	113.957	19.390	133.346	116337.8	19.864
6100.	114.277	19.397	133.675	118324.2	19.864
6200.	114.593	19.405	133.998	120310.6	19.864
6300.	114.903	19.412	134.315	122297.0	19.864
6400.	115.209	19.419	134.628	124283.5	19.865
6500.	115.510	19.426	134.936	126269.9	19.865
6600.	115.807	19.433	135.239	128256.4	19.865
6700.	116.099	19.439	135.538	130243.0	19.865
6800.	116.387	19.446	135.833	132229.5	19.866
6900.	116.671	19.452	136.123	134216.1	19.866
7000.	116.951	19.458	136.408	136202.7	19.866

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0074990
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0313759
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.0074941

Table 1-65. Thermodynamic Functions for Al_2Cl_6 (gas)

T °K	$-\frac{(F^o-H_0^o)}{T}$	$\frac{H^o-H_0^o}{T}$	S^o	$H^o-H_0^o$	C_p^o
50.	50.856	10.474	61.329	523.7	14.858
75.	55.529	12.742	68.271	955.7	19.548
100.	59.499	14.932	74.430	1493.2	23.314
125.	63.049	16.926	79.975	2115.8	26.400
150.	66.297	18.727	85.023	2809.0	28.986
175.	69.308	20.352	89.660	3561.6	31.156
200.	72.123	21.819	93.942	4363.8	32.968
225.	74.770	23.144	97.915	5207.4	34.473
250.	77.272	24.341	101.613	6085.4	35.722
275.	79.644	25.425	105.068	6991.8	36.761
300.	81.899	26.407	108.305	7922.0	37.627
325.	84.048	27.298	111.346	8872.0	38.353
350.	86.101	28.110	114.212	9838.6	38.965
375.	88.066	28.852	116.918	10819.4	39.483
400.	89.950	29.530	119.481	11812.2	39.926
425.	91.760	30.153	121.913	12815.2	40.305
450.	93.500	30.727	124.226	13827.0	40.633
475.	95.175	31.256	126.431	14846.5	40.917
500.	96.791	31.745	128.536	15872.6	41.165
550.	99.859	32.621	132.480	17941.5	41.574
600.	102.730	33.381	136.111	20028.5	41.894
650.	105.429	34.046	139.475	22129.8	42.149
700.	107.974	34.632	142.606	24242.5	42.354
750.	110.382	35.153	145.534	26364.6	42.523
800.	112.665	35.618	148.283	28494.3	42.662
850.	114.838	36.036	150.873	30630.4	42.779
900.	116.908	36.413	153.321	32771.9	42.877
950.	118.886	36.756	155.642	34917.9	42.961
1000.	120.780	37.068	157.847	37067.8	43.033
1050.	122.595	37.353	159.949	39221.1	43.096
1100.	124.339	37.616	161.955	41377.3	43.150
1150.	126.016	37.857	163.874	43536.0	43.198
1200.	127.632	38.081	165.713	45697.0	43.239
1250.	129.191	38.288	167.479	47859.9	43.277
1300.	130.697	38.480	169.177	50024.5	43.309
1350.	132.152	38.660	170.812	52190.8	43.339
1400.	133.561	38.827	172.389	54358.4	43.365
1450.	134.927	38.984	173.911	56527.2	43.389
1500.	136.251	39.131	175.382	58697.2	43.410
1550.	137.536	39.270	176.806	60868.3	43.430
1600.	138.785	39.400	178.185	63040.2	43.448
1650.	139.999	39.523	179.522	65213.0	43.464
1700.	141.181	39.639	180.820	67386.5	43.478
1750.	142.332	39.749	182.081	69560.8	43.492
1800.	143.453	39.853	183.306	71735.7	43.504
1850.	144.546	39.952	184.498	73911.2	43.516
1900.	145.613	40.046	185.659	76087.2	43.526
1950.	146.654	40.135	186.789	78263.8	43.536
2000.	147.671	40.220	187.892	80440.8	43.545
2050.	148.666	40.302	188.967	82618.3	43.553
2100.	149.638	40.379	190.017	84796.1	43.561
2150.	150.589	40.453	191.042	86974.4	43.568
2200.	151.520	40.524	192.044	89153.0	43.575
2250.	152.431	40.592	193.023	91331.9	43.581
2300.	153.324	40.657	193.981	93511.1	43.587
2350.	154.199	40.719	194.918	95690.6	43.593
273.15	79.472	25.348	104.820	6923.9	36.690
298.15	81.735	26.337	108.073	7852.4	37.568

This table has been computed for the harmonic oscillator-rigid rotator approximation using the following data for molecular weight, I_A, I_B, I_C, (in units of 10^{-39} gm cm^2) and σ respectively:

266.702, 94.6973, 216.695, 168.809, 4.

The frequencies and their degeneracies were taken as:

506. (1), 340. (1), 217. (1), 112. (1), 75. (1), 438. (1), 164. (1), 625. (1), 202. (1), 42. (1), 606. (1), 164. (1), 420. (1), 108. (1), 160. (1), 484. (1), 301. (1), 177. (1)

The tables are in units of calories, moles and °K. See reverse side for conversion factors to other units.

Table 1-65. Thermodynamic Functions for Al_2Cl_6 (gas) - Continued

T °K	$\frac{-(F^o-H^o_0)}{T}$	$\frac{H^o-H^o_0}{T}$	S^o	$H^o-H^o_0$	C^o_p
2400.	155.057	40.779	195.836	97870.4	43.598
2450.	155.898	40.837	196.735	100050.4	43.603
2500.	156.724	40.892	197.616	102230.7	43.608
2600.	158.330	40.997	199.327	106591.9	43.616
2700.	159.879	41.094	200.973	110953.8	43.624
2800.	161.375	41.184	202.559	115316.5	43.630
2900.	162.822	41.269	204.091	119679.9	43.636
3000.	164.222	41.348	205.570	124043.8	43.642
3100.	165.579	41.422	207.001	128408.2	43.647
3200.	166.895	41.492	208.387	132773.1	43.651
3300.	168.173	41.557	209.730	137138.4	43.655
3400.	169.415	41.619	211.033	141504.1	43.659
3500.	170.622	41.677	212.299	145870.2	43.662
3600.	171.797	41.732	213.529	150236.6	43.666
3700.	172.941	41.785	214.726	154603.3	43.668
3800.	174.056	41.834	215.890	158970.3	43.671
3900.	175.143	41.881	217.025	163337.5	43.674
4000.	176.204	41.926	218.130	167705.0	43.676
4100.	177.240	41.969	219.209	172072.7	43.678
4200.	178.252	42.010	220.261	176440.6	43.680
4300.	179.241	42.049	221.289	180808.6	43.682
4400.	180.208	42.086	222.293	185176.9	43.683
4500.	181.154	42.121	223.275	189545.3	43.685
4600.	182.080	42.155	224.235	193913.9	43.687
4700.	182.987	42.188	225.175	198282.6	43.688
4800.	183.876	42.219	226.095	202651.5	43.689
4900.	184.746	42.249	226.996	207020.5	43.690
5000.	185.600	42.278	227.878	211389.6	43.692
5100.	186.438	42.306	228.743	215758.8	43.693
5200.	187.260	42.332	229.592	220128.1	43.694
5300.	188.066	42.358	230.424	224497.5	43.695
5400.	188.858	42.383	231.241	228867.0	43.696
5500.	189.636	42.407	232.043	233236.6	43.696
5600.	190.400	42.430	232.830	237606.3	43.697
5700.	191.152	42.452	233.603	241976.1	43.698
5800.	191.890	42.473	234.363	246345.9	43.699
5900.	192.616	42.494	235.110	250715.9	43.700
6000.	193.331	42.514	235.845	255085.9	43.700
6100.	194.034	42.534	236.567	259455.9	43.701
6200.	194.725	42.553	237.278	263826.0	43.701
6300.	195.406	42.571	237.977	268196.2	43.702
6400.	196.077	42.588	238.665	272566.4	43.703
6500.	196.737	42.606	239.343	276936.7	43.703
6600.	197.388	42.622	240.010	281307.0	43.704
6700.	198.029	42.638	240.667	285677.4	43.704
6800.	198.661	42.654	241.315	290047.8	43.705
6900.	199.284	42.669	241.953	294418.3	43.705
7000.	199.898	42.684	242.582	298788.8	43.705

CONVERSION FACTORS

To Convert Tabulated Values to Quantities Having the Dimensions Indicated Below	Multiply By
cal g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0037495
joules g^{-1} $°K^{-1}$ (or $°C^{-1}$)	0.0156879
Btu lb^{-1} $°R^{-1}$ (or $°F^{-1}$)	0.00374705

APPENDIX 2

THERMODYNAMIC FUNCTIONS OF SOLIDS AND LIQUIDS

Analysis of Low-Temperature Data: George T. Furukawa, Martin L. Reilly, and Jeanette M. Henning

High-Temperature Data: Thomas B. Douglas, Andrew C. Victor, and Adrienne R. Beaudoin

Details of the procedures followed in obtaining the thermodynamic functions given in the following portion of the Appendix are discussed in Chapter 1 of this report. In the process of joining smoothly the low-temperature values of the heat capacity with those derived from the high-temperature enthalpy equations given in Chapter III of the NBS Report No. 6297, the lower temperature limits of application of the enthalpy equations have been raised. These temperatures of "smooth-joining" are given in the discussion dealing with each substance.

TABLE 2-1

THERMODYNAMIC FUNCTIONS FOR ALUMINUM (AL)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.= 26.98 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0006	0.0011	0.002	0.005	0.003	0.003
10.00	0.0020	0.0033	0.005	0.033	0.009	0.020
15.00	0.0040	0.0075	0.012	0.113	0.024	0.060
20.00	0.0071	0.0151	0.022	0.301	0.054	0.142
25.00	0.0117	0.0279	0.040	0.698	0.109	0.294
30.00	0.0185	0.0483	0.067	1.449	0.197	0.555
35.00	0.0280	0.0781	0.106	2.734	0.323	0.981
40.00	0.0410	0.1187	0.160	4.748	0.488	1.640
45.00	0.0578	0.1704	0.228	7.669	0.685	2.603
50.00	0.0789	0.2327	0.312	11.635	0.905	3.946
55.00	0.1044	0.3044	0.409	16.739	1.139	5.742
60.00	0.1342	0.3839	0.518	23.031	1.379	8.054
65.00	0.1683	0.4696	0.638	30.525	1.619	10.940
70.00	0.2064	0.5602	0.767	39.214	1.856	14.448
75.00	0.2482	0.6543	0.903	49.075	2.088	18.618
80.00	0.2936	0.7510	1.045	60.078	2.312	23.484
85.00	0.3420	0.8492	1.191	72.184	2.529	29.071
90.00	0.3934	0.9483	1.342	85.348	2.735	35.402
95.00	0.4473	1.0476	1.495	99.520	2.932	42.493
100.00	0.5035	1.1465	1.650	114.65	3.117	50.354
105.00	0.5619	1.2445	1.806	130.67	3.291	58.995
110.00	0.6220	1.3413	1.963	147.54	3.453	68.419
115.00	0.6837	1.4364	2.120	165.19	3.605	78.628
120.00	0.7468	1.5298	2.277	183.57	3.746	89.620
125.00	0.8111	1.6211	2.432	202.64	3.879	101.390
130.00	0.8765	1.7103	2.587	222.34	4.003	113.94
135.00	0.9427	1.7974	2.740	242.65	4.119	127.26
140.00	1.0096	1.8823	2.892	263.53	4.230	141.34
145.00	1.0771	1.9651	3.042	284.94	4.335	156.17
150.00	1.1451	2.0458	3.191	306.87	4.434	171.76
155.00	1.2134	2.1243	3.338	329.27	4.527	188.08
160.00	1.2821	2.2008	3.483	352.13	4.615	205.13
165.00	1.3509	2.2753	3.626	375.42	4.698	222.91
170.00	1.4199	2.3477	3.768	399.11	4.777	241.39
175.00	1.4890	2.4182	3.907	423.18	4.851	260.58
180.00	1.5581	2.4867	4.045	447.61	4.921	280.46
185.00	1.6272	2.5534	4.181	472.38	4.986	301.02
190.00	1.6961	2.6182	4.314	497.46	5.048	322.26
195.00	1.7649	2.6813	4.446	522.85	5.106	344.16
200.00	1.8336	2.7426	4.576	548.52	5.161	366.72
205.00	1.9021	2.8022	4.704	574.45	5.211	389.92
210.00	1.9703	2.8601	4.830	600.63	5.258	413.76
215.00	2.0383	2.9164	4.955	627.03	5.301	438.22
220.00	2.1059	2.9711	5.077	653.63	5.342	463.30
225.00	2.1733	3.0242	5.198	680.44	5.380	488.99
230.00	2.2403	3.0758	5.316	707.43	5.417	515.28
235.00	2.3070	3.1260	5.433	734.61	5.453	542.15
240.00	2.3733	3.1749	5.548	761.96	5.489	569.60
245.00	2.4393	3.2224	5.662	789.49	5.523	597.63
250.00	2.5049	3.2688	5.774	817.19	5.557	626.22
255.00	2.5700	3.3140	5.884	845.06	5.589	655.36
260.00	2.6348	3.3580	5.993	873.08	5.620	685.05
265.00	2.6992	3.4010	6.100	901.26	5.651	715.29
270.00	2.7632	3.4429	6.206	929.58	5.680	746.05
273.15	2.8032	3.4688	6.272	947.50	5.697	765.71
275.00	2.8267	3.4838	6.311	958.05	5.708	777.35
280.00	2.8898	3.5238	6.414	986.66	5.735	809.16
285.00	2.9526	3.5628	6.515	1015.4	5.760	841.48
290.00	3.0149	3.6009	6.616	1044.3	5.785	874.31
295.00	3.0767	3.6381	6.715	1073.2	5.808	907.64
298.15	3.1155	3.6611	6.777	1091.6	5.821	928.88
300.00	3.1382	3.6744	6.813	1102.3	5.829	941.45

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-1(CONT.)

THERMODYNAMIC FUNCTIONS FOR ALUMINUM (AL)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.= 26.98 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	3.1382	3.6744	6.813	1102.3	5.829	941.45
310.00	3.2598	3.7446	7.004	1160.8	5.866	1010.5
320.00	3.3798	3.8114	7.191	1219.6	5.899	1081.5
330.00	3.4980	3.8751	7.373	1278.8	5.930	1154.4
340.00	3.6146	3.9360	7.551	1338.2	5.958	1229.0
350.00	3.7296	3.9941	7.724	1397.9	5.985	1305.3
360.00	3.8429	4.0498	7.893	1457.9	6.011	1383.4
370.00	3.9546	4.1031	8.058	1518.2	6.039	1463.2
373.15	3.9894	4.1195	8.109	1537.2	6.048	1488.7
380.00	4.0647	4.1545	8.219	1578.7	6.069	1544.6
390.00	4.1732	4.2039	8.377	1639.5	6.098	1627.6
400.00	4.2803	4.2516	8.532	1700.7	6.127	1712.1
425.00	4.5414	4.3641	8.906	1854.8	6.201	1930.1
450.00	4.7939	4.4682	9.262	2010.7	6.274	2157.2
475.00	5.038	4.565	9.603	2168.4	6.346	2393.1
500.00	5.275	4.656	9.931	2328.0	6.420	2637.3
550.00	5.726	4.823	10.549	2652.7	6.568	3149.4
600.00	6.153	4.975	11.127	2984.8	6.716	3691.5
650.00	6.556	5.114	11.671	3324.3	6.864	4261.6
700.00	6.940	5.245	12.185	3671.2	7.012	4858.1
750.00	7.306	5.367	12.674	4025.5	7.160	5479.6
800.00	7.656	5.484	13.140	4387.2	7.308	6125.1
850.00	7.992	5.596	13.588	4756.3	7.456	6792.3
900.00	8.315	5.703	14.018	5132.8	7.604	7483.6
932.00	8.515	5.770	14.285	5377.6	7.699	7936.4
			(LIQUID)			
932.00	8.515	8.526	17.042	7946.6	7.000	7936.4
950.00	8.678	8.497	17.176	8072.6	7.000	8244.4
1000.00	9.112	8.423	17.535	8422.6	7.000	9112.2
1050.00	9.522	8.355	17.876	8772.6	7.000	9997.6
1100.00	9.909	8.293	18.202	9122.6	7.000	10899.6
1150.00	10.276	8.237	18.513	9472.6	7.000	11817.5
1200.00	10.626	8.185	18.811	9822.6	7.000	12750.7
1250.00	10.959	8.138	19.097	10172.6	7.000	13698.4
1300.00	11.277	8.094	19.371	10522.6	7.000	14660.2
1350.00	11.582	8.054	19.636	10872.6	7.000	15635.4
1400.00	11.874	8.016	19.890	11222.6	7.000	16623.6
1450.00	12.155	7.981	20.136	11572.6	7.000	17624.3
1500.00	12.425	7.948	20.373	11922.6	7.000	18637.0
1550.00	12.685	7.918	20.603	12272.6	7.000	19661.5
1600.00	12.936	7.889	20.825	12622.6	7.000	20697.2
1650.00	13.178	7.862	21.040	12972.6	7.000	21743.8
1700.00	13.412	7.837	21.249	13322.6	7.000	22801.1
1750.00	13.639	7.813	21.452	13672.6	7.000	23868.6
1800.00	13.859	7.790	21.649	14022.6	7.000	24946.2
1850.00	14.072	7.769	21.841	14372.6	7.000	26033.5
1900.00	14.279	7.749	22.028	14722.6	7.000	27130.2
1950.00	14.480	7.730	22.210	15072.6	7.000	28236.2
2000.00	14.676	7.711	22.387	15422.6	7.000	29351.1
2050.00	14.866	7.694	22.560	15772.6	7.000	30474.8
2100.00	15.051	7.677	22.728	16122.6	7.000	31607.0
2150.00	15.231	7.662	22.893	16472.6	7.000	32747.6
2200.00	15.407	7.647	23.054	16822.6	7.000	33896.3
2250.00	15.579	7.632	23.211	17172.6	7.000	35052.9
2300.00	15.747	7.619	23.365	17522.6	7.000	36217.3
2350.00	15.910	7.605	23.516	17872.6	7.000	37389.4
2400.00	16.070	7.593	23.663	18222.6	7.000	38568.9
2450.00	16.227	7.581	23.807	18572.6	7.000	39755.6
2500.00	16.380	7.569	23.949	18922.6	7.000	40949.6

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-2

THERMODYNAMIC FUNCTIONS FOR ALUMINUM OXIDE (ALPHA-AL_2O_3)
SOLID PHASE

GRAM MOLECULAR WT.=101.96 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0001	0.000	0.000	0.000	0.000
10.00	0.0002	0.0006	0.001	0.006	0.002	0.002
15.00	0.0006	0.0018	0.002	0.028	0.007	0.009
20.00	0.0015	0.0044	0.006	0.088	0.018	0.029
25.00	0.0029	0.0086	0.011	0.214	0.034	0.072
30.00	0.0050	0.0150	0.020	0.450	0.063	0.149
35.00	0.0080	0.0246	0.033	0.862	0.105	0.278
40.00	0.0121	0.0382	0.050	1.528	0.165	0.483
45.00	0.0176	0.0567	0.074	2.552	0.249	0.791
50.00	0.0248	0.0811	0.106	4.053	0.357	1.238
55.00	0.0339	0.1122	0.146	6.169	0.495	1.864
60.00	0.0453	0.1509	0.196	9.053	0.664	2.715
65.00	0.0591	0.1979	0.257	12.864	0.865	3.843
70.00	0.0758	0.2536	0.329	17.752	1.095	5.305
75.00	0.0954	0.3182	0.414	23.863	1.355	7.157
80.00	0.1183	0.3920	0.510	31.356	1.648	9.461
85.00	0.1445	0.4752	0.620	40.393	1.971	12.280
90.00	0.1742	0.5678	0.742	51.102	2.316	15.679
95.00	0.2076	0.6694	0.877	63.591	2.682	19.722
100.00	0.2447	0.7796	1.024	77.959	3.069	24.470
105.00	0.2856	0.8982	1.184	94.312	3.476	29.985
110.00	0.3303	1.0250	1.355	112.74	3.900	36.327
115.00	0.3788	1.1595	1.538	133.34	4.341	43.556
120.00	0.4311	1.3014	1.733	156.17	4.794	51.728
125.00	0.4872	1.4503	1.938	181.29	5.256	60.899
130.00	0.5471	1.6057	2.153	208.75	5.727	71.121
135.00	0.6107	1.7672	2.378	238.57	6.203	82.443
140.00	0.6780	1.9341	2.612	270.78	6.682	94.915
145.00	0.7488	2.1061	2.855	305.39	7.163	108.58
150.00	0.8232	2.2827	3.106	342.41	7.644	123.48
155.00	0.9010	2.4634	3.364	381.83	8.123	139.65
160.00	0.9821	2.6477	3.630	423.64	8.601	157.13
165.00	1.0664	2.8353	3.902	467.83	9.075	175.96
170.00	1.1539	3.0258	4.180	514.38	9.545	196.16
175.00	1.2444	3.2187	4.463	563.27	10.009	217.76
180.00	1.3378	3.4137	4.752	614.46	10.467	240.80
185.00	1.4340	3.6104	5.044	667.93	10.917	265.29
190.00	1.5329	3.8086	5.341	723.62	11.361	291.25
195.00	1.6344	4.0078	5.642	781.52	11.796	318.71
200.00	1.7384	4.2078	5.946	841.57	12.223	347.68
205.00	1.8448	4.4084	6.253	903.73	12.641	378.17
210.00	1.9534	4.6093	6.563	967.96	13.050	410.21
215.00	2.0642	4.8103	6.875	1034.2	13.451	443.81
220.00	2.1771	5.0112	7.188	1102.5	13.843	478.96
225.00	2.2920	5.2117	7.504	1172.6	14.227	515.69
230.00	2.4087	5.4118	7.821	1244.7	14.602	554.00
235.00	2.5272	5.6113	8.138	1318.6	14.969	593.90
240.00	2.6475	5.8100	8.457	1394.4	15.327	635.39
245.00	2.7693	6.0078	8.777	1471.9	15.676	678.47
250.00	2.8926	6.2045	9.097	1551.1	16.016	723.16
255.00	3.0174	6.4002	9.418	1632.1	16.349	769.45
260.00	3.1436	6.5946	9.738	1714.6	16.673	817.34
265.00	3.2711	6.7878	10.059	1798.8	16.988	866.83
270.00	3.3997	6.9795	10.379	1884.5	17.296	917.92
273.15	3.4814	7.0996	10.581	1939.3	17.486	950.94
275.00	3.5295	7.1699	10.699	1971.7	17.596	970.62
280.00	3.6604	7.3586	11.019	2060.4	17.887	1024.9
285.00	3.7923	7.5459	11.338	2150.6	18.172	1080.8
290.00	3.9252	7.7315	11.657	2242.1	18.448	1138.3
295.00	4.0589	7.9154	11.974	2335.0	18.717	1197.4
298.15	4.1436	8.0304	12.174	2394.3	18.883	1235.4
300.00	4.1935	8.0976	12.291	2429.3	18.979	1258.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-2(CONT.)

THERMODYNAMIC FUNCTIONS FOR ALUMINUM OXIDE (ALPHA-AL_2O_3)
SOLID PHASE

GRAM MOLECULAR WT.=101.96 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG-MOLE	$(H_T-H_0)/T$ CAL/DEG-MOLE	(S_T-S_0) CAL/DEG-MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG-MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	4.1935	8.0976	12.291	2429.3	18.979	1258.0
310.00	4.4649	8.4568	12.922	2621.6	19.482	1384.1
320.00	4.7389	8.8088	13.548	2818.8	19.957	1516.5
330.00	5.0153	9.1535	14.169	3020.7	20.408	1655.0
340.00	5.2936	9.4909	14.784	3226.9	20.836	1799.8
350.00	5.5735	9.8209	15.394	3437.3	21.243	1950.7
360.00	5.8547	10.144	15.998	3651.7	21.633	2107.7
370.00	6.1369	10.459	16.596	3869.9	22.003	2270.7
373.15	6.2260	10.557	16.783	3939.4	22.114	2323.2
380.00	6.4200	10.768	17.188	4091.7	22.349	2439.6
390.00	6.7036	11.069	17.772	4316.8	22.677	2614.4
400.00	6.9875	11.363	18.350	4545.2	22.986	2795.0
425.00	7.697	12.068	19.765	5128.7	23.685	3271.4
450.00	8.406	12.731	21.136	5728.7	24.302	3782.7
475.00	9.111	13.354	22.465	6343.3	24.852	4327.8
500.00	9.811	13.942	23.753	6970.9	25.345	4905.6
550.00	11.191	15.018	26.210	8260.0	26.191	6155.3
600.00	12.540	15.979	28.519	9587.5	26.889	7524.1
650.00	13.854	16.842	30.695	10947.0	27.474	9005.0
700.00	15.131	17.619	32.750	12333.4	27.969	10591.6
750.00	16.371	18.324	34.695	13742.8	28.393	12278.2
800.00	17.574	18.965	36.539	15171.8	28.758	14059.4
850.00	18.742	19.550	38.292	16617.8	29.076	15930.6
900.00	19.875	20.087	39.962	18078.7	29.354	17887.3
950.00	20.974	20.582	41.556	19552.7	29.599	19925.5
1000.00	22.042	21.038	43.080	21038.1	29.814	22041.7
1050.00	23.079	21.461	44.539	22533.7	30.006	24232.4
1100.00	24.086	21.853	45.939	24038.3	30.176	26494.6
1150.00	25.066	22.218	47.284	25551.0	30.328	28825.4
1200.00	26.018	22.559	48.578	27070.9	30.464	31222.2
1250.00	26.946	22.878	49.824	28597.2	30.586	33682.4
1300.00	27.849	23.176	51.025	30129.2	30.695	36203.8
1350.00	28.729	23.457	52.186	31666.5	30.793	38784.2
1400.00	29.587	23.720	53.307	33208.3	30.881	41421.7
1450.00	30.424	23.969	54.392	34754.4	30.960	44114.3
1500.00	31.240	24.203	55.443	36304.2	31.032	46860.3
1550.00	32.037	24.424	56.462	37857.5	31.096	49658.1
1600.00	32.816	24.634	57.450	39413.7	31.153	52506.0
1650.00	33.577	24.832	58.409	40972.7	31.205	55402.6
1700.00	34.321	25.020	59.341	42534.1	31.251	58346.5
1750.00	35.049	25.199	60.248	44097.6	31.292	61336.3
1800.00	35.762	25.368	61.130	45663.2	31.328	64370.9
1850.00	36.459	25.530	61.989	47230.4	31.361	67448.9
1900.00	37.142	25.684	62.826	48799.2	31.389	70569.4
1950.00	37.811	25.830	63.641	50369.3	31.414	73731.1
2000.00	38.467	25.970	64.437	51940.5	31.436	76933.2
2050.00	39.110	26.104	65.213	53512.8	31.454	80174.5
2100.00	39.740	26.231	65.971	55085.9	31.470	83454.2
2150.00	40.359	26.353	66.712	56659.8	31.483	86771.4
2200.00	40.966	26.470	67.436	58234.2	31.494	90125.1
2250.00	41.562	26.582	68.144	59809.1	31.502	93514.7
2300.00	42.148	26.689	68.836	61384.4	31.509	96939.3

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-3

THERMODYNAMIC FUNCTIONS FOR ALUMINA MONOHYDRATE ($AL_2O_3 \cdot H_2O$, BOEHMITE)
SOLID PHASE

GRAM MOLECULAR WT.=119.976 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0003	0.0017	0.002	0.009	0.009	0.002
10.00	0.0058	0.0193	0.025	0.193	0.072	0.058
15.00	0.0196	0.0534	0.073	0.802	0.177	0.294
20.00	0.0412	0.1014	0.143	2.027	0.320	0.825
25.00	0.0702	0.1626	0.233	4.065	0.502	1.755
30.00	0.1062	0.2372	0.343	7.115	0.724	3.187
35.00	0.1492	0.3250	0.474	11.373	0.985	5.222
40.00	0.1990	0.4256	0.625	17.025	1.282	7.961
45.00	0.2556	0.5388	0.794	24.245	1.612	11.501
50.00	0.3187	0.6641	0.983	33.207	1.978	15.936
55.00	0.3884	0.8016	1.190	44.086	2.380	21.361
60.00	0.4645	0.9511	1.416	57.065	2.818	27.867
65.00	0.5469	1.1127	1.660	72.325	3.292	35.547
70.00	0.6356	1.2863	1.922	90.038	3.798	44.493
75.00	0.7306	1.4714	2.202	110.36	4.333	54.795
80.00	0.8318	1.6676	2.499	133.41	4.892	66.541
85.00	0.9390	1.8742	2.813	159.31	5.470	79.816
90.00	1.0522	2.0904	3.143	188.13	6.064	94.700
95.00	1.1712	2.3155	3.487	219.97	6.672	111.27
100.00	1.2959	2.5488	3.845	254.88	7.293	129.59
105.00	1.4261	2.7897	4.216	292.92	7.925	149.74
110.00	1.5615	3.0377	4.599	334.14	8.567	171.77
115.00	1.7021	3.2922	4.994	378.60	9.218	195.75
120.00	1.8477	3.5528	5.401	426.34	9.876	221.73
125.00	1.9982	3.8190	5.817	477.38	10.541	249.77
130.00	2.1532	4.0904	6.244	531.75	11.210	279.92
135.00	2.3128	4.3666	6.679	589.49	11.883	312.22
140.00	2.4766	4.6471	7.124	650.59	12.559	346.73
145.00	2.6446	4.9315	7.576	715.07	13.236	383.47
150.00	2.8167	5.2196	8.036	782.95	13.913	422.50
155.00	2.9926	5.5110	8.504	854.21	14.590	463.85
160.00	3.1722	5.8053	8.977	928.85	15.266	507.55
165.00	3.3553	6.1022	9.458	1006.9	15.940	553.63
170.00	3.5420	6.4014	9.943	1088.2	16.610	602.13
175.00	3.7319	6.7026	10.434	1173.0	17.277	653.07
180.00	3.9249	7.0056	10.930	1261.0	17.939	706.48
185.00	4.1210	7.3100	11.431	1352.3	18.596	762.39
190.00	4.3200	7.6156	11.936	1447.0	19.248	820.80
195.00	4.5218	7.9221	12.444	1544.8	19.893	881.75
200.00	4.7262	8.2294	12.956	1645.9	20.531	945.25
205.00	4.9332	8.5371	13.470	1750.1	21.163	1011.3
210.00	5.1426	8.8452	13.988	1857.5	21.786	1080.0
215.00	5.3544	9.1533	14.508	1968.0	22.402	1151.2
220.00	5.5683	9.4613	15.030	2081.5	23.009	1225.0
225.00	5.7844	9.7691	15.553	2198.0	23.607	1301.5
230.00	6.0025	10.076	16.079	2317.6	24.197	1380.6
235.00	6.2225	10.383	16.605	2440.0	24.778	1462.3
240.00	6.4443	10.689	17.133	2565.3	25.350	1546.6
245.00	6.6678	10.994	17.662	2693.5	25.912	1633.6
250.00	6.8930	11.298	18.191	2824.4	26.466	1723.2
255.00	7.1197	11.600	18.720	2958.1	27.010	1815.5
260.00	7.3479	11.902	19.250	3094.5	27.545	1910.4
265.00	7.5774	12.202	19.780	3233.5	28.071	2008.0
270.00	7.8083	12.501	20.309	3375.2	28.588	2108.2
273.15	7.9544	12.688	20.643	3465.8	28.910	2172.7
275.00	8.0404	12.798	20.838	3519.4	29.097	2211.1
280.00	8.2737	13.093	21.367	3666.2	29.597	2316.6
285.00	8.5030	13.387	21.895	3815.4	30.089	2424.8
290.00	8.7434	13.679	22.423	3967.0	30.574	2535.6
295.00	8.9797	13.970	22.950	4121.1	31.051	2649.0
298.15	9.1290	14.152	23.281	4219.4	31.348	2721.8
300.00	9.2169	14.258	23.475	4277.5	31.521	2765.1

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-4

THERMODYNAMIC FUNCTIONS FOR ALUMINA TRIHYDRATE ($AL_2O_3 \cdot 3H_2O$, GIBBSITE)
SOLID PHASE

GRAM MOLECULAR WT.=156.008 GRAMS — 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL / DEG MOLE	$(H_T-H_0)/T$ CAL / DEG MOLE	(S_T-S_0) CAL / DEG MOLE	(H_T-H_0) CAL / MOLE	C_P CAL / DEG MOLE	$-(F_T-H_0)$ CAL / MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0005	0.0026	0.003	0.013	0.014	0.003
10.00	0.0088	0.0291	0.038	0.291	0.110	0.088
15.00	0.0296	0.0808	0.110	1.212	0.268	0.444
20.00	0.0623	0.1532	0.216	3.065	0.483	1.246
25.00	0.1060	0.2455	0.351	6.136	0.756	2.650
30.00	0.1604	0.3573	0.518	10.717	1.086	4.810
35.00	0.2250	0.4882	0.713	17.086	1.470	7.875
40.00	0.2997	0.6375	0.937	25.499	1.903	11.990
45.00	0.3843	0.8043	1.189	36.194	2.383	17.293
50.00	0.4784	0.9881	1.467	49.407	2.910	23.920
55.00	0.5819	1.1887	1.771	65.380	3.487	32.002
60.00	0.6945	1.4061	2.101	84.367	4.116	41.669
65.00	0.8162	1.6404	2.457	106.63	4.797	53.051
70.00	0.9468	1.8917	2.839	132.42	5.526	66.278
75.00	1.0864	2.1595	3.246	161.96	6.300	81.479
80.00	1.2347	2.4435	3.678	195.48	7.111	98.779
85.00	1.3918	2.7427	4.135	233.13	7.956	118.30
90.00	1.5574	3.0564	4.614	275.08	8.828	140.16
95.00	1.7313	3.3837	5.115	321.45	9.725	164.48
100.00	1.9135	3.7237	5.637	372.37	10.645	191.35
105.00	2.1036	4.0755	6.179	427.93	11.583	220.88
110.00	2.3015	4.4384	6.740	488.22	12.536	253.17
115.00	2.5070	4.8115	7.319	553.32	13.503	288.31
120.00	2.7199	5.1939	7.914	623.27	14.479	326.38
125.00	2.9398	5.5849	8.525	698.11	15.461	367.47
130.00	3.1666	5.9837	9.150	777.88	16.446	411.65
135.00	3.4000	6.3894	9.789	862.58	17.433	459.00
140.00	3.6398	6.8015	10.441	952.21	18.419	509.57
145.00	3.8857	7.2190	11.105	1046.8	19.403	563.43
150.00	4.1376	7.6415	11.779	1146.2	20.383	620.63
155.00	4.3951	8.0683	12.463	1250.6	21.358	681.24
160.00	4.6580	8.4987	13.157	1359.8	22.326	745.28
165.00	4.9262	8.9323	13.858	1473.8	23.287	812.82
170.00	5.1993	9.3685	14.568	1592.6	24.239	883.88
175.00	5.4772	9.8069	15.284	1716.2	25.181	958.51
180.00	5.7596	10.247	16.006	1844.4	26.112	1036.7
185.00	6.0464	10.688	16.735	1977.3	27.032	1118.6
190.00	6.3373	11.130	17.467	2114.7	27.940	1204.1
195.00	6.6321	11.573	18.205	2256.7	28.835	1293.3
200.00	6.9307	12.015	18.946	2403.1	29.717	1386.1
205.00	7.2328	12.458	19.690	2553.8	30.585	1482.7
210.00	7.5383	12.899	20.438	2708.9	31.440	1583.0
215.00	7.8470	13.340	21.187	2868.2	32.281	1687.1
220.00	8.1588	13.780	21.939	3031.7	33.108	1794.9
225.00	8.4734	14.219	22.692	3199.3	33.921	1906.5
230.00	8.7907	14.656	23.447	3370.9	34.721	2021.9
235.00	9.1105	15.091	24.202	3546.4	35.507	2141.0
240.00	9.4328	15.525	24.957	3725.9	36.280	2263.9
245.00	9.7573	15.956	25.713	3909.2	37.041	2390.5
250.00	10.084	16.385	26.469	4096.3	37.790	2521.0
255.00	10.413	16.812	27.225	4287.1	38.527	2655.2
260.00	10.743	17.237	27.980	4481.5	39.253	2793.3
265.00	11.076	17.659	28.735	4679.6	39.969	2935.0
270.00	11.410	18.079	29.488	4881.2	40.676	3080.6
273.15	11.621	18.342	29.963	5010.0	41.117	3174.2
275.00	11.745	18.496	30.241	5086.3	41.375	3229.9
280.00	12.082	18.911	30.993	5295.0	42.066	3383.0
285.00	12.421	19.323	31.743	5507.0	42.752	3539.8
290.00	12.760	19.733	32.493	5722.5	43.433	3700.4
295.00	13.101	20.140	33.241	5941.3	44.110	3864.8
298.15	13.316	20.396	33.712	6080.9	44.535	3970.2
300.00	13.443	20.545	33.988	6163.6	44.785	4032.8

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-5

THERMODYNAMIC FUNCTIONS FOR ALUMINUM FLUORIDE (ALF_3)
SOLID PHASE

GRAM MOLECULAR WT.=83.98 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID-ALPHA)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0001	0.0003	0.000	0.001	0.001	0.000
10.00	0.0010	0.0035	0.005	0.035	0.015	0.010
15.00	0.0038	0.0119	0.016	0.179	0.046	0.057
20.00	0.0091	0.0273	0.036	0.545	0.106	0.183
25.00	0.0177	0.0521	0.070	1.301	0.204	0.442
30.00	0.0302	0.0889	0.119	2.667	0.351	0.907
35.00	0.0476	0.1401	0.188	4.905	0.553	1.665
40.00	0.0705	0.2073	0.278	8.292	0.811	2.819
45.00	0.0996	0.2911	0.391	13.100	1.120	4.481
50.00	0.1353	0.3914	0.527	19.569	1.474	6.764
55.00	0.1779	0.5073	0.685	27.901	1.864	9.785
60.00	0.2275	0.6376	0.865	38.255	2.282	13.652
65.00	0.2841	0.7808	1.065	50.753	2.720	18.469
70.00	0.3476	0.9354	1.283	65.479	3.172	24.331
75.00	0.4177	1.0999	1.518	82.489	3.633	31.326
80.00	0.4941	1.2727	1.767	101.82	4.099	39.532
85.00	0.5767	1.4527	2.029	123.48	4.566	49.017
90.00	0.6649	1.6386	2.304	147.48	5.033	59.845
95.00	0.7586	1.8295	2.588	173.80	5.497	72.070
100.00	0.8574	2.0244	2.882	202.44	5.959	85.741
105.00	0.9610	2.2227	3.184	233.38	6.416	100.90
110.00	1.0690	2.4235	3.493	266.59	6.868	117.59
115.00	1.1812	2.6265	3.808	302.05	7.314	135.84
120.00	1.2973	2.8310	4.128	339.72	7.755	155.68
125.00	1.4170	3.0367	4.454	379.59	8.190	177.13
130.00	1.5402	3.2432	4.783	421.61	8.617	200.22
135.00	1.6664	3.4500	5.116	465.75	9.037	224.97
140.00	1.7956	3.6569	5.453	511.97	9.447	251.39
145.00	1.9276	3.8635	5.791	560.20	9.846	279.50
150.00	2.0620	4.0694	6.131	610.41	10.235	309.30
155.00	2.1988	4.2744	6.473	662.53	10.613	340.81
160.00	2.3377	4.4783	6.816	716.53	10.982	374.04
165.00	2.4786	4.6808	7.159	772.33	11.340	408.98
170.00	2.6214	4.8818	7.503	829.91	11.689	445.63
175.00	2.7658	5.0812	7.847	889.21	12.029	484.01
180.00	2.9117	5.2788	8.190	950.18	12.359	524.10
185.00	3.0590	5.4745	8.533	1012.8	12.681	565.91
190.00	3.2076	5.6683	8.876	1077.0	12.994	609.43
195.00	3.3573	5.8600	9.217	1142.7	13.298	654.67
200.00	3.5080	6.0497	9.558	1209.9	13.594	701.61
205.00	3.6597	6.2373	9.897	1278.6	13.883	750.24
210.00	3.8123	6.4226	10.235	1348.8	14.163	800.57
215.00	3.9655	6.6058	10.571	1420.3	14.436	852.59
220.00	4.1195	6.7868	10.906	1493.1	14.701	906.28
225.00	4.2740	6.9655	11.240	1567.2	14.958	961.65
230.00	4.4290	7.1420	11.571	1642.7	15.208	1018.7
235.00	4.5845	7.3162	11.901	1719.3	15.450	1077.4
240.00	4.7403	7.4882	12.228	1797.2	15.686	1137.7
245.00	4.8965	7.6578	12.554	1876.2	15.914	1199.6
250.00	5.0529	7.8251	12.878	1956.3	16.135	1263.2
255.00	5.2095	7.9902	13.200	2037.5	16.349	1328.4
260.00	5.3662	8.1529	13.519	2119.8	16.556	1395.2
265.00	5.5230	8.3134	13.836	2203.0	16.757	1463.6
270.00	5.6799	8.4715	14.151	2287.3	16.950	1533.6
273.15	5.7737	8.5700	14.349	2340.9	17.068	1578.5
275.00	5.8368	8.6274	14.464	2372.5	17.136	1605.1
280.00	5.9936	8.7809	14.775	2458.7	17.315	1678.2
285.00	6.1504	8.9322	15.083	2545.7	17.485	1752.9
290.00	6.3070	9.0810	15.388	2633.5	17.649	1829.0
295.00	6.4635	9.2276	15.691	2722.1	17.806	1906.7
298.15	6.5620	9.3187	15.881	2778.4	17.903	1956.5
300.00	6.6198	9.3719	15.992	2811.6	17.959	1985.9

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-5(CONT.)

THERMODYNAMIC FUNCTIONS FOR ALUMINUM FLUORIDE (ALF_3)
SOLID PHASE

GRAM MOLECULAR WT.=83.98 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG-MOLE	$(H_T-H_0)/T$ CAL/DEG-MOLE	(S_T-S_0) CAL/DEG-MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG-MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID-ALPHA)			
300.00	6.6198	9.3719	15.992	2811.6	17.959	1985.9
310.00	6.9317	9.6536	16.585	2992.6	18.248	2148.8
320.00	7.2425	9.9264	17.169	3176.5	18.520	2317.6
330.00	7.5521	10.191	17.743	3363.0	18.776	2492.2
340.00	7.8601	10.447	18.307	3551.9	19.017	2672.4
350.00	8.1665	10.695	18.862	3743.3	19.246	2858.3
360.00	8.4712	10.936	19.407	3936.8	19.464	3049.6
370.00	8.7740	11.169	19.943	4132.5	19.672	3246.4
373.15	8.8690	11.241	20.110	4194.6	19.736	3309.5
380.00	9.0749	11.395	20.470	4330.2	19.872	3448.5
390.00	9.3738	11.615	20.989	4529.9	20.063	3655.8
400.00	9.6705	11.829	21.499	4731.5	20.247	3868.2
425.00	10.403	12.337	22.740	5243.1	20.680	4421.3
450.00	11.122	12.812	23.933	5765.2	21.077	5004.8
475.00	11.827	13.256	25.083	6296.8	21.457	5617.6
500.00	12.517	13.676	26.193	6837.9	21.830	6258.7
550.00	13.858	14.450	28.307	7947.3	22.538	7621.7
600.00	15.146	15.152	30.297	9091.0	23.207	9087.3
650.00	16.384	15.796	32.180	10267.5	23.850	10649.7
650.00	16.384	15.796	32.180	10267.5	23.850	10649.7
700.00	17.577	16.394	33.971	11475.7	24.473	12303.8
727.00	18.203	16.700	34.903	12140.9	24.803	13233.7
			(SOLID-BETA)			
727.00	18.203	16.905	35.108	12289.9	23.111	13233.7
750.00	18.733	17.096	35.829	12822.2	23.180	14049.6
800.00	19.849	17.481	37.330	13985.0	23.330	15878.9
850.00	20.919	17.830	38.749	15155.2	23.480	17781.2
900.00	21.947	18.148	40.095	16333.0	23.630	19752.6
950.00	22.936	18.440	41.377	17518.2	23.780	21789.6
1000.00	23.889	18.711	42.600	18711.0	23.930	23889.3
1050.00	24.808	18.963	43.771	19911.2	24.080	26048.8
1100.00	25.696	19.199	44.895	21119.0	24.230	28265.7
1150.00	26.554	19.421	45.976	22334.2	24.380	30537.6
1200.00	27.385	19.631	47.016	23557.0	24.530	32862.5
1250.00	28.191	19.830	48.021	24787.2	24.680	35238.6
1300.00	28.972	20.019	48.992	26025.0	24.830	37664.1
1350.00	29.731	20.200	49.931	27270.2	24.980	40137.3
1400.00	30.469	20.374	50.843	28523.0	25.130	42656.7
1450.00	31.187	20.540	51.727	29783.2	25.280	45221.1
1500.00	31.886	20.701	52.587	31051.0	25.430	47829.0
1550.00	32.567	20.856	53.423	32326.2	25.580	50479.4

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-6

THERMODYNAMIC FUNCTIONS FOR ALUMINUM CHLORIDE ($AlCl_3$)
SOLID AND LIQUID PHASES [3]

GRAM MOLECULAR WT.=133.351 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T - H_{298.15})/T$ CAL/DEG MOLE	$(H_T - H_{298.15})/T$ CAL/DEG MOLE	$(S_T - S_0)$ CAL/DEG MOLE	$(H_T - H_{298.15})$ CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T - H_{298.15})$ CAL/MOLE
			(SOLID)			
298.15	22.430	0.000	22.430	0.0	21.598	6687.7
300.00	22.431	0.133	22.564	40.0	21.650	6729.3
325.00	22.509	1.815	24.325	590.0	22.350	7315.6
350.00	22.700	3.307	26.007	1157.5	23.050	7944.9
375.00	22.974	4.647	27.621	1742.5	23.750	8615.3
400.00	23.314	5.862	29.176	2345.0	24.450	9325.4
425.00	23.703	6.976	30.679	2965.0	25.150	10073.7
450.00	24.131	8.006	32.137	3602.5	25.850	10859.0
465.60	24.414	8.611	33.025	4009.2	26.287	11367.3
			(LIQUID)			
465.60	24.414	26.867	51.281	12509.2	31.200	11367.3
475.00	24.952	26.953	51.905	12802.5	31.200	11852.3
500.00	26.340	27.165	53.505	13582.5	31.200	13170.1
550.00	28.947	27.532	56.479	15142.5	31.200	15920.9
600.00	31.356	27.837	59.194	16702.5	31.200	18813.7
650.00	33.595	28.096	61.691	18262.5	31.200	21836.6
700.00	35.685	28.318	64.003	19822.5	31.200	24979.7
750.00	37.646	28.510	66.156	21382.5	31.200	28234.3
800.00	39.491	28.678	68.169	22942.5	31.200	31592.9
850.00	41.234	28.826	70.061	24502.5	31.200	35049.2
900.00	42.886	28.958	71.844	26062.5	31.200	38597.2
950.00	44.455	29.076	73.531	27622.5	31.200	42232.0
1000.00	45.949	29.182	75.131	29182.5	31.200	45948.9
1050.00	47.375	29.279	76.654	30742.5	31.200	49743.8
1100.00	48.739	29.366	78.105	32302.5	31.200	53613.1
1150.00	50.046	29.446	79.492	33862.5	31.200	57553.3
1200.00	51.301	29.519	80.820	35422.5	31.200	61561.3
1250.00	52.507	29.586	82.093	36982.5	31.200	65634.3
1300.00	53.669	29.648	83.317	38542.5	31.200	69769.8
1350.00	54.789	29.706	84.495	40102.5	31.200	73965.3
1400.00	55.870	29.759	85.629	41662.5	31.200	78218.6
1450.00	56.916	29.809	86.724	43222.5	31.200	82527.6
1500.00	57.927	29.855	87.782	44782.5	31.200	86890.4
1550.00	58.907	29.898	88.805	46342.5	31.200	91305.2

S_0 APPLIES TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

$H_{298.15}$ APPLIES TO THE REFERENCE STATE OF THE SOLID AT 298.15 DEG K

TABLE 2-7

THERMODYNAMIC FUNCTIONS FOR BERYLLIUM (BE)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=9.013 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T	$-(F_T-H_0)/T$	$(H_T-H_0)/T$	(S_T-S_0)	(H_T-H_0)	C_P	$-(F_T-H_0)$
DEG K	CAL/DEG MOLE	CAL/DEG MOLE	CAL/DEG MOLE	CAL/MOLE	CAL/DEG MOLE	CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0001	0.000	0.000	0.000	0.000
10.00	0.0002	0.0003	0.000	0.003	0.001	0.002
15.00	0.0004	0.0007	0.001	0.010	0.002	0.005
20.00	0.0006	0.0011	0.002	0.023	0.003	0.012
25.00	0.0009	0.0018	0.003	0.046	0.006	0.023
30.00	0.0014	0.0028	0.004	0.084	0.009	0.041
35.00	0.0019	0.0041	0.006	0.143	0.015	0.066
40.00	0.0025	0.0058	0.008	0.232	0.021	0.101
45.00	0.0033	0.0080	0.011	0.360	0.030	0.150
50.00	0.0043	0.0108	0.015	0.538	0.041	0.216
55.00	0.0055	0.0142	0.020	0.779	0.056	0.302
60.00	0.0069	0.0183	0.025	1.100	0.073	0.414
65.00	0.0086	0.0234	0.032	1.521	0.095	0.556
70.00	0.0105	0.0295	0.040	2.064	0.123	0.736
75.00	0.0128	0.0368	0.050	2.758	0.156	0.959
80.00	0.0154	0.0454	0.061	3.635	0.196	1.234
85.00	0.0185	0.0557	0.074	4.734	0.244	1.571
90.00	0.0220	0.0677	0.090	6.092	0.300	1.979
95.00	0.0260	0.0816	0.108	7.747	0.363	2.472
100.00	0.0306	0.0974	0.128	9.737	0.434	3.059
105.00	0.0358	0.1152	0.151	12.094	0.510	3.755
110.00	0.0416	0.1350	0.177	14.845	0.591	4.573
115.00	0.0480	0.1567	0.205	18.015	0.677	5.525
120.00	0.0552	0.1802	0.235	21.624	0.767	6.624
125.00	0.0631	0.2055	0.269	25.690	0.860	7.883
130.00	0.0717	0.2325	0.304	30.228	0.956	9.314
135.00	0.0810	0.2611	0.342	35.253	1.055	10.929
140.00	0.0910	0.2913	0.382	40.777	1.155	12.739
145.00	0.1018	0.3228	0.425	46.809	1.258	14.755
150.00	0.1133	0.3557	0.469	53.358	1.362	16.988
155.00	0.1255	0.3899	0.515	60.430	1.467	19.448
160.00	0.1384	0.4252	0.564	68.029	1.573	22.144
165.00	0.1520	0.4616	0.614	76.157	1.679	25.087
170.00	0.1664	0.4989	0.665	84.816	1.785	28.283
175.00	0.1814	0.5372	0.719	94.005	1.891	31.742
180.00	0.1971	0.5762	0.773	103.72	1.996	35.471
185.00	0.2134	0.6160	0.829	113.96	2.101	39.477
190.00	0.2304	0.6565	0.887	124.73	2.204	43.768
195.00	0.2479	0.6975	0.945	136.01	2.307	48.348
200.00	0.2661	0.7390	1.005	147.79	2.408	53.223
205.00	0.2849	0.7809	1.066	160.08	2.507	58.400
210.00	0.3042	0.8231	1.127	172.86	2.605	63.882
215.00	0.3241	0.8657	1.190	186.12	2.700	69.675
220.00	0.3445	0.9084	1.253	199.86	2.794	75.781
225.00	0.3654	0.9514	1.317	214.05	2.885	82.205
230.00	0.3867	0.9944	1.381	228.70	2.974	88.949
235.00	0.4086	1.0374	1.446	243.79	3.060	96.017
240.00	0.4309	1.0804	1.511	259.30	3.145	103.41
245.00	0.4536	1.1234	1.577	275.23	3.226	111.13
250.00	0.4767	1.1662	1.643	291.56	3.305	119.18
255.00	0.5002	1.2089	1.709	308.27	3.381	127.56
260.00	0.5241	1.2514	1.776	325.36	3.455	136.27
265.00	0.5484	1.2936	1.842	342.82	3.526	145.32
270.00	0.5729	1.3356	1.909	360.62	3.594	154.69
273.15	0.5886	1.3619	1.951	372.00	3.636	160.77
275.00	0.5978	1.3773	1.975	378.75	3.660	164.40
280.00	0.6230	1.4186	2.042	397.21	3.723	174.44
285.00	0.6485	1.4596	2.108	415.98	3.784	184.82
290.00	0.6742	1.5002	2.174	435.05	3.842	195.52
295.00	0.7002	1.5403	2.241	454.40	3.898	206.56
298.15	0.7167	1.5654	2.282	466.73	3.932	213.68
300.00	0.7264	1.5801	2.307	474.02	3.951	217.93

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-7(CONT.)

THERMODYNAMIC FUNCTIONS FOR BERYLLIUM (BE)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=9.013 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG-MOLE	$(H_T-H_0)/T$ CAL/DEG-MOLE	(S_T-S_0) CAL/DEG-MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG-MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	0.7264	1.5801	2.307	474.02	3.951	217.93
310.00	0.7795	1.6582	2.438	514.05	4.053	241.65
320.00	0.8334	1.7345	2.568	555.06	4.148	266.68
330.00	0.8879	1.8091	2.697	597.00	4.240	293.00
340.00	0.9430	1.8819	2.825	639.84	4.327	320.61
350.00	0.9986	1.9529	2.952	683.53	4.411	349.50
360.00	1.0546	2.0223	3.077	728.04	4.491	379.64
370.00	1.1109	2.0901	3.201	773.33	4.567	411.03
373.15	1.1287	2.1111	3.240	787.75	4.590	421.18
380.00	1.1675	2.1562	3.324	819.36	4.639	443.66
390.00	1.2244	2.2208	3.445	866.10	4.708	477.50
400.00	1.2814	2.2838	3.565	913.51	4.773	512.55
425.00	1.4244	2.4346	3.859	1034.7	4.920	605.38
450.00	1.5676	2.5763	4.144	1159.3	5.046	705.43
475.00	1.7105	2.7093	4.420	1286.9	5.159	812.50
500.00	1.8527	2.8344	4.687	1417.2	5.260	926.35
550.00	2.1337	3.0632	5.196	1684.7	5.436	1173.5
600.00	2.4091	3.2674	5.676	1960.4	5.588	1445.5
650.00	2.6780	3.4512	6.129	2243.3	5.723	1740.7
700.00	2.9400	3.6179	6.557	2532.5	5.846	2058.0
750.00	3.1949	3.7703	6.965	2827.8	5.961	2396.2
800.00	3.4428	3.9108	7.353	3128.6	6.072	2754.2
850.00	3.6838	4.0411	7.724	3434.9	6.179	3131.2
900.00	3.9183	4.1629	8.081	3746.6	6.287	3526.4
950.00	4.1465	4.2775	8.424	4063.7	6.395	3939.1
1000.00	4.3686	4.3862	8.754	4386.2	6.508	4368.6
1050.00	4.5852	4.4901	9.075	4714.6	6.627	4814.4
1100.00	4.7964	4.5901	9.386	5049.2	6.758	5276.0
1150.00	5.0026	4.6876	9.690	5390.7	6.905	5753.0
1200.00	5.2041	4.7831	9.987	5739.7	7.054	6244.9
1250.00	5.4013	4.8769	10.278	6096.1	7.203	6751.6
1300.00	5.5943	4.9693	10.564	6460.0	7.352	7272.7
1350.00	5.7836	5.0603	10.844	6831.4	7.502	7807.9
1400.00	5.9693	5.1502	11.119	7210.3	7.651	8357.0
1450.00	6.1515	5.2390	11.391	7596.6	7.800	8919.7
1500.00	6.3306	5.3269	11.658	7990.3	7.949	9495.8
1550.00	6.5067	5.4139	11.921	8391.5	8.099	10085.0
1556.00	6.5276	5.4243	11.952	8440.1	8.117	10157.0
			(LIQUID)			
1556.00	6.528	7.224	13.751	11240.1	7.500	10157.0
1600.00	6.729	7.231	13.960	11570.1	7.500	10766.7
1650.00	6.952	7.239	14.191	11945.1	7.500	11470.5
1700.00	7.168	7.247	14.415	12320.1	7.500	12185.7
1750.00	7.378	7.254	14.633	12695.1	7.500	12911.9
1800.00	7.583	7.261	14.844	13070.1	7.500	13648.8
1850.00	7.782	7.268	15.049	13445.1	7.500	14396.2
1900.00	7.976	7.274	15.249	13820.1	7.500	15153.7
1950.00	8.165	7.280	15.444	14195.1	7.500	15921.1
2000.00	8.349	7.285	15.634	14570.1	7.500	16698.0
2050.00	8.529	7.290	15.819	14945.1	7.500	17484.4
2100.00	8.705	7.295	16.000	15320.1	7.500	18279.9
2150.00	8.876	7.300	16.176	15695.1	7.500	19084.3
2200.00	9.044	7.305	16.349	16070.1	7.500	19887.5
2250.00	9.209	7.309	16.517	16445.1	7.500	20719.1
2300.00	9.369	7.313	16.682	16820.1	7.500	21549.1
2350.00	9.527	7.317	16.844	17195.1	7.500	22387.3
2400.00	9.681	7.321	17.001	17570.1	7.500	23233.5
2450.00	9.832	7.325	17.156	17945.1	7.500	24087.4
2500.00	9.980	7.328	17.308	18320.1	7.500	24949.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-8

THERMODYNAMIC FUNCTIONS FOR BERYLLIUM OXIDE (BE O)
SOLID PHASE

GRAM MOLECULAR WT.=25.013 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T	$-(F_T-H_0)/T$	$(H_T-H_0)/T$	(S_T-S_0)	(H_T-H_0)	C_P	$-(F_T-H_0)$
DEG K	CAL / DEG MOLE	CAL / DEG MOLE	CAL / DEG MOLE	CAL / MOLE	CAL / DEG MOLE	CAL / MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0000	0.000	0.000	0.000	0.000
10.00	0.0001	0.0002	0.000	0.002	0.001	0.001
15.00	0.0002	0.0007	0.001	0.011	0.003	0.003
20.00	0.0005	0.0016	0.002	0.032	0.006	0.011
25.00	0.0010	0.0031	0.004	0.076	0.012	0.026
30.00	0.0018	0.0052	0.007	0.156	0.021	0.053
35.00	0.0028	0.0083	0.011	0.289	0.033	0.098
40.00	0.0042	0.0124	0.017	0.495	0.050	0.166
45.00	0.0059	0.0177	0.024	0.797	0.072	0.266
50.00	0.0081	0.0244	0.032	1.219	0.098	0.405
55.00	0.0108	0.0325	0.043	1.788	0.130	0.594
60.00	0.0140	0.0422	0.056	2.529	0.167	0.842
65.00	0.0178	0.0534	0.071	3.470	0.210	1.159
70.00	0.0223	0.0663	0.089	4.637	0.258	1.558
75.00	0.0273	0.0808	0.108	6.058	0.311	2.048
80.00	0.0330	0.0970	0.130	7.759	0.370	2.643
85.00	0.0394	0.1150	0.154	9.771	0.436	3.353
90.00	0.0466	0.1348	0.181	12.128	0.508	4.191
95.00	0.0544	0.1565	0.211	14.864	0.588	5.170
100.00	0.0630	0.1802	0.243	18.018	0.675	6.304
105.00	0.0725	0.2060	0.278	21.632	0.772	7.607
110.00	0.0827	0.2341	0.317	25.747	0.876	9.094
115.00	0.0937	0.2644	0.358	30.401	0.987	10.780
120.00	0.1057	0.2969	0.403	35.629	1.105	12.680
125.00	0.1185	0.3317	0.450	41.463	1.229	14.811
130.00	0.1322	0.3687	0.501	47.926	1.357	17.187
135.00	0.1469	0.4077	0.555	55.040	1.489	19.824
140.00	0.1624	0.4487	0.611	62.822	1.624	22.737
145.00	0.1789	0.4917	0.671	71.289	1.763	25.940
150.00	0.1963	0.5364	0.733	80.456	1.905	29.447
155.00	0.2147	0.5828	0.797	90.338	2.049	33.272
160.00	0.2339	0.6309	0.865	100.95	2.195	37.426
165.00	0.2541	0.6806	0.935	112.30	2.344	41.924
170.00	0.2752	0.7317	1.007	124.39	2.495	46.777
175.00	0.2971	0.7843	1.081	137.24	2.646	51.997
180.00	0.3200	0.8381	1.158	150.86	2.799	57.594
185.00	0.3437	0.8932	1.237	165.24	2.953	63.581
190.00	0.3682	0.9494	1.318	180.39	3.107	69.966
195.00	0.3936	1.0067	1.400	196.31	3.261	76.761
200.00	0.4199	1.0650	1.485	213.00	3.415	83.973
205.00	0.4469	1.1242	1.571	230.46	3.569	91.612
210.00	0.4747	1.1842	1.659	248.69	3.722	99.687
215.00	0.5033	1.2450	1.748	267.68	3.873	108.20
220.00	0.5326	1.3065	1.839	287.42	4.024	117.17
225.00	0.5627	1.3685	1.931	307.91	4.173	126.60
230.00	0.5934	1.4311	2.025	329.15	4.320	136.49
235.00	0.6249	1.4941	2.119	351.11	4.466	146.84
240.00	0.6570	1.5575	2.215	373.80	4.609	157.68
245.00	0.6898	1.6212	2.311	397.20	4.750	168.99
250.00	0.7232	1.6852	2.408	421.30	4.889	180.79
255.00	0.7572	1.7493	2.507	446.08	5.024	193.07
260.00	0.7918	1.8136	2.605	471.53	5.156	205.85
265.00	0.8269	1.8779	2.705	497.64	5.286	219.13
270.00	0.8626	1.9422	2.805	524.38	5.413	232.90
273.15	0.8854	1.9827	2.868	541.56	5.493	241.84
275.00	0.8988	2.0064	2.905	551.77	5.539	247.18
280.00	0.9356	2.0706	3.006	579.78	5.664	261.96
285.00	0.9728	2.1348	3.108	608.41	5.787	277.24
290.00	1.0105	2.1988	3.209	637.65	5.909	293.03
295.00	1.0486	2.2627	3.311	667.50	6.030	309.33
298.15	1.0728	2.3029	3.376	686.61	6.105	319.87
300.00	1.0872	2.3265	3.414	697.94	6.148	326.15

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

524802 O-59-18

TABLE 2-8(CONT.)

THERMODYNAMIC FUNCTIONS FOR BERYLLIUM OXIDE (BE O)
SOLID PHASE

GRAM MOLECULAR WT.=25.013 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	1.0872	2.3265	3.414	697.94	6.148	326.15
310.00	1.1655	2.4535	3.619	760.59	6.379	361.31
320.00	1.2454	2.5797	3.825	825.49	6.600	398.53
330.00	1.3267	2.7047	4.031	892.55	6.811	437.81
340.00	1.4093	2.8285	4.238	961.69	7.016	479.16
350.00	1.4930	2.9510	4.444	1032.8	7.215	522.56
360.00	1.5779	3.0721	4.650	1106.0	7.408	568.04
370.00	1.6637	3.1918	4.856	1181.0	7.591	615.56
373.15	1.6909	3.2292	4.920	1205.0	7.647	630.96
380.00	1.7504	3.3099	5.060	1257.8	7.764	665.14
390.00	1.8379	3.4262	5.264	1336.2	7.927	716.77
400.00	1.9261	3.5407	5.467	1416.3	8.083	770.42
425.00	2.149	3.819	5.967	1623.0	8.443	913.1
450.00	2.374	4.085	6.459	1838.1	8.764	1068.5
475.00	2.602	4.338	6.940	2060.8	9.051	1236.0
500.00	2.831	4.581	7.412	2290.4	9.310	1415.4
550.00	3.289	5.032	8.320	2767.4	9.756	1808.9
600.00	3.745	5.441	9.186	3264.8	10.128	2246.8
650.00	4.195	5.814	10.009	3779.3	10.443	2726.8
700.00	4.639	6.155	10.793	4308.4	10.714	3247.1
750.00	5.074	6.466	11.541	4850.1	10.948	3805.5
800.00	5.501	6.753	12.254	5402.7	11.154	4400.6
850.00	5.913	7.017	12.936	5965.1	11.336	5030.4
900.00	6.327	7.262	13.588	6536.0	11.498	5693.7
950.00	6.725	7.489	14.214	7114.6	11.644	6388.9
1000.00	7.115	7.700	14.815	7700.2	11.776	7114.7
1050.00	7.496	7.897	15.392	8292.0	11.895	7870.0
1100.00	7.866	8.082	15.948	8889.5	12.005	8653.5
1150.00	8.229	8.255	16.484	9492.3	12.105	9464.5
1200.00	8.584	8.417	17.001	10099.9	12.197	10301.6
1250.00	8.931	8.570	17.501	10711.9	12.282	11164.3
1300.00	9.270	8.714	17.984	11328.0	12.361	12051.4
1350.00	9.601	8.851	18.452	11947.9	12.435	12962.4
1400.00	9.926	8.980	18.905	12571.4	12.503	13896.5
1450.00	10.243	9.103	19.345	13198.2	12.568	14852.8
1500.00	10.553	9.219	19.772	13828.1	12.628	15830.8
1550.00	10.858	9.330	20.187	14460.9	12.685	16829.8
1600.00	11.155	9.436	20.591	15096.5	12.738	17849.4
1650.00	11.447	9.536	20.984	15734.7	12.788	18888.7
1700.00	11.733	9.633	21.366	16375.3	12.836	19947.6
1750.00	12.014	9.725	21.739	17018.2	12.882	21025.2
1800.00	12.289	9.813	22.103	17663.4	12.925	22121.3
1850.00	12.559	9.898	22.457	18310.7	12.966	23235.3
1900.00	12.824	9.979	22.804	18960.0	13.005	24366.9
1950.00	13.085	10.057	23.142	19611.2	13.042	25515.6
2000.00	13.340	10.132	23.472	20264.2	13.078	26680.9
2050.00	13.591	10.205	23.796	20919.0	13.112	27862.7
2100.00	13.838	10.274	24.112	21575.4	13.145	29060.4
2150.00	14.081	10.341	24.422	22233.5	13.177	30273.8
2200.00	14.319	10.406	24.725	22893.1	13.207	31502.5
2250.00	14.554	10.469	25.022	23554.2	13.236	32746.2
2300.00	14.784	10.529	25.314	24216.7	13.265	34004.6
2350.00	15.011	10.588	25.599	24880.6	13.292	35277.5
2400.00	15.235	10.644	25.879	25545.9	13.318	36564.5
2450.00	15.455	10.699	26.154	26212.4	13.343	37865.3
2500.00	15.672	10.752	26.424	26880.2	13.368	39179.9
2600.00	16.095	10.854	26.949	28219.4	13.415	41848.7
2700.00	16.507	10.949	27.456	29563.1	13.459	44569.1
2800.00	16.907	11.040	27.946	30911.1	13.501	47339.3

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-9

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM (MG)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=24.32 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0002	0.000	0.001	0.001	0.000
10.00	0.0006	0.0022	0.003	0.022	0.010	0.006
15.00	0.0025	0.0081	0.011	0.122	0.034	0.037
20.00	0.0063	0.0203	0.027	0.407	0.086	0.126
25.00	0.0130	0.0421	0.055	1.052	0.180	0.324
30.00	0.0235	0.0767	0.100	2.301	0.328	0.704
35.00	0.0388	0.1266	0.165	4.431	0.532	1.359
40.00	0.0599	0.1926	0.252	7.703	0.783	2.394
45.00	0.0871	0.2738	0.361	12.319	1.067	3.918
50.00	0.1207	0.3679	0.489	18.394	1.365	6.034
55.00	0.1606	0.4722	0.633	25.971	1.665	8.831
60.00	0.2064	0.5839	0.790	35.035	1.959	12.384
65.00	0.2577	0.7006	0.958	45.538	2.240	16.752
70.00	0.3140	0.8202	1.134	57.413	2.507	21.980
75.00	0.3747	0.9411	1.316	70.585	2.759	28.103
80.00	0.4393	1.0622	1.502	84.974	2.994	35.145
85.00	0.5073	1.1823	1.690	100.50	3.212	43.123
90.00	0.5783	1.3007	1.879	117.06	3.413	52.044
95.00	0.6517	1.4168	2.069	134.60	3.598	61.913
100.00	0.7273	1.5302	2.258	153.02	3.769	72.729
105.00	0.8046	1.6406	2.445	172.26	3.925	84.486
110.00	0.8834	1.7478	2.631	192.25	4.069	97.178
115.00	0.9634	1.8516	2.815	212.94	4.203	110.79
120.00	1.0444	1.9523	2.997	234.27	4.328	125.32
125.00	1.1261	2.0496	3.176	256.20	4.444	140.76
130.00	1.2083	2.1438	3.352	278.69	4.551	157.08
135.00	1.2909	2.2348	3.526	301.70	4.651	174.27
140.00	1.3738	2.3228	3.697	325.19	4.743	192.33
145.00	1.4568	2.4077	3.865	349.12	4.828	211.23
150.00	1.5398	2.4897	4.030	373.45	4.905	230.97
155.00	1.6227	2.5688	4.192	398.16	4.976	251.52
160.00	1.7055	2.6450	4.351	423.21	5.042	272.88
165.00	1.7880	2.7186	4.507	448.57	5.102	295.02
170.00	1.8702	2.7895	4.660	474.22	5.158	317.94
175.00	1.9521	2.8579	4.810	500.14	5.209	341.62
180.00	2.0335	2.9239	4.958	526.31	5.258	366.04
185.00	2.1145	2.9876	5.102	552.71	5.303	391.19
190.00	2.1950	3.0491	5.244	579.33	5.346	417.05
195.00	2.2750	3.1086	5.384	606.17	5.387	443.62
200.00	2.3544	3.1660	5.520	633.20	5.426	470.88
205.00	2.4333	3.2216	5.655	660.42	5.463	498.82
210.00	2.5116	3.2754	5.787	687.82	5.499	527.43
215.00	2.5893	3.3275	5.917	715.41	5.534	556.69
220.00	2.6663	3.3780	6.044	743.16	5.568	586.59
225.00	2.7428	3.4271	6.170	771.09	5.602	617.13
230.00	2.8186	3.4747	6.293	799.18	5.634	648.29
235.00	2.8939	3.5210	6.415	827.43	5.665	680.06
240.00	2.9685	3.5660	6.534	855.83	5.695	712.43
245.00	3.0425	3.6097	6.652	884.38	5.724	745.40
250.00	3.1158	3.6523	6.768	913.07	5.751	778.95
255.00	3.1885	3.6937	6.882	941.89	5.777	813.08
260.00	3.2607	3.7340	6.995	970.83	5.801	847.77
265.00	3.3322	3.7732	7.105	999.89	5.824	883.02
270.00	3.4030	3.8114	7.214	1029.1	5.846	918.82
273.15	3.4474	3.8349	7.282	1047.5	5.859	941.65
275.00	3.4733	3.8486	7.322	1058.4	5.867	955.16
280.00	3.5430	3.8848	7.428	1087.7	5.887	992.04
285.00	3.6121	3.9201	7.532	1117.2	5.906	1029.4
290.00	3.6805	3.9545	7.635	1146.8	5.923	1067.4
295.00	3.7484	3.9880	7.736	1176.5	5.941	1105.8
298.15	3.7909	4.0087	7.800	1195.2	5.951	1130.3
300.00	3.8157	4.0207	7.836	1206.2	5.957	1144.7

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-9(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM (MG)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=24.32 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	3.8157	4.0207	7.836	1206.2	5.957	1144.7
310.00	3.9486	4.0836	8.032	1265.9	5.988	1224.1
320.00	4.0792	4.1436	8.223	1325.9	6.016	1305.3
330.00	4.2076	4.2007	8.408	1386.2	6.043	1388.5
340.00	4.3338	4.2553	8.589	1446.8	6.068	1473.5
350.00	4.4579	4.3074	8.765	1507.6	6.093	1560.3
360.00	4.5800	4.3574	8.937	1568.6	6.117	1648.8
370.00	4.7000	4.4052	9.105	1629.9	6.141	1739.0
373.15	4.7374	4.4199	9.157	1649.3	6.148	1767.8
380.00	4.8181	4.4512	9.269	1691.5	6.164	1830.9
390.00	4.9343	4.4954	9.430	1753.2	6.188	1924.4
400.00	5.0487	4.5380	9.587	1815.2	6.212	2019.5
425.00	5.3268	4.6383	9.965	1971.3	6.274	2263.9
450.00	5.5946	4.7309	10.326	2128.9	6.340	2517.6
475.00	5.8527	4.8175	10.670	2288.3	6.413	2780.0
500.00	6.102	4.899	11.001	2449.5	6.490	3050.8
550.00	6.576	5.051	11.627	2778.0	6.647	3616.7
600.00	7.021	5.191	12.212	3114.4	6.808	4212.8
650.00	7.442	5.321	12.763	3458.8	6.972	4837.3
700.00	7.841	5.445	13.286	3811.5	7.137	5488.6
750.00	8.221	5.563	13.784	4172.5	7.303	6165.5
800.00	8.583	5.677	14.261	4541.8	7.470	6866.7
850.00	8.931	5.788	14.719	4919.6	7.638	7591.2
900.00	9.265	5.895	15.160	5305.7	7.807	8338.2
923.00	9.414	5.944	15.358	5486.2	7.885	8689.2
			(LIQUID)			
923.00	9.414	8.248	17.662	7613.2	7.678	8689.2
950.00	9.652	8.233	17.885	7821.5	7.749	9169.1
1000.00	10.073	8.212	18.286	8212.2	7.880	10073.4
1050.00	10.474	8.200	18.673	8609.5	8.011	10997.4
1100.00	10.855	8.194	19.049	9013.3	8.142	11940.5
1150.00	11.219	8.195	19.414	9423.7	8.273	12902.1
1200.00	11.568	8.201	19.769	9840.6	8.404	13881.7
1250.00	11.903	8.211	20.114	10264.1	8.534	14878.9
1300.00	12.225	8.226	20.452	10694.1	8.665	15893.0
1350.00	12.536	8.245	20.781	11130.6	8.796	16923.9
1400.00	12.836	8.267	21.103	11573.6	8.926	17971.0
1450.00	13.127	8.292	21.419	12023.2	9.056	19034.1
1500.00	13.409	8.320	21.728	12479.3	9.187	20112.8
1550.00	13.682	8.350	22.031	12941.9	9.317	21206.8
1600.00	13.947	8.382	22.329	13411.0	9.447	22315.9
1650.00	14.206	8.416	22.622	13886.6	9.578	23439.7
1700.00	14.458	8.452	22.910	14368.7	9.708	24578.0
1750.00	14.703	8.490	23.193	14857.4	9.838	25730.6
1800.00	14.943	8.529	23.472	15352.5	9.968	26897.2
1850.00	15.177	8.570	23.747	15854.2	10.099	28077.7
1900.00	15.406	8.612	24.018	16362.4	10.229	29271.8
1950.00	15.630	8.655	24.285	16877.1	10.359	30479.5
2000.00	15.850	8.699	24.549	17398.3	10.489	31700.3
2050.00	16.066	8.744	24.810	17926.0	10.619	32934.3
2100.00	16.277	8.791	25.067	18460.2	10.749	34181.3
2150.00	16.484	8.838	25.322	19000.9	10.879	35441.0
2200.00	16.688	8.886	25.573	19548.2	11.010	36713.4
2250.00	16.888	8.934	25.822	20101.9	11.140	37998.3
2300.00	17.085	8.984	26.069	20662.1	11.270	39295.6
2350.00	17.279	9.034	26.312	21228.9	11.400	40605.1
2400.00	17.469	9.084	26.554	21802.1	11.530	41926.8
2450.00	17.657	9.135	26.793	22381.9	11.660	43260.5
2500.00	17.842	9.187	27.030	22968.1	11.790	44606.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-10

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM OXIDE (MG O)
MACRO-CRYSTALLINE SOLID PHASE

GRAM MOLECULAR WT.=40.32 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0000	0.000	0.000	0.000	0.000
10.00	0.0001	0.0003	0.000	0.003	0.001	0.001
15.00	0.0003	0.0010	0.001	0.015	0.004	0.005
20.00	0.0008	0.0023	0.003	0.045	0.009	0.015
25.00	0.0015	0.0044	0.006	0.110	0.018	0.037
30.00	0.0026	0.0078	0.010	0.233	0.033	0.077
35.00	0.0041	0.0128	0.017	0.449	0.055	0.144
40.00	0.0063	0.0201	0.026	0.803	0.089	0.251
45.00	0.0092	0.0302	0.039	1.358	0.136	0.414
50.00	0.0130	0.0438	0.057	2.188	0.199	0.652
55.00	0.0180	0.0615	0.079	3.381	0.281	0.990
60.00	0.0243	0.0839	0.108	5.035	0.384	1.457
65.00	0.0321	0.1116	0.144	7.255	0.507	2.084
70.00	0.0415	0.1449	0.186	10.145	0.652	2.906
75.00	0.0528	0.1841	0.237	13.808	0.816	3.961
80.00	0.0661	0.2293	0.295	18.340	0.999	5.288
85.00	0.0815	0.2803	0.362	23.825	1.197	6.927
90.00	0.0991	0.3371	0.436	30.337	1.409	8.919
95.00	0.1190	0.3993	0.518	37.937	1.633	11.302
100.00	0.1411	0.4668	0.608	46.677	1.865	14.114
105.00	0.1657	0.5390	0.705	56.595	2.104	17.393
110.00	0.1925	0.6157	0.808	67.722	2.348	21.172
115.00	0.2216	0.6964	0.918	80.080	2.596	25.485
120.00	0.2530	0.7807	1.034	93.684	2.846	30.362
125.00	0.2867	0.8683	1.155	108.54	3.097	35.831
130.00	0.3225	0.9589	1.281	124.65	3.348	41.920
135.00	0.3604	1.0520	1.412	142.01	3.596	48.652
140.00	0.4004	1.1472	1.548	160.61	3.842	56.050
145.00	0.4423	1.2444	1.687	180.43	4.085	64.135
150.00	0.4862	1.3430	1.829	201.45	4.322	72.923
155.00	0.5318	1.4429	1.975	223.65	4.555	82.431
160.00	0.5792	1.5437	2.123	246.99	4.783	92.674
165.00	0.6283	1.6452	2.274	271.46	5.004	103.66
170.00	0.6789	1.7472	2.426	297.03	5.220	115.41
175.00	0.7310	1.8494	2.580	323.65	5.429	127.93
180.00	0.7846	1.9517	2.736	351.31	5.632	141.22
185.00	0.8394	2.0539	2.893	379.96	5.829	155.29
190.00	0.8956	2.1557	3.051	409.59	6.019	170.15
195.00	0.9529	2.2571	3.210	440.14	6.203	185.81
200.00	1.0113	2.3580	3.369	471.60	6.380	202.25
205.00	1.0707	2.4582	3.529	503.94	6.551	219.50
210.00	1.1312	2.5577	3.689	537.11	6.716	237.54
215.00	1.1925	2.6562	3.849	571.09	6.876	256.39
220.00	1.2547	2.7539	4.009	605.85	7.029	276.03
225.00	1.3177	2.8505	4.168	641.37	7.177	296.47
230.00	1.3814	2.9462	4.328	677.62	7.321	317.71
235.00	1.4457	3.0407	4.487	714.57	7.460	339.75
240.00	1.5107	3.1342	4.645	752.21	7.595	362.58
245.00	1.5763	3.2266	4.803	790.51	7.727	386.20
250.00	1.6424	3.3179	4.960	829.47	7.856	410.61
255.00	1.7090	3.4081	5.117	869.07	7.982	435.80
260.00	1.7761	3.4973	5.273	909.29	8.104	461.78
265.00	1.8435	3.5853	5.429	950.11	8.224	488.53
270.00	1.9113	3.6723	5.584	991.51	8.339	516.06
273.15	1.9543	3.7265	5.681	1017.9	8.409	533.80
275.00	1.9795	3.7581	5.738	1033.5	8.450	544.37
280.00	2.0480	3.8429	5.891	1076.0	8.556	573.44
285.00	2.1167	3.9265	6.043	1119.0	8.658	603.27
290.00	2.1858	4.0089	6.195	1162.6	8.756	633.87
295.00	2.2550	4.0902	6.345	1206.6	8.850	665.22
298.15	2.2987	4.1407	6.439	1234.6	8.906	685.35
300.00	2.3244	4.1702	6.495	1251.1	8.939	697.32

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-10(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM OXIDE (MG O)
MACRO-CRYSTALLINE SOLID PHASE

GRAM MOLECULAR WT.=40.32 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	2.3244	4.1702	6.495	1251.1	8.939	697.32
310.00	2.4637	4.3268	6.791	1341.3	9.107	763.75
320.00	2.6035	4.4786	7.082	1433.2	9.261	833.11
330.00	2.7436	4.6257	7.369	1526.5	9.401	905.38
340.00	2.8838	4.7681	7.652	1621.2	9.530	980.48
350.00	3.0240	4.9059	7.930	1717.1	9.649	1058.4
360.00	3.1641	5.0392	8.203	1814.1	9.760	1139.1
370.00	3.3039	5.1682	8.472	1912.2	9.865	1222.4
373.15	3.3479	5.2080	8.556	1943.4	9.897	1249.3
380.00	3.4434	5.2931	8.736	2011.4	9.964	1308.5
390.00	3.5825	5.4141	8.997	2111.5	10.058	1397.2
400.00	3.7210	5.5313	9.252	2212.5	10.148	1488.4
425.00	4.0648	5.8091	9.874	2468.9	10.355	1727.5
450.00	4.4042	6.0669	10.471	2730.1	10.541	1981.9
475.00	4.739	6.307	11.046	2995.7	10.706	2250.9
500.00	5.068	6.531	11.599	3265.3	10.854	2534.0
550.00	5.710	6.936	12.646	3814.6	11.110	3140.5
600.00	6.329	7.293	13.622	4375.6	11.323	3797.4
650.00	6.926	7.610	14.535	4946.3	11.502	4501.6
700.00	7.500	7.893	15.393	5525.4	11.656	5250.0
750.00	8.053	8.149	16.202	6111.6	11.789	6040.1
800.00	8.587	8.380	16.967	6704.0	11.905	6869.5
850.00	9.101	8.590	17.692	7301.9	12.007	7736.1
900.00	9.598	8.783	18.381	7904.5	12.098	8638.1
950.00	10.078	8.959	19.037	8511.5	12.178	9573.6
1000.00	10.541	9.122	19.663	9122.2	12.251	10541.3
1050.00	10.990	9.273	20.263	9736.4	12.316	11539.5
1100.00	11.425	9.412	20.837	10353.7	12.375	12567.1
1150.00	11.846	9.542	21.388	10973.9	12.429	13622.9
1200.00	12.255	9.664	21.918	11596.6	12.478	14705.6
1250.00	12.652	9.777	22.429	12221.6	12.523	15814.4
1300.00	13.037	9.884	22.921	12848.8	12.565	16948.2
1350.00	13.412	9.984	23.396	13478.0	12.603	18106.2
1400.00	13.777	10.078	23.855	14109.1	12.638	19287.5
1450.00	14.132	10.167	24.299	14741.8	12.671	20491.4
1500.00	14.478	10.251	24.729	15376.1	12.701	21717.1
1550.00	14.816	10.330	25.146	16011.9	12.730	22964.1
1600.00	15.145	10.406	25.550	16649.1	12.756	24231.5
1650.00	15.466	10.477	25.943	17287.5	12.781	25518.9
1700.00	15.780	10.545	26.325	17927.1	12.804	26825.6
1750.00	16.086	10.610	26.697	18567.8	12.825	28151.2
1800.00	16.386	10.672	27.058	19209.6	12.845	29495.1
1850.00	16.679	10.731	27.410	19852.3	12.864	30856.9
1900.00	16.966	10.787	27.754	20495.0	12.882	32236.0
1950.00	17.247	10.841	28.089	21140.6	12.899	33632.1
2000.00	17.522	10.893	28.415	21785.9	12.915	35044.7
2050.00	17.792	10.942	28.734	22432.1	12.930	36473.5
2100.00	18.056	10.990	29.046	23078.9	12.945	37918.1
2150.00	18.315	11.036	29.351	23726.5	12.958	39378.0
2200.00	18.570	11.079	29.649	24374.7	12.971	40853.0
2250.00	18.819	11.122	29.941	25023.6	12.983	42342.8
2300.00	19.064	11.162	30.226	25673.0	12.994	43847.0
2350.00	19.304	11.201	30.506	26323.0	13.005	45365.3
2400.00	19.541	11.239	30.780	26973.5	13.016	46897.5
2450.00	19.773	11.275	31.048	27624.5	13.025	48443.2
2500.00	20.001	11.310	31.311	28276.1	13.035	50002.2
2600.00	20.446	11.377	31.823	29580.4	13.052	53159.1
2700.00	20.876	11.439	32.316	30886.4	13.068	56366.1
2800.00	21.293	11.498	32.791	32193.9	13.082	59621.6
2900.00	21.698	11.553	33.251	33502.8	13.095	62923.8
3000.00	22.090	11.604	33.695	34812.9	13.107	66271.2

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-11

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM OXIDE (MG O)
MICRO-CRYSTALLINE SOLID PHASE

GRAM MOLECULAR WT.=40.32 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0005	0.0009	0.001	0.005	0.002	0.003
10.00	0.0016	0.0024	0.004	0.024	0.006	0.016
15.00	0.0029	0.0044	0.007	0.066	0.012	0.044
20.00	0.0046	0.0073	0.012	0.145	0.021	0.091
25.00	0.0066	0.0113	0.018	0.283	0.035	0.165
30.00	0.0091	0.0169	0.026	0.506	0.056	0.274
35.00	0.0123	0.0243	0.037	0.852	0.084	0.429
40.00	0.0161	0.0340	0.050	1.360	0.121	0.645
45.00	0.0208	0.0463	0.067	2.083	0.170	0.936
50.00	0.0264	0.0616	0.088	3.081	0.232	1.322
55.00	0.0332	0.0806	0.114	4.434	0.312	1.825
60.00	0.0412	0.1040	0.145	6.241	0.414	2.470
65.00	0.0506	0.1326	0.183	8.620	0.542	3.287
70.00	0.0616	0.1672	0.229	11.704	0.696	4.314
75.00	0.0745	0.2083	0.283	15.626	0.876	5.590
80.00	0.0895	0.2563	0.346	20.504	1.078	7.157
85.00	0.1066	0.3110	0.418	26.432	1.296	9.062
90.00	0.1261	0.3720	0.498	33.475	1.523	11.347
95.00	0.1480	0.4387	0.587	41.676	1.758	14.056
100.00	0.1723	0.5106	0.683	51.063	1.998	17.227
105.00	0.1990	0.5872	0.786	61.660	2.242	20.897
110.00	0.2282	0.6681	0.896	73.494	2.492	25.100
115.00	0.2597	0.7530	1.013	86.589	2.746	29.870
120.00	0.2936	0.8414	1.135	100.96	3.004	35.237
125.00	0.3298	0.9330	1.263	116.63	3.261	41.229
130.00	0.3683	1.0275	1.396	133.57	3.516	47.874
135.00	0.4089	1.1243	1.533	151.78	3.766	55.194
140.00	0.4515	1.2230	1.675	171.22	4.010	63.212
145.00	0.4962	1.3233	1.819	191.87	4.248	71.946
150.00	0.5427	1.4246	1.967	213.69	4.479	81.411
155.00	0.5911	1.5268	2.118	236.65	4.704	91.623
160.00	0.6412	1.6295	2.271	260.72	4.924	102.590
165.00	0.6929	1.7326	2.426	285.88	5.140	114.33
170.00	0.7462	1.8359	2.582	312.11	5.352	126.85
175.00	0.8009	1.9394	2.740	339.39	5.560	140.16
180.00	0.8570	2.0428	2.900	367.70	5.763	154.26
185.00	0.9144	2.1460	3.060	397.02	5.963	169.16
190.00	0.9730	2.2490	3.222	427.32	6.157	184.86
195.00	1.0327	2.3517	3.384	458.58	6.346	201.38
200.00	1.0935	2.4538	3.547	490.77	6.528	218.71
205.00	1.1554	2.5554	3.711	523.85	6.703	236.85
210.00	1.2182	2.6561	3.874	557.78	6.871	255.82
215.00	1.2818	2.7560	4.038	592.54	7.031	275.60
220.00	1.3463	2.8549	4.201	628.08	7.184	296.19
225.00	1.4116	2.9527	4.364	664.37	7.330	317.61
230.00	1.4775	3.0494	4.527	701.37	7.469	339.84
235.00	1.5442	3.1449	4.689	739.05	7.602	362.88
240.00	1.6114	3.2391	4.850	777.38	7.731	386.73
245.00	1.6791	3.3320	5.011	816.35	7.856	411.38
250.00	1.7473	3.4238	5.171	855.94	7.979	436.84
255.00	1.8160	3.5142	5.330	896.13	8.098	463.09
260.00	1.8851	3.6035	5.489	936.92	8.216	490.14
265.00	1.9546	3.6916	5.646	978.29	8.331	517.97
270.00	2.0244	3.7786	5.803	1020.2	8.443	546.60
273.15	2.0686	3.8328	5.901	1046.9	8.512	565.03
275.00	2.0946	3.8644	5.959	1062.7	8.551	576.00
280.00	2.1650	3.9490	6.114	1105.7	8.656	606.19
285.00	2.2356	4.0325	6.268	1149.3	8.757	637.14
290.00	2.3064	4.1148	6.421	1193.3	8.854	668.87
295.00	2.3775	4.1960	6.573	1237.8	8.947	701.35
298.15	2.4223	4.2464	6.669	1266.1	9.004	722.21
300.00	2.4487	4.2759	6.725	1282.8	9.036	734.60

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-11(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM OXIDE (MG O)
MICRO-CRYSTALLINE SOLID PHASE

GRAM MOLECULAR WT.=40.32 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL DEG-MOLE	$(H_T-H_0)/T$ CAL DEG-MOLE	(S_T-S_0) CAL DEG-MOLE	(H_T-H_0) CAL MOLE	C_P CAL DEG-MOLE	$-(F_T-H_0)$ CAL MOLE
			(SOLID)			
300.00	2.4487	4.2759	6.725	1282.8	9.036	734.60
305.00	2.5200	4.3546	6.875	1328.2	9.121	768.60
310.00	2.5914	4.4322	7.024	1374.0	9.201	803.34
315.00	2.6630	4.5085	7.171	1420.2	9.278	838.83
320.00	2.7345	4.5836	7.318	1466.7	9.350	875.05
325.00	2.8062	4.6574	7.464	1513.7	9.419	912.01
330.00	2.8778	4.7301	7.608	1560.9	9.483	949.69
335.00	2.9495	4.8015	7.751	1608.5	9.544	988.09
340.00	3.0212	4.8716	7.893	1656.4	9.601	1027.2
345.00	3.0928	4.9406	8.033	1704.5	9.654	1067.0
350.00	3.1644	5.0083	8.173	1752.9	9.704	1107.5
355.00	3.2359	5.0747	8.311	1801.5	9.750	1148.7
360.00	3.3073	5.1400	8.447	1850.4	9.794	1190.6
365.00	3.3787	5.2040	8.583	1899.5	9.834	1233.2
370.00	3.4499	5.2668	8.717	1948.7	9.871	1276.5
373.15	3.4947	5.3058	8.800	1979.9	9.894	1304.0
375.00	3.5210	5.3285	8.849	1998.2	9.906	1320.4
380.00	3.5920	5.3889	8.981	2047.8	9.939	1364.9
385.00	3.6628	5.4482	9.111	2097.6	9.969	1410.2
390.00	3.7335	5.5064	9.240	2147.5	9.997	1456.1
395.00	3.8040	5.5634	9.367	2197.5	10.024	1502.6
400.00	3.8743	5.6193	9.494	2247.7	10.049	1549.7
405.00	3.9445	5.6741	9.619	2298.0	10.073	1597.5
410.00	4.0144	5.7279	9.742	2348.4	10.096	1645.9
415.00	4.0842	5.7807	9.865	2399.0	10.118	1694.9
420.00	4.1537	5.8324	9.986	2449.6	10.139	1744.6
425.00	4.2230	5.8832	10.106	2500.4	10.161	1794.8
430.00	4.2921	5.9331	10.225	2551.2	10.182	1845.6
435.00	4.3610	5.9821	10.343	2602.2	10.204	1897.0
440.00	4.4297	6.0302	10.460	2653.3	10.226	1949.0
445.00	4.4981	6.0774	10.575	2704.5	10.249	2001.6
450.00	4.5662	6.1239	10.690	2755.8	10.273	2054.8
455.00	4.6341	6.1697	10.804	2807.2	10.299	2108.5
460.00	4.7018	6.2147	10.917	2858.8	10.326	2162.8
465.00	4.7692	6.2591	11.028	2910.5	10.356	2217.7
470.00	4.8364	6.3028	11.139	2962.3	10.387	2273.1
475.00	4.9033	6.3460	11.249	3014.3	10.421	2329.1
480.00	4.9700	6.3886	11.359	3066.5	10.458	2385.6
485.00	5.0364	6.4308	11.467	3118.9	10.498	2442.7
490.00	5.1026	6.4725	11.575	3171.5	10.542	2500.3
495.00	5.1685	6.5138	11.682	3224.3	10.589	2558.4
500.00	5.2342	6.5548	11.789	3277.4	10.640	2617.1

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-12

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM HYDRIDE ($MG H_2$)
SOLID PHASE

GRAM MOLECULAR WT.=26.336 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0006	0.0015	0.002	0.007	0.004	0.003
10.00	0.0027	0.0053	0.008	0.053	0.015	0.027
15.00	0.0059	0.0113	0.017	0.169	0.033	0.088
20.00	0.0103	0.0204	0.031	0.409	0.065	0.205
25.00	0.0162	0.0341	0.050	0.852	0.116	0.405
30.00	0.0240	0.0536	0.078	1.609	0.191	0.721
35.00	0.0342	0.0804	0.115	2.815	0.296	1.198
40.00	0.0471	0.1155	0.163	4.620	0.431	1.886
45.00	0.0632	0.1595	0.223	7.177	0.596	2.844
50.00	0.0827	0.2124	0.295	10.622	0.785	4.133
55.00	0.1057	0.2739	0.380	15.063	0.994	5.814
60.00	0.1325	0.3430	0.476	20.582	1.216	7.948
65.00	0.1629	0.4190	0.582	27.235	1.447	10.587
70.00	0.1969	0.5008	0.698	35.057	1.683	13.782
75.00	0.2344	0.5876	0.822	44.070	1.923	17.578
80.00	0.2752	0.6786	0.954	54.284	2.162	22.014
85.00	0.3191	0.7728	1.092	65.687	2.398	27.126
90.00	0.3660	0.8695	1.236	78.252	2.626	32.942
95.00	0.4157	0.9677	1.383	91.929	2.843	39.488
100.00	0.4678	1.0666	1.534	106.66	3.047	46.781
105.00	0.5222	1.1655	1.688	122.38	3.238	54.836
110.00	0.5787	1.2639	1.843	139.02	3.418	63.661
115.00	0.6371	1.3613	1.998	156.55	3.590	73.263
120.00	0.6971	1.4576	2.155	174.91	3.754	83.645
125.00	0.7585	1.5527	2.311	194.08	3.914	94.810
130.00	0.8212	1.6465	2.468	214.05	4.071	106.76
135.00	0.8851	1.7391	2.624	234.79	4.225	119.49
140.00	0.9500	1.8306	2.781	256.29	4.376	133.00
145.00	1.0158	1.9210	2.937	278.54	4.526	147.29
150.00	1.0824	2.0103	3.093	301.54	4.673	162.37
155.00	1.1498	2.0985	3.248	325.27	4.818	178.22
160.00	1.2178	2.1857	3.404	349.72	4.961	194.85
165.00	1.2864	2.2720	3.558	374.88	5.102	212.25
170.00	1.3555	2.3573	3.713	400.74	5.242	230.43
175.00	1.4250	2.4416	3.867	427.29	5.379	249.38
180.00	1.4950	2.5251	4.020	454.52	5.514	269.10
185.00	1.5653	2.6077	4.173	482.43	5.649	289.58
190.00	1.6359	2.6895	4.325	511.00	5.781	310.83
195.00	1.7068	2.7705	4.477	540.24	5.913	332.83
200.00	1.7780	2.8506	4.629	570.13	6.043	355.60
205.00	1.8494	2.9301	4.780	600.67	6.173	379.12
210.00	1.9209	3.0088	4.930	631.86	6.301	403.39
215.00	1.9926	3.0869	5.080	663.68	6.429	428.42
220.00	2.0645	3.1643	5.229	696.14	6.556	454.19
225.00	2.1365	3.2410	5.378	729.24	6.682	480.70
230.00	2.2085	3.3172	5.526	762.96	6.807	507.96
235.00	2.2807	3.3928	5.674	797.30	6.931	535.96
240.00	2.3529	3.4678	5.821	832.27	7.055	564.70
245.00	2.4252	3.5423	5.967	867.85	7.178	594.17
250.00	2.4975	3.6162	6.114	904.05	7.301	624.37
255.00	2.5698	3.6896	6.260	940.86	7.423	655.30
260.00	2.6422	3.7626	6.405	978.28	7.544	686.96
265.00	2.7145	3.8351	6.550	1016.3	7.664	719.35
270.00	2.7869	3.9071	6.694	1054.9	7.784	752.46
273.15	2.8325	3.9523	6.785	1079.6	7.859	773.69
275.00	2.8592	3.9787	6.838	1094.1	7.903	786.29
280.00	2.9316	4.0498	6.981	1133.9	8.022	820.84
285.00	3.0039	4.1205	7.124	1174.4	8.139	856.10
290.00	3.0761	4.1908	7.267	1215.3	8.256	892.08
295.00	3.1484	4.2607	7.409	1256.9	8.372	928.77
298.15	3.1939	4.3045	7.498	1283.4	8.445	952.25
300.00	3.2206	4.3302	7.551	1299.1	8.487	966.17

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-13

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM HYDROXIDE ($MG(OH)_2$)
SOLID PHASE

GRAM MOLECULAR WT.=58.336 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL DEG-MOLE	$(H_T-H_0)/T$ CAL DEG-MOLE	(S_T-S_0) CAL DEG-MOLE	(H_T-H_0) CAL MOLE	C_P CAL DEG-MOLE	$-(F_T-H_0)$ CAL MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0001	0.000	0.001	0.001	0.000
10.00	0.0006	0.0021	0.003	0.021	0.009	0.006
15.00	0.0024	0.0080	0.010	0.119	0.033	0.036
20.00	0.0061	0.0197	0.026	0.393	0.082	0.122
25.00	0.0125	0.0398	0.052	0.995	0.165	0.312
30.00	0.0223	0.0707	0.093	2.120	0.292	0.668
35.00	0.0362	0.1138	0.150	3.981	0.460	1.268
40.00	0.0549	0.1694	0.224	6.776	0.664	2.196
45.00	0.0786	0.2371	0.316	10.669	0.898	3.539
50.00	0.1076	0.3159	0.423	15.793	1.157	5.380
55.00	0.1418	0.4050	0.547	22.275	1.441	7.799
60.00	0.1812	0.5041	0.685	30.244	1.752	10.873
65.00	0.2258	0.6130	0.839	39.842	2.093	14.677
70.00	0.2755	0.7317	1.007	51.222	2.464	19.286
75.00	0.3303	0.8604	1.191	64.530	2.864	24.775
80.00	0.3902	0.9988	1.389	79.905	3.290	31.218
85.00	0.4552	1.1466	1.602	97.463	3.737	38.689
90.00	0.5251	1.3033	1.828	117.30	4.200	47.259
95.00	0.6000	1.4683	2.068	139.49	4.676	56.995
100.00	0.6796	1.6407	2.320	164.07	5.159	67.962
105.00	0.7640	1.8198	2.584	191.08	5.646	80.218
110.00	0.8529	2.0048	2.858	220.53	6.132	93.817
115.00	0.9462	2.1948	3.141	252.40	6.615	108.81
120.00	1.0437	2.3889	3.433	286.67	7.094	125.24
125.00	1.1452	2.5866	3.732	323.32	7.565	143.15
130.00	1.2505	2.7870	4.038	362.31	8.028	162.57
135.00	1.3595	2.9895	4.349	403.59	8.482	183.53
140.00	1.4719	3.1937	4.666	447.12	8.928	206.07
145.00	1.5876	3.3990	4.987	492.85	9.365	230.20
150.00	1.7063	3.6050	5.311	540.75	9.793	255.94
155.00	1.8278	3.8114	5.639	590.77	10.212	283.31
160.00	1.9521	4.0178	5.970	642.85	10.622	312.34
165.00	2.0789	4.2241	6.303	696.97	11.024	343.02
170.00	2.2081	4.4299	6.638	753.08	11.416	375.37
175.00	2.3394	4.6350	6.974	811.12	11.800	409.40
180.00	2.4729	4.8392	7.312	871.06	12.174	445.12
185.00	2.6082	5.0424	7.651	932.84	12.539	482.52
190.00	2.7454	5.2444	7.990	996.43	12.894	521.62
195.00	2.8842	5.4450	8.329	1061.8	13.240	562.42
200.00	3.0246	5.6441	8.669	1128.8	13.577	604.91
205.00	3.1664	5.8416	9.008	1197.5	13.905	649.11
210.00	3.3095	6.0374	9.347	1267.8	14.223	694.99
215.00	3.4538	6.2313	9.685	1339.7	14.532	742.57
220.00	3.5993	6.4234	10.023	1413.2	14.832	791.84
225.00	3.7458	6.6135	10.359	1488.0	15.122	842.80
230.00	3.8932	6.8015	10.695	1564.4	15.403	895.43
235.00	4.0415	6.9875	11.029	1642.1	15.676	949.74
240.00	4.1905	7.1713	11.362	1721.1	15.939	1005.7
245.00	4.3402	7.3528	11.693	1801.4	16.194	1063.4
250.00	4.4906	7.5321	12.023	1883.0	16.440	1122.6
255.00	4.6415	7.7091	12.351	1965.8	16.678	1183.6
260.00	4.7929	7.8838	12.677	2049.8	16.908	1246.2
265.00	4.9447	8.0562	13.001	2134.9	17.129	1310.3
270.00	5.0969	8.2262	13.323	2221.1	17.343	1376.2
273.15	5.1929	8.3321	13.525	2275.9	17.473	1418.4
275.00	5.2494	8.3938	13.643	2308.3	17.549	1443.6
280.00	5.4021	8.5591	13.961	2396.5	17.748	1512.6
285.00	5.5550	8.7220	14.277	2485.8	17.939	1583.2
290.00	5.7081	8.8825	14.591	2575.9	18.124	1655.4
295.00	5.8613	9.0407	14.902	2667.0	18.303	1729.1
298.15	5.9579	9.1391	15.097	2724.8	18.412	1776.3
300.00	6.0146	9.1965	15.211	2758.9	18.475	1804.4

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-13(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM HYDROXIDE ($MG(OH)_2$)
SOLID PHASE

GRAM MOLECULAR WT.=58.336 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T	$-(F_T-H_0)/T$	$(H_T-H_0)/T$	(S_T-S_0)	(H_T-H_0)	C_P	$-(F_T-H_0)$
DEG K	CAL / DEG MOLE	CAL / DEG MOLE	CAL / DEG MOLE	CAL / MOLE	CAL / DEG MOLE	CAL / MOLE
			(SOLID)			
300.00	6.0146	9.1965	15.211	2758.9	18.475	1804.4
305.00	6.1678	9.3500	15.518	2851.7	18.642	1881.2
310.00	6.3211	9.5011	15.822	2945.4	18.803	1959.5
315.00	6.4743	9.6500	16.124	3039.8	18.959	2039.4
320.00	6.6274	9.7967	16.424	3134.9	19.110	2120.8
325.00	6.7805	9.9411	16.722	3230.9	19.257	2203.6
330.00	6.9333	10.083	17.017	3327.5	19.401	2288.0
335.00	7.0860	10.223	17.309	3424.9	19.541	2373.8
340.00	7.2385	10.361	17.600	3522.9	19.678	2461.1
345.00	7.3907	10.497	17.888	3621.6	19.812	2549.8
350.00	7.5428	10.631	18.174	3721.0	19.945	2640.0
355.00	7.6945	10.764	18.458	3821.1	20.076	2731.5
360.00	7.8459	10.894	18.740	3921.8	20.207	2824.5
365.00	7.9971	11.022	19.019	4023.1	20.337	2918.9
370.00	8.1479	11.149	19.297	4125.1	20.467	3014.7
373.15	8.2428	11.228	19.471	4189.8	20.550	3075.8
375.00	8.2984	11.274	19.573	4227.8	20.599	3111.9
380.00	8.4486	11.398	19.846	4331.1	20.731	3210.5
385.00	8.5984	11.520	20.118	4435.1	20.866	3310.4
390.00	8.7478	11.641	20.388	4539.8	21.004	3411.6
395.00	8.8968	11.760	20.657	4645.2	21.145	3514.2
400.00	9.0455	11.878	20.924	4751.3	21.290	3618.2

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-14

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM FLUORIDE (MgF_2)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=62.32 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)'/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0001	0.0003	0.000	0.001	0.001	0.000
10.00	0.0010	0.0035	0.005	0.035	0.015	0.010
15.00	0.0038	0.0119	0.016	0.179	0.046	0.057
20.00	0.0091	0.0273	0.036	0.546	0.106	0.183
25.00	0.0177	0.0521	0.070	1.302	0.203	0.442
30.00	0.0302	0.0886	0.119	2.657	0.346	0.906
35.00	0.0474	0.1385	0.186	4.847	0.537	1.660
40.00	0.0699	0.2026	0.273	8.103	0.772	2.797
45.00	0.0982	0.2806	0.379	12.628	1.043	4.417
50.00	0.1323	0.3717	0.504	18.584	1.343	6.617
55.00	0.1725	0.4745	0.647	26.097	1.666	9.487
60.00	0.2186	0.5879	0.806	35.271	2.007	13.114
65.00	0.2704	0.7107	0.981	46.197	2.366	17.577
70.00	0.3278	0.8423	1.170	58.959	2.742	22.949
75.00	0.3907	0.9818	1.373	73.638	3.132	29.300
80.00	0.4587	1.1288	1.588	90.303	3.536	36.695
85.00	0.5317	1.2824	1.814	109.01	3.947	45.194
90.00	0.6095	1.4421	2.052	129.78	4.364	54.854
95.00	0.6919	1.6068	2.299	152.65	4.781	65.726
100.00	0.7786	1.7759	2.555	177.59	5.196	77.855
105.00	0.8694	1.9486	2.818	204.60	5.608	91.283
110.00	0.9641	2.1242	3.088	233.66	6.014	106.05
115.00	1.0624	2.3020	3.364	264.73	6.415	122.18
120.00	1.1642	2.4816	3.646	297.80	6.809	139.70
125.00	1.2691	2.6625	3.932	332.81	7.196	158.64
130.00	1.3771	2.8442	4.221	369.74	7.574	179.02
135.00	1.4878	3.0262	4.514	408.54	7.943	200.86
140.00	1.6012	3.2082	4.809	449.15	8.298	224.17
145.00	1.7169	3.3896	5.107	491.50	8.641	248.96
150.00	1.8349	3.5702	5.405	535.54	8.972	275.23
155.00	1.9549	3.7497	5.705	581.20	9.291	303.01
160.00	2.0768	3.9276	6.004	628.42	9.597	332.28
165.00	2.2003	4.1039	6.304	677.15	9.893	363.05
170.00	2.3254	4.2784	6.604	727.33	10.177	395.32
175.00	2.4519	4.4509	6.903	778.90	10.450	429.09
180.00	2.5797	4.6212	7.201	831.82	10.714	464.35
185.00	2.7086	4.7893	7.498	886.02	10.967	501.10
190.00	2.8386	4.9551	7.794	941.47	11.211	539.33
195.00	2.9694	5.1185	8.088	998.12	11.445	579.03
200.00	3.1010	5.2796	8.381	1055.9	11.671	620.20
205.00	3.2333	5.4381	8.671	1114.8	11.889	662.83
210.00	3.3663	5.5942	8.960	1174.8	12.100	706.91
215.00	3.4997	5.7479	9.248	1235.8	12.302	752.44
220.00	3.6336	5.8991	9.533	1297.8	12.496	799.39
225.00	3.7678	6.0478	9.816	1360.7	12.683	847.76
230.00	3.9023	6.1940	10.096	1424.6	12.862	897.54
235.00	4.0371	6.3377	10.375	1489.4	13.034	948.72
240.00	4.1720	6.4789	10.651	1554.9	13.200	1001.3
245.00	4.3070	6.6177	10.925	1621.3	13.359	1055.2
250.00	4.4421	6.7541	11.196	1688.5	13.512	1110.5
255.00	4.5772	6.8880	11.465	1756.4	13.659	1167.2
260.00	4.7122	7.0196	11.732	1825.1	13.801	1225.2
265.00	4.8472	7.1489	11.996	1894.5	13.938	1284.5
270.00	4.9820	7.2758	12.258	1964.5	14.070	1345.1
273.15	5.0668	7.3547	12.421	2008.9	14.151	1384.0
275.00	5.1166	7.4005	12.517	2035.1	14.197	1407.1
280.00	5.2511	7.5230	12.774	2106.4	14.320	1470.3
285.00	5.3853	7.6433	13.029	2178.3	14.438	1534.8
290.00	5.5192	7.7614	13.281	2250.8	14.553	1600.6
295.00	5.6529	7.8775	13.530	2323.9	14.663	1667.6
295.00	5.6529	7.8775	13.530	2323.9	14.663	1667.6
298.15	5.7370	7.9495	13.687	2370.2	14.730	1710.5
300.00	5.7863	7.9915	13.778	2397.4	14.770	1735.9

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-14(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM FLUORIDE (MgF_2)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=62.32 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	5.7863	7.9915	13.778	2397.4	14.770	1735.9
310.00	6.0520	8.2134	14.265	2546.2	14.972	1876.1
320.00	6.3161	8.4276	14.744	2696.8	15.162	2021.2
330.00	6.5786	8.6344	15.213	2849.4	15.340	2170.9
340.00	6.8394	8.8341	15.674	3003.6	15.507	2325.4
350.00	7.0983	9.0270	16.125	3159.5	15.663	2484.4
360.00	7.3552	9.2134	16.569	3316.8	15.811	2647.9
370.00	7.6101	9.3936	17.004	3475.6	15.950	2815.7
373.15	7.6900	9.4492	17.139	3526.0	15.992	2869.5
380.00	7.8629	9.5679	17.431	3635.8	16.081	2987.9
390.00	8.1137	9.7365	17.850	3797.2	16.204	3164.3
400.00	8.3622	9.8997	18.262	3959.9	16.321	3344.9
425.00	8.9741	10.285	19.259	4371.3	16.585	3814.0
450.00	9.5722	10.642	20.214	4788.8	16.813	4307.5
475.00	10.157	10.972	21.129	5211.6	17.014	4824.4
500.00	10.727	11.279	22.006	5639.3	17.194	5363.7
550.00	11.829	11.831	23.660	6507.0	17.507	6505.8
600.00	12.879	12.315	25.195	7389.2	17.774	7727.7
650.00	13.882	12.744	26.627	8283.9	18.008	9023.6
700.00	14.841	13.128	27.969	9189.7	18.218	10388.9
750.00	15.759	13.474	29.233	10105.4	18.411	11819.2
800.00	16.639	13.788	30.427	11030.5	18.590	13311.0
850.00	17.483	14.076	31.559	11964.3	18.759	14860.9
900.00	18.296	14.340	32.636	12906.3	18.920	16466.0
950.00	19.078	14.585	33.663	13856.1	19.074	18123.6
1000.00	19.832	14.814	34.645	14813.6	19.223	19831.5
1050.00	20.559	15.027	35.586	15778.4	19.368	21587.5
1100.00	21.263	15.228	36.491	16750.3	19.509	23389.5
1150.00	21.944	15.417	37.361	17729.2	19.648	25236.0
1200.00	22.604	15.596	38.200	18715.1	19.784	27125.1
1250.00	23.244	15.766	39.011	19707.6	19.918	29055.5
1300.00	23.866	15.928	39.794	20706.9	20.051	31025.7
1350.00	24.470	16.083	40.553	21712.7	20.182	33034.5
1400.00	25.058	16.232	41.290	22725.0	20.311	35080.7
1450.00	25.630	16.375	42.005	23743.8	20.440	37163.1
1500.00	26.187	16.513	42.700	24769.0	20.568	39280.8
1536.00	26.580	16.609	43.189	25511.1	20.659	40826.9
			(LIQUID)			
1536.00	26.580	25.710	52.290	39491.1	22.570	40826.9
1550.00	26.813	25.682	52.495	39807.1	22.570	41560.4
1600.00	27.627	25.585	53.212	40935.6	22.570	44203.2
1650.00	28.413	25.493	53.906	42064.1	22.570	46881.2
1700.00	29.173	25.407	54.580	43192.6	22.570	49593.4
1750.00	29.908	25.326	55.234	44321.1	22.570	52338.9
1800.00	30.620	25.250	55.870	45449.6	22.570	55116.6
1850.00	31.311	25.177	56.488	46578.1	22.570	57925.6
1900.00	31.982	25.109	57.090	47706.6	22.570	60765.1
1950.00	32.633	25.044	57.677	48835.1	22.570	63634.4
2000.00	33.266	24.982	58.248	49963.6	22.570	66532.6
2050.00	33.882	24.923	58.805	51092.1	22.570	69459.0
2100.00	34.482	24.867	59.349	52220.6	22.570	72412.9
2150.00	35.067	24.814	59.880	53349.1	22.570	75393.7
2200.00	35.637	24.763	60.399	54477.6	22.570	78400.7
2250.00	36.193	24.714	60.906	55606.1	22.570	81433.4
2300.00	36.735	24.667	61.403	56734.6	22.570	84491.2
2350.00	37.265	24.623	61.888	57863.1	22.570	87573.5
2400.00	37.783	24.580	62.363	58991.6	22.570	90679.8
2450.00	38.290	24.539	62.828	60120.1	22.570	93809.6
2500.00	38.785	24.499	63.284	61248.6	22.570	96962.5

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-15

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM CHLORIDE ($MG\ CL_2$)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=95.234 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0002	0.0010	0.001	0.005	0.006	0.001
10.00	0.0045	0.0173	0.022	0.173	0.074	0.045
15.00	0.0186	0.0595	0.078	0.892	0.229	0.279
20.00	0.0447	0.1311	0.176	2.622	0.481	0.895
25.00	0.0845	0.2354	0.320	5.884	0.841	2.113
30.00	0.1391	0.3734	0.513	11.202	1.301	4.173
35.00	0.2090	0.5434	0.752	19.018	1.836	7.315
40.00	0.2942	0.7411	1.035	29.645	2.421	11.768
45.00	0.3940	0.9616	1.356	43.274	3.034	17.731
50.00	0.5076	1.2001	1.708	60.006	3.662	25.377
55.00	0.6337	1.4529	2.087	79.907	4.300	34.853
60.00	0.7714	1.7171	2.488	103.02	4.947	46.281
65.00	0.9195	1.9906	2.910	129.39	5.598	59.770
70.00	1.0773	2.2713	3.349	158.99	6.244	75.411
75.00	1.2437	2.5573	3.801	191.80	6.877	93.279
80.00	1.4180	2.8465	4.265	227.72	7.488	113.44
85.00	1.5993	3.1368	4.736	266.63	8.071	135.94
90.00	1.7868	3.4265	5.213	308.38	8.624	160.81
95.00	1.9798	3.7139	5.694	352.82	9.147	188.08
100.00	2.1775	3.9981	6.176	399.81	9.641	217.75
105.00	2.3793	4.2780	6.657	449.19	10.107	249.83
110.00	2.5847	4.5530	7.138	500.83	10.548	284.32
115.00	2.7931	4.8228	7.616	554.63	10.964	321.21
120.00	3.0040	5.0870	8.091	610.44	11.357	360.47
125.00	3.2169	5.3452	8.562	668.15	11.725	402.11
130.00	3.4314	5.5973	9.029	727.65	12.071	446.09
135.00	3.6473	5.8432	9.490	788.83	12.396	492.39
140.00	3.8642	6.0827	9.947	851.58	12.700	540.98
145.00	4.0817	6.3159	10.398	915.80	12.986	591.85
150.00	4.2997	6.5427	10.842	981.41	13.254	644.95
155.00	4.5178	6.7633	11.281	1048.3	13.507	700.26
160.00	4.7359	6.9778	11.714	1116.5	13.744	757.75
165.00	4.9539	7.1863	12.140	1185.7	13.967	817.39
170.00	5.1714	7.3888	12.560	1256.1	14.177	879.14
175.00	5.3885	7.5856	12.974	1327.5	14.374	942.98
180.00	5.6048	7.7768	13.382	1399.8	14.559	1008.9
185.00	5.8205	7.9624	13.783	1473.0	14.732	1076.8
190.00	6.0352	8.1427	14.178	1547.1	14.895	1146.7
195.00	6.2490	8.3179	14.567	1622.0	15.048	1218.6
200.00	6.4617	8.4880	14.950	1697.6	15.193	1292.3
205.00	6.6734	8.6532	15.327	1773.9	15.328	1368.0
210.00	6.8838	8.8136	15.697	1850.9	15.458	1445.6
215.00	7.0931	8.9696	16.063	1928.5	15.582	1525.0
220.00	7.3010	9.1212	16.422	2006.7	15.700	1606.2
225.00	7.5077	9.2687	16.776	2085.5	15.812	1689.2
230.00	7.7129	9.4121	17.125	2164.8	15.919	1774.0
235.00	7.9169	9.5516	17.468	2244.6	16.021	1860.5
240.00	8.1194	9.6874	17.807	2325.0	16.118	1948.7
245.00	8.3205	9.8196	18.140	2405.8	16.210	2038.5
250.00	8.5202	9.9483	18.469	2487.1	16.300	2130.0
255.00	8.7184	10.074	18.792	2568.8	16.387	2223.2
260.00	8.9152	10.196	19.111	2650.9	16.473	2318.0
265.00	9.1106	10.315	19.426	2733.5	16.558	2414.3
270.00	9.3045	10.432	19.736	2816.5	16.643	2512.2
273.15	9.4259	10.504	19.929	2869.0	16.696	2574.7
275.00	9.4969	10.545	20.042	2900.0	16.727	2611.7
280.00	9.6879	10.656	20.344	2983.8	16.808	2712.6
285.00	9.8775	10.765	20.643	3068.0	16.887	2815.1
290.00	10.066	10.871	20.937	3152.7	16.961	2919.0
295.00	10.252	10.975	21.227	3237.6	17.033	3024.5
298.15	10.369	11.039	21.409	3291.4	17.077	3091.6
300.00	10.438	11.077	21.514	3323.0	17.102	3131.3

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-15(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM CHLORIDE ($MG\ CL_2$)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=95.234 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG-MOLE	$(H_T-H_0)/T$ CAL/DEG-MOLE	(S_T-S_0) CAL/DEG-MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG-MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	10.438	11.077	21.514	3323.0	17.102	3131.3
310.00	10.804	11.273	22.077	3494.7	17.233	3349.3
320.00	11.165	11.461	22.626	3667.6	17.356	3572.8
330.00	11.521	11.642	23.162	3841.8	17.472	3801.8
340.00	11.871	11.815	23.685	4017.0	17.580	4036.0
350.00	12.216	11.981	24.197	4193.4	17.683	4275.4
360.00	12.555	12.141	24.696	4370.7	17.781	4519.9
370.00	12.890	12.294	25.185	4549.0	17.874	4769.3
373.15	12.994	12.342	25.336	4605.3	17.902	4848.9
380.00	13.220	12.442	25.662	4728.1	17.963	5023.6
390.00	13.545	12.585	26.130	4908.2	18.048	5282.5
400.00	13.865	12.723	26.588	5089.1	18.130	5546.1
425.00	14.646	13.047	27.693	5544.8	18.321	6224.8
450.00	15.401	13.345	28.745	6005.0	18.498	6930.3
475.00	16.130	13.620	29.750	6469.5	18.659	7661.6
500.00	16.835	13.875	30.710	6937.6	18.786	8417.5
550.00	18.179	14.332	32.511	7882.4	19.000	9998.7
600.00	19.444	14.728	34.172	8837.0	19.180	11666.3
650.00	20.637	15.077	35.714	9800.0	19.335	13413.9
700.00	21.766	15.386	37.152	10770.3	19.474	15235.9
750.00	22.837	15.663	38.500	11747.1	19.599	17127.6
800.00	23.856	15.912	39.768	12730.0	19.714	19084.6
850.00	24.827	16.139	40.967	13718.4	19.822	21103.2
900.00	25.756	16.347	42.103	14712.1	19.924	23180.2
950.00	26.645	16.538	43.182	15710.7	20.021	25312.5
987.00	27.279	16.669	43.949	16452.8	20.090	26924.4
			(LIQUID)			
987.00	27.279	27.105	54.384	26752.8	22.100	26924.4
1000.00	27.633	27.040	54.673	27040.1	22.100	27633.2
1050.00	28.947	26.805	55.752	28145.1	22.100	30394.0
1100.00	30.189	26.591	56.780	29250.1	22.100	33207.5
1150.00	31.366	26.396	57.762	30355.1	22.100	36071.2
1200.00	32.486	26.217	58.703	31460.1	22.100	38983.0
1250.00	33.553	26.052	59.605	32565.1	22.100	41940.9
1300.00	34.571	25.900	60.472	33670.1	22.100	44942.9
1350.00	35.546	25.759	61.306	34775.1	22.100	47987.5
1400.00	36.481	25.629	62.109	35880.1	22.100	51073.0
1450.00	37.378	25.507	62.885	36985.1	22.100	54197.9
1500.00	38.241	25.393	63.634	38090.1	22.100	57361.0
1550.00	39.072	25.287	64.359	39195.1	22.100	60560.9
1600.00	39.873	25.188	65.060	40300.1	22.100	63796.5
1650.00	40.646	25.094	65.740	41405.1	22.100	67066.6
1700.00	41.394	25.006	66.400	42510.1	22.100	70370.2
1750.00	42.118	24.923	67.041	43615.1	22.100	73706.3
1800.00	42.819	24.844	67.663	44720.1	22.100	77074.0
1850.00	43.499	24.770	68.269	45825.1	22.100	80472.3
1900.00	44.158	24.700	68.858	46930.1	22.100	83900.6
1950.00	44.799	24.633	69.432	48035.1	22.100	87357.9
2000.00	45.422	24.570	69.992	49140.1	22.100	90843.6
2050.00	46.028	24.510	70.538	50245.1	22.100	94356.9
2100.00	46.618	24.452	71.070	51350.1	22.100	97897.1
2150.00	47.192	24.398	71.590	52455.1	22.100	101463.7
2200.00	47.753	24.345	72.098	53560.1	22.100	105055.9
2250.00	48.299	24.296	72.595	54665.1	22.100	108673.3
2300.00	48.833	24.248	73.081	55770.1	22.100	112315.2
2350.00	49.354	24.202	73.556	56875.1	22.100	115981.2
2400.00	49.863	24.158	74.021	57980.1	22.100	119670.7
2450.00	50.360	24.116	74.477	59085.1	22.100	123383.1
2500.00	50.847	24.076	74.923	60190.1	22.100	127118.2

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-16

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM CHLORIDE MONOHYDRATE ($MgCl_2 \cdot H_2O$)
SOLID PHASE

GRAM MOLECULAR WT.=113.250 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0001	0.0010	0.001	0.005	0.008	0.001
10.00	0.0075	0.0335	0.041	0.335	0.161	0.075
15.00	0.0371	0.1297	0.167	1.945	0.512	0.557
20.00	0.0944	0.2856	0.380	5.712	1.018	1.889
25.00	0.1796	0.4935	0.673	12.336	1.651	4.490
30.00	0.2913	0.7466	1.038	22.398	2.388	8.739
35.00	0.4278	1.0385	1.466	36.349	3.202	14.974
40.00	0.5874	1.3626	1.950	54.506	4.067	23.494
45.00	0.7678	1.7125	2.480	77.063	4.959	34.553
50.00	0.9673	2.0824	3.050	104.12	5.864	48.363
55.00	1.1837	2.4674	3.651	135.71	6.771	65.103
60.00	1.4153	2.8637	4.279	171.82	7.674	84.919
65.00	1.6605	3.2682	4.929	212.43	8.568	107.930
70.00	1.9176	3.6783	5.596	257.48	9.447	134.23
75.00	2.1855	4.0916	6.277	306.87	10.305	163.91
80.00	2.4628	4.5061	6.969	360.49	11.137	197.02
85.00	2.7484	4.9198	7.668	418.18	11.936	233.61
90.00	3.0413	5.3310	8.372	479.79	12.702	273.71
95.00	3.3404	5.7384	9.079	545.15	13.435	317.34
100.00	3.6450	6.1409	9.786	614.09	14.136	364.50
105.00	3.9543	6.5378	10.492	686.46	14.809	415.20
110.00	4.2675	6.9285	11.196	762.14	15.456	469.42
115.00	4.5839	7.3129	11.897	840.99	16.080	527.15
120.00	4.9032	7.6908	12.594	922.90	16.680	588.38
125.00	5.2247	8.0620	13.287	1007.8	17.257	653.09
130.00	5.5480	8.4264	13.974	1095.4	17.811	721.24
135.00	5.8727	8.7839	14.657	1185.8	18.341	792.82
140.00	6.1986	9.1342	15.333	1278.8	18.842	867.80
145.00	6.5251	9.4772	16.002	1374.2	19.319	946.14
150.00	6.8521	9.8129	16.665	1471.9	19.772	1027.8
155.00	7.1792	10.141	17.320	1571.9	20.203	1112.8
160.00	7.5062	10.462	17.968	1673.9	20.614	1201.0
165.00	7.8330	10.776	18.609	1778.0	21.007	1292.4
170.00	8.1593	11.082	19.241	1884.0	21.384	1387.1
175.00	8.4848	11.382	19.867	1991.8	21.745	1484.8
180.00	8.8096	11.674	20.484	2101.4	22.093	1585.7
185.00	9.1334	11.961	21.094	2212.7	22.428	1689.7
190.00	9.4561	12.240	21.696	2325.7	22.752	1796.7
195.00	9.7776	12.514	22.291	2440.2	23.065	1906.6
200.00	10.098	12.782	22.879	2556.3	23.369	2019.6
205.00	10.417	13.043	23.460	2673.9	23.664	2135.4
210.00	10.734	13.300	24.034	2792.9	23.950	2254.1
215.00	11.050	13.551	24.601	2913.4	24.229	2375.7
220.00	11.364	13.796	25.161	3035.2	24.499	2500.1
225.00	11.677	14.037	25.714	3158.4	24.762	2627.3
230.00	11.988	14.273	26.261	3282.8	25.017	2757.3
235.00	12.298	14.504	26.802	3408.5	25.264	2889.9
240.00	12.605	14.731	27.336	3535.4	25.504	3025.3
245.00	12.911	14.953	27.865	3663.5	25.735	3163.3
250.00	13.216	15.171	28.387	3792.8	25.958	3303.9
255.00	13.518	15.385	28.903	3923.1	26.172	3447.1
260.00	13.819	15.594	29.413	4054.5	26.376	3592.9
265.00	14.118	15.799	29.917	4186.9	26.570	3741.3
270.00	14.415	16.001	30.416	4320.2	26.753	3892.1
273.15	14.601	16.125	30.727	4404.6	26.863	3988.4
275.00	14.711	16.198	30.908	4454.4	26.925	4045.4
280.00	15.004	16.391	31.395	4589.4	27.084	4201.2
285.00	15.296	16.580	31.876	4725.2	27.229	4359.3
290.00	15.586	16.764	32.350	4861.7	27.359	4519.9
295.00	15.874	16.945	32.819	4998.7	27.474	4682.8
298.15	16.055	17.056	33.111	5085.4	27.538	4786.7
300.00	16.160	17.121	33.282	5136.4	27.573	4848.1

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-17

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM CHLORIDE DIHYDRATE ($MgCl_2 \cdot 2H_2O$)
SOLID PHASE

GRAM MOLECULAR WT.=131.266 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL / DEG MOLE	$(H_T-H_0)/T$ CAL / DEG MOLE	(S_T-S_0) CAL / DEG MOLE	(H_T-H_0) CAL / MOLE	C_P CAL / DEG MOLE	$-(F_T-H_0)$ CAL / MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0002	0.0011	0.001	0.006	0.009	0.001
10.00	0.0100	0.0467	0.057	0.467	0.232	0.100
15.00	0.0527	0.1898	0.242	2.847	0.763	0.790
20.00	0.1372	0.4228	0.560	8.456	1.511	2.745
25.00	0.2632	0.7285	0.992	18.213	2.414	6.581
30.00	0.4274	1.0922	1.520	32.766	3.421	12.823
35.00	0.6260	1.5006	2.127	52.521	4.488	21.910
40.00	0.8549	1.9422	2.797	77.687	5.581	34.196
45.00	1.1104	2.4076	3.518	108.34	6.681	49.966
50.00	1.3889	2.8899	4.279	144.50	7.781	69.444
55.00	1.6874	3.3846	5.072	186.15	8.881	92.809
60.00	2.0035	3.8884	5.892	233.30	9.979	120.21
65.00	2.3348	4.3990	6.734	285.94	11.073	151.76
70.00	2.6797	4.9144	7.594	344.00	12.152	187.58
75.00	3.0364	5.4322	8.468	407.41	13.206	227.73
80.00	3.4035	5.9502	9.354	476.01	14.228	272.28
85.00	3.7797	6.4663	10.246	549.63	15.213	321.28
90.00	4.1639	6.9787	11.143	628.08	16.162	374.75
95.00	4.5548	7.4862	12.041	711.19	17.076	432.71
100.00	4.9516	7.9879	12.940	798.79	17.960	495.16
105.00	5.3533	8.4833	13.837	890.75	18.818	562.10
110.00	5.7593	8.9721	14.731	986.94	19.653	633.52
115.00	6.1688	9.4543	15.623	1087.2	20.465	709.41
120.00	6.5812	9.9296	16.511	1191.6	21.256	789.75
125.00	6.9961	10.398	17.394	1299.8	22.023	874.51
130.00	7.4129	10.860	18.272	1411.7	22.767	963.68
135.00	7.8313	11.314	19.145	1527.4	23.486	1057.2
140.00	8.2509	11.761	20.012	1646.6	24.179	1155.1
145.00	8.6713	12.201	20.872	1769.1	24.845	1257.3
150.00	9.0922	12.633	21.725	1895.0	25.485	1363.8
155.00	9.5134	13.058	22.571	2023.9	26.101	1474.6
160.00	9.9346	13.475	23.409	2155.9	26.695	1589.5
165.00	10.355	13.884	24.239	2290.9	27.267	1708.7
170.00	10.776	14.286	25.062	2428.6	27.820	1831.9
175.00	11.196	14.680	25.876	2569.0	28.355	1959.3
180.00	11.615	15.067	26.682	2712.1	28.874	2090.7
185.00	12.033	15.447	27.480	2857.7	29.377	2226.1
190.00	12.450	15.820	28.270	3005.9	29.866	2365.4
195.00	12.865	16.187	29.052	3156.4	30.342	2508.8
200.00	13.280	16.546	29.826	3309.3	30.807	2656.0
205.00	13.693	16.900	30.592	3464.4	31.260	2807.0
210.00	14.104	17.247	31.351	3621.8	31.703	2961.9
215.00	14.514	17.588	32.102	3781.4	32.137	3120.5
220.00	14.922	17.924	32.846	3943.2	32.561	3282.9
225.00	15.329	18.254	33.582	4107.0	32.977	3448.9
230.00	15.733	18.578	34.311	4272.9	33.385	3618.7
235.00	16.136	18.897	35.034	4440.9	33.785	3792.0
240.00	16.538	19.212	35.749	4610.8	34.177	3969.0
245.00	16.937	19.521	36.458	4782.6	34.562	4149.5
250.00	17.334	19.826	37.160	4956.4	34.938	4333.6
255.00	17.730	20.126	37.855	5132.0	35.307	4521.1
260.00	18.124	20.421	38.544	5309.4	35.668	4712.1
265.00	18.515	20.712	39.227	5488.7	36.021	4906.5
270.00	18.905	20.999	39.904	5669.6	36.365	5104.4
273.15	19.150	21.177	40.327	5784.5	36.577	5230.7
275.00	19.293	21.281	40.574	5852.3	36.700	5305.6
280.00	19.679	21.559	41.238	6036.6	37.026	5510.1
285.00	20.063	21.834	41.897	6222.6	37.342	5717.9
290.00	20.445	22.104	42.549	6410.0	37.648	5929.1
295.00	20.825	22.370	43.195	6599.0	37.942	6143.4
298.15	21.064	22.535	43.599	6718.8	38.121	6280.1
300.00	21.203	22.631	43.835	6789.4	38.224	6361.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

524802 O-59-19

TABLE 2-18

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM CHLORIDE TETRAHYDRATE ($MG\ CL_2 \cdot 4H_2O$)
SOLID PHASE

GRAM MOLECULAR WT.=167.298 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0002	0.0013	0.002	0.007	0.012	0.001
10.00	0.0147	0.0723	0.087	0.723	0.375	0.147
15.00	0.0834	0.3110	0.394	4.665	1.273	1.251
20.00	0.2230	0.6991	0.922	13.982	2.495	4.459
25.00	0.4308	1.1969	1.628	29.922	3.905	10.770
30.00	0.6990	1.7731	2.472	53.194	5.416	20.971
35.00	1.0192	2.4041	3.423	84.145	6.968	35.673
40.00	1.3836	3.0720	4.456	122.88	8.525	55.343
45.00	1.7852	3.7637	5.549	169.36	10.067	80.333
50.00	2.2182	4.4704	6.689	223.52	11.593	110.91
55.00	2.6779	5.1869	7.865	285.28	13.108	147.28
60.00	3.1601	5.9099	9.070	354.59	14.615	189.61
65.00	3.6619	6.6371	10.299	431.41	16.110	238.02
70.00	4.1804	7.3666	11.547	515.66	17.584	292.63
75.00	4.7136	8.0960	12.810	607.20	19.025	353.52
80.00	5.2593	8.8230	14.082	705.84	20.422	420.74
85.00	5.8159	9.5452	15.361	811.34	21.770	494.35
90.00	6.3818	10.261	16.642	923.46	23.071	574.36
95.00	6.9555	10.968	17.924	1042.0	24.332	660.77
100.00	7.5359	11.667	19.203	1166.7	25.563	753.59
105.00	8.1219	12.358	20.480	1297.6	26.773	852.80
110.00	8.7126	13.040	21.753	1434.4	27.965	958.39
115.00	9.3072	13.715	23.022	1577.2	29.141	1070.3
120.00	9.9050	14.382	24.287	1725.8	30.298	1188.6
125.00	10.505	15.041	25.547	1880.2	31.433	1313.2
130.00	11.108	15.693	26.801	2040.1	32.539	1444.1
135.00	11.712	16.337	28.050	2205.5	33.618	1581.2
140.00	12.318	16.973	29.291	2376.2	34.661	1724.5
145.00	12.925	17.600	30.525	2552.1	35.673	1874.1
150.00	13.532	18.219	31.751	2732.9	36.656	2029.8
155.00	14.139	18.829	32.969	2918.6	37.611	2191.6
160.00	14.747	19.431	34.178	3109.0	38.541	2359.5
165.00	15.354	20.024	35.377	3303.9	39.447	2533.3
170.00	15.960	20.608	36.568	3503.4	40.330	2713.2
175.00	16.566	21.184	37.750	3707.2	41.193	2899.0
180.00	17.171	21.752	38.922	3915.3	42.036	3090.7
185.00	17.774	22.311	40.085	4127.5	42.861	3288.2
190.00	18.376	22.862	41.239	4343.9	43.669	3491.5
195.00	18.977	23.406	42.384	4564.2	44.462	3700.6
200.00	19.577	23.942	43.519	4788.5	45.239	3915.4
205.00	20.174	24.471	44.646	5016.6	46.002	4135.8
210.00	20.770	24.993	45.763	5248.5	46.751	4361.8
215.00	21.365	25.507	46.872	5484.1	47.487	4593.4
220.00	21.957	26.015	47.972	5723.3	48.209	4830.5
225.00	22.547	26.516	49.063	5966.1	48.919	5073.1
230.00	23.135	27.011	50.146	6212.5	49.616	5321.1
235.00	23.721	27.499	51.220	6462.3	50.301	5574.5
240.00	24.305	27.981	52.287	6715.5	50.973	5833.3
245.00	24.887	28.457	53.344	6972.0	51.633	6097.4
250.00	25.467	28.927	54.394	7231.8	52.280	6366.7
255.00	26.044	29.391	55.436	7494.8	52.913	6641.3
260.00	26.620	29.850	56.469	7760.9	53.534	6921.1
265.00	27.192	30.302	57.495	8030.1	54.141	7206.0
270.00	27.763	30.749	58.512	8302.3	54.734	7496.0
273.15	28.121	31.028	59.149	8475.3	55.101	7681.3
275.00	28.331	31.191	59.522	8577.4	55.313	7791.1
280.00	28.897	31.626	60.524	8855.4	55.878	8091.2
285.00	29.461	32.057	61.517	9136.1	56.427	8396.3
290.00	30.022	32.481	62.503	9419.6	56.961	8706.4
295.00	30.581	32.901	63.482	9705.7	57.480	9021.3
298.15	30.932	33.162	64.094	9887.3	57.798	9222.3
300.00	31.137	33.315	64.452	9994.4	57.982	9341.2

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-19

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM CHLORIDE HEXAHYDRATE (MG $CL_2 \cdot 6H_2O$)
SOLID PHASE

GRAM MOLECULAR WT.=203.330 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0002	0.0017	0.002	0.009	0.016	0.001
10.00	0.0215	0.1089	0.130	1.089	0.579	0.215
15.00	0.1273	0.4834	0.611	7.250	1.994	1.910
20.00	0.3448	1.0896	1.434	21.791	3.874	6.896
25.00	0.6680	1.8544	2.522	46.359	5.981	16.699
30.00	1.0819	2.7258	3.808	81.773	8.197	32.458
35.00	1.5723	3.6686	5.241	128.40	10.458	55.029
40.00	2.1264	4.6589	6.785	186.36	12.723	85.057
45.00	2.7339	5.6799	8.414	255.59	14.968	123.03
50.00	3.3861	6.7196	10.106	335.98	17.181	169.30
55.00	4.0757	7.7699	11.846	427.34	19.357	224.17
60.00	4.7970	8.8248	13.622	529.49	21.492	287.82
65.00	5.5451	9.8799	15.425	642.20	23.583	360.43
70.00	6.3158	10.932	17.248	765.24	25.624	442.10
75.00	7.1057	11.978	19.084	898.35	27.610	532.93
80.00	7.9119	13.015	20.927	1041.2	29.537	632.95
85.00	8.7319	14.043	22.774	1193.6	31.406	742.21
90.00	9.5633	15.058	24.621	1355.2	33.220	860.70
95.00	10.404	16.060	26.465	1525.7	34.986	988.42
100.00	11.253	17.050	28.303	1705.0	36.713	1125.3
105.00	12.109	18.027	30.136	1892.8	38.403	1271.4
110.00	12.970	18.991	31.961	2089.0	40.063	1426.7
115.00	13.835	19.943	33.778	2293.4	41.694	1591.0
120.00	14.704	20.882	35.586	2505.8	43.273	1764.4
125.00	15.575	21.809	37.384	2726.1	44.835	1946.9
130.00	16.448	22.724	39.172	2954.1	46.333	2138.3
133.00	16.973	23.266	40.239	3094.4	47.192	2257.4
Δ 133 TO 140	1.225	1.219	2.444	333.5		290.3
140.00	18.198	24.485	42.683	3427.9	46.866	2547.7
145.00	19.071	25.279	44.350	3665.4	48.130	2765.3
150.00	19.941	26.061	46.002	3909.1	49.356	2991.2
155.00	20.808	26.832	47.640	4158.9	50.548	3225.3
160.00	21.672	27.591	49.263	4414.6	51.708	3467.6
165.00	22.533	28.339	50.872	4675.9	52.839	3717.9
170.00	23.390	29.076	52.466	4942.9	53.942	3976.3
175.00	24.243	29.802	54.045	5215.3	55.020	4242.5
180.00	25.093	30.517	55.610	5493.1	56.074	4516.7
185.00	25.939	31.222	57.160	5776.0	57.105	4798.6
190.00	26.780	31.916	58.697	6064.1	58.115	5088.3
195.00	27.618	32.601	60.219	6357.2	59.105	5385.6
200.00	28.452	33.276	61.728	6655.1	60.075	5690.4
205.00	29.282	33.941	63.223	6957.9	61.027	6002.8
210.00	30.108	34.597	64.705	7265.4	61.961	6322.6
215.00	30.930	35.244	66.174	7577.5	62.877	6649.8
220.00	31.747	35.882	67.629	7894.1	63.776	6984.4
225.00	32.561	36.512	69.073	8215.2	64.658	7326.1
230.00	33.370	37.133	70.503	8540.7	65.524	7675.1
235.00	34.175	37.746	71.921	8870.3	66.373	8031.1
240.00	34.976	38.351	73.328	9204.3	67.205	8394.2
245.00	35.773	38.949	74.722	9542.3	68.020	8764.3
250.00	36.566	39.538	76.104	9884.5	68.817	9141.5
255.00	37.355	40.120	77.474	10231.0	69.597	9525.3
260.00	38.139	40.694	78.833	10580.0	70.359	9916.2
265.00	38.920	41.261	80.181	10934.0	71.103	10314.0
270.00	39.696	41.820	81.516	11291.0	71.827	10718.0
273.15	40.183	42.169	82.352	11518.0	72.273	10976.0
275.00	40.469	42.372	82.841	11652.0	72.531	11129.0
280.00	41.237	42.917	84.154	12017.0	73.214	11546.0
285.00	42.001	43.454	85.456	12384.0	73.875	11970.0
290.00	42.762	43.984	86.746	12755.0	74.513	12401.0
295.00	43.518	44.507	88.025	13130.0	75.128	12838.0
298.15	43.992	44.833	88.825	13130.0	75.502	13116.0
300.00	44.270	45.022	89.293	13507.0	75.717	13281.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-20

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM ALUMINATE ($MG\ O.AL_2O_3$)
SOLID PHASE

GRAM MOLECULAR WT.=142.280 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0001	0.000	0.001	0.001	0.000
10.00	0.0005	0.0020	0.003	0.020	0.008	0.005
15.00	0.0021	0.0066	0.009	0.100	0.026	0.032
20.00	0.0051	0.0151	0.020	0.303	0.058	0.102
25.00	0.0098	0.0288	0.039	0.720	0.113	0.246
30.00	0.0168	0.0491	0.066	1.474	0.194	0.503
35.00	0.0264	0.0776	0.104	2.717	0.309	0.922
40.00	0.0391	0.1155	0.155	4.621	0.459	1.563
45.00	0.0554	0.1638	0.219	7.370	0.647	2.491
50.00	0.0756	0.2232	0.299	11.158	0.875	3.780
55.00	0.1001	0.2943	0.394	16.186	1.143	5.506
60.00	0.1292	0.3777	0.507	22.663	1.455	7.752
65.00	0.1631	0.4739	0.637	30.805	1.810	10.604
70.00	0.2022	0.5833	0.786	40.833	2.209	14.153
75.00	0.2465	0.7062	0.953	52.968	2.652	18.490
80.00	0.2964	0.8428	1.139	67.420	3.136	23.712
85.00	0.3519	0.9928	1.345	84.388	3.657	29.914
90.00	0.4132	1.1561	1.569	104.05	4.214	37.191
95.00	0.4804	1.3324	1.813	126.58	4.802	45.639
100.00	0.5535	1.5212	2.075	152.12	5.418	55.350
105.00	0.6325	1.7219	2.354	180.80	6.058	66.415
110.00	0.7175	1.9340	2.651	212.74	6.720	78.923
115.00	0.8083	2.1567	2.965	248.02	7.397	92.957
120.00	0.9050	2.3893	3.294	286.72	8.085	108.60
125.00	1.0074	2.6310	3.639	328.88	8.779	125.93
130.00	1.1154	2.8809	3.996	374.52	9.477	145.01
135.00	1.2290	3.1381	4.367	423.65	10.174	165.91
140.00	1.3478	3.4019	4.750	476.26	10.870	188.70
145.00	1.4719	3.6714	5.143	532.35	11.564	213.43
150.00	1.6010	3.9460	5.547	591.90	12.255	240.15
155.00	1.7349	4.2251	5.960	654.89	12.941	268.91
160.00	1.8735	4.5081	6.382	721.30	13.621	299.76
165.00	2.0166	4.7945	6.811	791.09	14.291	332.74
170.00	2.1640	5.0835	7.248	864.20	14.952	367.88
175.00	2.3156	5.3748	7.690	940.58	15.601	405.23
180.00	2.4711	5.6677	8.139	1020.2	16.237	444.80
185.00	2.6304	5.9618	8.592	1102.9	16.862	486.62
190.00	2.7933	6.2567	9.050	1188.8	17.473	530.73
195.00	2.9596	6.5521	9.512	1277.7	18.073	577.13
200.00	3.1292	6.8474	9.977	1369.5	18.659	625.85
205.00	3.3020	7.1425	10.444	1464.2	19.233	676.90
210.00	3.4776	7.4371	10.915	1561.8	19.794	730.30
215.00	3.6561	7.7309	11.387	1662.1	20.343	786.05
220.00	3.8371	8.0237	11.861	1765.2	20.879	844.17
225.00	4.0207	8.3152	12.336	1870.9	21.403	904.66
230.00	4.2067	8.6053	12.812	1979.2	21.914	967.53
235.00	4.3948	8.8937	13.289	2090.0	22.412	1032.8
240.00	4.5851	9.1805	13.766	2203.3	22.899	1100.4
245.00	4.7773	9.4653	14.243	2319.0	23.374	1170.4
250.00	4.9714	9.7481	14.720	2437.0	23.837	1242.8
255.00	5.1672	10.029	15.196	2557.4	24.290	1317.6
260.00	5.3646	10.307	15.672	2679.9	24.731	1394.8
265.00	5.5636	10.584	16.147	2804.6	25.162	1474.4
270.00	5.7640	10.857	16.621	2931.5	25.583	1556.3
273.15	5.8909	11.029	16.920	3012.5	25.843	1609.1
275.00	5.9657	11.129	17.095	3060.5	25.994	1640.6
280.00	6.1686	11.398	17.567	3191.4	26.395	1727.2
285.00	6.3727	11.665	18.037	3324.4	26.787	1816.2
290.00	6.5779	11.929	18.506	3459.3	27.169	1907.6
295.00	6.7840	12.190	18.974	3596.1	27.542	2001.3
298.15	6.9144	12.353	19.268	3683.2	27.772	2061.5
300.00	6.9911	12.449	19.440	3734.7	27.905	2097.3

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-20(CONT.)

THERMODYNAMIC FUNCTIONS FOR MAGNESIUM ALUMINATE ($MG\ O \cdot AL_2O_3$)
SOLID PHASE

GRAM MOLECULAR WT.=142.280 GRAMS 1 CAL=4.1840 ABS J
T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	6.9911	12.449	19.440	3734.7	27.905	2097.3
310.00	7.4076	12.959	20.367	4017.3	28.606	2296.4
320.00	7.8270	13.458	21.285	4306.7	29.270	2504.6
330.00	8.2486	13.947	22.196	4602.6	29.899	2722.0
340.00	8.6721	14.425	23.097	4904.5	30.491	2948.5
350.00	9.0970	14.892	23.989	5212.3	31.044	3184.0
360.00	9.5230	15.348	24.871	5525.3	31.555	3428.3
370.00	9.9496	15.792	25.742	5843.2	32.025	3681.3
373.15	10.084	15.930	26.014	5944.3	32.165	3762.9
380.00	10.376	16.225	26.602	6165.7	32.460	3943.1
390.00	10.803	16.647	27.450	6492.3	32.866	4213.3
400.00	11.230	17.057	28.287	6822.9	33.247	4492.0
425.00	12.294	18.035	30.329	7665.1	34.105	5224.9
450.00	13.351	18.949	32.300	8527.2	34.850	6007.9
475.00	14.399	19.804	34.202	9406.8	35.505	6839.3
500.00	15.435	20.604	36.039	10302.0	36.088	7717.5
550.00	17.468	22.059	39.527	12132.0	37.087	9607.6
600.00	19.444	23.347	42.791	14008.0	37.923	11666.0
650.00	21.359	24.496	45.855	15923.0	38.645	13883.0
700.00	23.213	25.530	48.743	17871.0	39.284	16249.0
750.00	25.007	26.467	51.473	19850.0	39.861	18755.0
800.00	26.743	27.321	54.063	21856.0	40.392	21394.0
850.00	28.423	28.104	56.527	23889.0	40.886	24159.0
900.00	30.050	28.827	58.877	25945.0	41.353	27045.0
950.00	31.627	29.498	61.125	28023.0	41.796	30045.0
1000.00	33.156	30.124	63.280	30124.0	42.222	33156.0
1050.00	34.640	30.710	65.350	32245.0	42.633	36372.0
1100.00	36.081	31.261	67.342	34387.0	43.032	39689.0
1150.00	37.483	31.781	69.264	36548.0	43.420	43105.0
1200.00	38.846	32.274	71.120	38729.0	43.801	46615.0
1250.00	40.173	32.743	72.915	40928.0	44.174	50216.0
1300.00	41.466	33.189	74.655	43146.0	44.541	53905.0
1350.00	42.726	33.617	76.343	45382.0	44.903	57681.0
1400.00	43.956	34.026	77.982	47637.0	45.261	61539.0
1450.00	45.157	34.420	79.577	49908.0	45.615	65478.0
1500.00	46.331	34.799	81.129	52198.0	45.965	69496.0
1550.00	47.478	35.164	82.642	54505.0	46.313	73590.0
1600.00	48.600	35.518	84.118	56829.0	46.658	77759.0
1650.00	49.698	35.861	85.559	59171.0	47.001	82002.0
1700.00	50.773	36.194	86.967	61529.0	47.342	86315.0
1750.00	51.827	36.517	88.344	63905.0	47.681	90698.0
1800.00	52.860	36.832	89.692	66297.0	48.018	95149.0
1850.00	53.874	37.139	91.012	68707.0	48.354	99666.0
1900.00	54.868	37.438	92.306	71133.0	48.689	104250.0
1950.00	55.844	37.731	93.576	73577.0	49.023	108900.0
2000.00	56.803	38.017	94.821	76035.0	49.356	113610.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

524802 O-59-20

TABLE 2-21

THERMODYNAMIC FUNCTIONS FOR LITHIUM (LI)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=6.940 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T	$-(F_T-H_0)/T$	$(H_T-H_0)/T$	(S_T-S_0)	(H_T-H_0)	C_P	$-(F_T-H_0)$
DEG K	CAL / DEG MOLE	CAL / DEG MOLE	CAL / DEG MOLE	CAL / MOLE	CAL / DEG MOLE	CAL / MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0001	0.0005	0.001	0.002	0.003	0.000
10.00	0.0015	0.0051	0.007	0.051	0.019	0.015
15.00	0.0052	0.0142	0.019	0.213	0.048	0.078
20.00	0.0110	0.0278	0.039	0.555	0.091	0.220
25.00	0.0191	0.0462	0.065	1.155	0.152	0.478
30.00	0.0296	0.0704	0.100	2.111	0.234	0.887
35.00	0.0426	0.1011	0.144	3.539	0.342	1.492
40.00	0.0585	0.1394	0.198	5.575	0.478	2.342
45.00	0.0776	0.1860	0.264	8.369	0.645	3.490
50.00	0.1000	0.2414	0.341	12.072	0.841	4.997
55.00	0.1259	0.3059	0.432	16.822	1.063	6.925
60.00	0.1556	0.3788	0.534	22.728	1.302	9.335
65.00	0.1890	0.4593	0.648	29.857	1.550	12.287
70.00	0.2262	0.5462	0.772	38.232	1.799	15.835
75.00	0.2670	0.6379	0.905	47.839	2.043	20.025
80.00	0.3112	0.7330	1.044	58.643	2.277	24.895
85.00	0.3586	0.8305	1.189	70.593	2.501	30.477
90.00	0.4088	0.9293	1.338	83.635	2.714	36.793
95.00	0.4617	1.0285	1.490	97.710	2.915	43.863
100.00	0.5170	1.1276	1.645	112.76	3.104	51.699
105.00	0.5744	1.2260	1.800	128.73	3.281	60.311
110.00	0.6337	1.3232	1.957	145.55	3.447	69.704
115.00	0.6946	1.4189	2.114	163.18	3.601	79.881
120.00	0.7570	1.5129	2.270	181.55	3.745	90.839
125.00	0.8206	1.6049	2.426	200.61	3.879	102.58
130.00	0.8853	1.6948	2.580	220.32	4.003	115.09
135.00	0.9509	1.7824	2.733	240.63	4.120	128.38
140.00	1.0173	1.8679	2.885	261.50	4.229	142.42
145.00	1.0843	1.9511	3.035	282.91	4.332	157.23
150.00	1.1518	2.0321	3.184	304.81	4.429	172.78
155.00	1.2198	2.1109	3.331	327.19	4.521	189.06
160.00	1.2880	2.1876	3.476	350.01	4.608	206.08
165.00	1.3565	2.2622	3.619	373.26	4.691	223.82
170.00	1.4251	2.3348	3.760	396.92	4.770	242.26
175.00	1.4938	2.4054	3.899	420.95	4.844	261.41
180.00	1.5625	2.4742	4.037	445.35	4.914	281.25
185.00	1.6312	2.5410	4.172	470.08	4.980	301.77
190.00	1.6998	2.6060	4.306	495.14	5.042	322.97
195.00	1.7684	2.6692	4.438	520.49	5.100	344.83
200.00	1.8367	2.7307	4.567	546.14	5.156	367.34
205.00	1.9049	2.7905	4.695	572.05	5.208	390.50
210.00	1.9728	2.8486	4.821	598.21	5.258	414.29
215.00	2.0405	2.9052	4.946	624.62	5.305	438.71
220.00	2.1079	2.9602	5.068	651.25	5.349	463.75
225.00	2.1751	3.0138	5.189	678.11	5.392	489.39
230.00	2.2419	3.0660	5.308	705.17	5.433	515.63
235.00	2.3084	3.1167	5.425	732.43	5.472	542.47
240.00	2.3745	3.1662	5.541	759.89	5.509	569.88
245.00	2.4403	3.2144	5.655	787.52	5.546	597.87
250.00	2.5057	3.2614	5.767	815.34	5.581	626.43
255.00	2.5707	3.3072	5.878	843.33	5.615	655.54
260.00	2.6354	3.3519	5.987	871.49	5.648	685.20
265.00	2.6997	3.3955	6.095	899.81	5.681	715.41
270.00	2.7635	3.4381	6.202	928.29	5.713	746.15
273.15	2.8036	3.4645	6.268	946.32	5.733	765.79
275.00	2.8270	3.4798	6.307	956.94	5.745	777.42
280.00	2.8901	3.5205	6.411	985.74	5.777	809.22
285.00	2.9527	3.5604	6.513	1014.7	5.807	841.53
290.00	3.0150	3.5994	6.614	1043.8	5.837	874.35
295.00	3.0768	3.6375	6.714	1073.1	5.866	907.67
298.15	3.1156	3.6612	6.777	1091.6	5.884	928.92
300.00	3.1383	3.6749	6.813	1102.5	5.894	941.49

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-21(CONT.)

THERMODYNAMIC FUNCTIONS FOR LITHIUM (LI)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=6.940 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG-MOLE	$(H_T-H_0)/T$ CAL/DEG-MOLE	(S_T-S_0) CAL/DEG-MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG-MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	3.1383	3.6749	6.813	1102.5	5.894	941.49
310.00	3.2630	3.7473	7.007	1161.7	5.946	1010.6
320.00	3.3801	3.8169	7.197	1221.4	6.000	1081.6
330.00	3.4985	3.8839	7.383	1281.7	6.059	1154.5
340.00	3.6155	3.9489	7.564	1342.6	6.125	1229.3
350.00	3.7308	4.0121	7.743	1404.2	6.197	1305.8
360.00	3.8447	4.0738	7.919	1466.6	6.273	1384.1
370.00	3.9572	4.1343	8.091	1529.7	6.351	1464.2
373.15	3.9923	4.1531	8.145	1549.7	6.377	1489.7
380.00	4.0682	4.1937	8.262	1593.6	6.433	1545.9
390.00	4.1779	4.2522	8.430	1658.3	6.516	1629.4
400.00	4.286	4.310	8.596	1723.9	6.599	1714.4
425.00	4.551	4.451	9.002	1891.5	6.805	1934.4
450.00	4.810	4.587	9.396	2064.0	6.996	2164.4
453.70	4.848	4.606	9.454	2090.0	7.022	2199.4
			(LIQUID)			
453.70	4.848	6.187	11.035	2807.0	7.350	2199.4
475.00	5.133	6.237	11.370	2962.8	7.280	2438.1
500.00	5.454	6.288	11.742	3143.9	7.212	2727.0
550.00	6.057	6.367	12.424	3501.8	7.109	3331.5
600.00	6.614	6.426	13.039	3855.4	7.038	3968.3
650.00	7.130	6.471	13.601	4205.9	6.989	4634.5
700.00	7.611	6.506	14.117	4554.5	6.954	5327.6
750.00	8.061	6.535	14.596	4901.6	6.931	6045.6
800.00	8.483	6.560	15.043	5247.7	6.915	6786.7
850.00	8.882	6.580	15.462	5593.2	6.904	7549.5
900.00	9.258	6.598	15.856	5938.2	6.897	8332.5
950.00	9.616	6.614	16.229	6282.9	6.892	9134.7
1000.00	9.955	6.627	16.583	6627.4	6.889	9955.1
1050.00	10.279	6.640	16.919	6971.8	6.886	10792.7
1100.00	10.588	6.651	17.239	7316.1	6.884	11646.7
1150.00	10.884	6.661	17.545	7660.2	6.881	12516.4
1200.00	11.167	6.670	17.838	8004.2	6.878	13401.0

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-22

THERMODYNAMIC FUNCTIONS FOR LITHIUM OXIDE (LI_2O)
SOLID PHASE

GRAM MOLECULAR WT.=29.880 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL / DEG MOLE	$(H_T-H_0)/T$ CAL / DEG MOLE	(S_T-S_0) CAL / DEG MOLE	(H_T-H_0) CAL / MOLE	C_P CAL / DEG MOLE	$-(F_T-H_0)$ CAL / MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0001	0.000	0.001	0.000	0.000
10.00	0.0003	0.0006	0.001	0.006	0.002	0.003
15.00	0.0006	0.0015	0.002	0.022	0.005	0.010
20.00	0.0013	0.0032	0.004	0.063	0.012	0.025
25.00	0.0023	0.0061	0.008	0.152	0.025	0.057
30.00	0.0038	0.0110	0.015	0.330	0.048	0.113
35.00	0.0060	0.0187	0.025	0.654	0.084	0.210
40.00	0.0092	0.0301	0.039	1.204	0.139	0.368
45.00	0.0136	0.0461	0.060	2.074	0.213	0.613
50.00	0.0195	0.0674	0.087	3.371	0.309	0.976
55.00	0.0272	0.0947	0.122	5.206	0.428	1.495
60.00	0.0368	0.1282	0.165	7.691	0.569	2.208
65.00	0.0486	0.1683	0.217	10.937	0.733	3.159
70.00	0.0628	0.2151	0.278	15.055	0.919	4.392
75.00	0.0794	0.2688	0.348	20.161	1.128	5.953
80.00	0.0986	0.3296	0.428	26.370	1.360	7.890
85.00	0.1206	0.3976	0.518	33.797	1.615	10.252
90.00	0.1454	0.4728	0.618	42.551	1.890	13.089
95.00	0.1732	0.5550	0.728	52.728	2.183	16.451
100.00	0.2039	0.6441	0.848	64.410	2.491	20.387
105.00	0.2376	0.7396	0.977	77.659	2.810	24.946
110.00	0.2743	0.8412	1.116	92.528	3.138	30.174
115.00	0.3141	0.9483	1.262	109.05	3.473	36.116
120.00	0.3568	1.0605	1.417	127.26	3.812	42.811
125.00	0.4024	1.1774	1.580	147.18	4.154	50.301
130.00	0.4509	1.2985	1.749	168.80	4.497	58.621
135.00	0.5023	1.4233	1.926	192.15	4.841	67.806
140.00	0.5563	1.5515	2.108	217.21	5.183	77.887
145.00	0.6131	1.6826	2.296	243.97	5.522	88.894
150.00	0.6724	1.8162	2.489	272.42	5.858	100.85
155.00	0.7341	1.9519	2.686	302.54	6.189	113.79
160.00	0.7982	2.0894	2.888	334.31	6.515	127.72
165.00	0.8647	2.2284	3.093	367.68	6.835	142.67
170.00	0.9333	2.3685	3.302	402.65	7.149	158.66
175.00	1.0040	2.5095	3.513	439.16	7.455	175.69
180.00	1.0766	2.6510	3.728	477.18	7.753	193.79
185.00	1.1512	2.7929	3.944	516.68	8.045	212.97
190.00	1.2276	2.9348	4.162	557.62	8.329	233.24
195.00	1.3056	3.0767	4.382	599.96	8.607	254.60
200.00	1.3853	3.2184	4.604	643.67	8.878	277.06
205.00	1.4665	3.3596	4.826	688.72	9.143	300.64
210.00	1.5492	3.5004	5.050	735.09	9.400	325.33
215.00	1.6332	3.6405	5.274	782.72	9.651	351.13
220.00	1.7185	3.7799	5.498	831.58	9.895	378.06
225.00	1.8050	3.9185	5.723	881.65	10.132	406.12
230.00	1.8926	4.0560	5.949	932.89	10.362	435.30
235.00	1.9813	4.1926	6.174	985.26	10.586	465.61
240.00	2.0710	4.3281	6.399	1038.7	10.804	497.04
245.00	2.1616	4.4624	6.624	1093.3	11.015	529.60
250.00	2.2531	4.5955	6.849	1148.9	11.221	563.28
255.00	2.3454	4.7274	7.073	1205.5	11.421	598.08
260.00	2.4385	4.8580	7.297	1263.1	11.616	634.00
265.00	2.5322	4.9873	7.520	1321.6	11.807	671.05
270.00	2.6267	5.1153	7.742	1381.1	11.991	709.20
273.15	2.6865	5.1953	7.882	1419.1	12.105	733.81
275.00	2.7217	5.2420	7.964	1441.5	12.170	748.46
280.00	2.8173	5.3673	8.184	1502.8	12.344	788.83
285.00	2.9134	5.4912	8.404	1565.0	12.513	830.31
290.00	3.0099	5.6137	8.624	1628.0	12.677	872.88
295.00	3.1069	5.7347	8.842	1691.7	12.836	916.54
298.15	3.1682	5.8103	8.978	1732.3	12.934	944.61
300.00	3.2043	5.8544	9.059	1756.3	12.991	961.29

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-22(CONT.)

THERMODYNAMIC FUNCTIONS FOR LITHIUM OXIDE (LI_2O)
SOLID PHASE

GRAM MOLECULAR WT.=29.880 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	3.2043	5.8544	9.059	1756.3	12.991	961.29
310.00	3.4001	6.0894	9.489	1887.7	13.286	1054.0
320.00	3.5971	6.3187	9.916	2022.0	13.564	1151.1
330.00	3.7950	6.5422	10.337	2158.9	13.826	1252.3
340.00	3.9935	6.7601	10.754	2298.4	14.072	1357.8
350.00	4.1925	6.9723	11.165	2440.3	14.304	1467.4
360.00	4.3919	7.1790	11.571	2584.5	14.521	1581.1
370.00	4.5913	7.3803	11.972	2730.7	14.726	1698.8
373.15	4.6542	7.4426	12.097	2777.2	14.788	1736.7
380.00	4.7908	7.5762	12.367	2878.9	14.919	1820.5
390.00	4.9900	7.7668	12.757	3029.1	15.101	1946.1
400.00	5.1890	7.9523	13.141	3180.9	15.272	2075.6
425.00	5.6845	8.3945	14.079	3567.7	15.660	2415.9
450.00	6.1762	8.8079	14.984	3963.6	16.005	2779.3
475.00	6.663	9.195	15.858	4367.8	16.329	3165.0
500.00	7.144	9.560	16.704	4779.8	16.627	3572.0
550.00	8.087	10.227	18.314	5624.9	17.166	4447.9
600.00	9.003	10.826	19.829	6495.4	17.648	5401.9
650.00	9.891	11.368	21.259	7389.0	18.091	6429.4
700.00	10.752	11.863	22.615	8304.1	18.505	7526.5
750.00	11.586	12.319	23.905	9239.2	18.898	8689.8
800.00	12.395	12.742	25.137	10193.6	19.275	9916.1
850.00	13.180	13.137	26.317	11166.5	19.639	11202.6
900.00	13.941	13.508	27.449	12157.4	19.994	12547.0
950.00	14.681	13.859	28.540	13165.7	20.340	13946.9
1000.00	15.400	14.191	29.592	14191.3	20.681	15400.3
1050.00	16.100	14.508	30.609	15233.8	21.016	16905.4
1100.00	16.782	14.812	31.594	16292.9	21.348	18460.6
1150.00	17.447	15.103	32.550	17368.5	21.675	20064.4
1200.00	18.096	15.384	33.480	18460.4	22.000	21715.2
1250.00	18.730	15.655	34.384	19568.4	22.323	23411.9
1300.00	19.349	15.917	35.266	20692.6	22.643	25153.3
1350.00	19.954	16.172	36.127	21832.7	22.962	26938.2
1400.00	20.547	16.421	36.967	22988.7	23.279	28765.6
1450.00	21.127	16.662	37.790	24160.6	23.594	30634.6
1500.00	21.696	16.899	38.595	25348.1	23.909	32544.3
1550.00	22.254	17.130	39.384	26551.4	24.222	34493.8
1600.00	22.802	17.356	40.158	27770.3	24.535	36482.4
1650.00	23.339	17.579	40.918	29004.9	24.847	38509.4
1700.00	23.867	17.797	41.664	30255.0	25.158	40574.0
1750.00	24.386	18.012	42.398	31520.7	25.469	42675.6
1800.00	24.896	18.223	43.120	32801.9	25.779	44813.6
1850.00	25.399	18.432	43.830	34098.6	26.088	46987.4
1900.00	25.893	18.637	44.530	35410.7	26.397	49196.4
1950.00	26.380	18.840	45.220	36738.3	26.706	51440.2
2000.00	26.859	19.041	45.900	38081.3	27.014	53718.2

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-23

THERMODYNAMIC FUNCTIONS FOR LITHIUM HYDROXIDE (LI O H)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=23.948 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0001	0.0004	0.000	0.002	0.002	0.000
10.00	0.0017	0.0063	0.008	0.063	0.027	0.017
15.00	0.0067	0.0210	0.028	0.314	0.079	0.101
20.00	0.0158	0.0449	0.061	0.898	0.160	0.316
25.00	0.0293	0.0789	0.108	1.972	0.274	0.732
30.00	0.0474	0.1231	0.171	3.694	0.419	1.422
35.00	0.0703	0.1773	0.248	6.206	0.589	2.461
40.00	0.0980	0.2404	0.338	9.617	0.777	3.921
45.00	0.1304	0.3110	0.441	13.996	0.976	5.866
50.00	0.1670	0.3877	0.555	19.383	1.180	8.352
55.00	0.2078	0.4691	0.677	25.801	1.388	11.428
60.00	0.2522	0.5544	0.807	33.264	1.598	15.134
65.00	0.3001	0.6429	0.943	41.786	1.812	19.505
70.00	0.3510	0.7341	1.085	51.387	2.029	24.573
75.00	0.4049	0.8279	1.233	62.091	2.253	30.365
80.00	0.4614	0.9241	1.386	73.931	2.484	36.909
85.00	0.5203	1.0229	1.543	86.949	2.724	44.229
90.00	0.5817	1.1243	1.706	101.19	2.973	52.350
95.00	0.6452	1.2283	1.874	116.69	3.230	61.297
100.00	0.7109	1.3350	2.046	133.50	3.495	71.093
105.00	0.7787	1.4443	2.223	151.65	3.767	81.764
110.00	0.8485	1.5561	2.405	171.18	4.043	93.331
115.00	0.9202	1.6703	2.591	192.09	4.323	105.82
120.00	0.9937	1.7867	2.780	214.40	4.604	119.24
125.00	1.0690	1.9050	2.974	238.13	4.885	133.63
130.00	1.1461	2.0250	3.171	263.25	5.166	148.99
135.00	1.2248	2.1465	3.371	289.78	5.444	165.34
140.00	1.3050	2.2692	3.574	317.69	5.720	182.71
145.00	1.3868	2.3929	3.780	346.97	5.992	201.09
150.00	1.4700	2.5173	3.987	377.60	6.259	220.51
155.00	1.5546	2.6423	4.197	409.55	6.522	240.97
160.00	1.6405	2.7676	4.408	442.81	6.780	262.48
165.00	1.7276	2.8930	4.621	477.35	7.033	285.05
170.00	1.8158	3.0184	4.834	513.13	7.280	308.69
175.00	1.9051	3.1436	5.049	550.13	7.521	333.39
180.00	1.9954	3.2685	5.264	588.33	7.756	359.17
185.00	2.0867	3.3929	5.480	627.69	7.986	386.03
190.00	2.1788	3.5167	5.696	668.18	8.210	413.97
195.00	2.2717	3.6399	5.912	709.78	8.428	442.99
200.00	2.3654	3.7623	6.128	752.45	8.641	473.09
205.00	2.4598	3.8838	6.344	796.18	8.848	504.27
210.00	2.5549	4.0044	6.559	840.92	9.049	536.52
215.00	2.6505	4.1240	6.775	886.66	9.245	569.86
220.00	2.7467	4.2426	6.989	933.37	9.436	604.27
225.00	2.8433	4.3601	7.203	981.02	9.622	639.75
230.00	2.9404	4.4764	7.417	1029.6	9.803	676.30
235.00	3.0379	4.5917	7.630	1079.0	9.980	713.92
240.00	3.1358	4.7057	7.842	1129.4	10.152	752.59
245.00	3.2340	4.8186	8.053	1180.6	10.319	792.33
250.00	3.3325	4.9302	8.263	1232.6	10.482	833.12
255.00	3.4312	5.0407	8.472	1285.4	10.642	874.96
260.00	3.5301	5.1499	8.680	1339.0	10.797	917.84
265.00	3.6293	5.2579	8.887	1393.3	10.949	961.75
270.00	3.7285	5.3646	9.093	1448.4	11.097	1006.7
273.15	3.7911	5.4313	9.222	1483.5	11.188	1035.6
275.00	3.8279	5.4702	9.298	1504.3	11.241	1052.7
280.00	3.9274	5.5745	9.502	1560.9	11.383	1099.7
285.00	4.0270	5.6776	9.705	1618.1	11.520	1147.7
290.00	4.1267	5.7795	9.906	1676.1	11.655	1196.7
295.00	4.2263	5.8802	10.107	1734.7	11.787	1246.8
298.15	4.2891	5.9431	10.232	1771.9	11.868	1278.8
300.00	4.3260	5.9797	10.306	1793.9	11.916	1297.8

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-23(CONT.)

THERMODYNAMIC FUNCTIONS FOR LITHIUM HYDROXIDE (LI O H)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=23.948 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	4.3260	5.9797	10.306	1793.9	11.916	1297.8
310.00	4.5252	6.1753	10.701	1914.3	12.164	1402.8
320.00	4.7243	6.3661	11.090	2037.2	12.401	1511.8
330.00	4.9231	6.5525	11.476	2162.3	12.628	1624.6
340.00	5.1214	6.7343	11.856	2289.7	12.837	1741.3
350.00	5.3192	6.9114	12.231	2419.0	13.026	1861.7
360.00	5.5163	7.0837	12.600	2550.1	13.203	1985.9
370.00	5.7127	7.2515	12.964	2683.1	13.379	2113.7
373.15	5.7744	7.3034	13.078	2725.3	13.433	2154.7
380.00	5.9083	7.4150	13.323	2817.7	13.548	2245.1
390.00	6.1029	7.5743	13.677	2954.0	13.710	2380.1
400.00	6.2967	7.7297	14.026	3091.9	13.867	2518.7
425.00	6.7766	8.1017	14.878	3443.2	14.236	2880.0
450.00	7.2497	8.4522	15.702	3803.5	14.580	3262.3
475.00	7.715	8.783	16.499	4172.1	14.900	3664.8
500.00	8.174	9.097	17.271	4548.4	15.204	4087.0
550.00	9.069	9.678	18.747	5323.0	15.773	4987.8
600.00	9.934	10.208	20.142	6125.1	16.304	5960.3
650.00	10.771	10.697	21.467	6953.0	16.809	7000.8
700.00	11.580	11.151	22.731	7805.7	17.295	8106.0
744.30	12.276	11.529	23.805	8581.1	17.713	9137.0
			(LIQUID)			
744.30	12.276	18.235	30.511	13572.1	20.740	9137.0
750.00	12.415	18.254	30.669	13690.3	20.740	9311.4
800.00	13.598	18.409	32.007	14727.3	20.740	10878.6
850.00	14.719	18.546	33.265	15764.3	20.740	12510.7
900.00	15.782	18.668	34.450	16801.3	20.740	14203.9
950.00	16.794	18.777	35.572	17838.3	20.740	15954.7
1000.00	17.760	18.875	36.635	18875.3	20.740	17760.1
1050.00	18.683	18.964	37.647	19912.3	20.740	19617.4
1100.00	19.567	19.045	38.612	20949.3	20.740	21524.0
1150.00	20.416	19.119	39.534	21986.3	20.740	23477.9
1200.00	21.231	19.186	40.417	23023.3	20.740	25476.8
1250.00	22.015	19.248	41.263	24060.3	20.740	27518.9
1300.00	22.771	19.306	42.077	25097.3	20.740	29602.6
1350.00	23.501	19.359	42.860	26134.3	20.740	31726.1
1400.00	24.206	19.408	43.614	27171.3	20.740	33888.1
1450.00	24.888	19.454	44.342	28208.3	20.740	36087.1
1500.00	25.548	19.497	45.045	29245.3	20.740	38321.8
1550.00	26.188	19.537	45.725	30282.3	20.740	40591.1
1600.00	26.809	19.575	46.383	31319.3	20.740	42893.9
1650.00	27.412	19.610	47.021	32356.3	20.740	45229.1
1700.00	27.998	19.643	47.641	33393.3	20.740	47595.8
1750.00	28.567	19.674	48.242	34430.3	20.740	49992.9
1800.00	29.122	19.704	48.826	35467.3	20.740	52419.7
1850.00	29.662	19.732	49.394	36504.3	20.740	54875.2
1900.00	30.189	19.759	49.947	37541.3	20.740	57358.8
1950.00	30.702	19.784	50.486	38578.3	20.740	59869.7
2000.00	31.204	19.808	51.011	39615.3	20.740	62407.2

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-24

THERMODYNAMIC FUNCTIONS FOR LITHIUM HYDROXIDE MONOHYDRATE (LI O $H.H_2O$)
SOLID PHASE

GRAM MOLECULAR WT.=41.964 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0000	0.000	0.000	0.000	0.000
10.00	0.0005	0.0024	0.003	0.024	0.013	0.005
15.00	0.0030	0.0126	0.016	0.188	0.060	0.045
20.00	0.0094	0.0352	0.045	0.704	0.156	0.188
25.00	0.0211	0.0746	0.096	1.864	0.320	0.528
30.00	0.0396	0.1342	0.174	4.025	0.557	1.189
35.00	0.0661	0.2159	0.282	7.556	0.866	2.315
40.00	0.1015	0.3197	0.421	12.790	1.236	4.059
45.00	0.1461	0.4441	0.590	19.982	1.647	6.576
50.00	0.2001	0.5861	0.786	29.304	2.085	10.006
55.00	0.2632	0.7428	1.006	40.853	2.536	14.477
60.00	0.3350	0.9112	1.246	54.673	2.992	20.100
65.00	0.4149	1.0889	1.504	70.775	3.448	26.969
70.00	0.5023	1.2736	1.776	89.153	3.902	35.162
75.00	0.5967	1.4639	2.061	109.79	4.353	44.749
80.00	0.6973	1.6584	2.356	132.67	4.799	55.785
85.00	0.8038	1.8562	2.660	157.78	5.242	68.321
90.00	0.9155	2.0565	2.972	185.08	5.680	82.398
95.00	1.0321	2.2585	3.291	214.56	6.112	98.052
100.00	1.1531	2.4619	3.615	246.19	6.537	115.31
105.00	1.2782	2.6659	3.944	279.92	6.957	134.21
110.00	1.4069	2.8704	4.277	315.74	7.370	154.76
115.00	1.5390	3.0749	4.614	353.61	7.777	176.99
120.00	1.6742	3.2792	4.953	393.50	8.178	200.91
125.00	1.8122	3.4831	5.295	435.38	8.575	226.53
130.00	1.9528	3.6864	5.639	479.24	8.966	253.86
135.00	2.0957	3.8891	5.985	525.03	9.351	282.92
140.00	2.2408	4.0910	6.332	572.74	9.729	313.71
145.00	2.3879	4.2918	6.680	622.31	10.101	346.24
150.00	2.5367	4.4915	7.028	673.73	10.466	380.51
155.00	2.6873	4.6901	7.377	726.96	10.825	416.52
160.00	2.8393	4.8873	7.727	781.97	11.177	454.28
165.00	2.9927	5.0831	8.076	838.72	11.523	493.79
170.00	3.1473	5.2775	8.425	897.18	11.862	535.04
175.00	3.3031	5.4705	8.773	957.33	12.196	578.04
180.00	3.4599	5.6618	9.122	1019.1	12.523	622.78
185.00	3.6176	5.8517	9.469	1082.6	12.845	669.25
190.00	3.7761	6.0399	9.816	1147.6	13.161	717.47
195.00	3.9355	6.2265	10.162	1214.2	13.472	767.41
200.00	4.0954	6.4114	10.507	1282.3	13.777	819.09
205.00	4.2560	6.5948	10.851	1351.9	14.077	872.48
210.00	4.4171	6.7764	11.194	1423.1	14.373	927.59
215.00	4.5787	6.9565	11.535	1495.6	14.663	984.41
220.00	4.7406	7.1349	11.876	1569.7	14.949	1042.9
225.00	4.9030	7.3117	12.215	1645.1	15.231	1103.2
230.00	5.0656	7.4868	12.552	1722.0	15.508	1165.1
235.00	5.2285	7.6604	12.889	1800.2	15.781	1228.7
240.00	5.3915	7.8324	13.224	1879.8	16.051	1294.0
245.00	5.5548	8.0029	13.558	1960.7	16.317	1360.9
250.00	5.7182	8.1718	13.890	2042.9	16.580	1429.5
255.00	5.8817	8.3392	14.221	2126.5	16.841	1499.8
260.00	6.0452	8.5052	14.550	2211.3	17.098	1571.8
265.00	6.2088	8.6697	14.879	2297.5	17.354	1645.3
270.00	6.3724	8.8329	15.205	2384.9	17.607	1720.5
273.15	6.4754	8.9350	15.410	2440.6	17.766	1768.8
275.00	6.5359	8.9947	15.531	2473.5	17.859	1797.4
280.00	6.6994	9.1553	15.855	2563.5	18.110	1875.8
285.00	6.8629	9.3145	16.177	2654.6	18.360	1955.9
290.00	7.0262	9.4726	16.499	2747.1	18.609	2037.6
295.00	7.1895	9.6296	16.819	2840.7	18.858	2120.9
298.15	7.2923	9.7279	17.020	2900.4	19.016	2174.2
300.00	7.3527	9.7855	17.138	2935.7	19.108	2205.8

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-25

THERMODYNAMIC FUNCTIONS FOR LITHIUM FLUORIDE (LI F)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.25.940 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0001	0.000	0.000	0.000	0.000
10.00	0.0002	0.0006	0.001	0.006	0.003	0.002
15.00	0.0007	0.0021	0.003	0.031	0.008	0.010
20.00	0.0016	0.0048	0.006	0.096	0.019	0.032
25.00	0.0031	0.0095	0.013	0.238	0.040	0.078
30.00	0.0055	0.0171	0.023	0.514	0.074	0.165
35.00	0.0090	0.0288	0.038	1.007	0.127	0.313
40.00	0.0138	0.0456	0.059	1.825	0.205	0.553
45.00	0.0205	0.0690	0.089	3.104	0.312	0.922
50.00	0.0293	0.0999	0.129	4.996	0.451	1.464
55.00	0.0406	0.1394	0.180	7.665	0.622	2.232
60.00	0.0547	0.1879	0.243	11.271	0.825	3.283
65.00	0.0720	0.2456	0.318	15.964	1.056	4.678
70.00	0.0926	0.3125	0.405	21.873	1.311	6.479
75.00	0.1166	0.3880	0.505	29.100	1.583	8.748
80.00	0.1443	0.4715	0.616	37.723	1.868	11.545
85.00	0.1756	0.5623	0.738	47.793	2.161	14.925
90.00	0.2104	0.6594	0.870	59.343	2.460	18.940
95.00	0.2488	0.7620	1.011	72.392	2.760	23.638
100.00	0.2906	0.8695	1.160	86.948	3.062	29.062
105.00	0.3357	0.9811	1.317	103.01	3.364	35.251
110.00	0.3840	1.0962	1.480	120.58	3.665	42.241
115.00	0.4353	1.2144	1.650	139.65	3.964	50.064
120.00	0.4896	1.3351	1.825	160.22	4.260	58.748
125.00	0.5466	1.4580	2.005	182.25	4.553	68.319
130.00	0.6062	1.5826	2.189	205.74	4.840	78.800
135.00	0.6682	1.7084	2.377	230.64	5.120	90.212
140.00	0.7327	1.8351	2.568	256.92	5.390	102.57
145.00	0.7993	1.9622	2.762	284.52	5.649	115.89
150.00	0.8679	2.0892	2.957	313.38	5.896	130.19
155.00	0.9385	2.2159	3.154	343.46	6.132	145.47
160.00	1.0108	2.3418	3.353	374.69	6.357	161.74
165.00	1.0848	2.4667	3.552	407.01	6.572	179.00
170.00	1.1603	2.5905	3.751	440.39	6.777	197.25
175.00	1.2372	2.7129	3.950	474.76	6.973	216.50
180.00	1.3153	2.8339	4.149	510.10	7.162	236.75
185.00	1.3946	2.9533	4.348	546.37	7.342	258.00
190.00	1.4749	3.0711	4.546	583.51	7.515	280.23
195.00	1.5562	3.1872	4.743	621.50	7.680	303.45
200.00	1.6383	3.3015	4.940	660.30	7.838	327.66
205.00	1.7212	3.4140	5.135	699.87	7.990	352.85
210.00	1.8048	3.5247	5.330	740.19	8.135	379.01
215.00	1.8890	3.6335	5.523	781.21	8.274	406.14
220.00	1.9738	3.7405	5.714	822.92	8.408	434.24
225.00	2.0590	3.8457	5.905	865.28	8.536	463.29
230.00	2.1447	3.9490	6.094	908.27	8.659	493.28
235.00	2.2307	4.0505	6.281	951.87	8.778	524.22
240.00	2.3170	4.1502	6.467	996.04	8.892	556.09
245.00	2.4036	4.2481	6.652	1040.8	9.001	588.89
250.00	2.4904	4.3442	6.835	1086.1	9.108	622.61
255.00	2.5774	4.4386	7.016	1131.8	9.211	657.23
260.00	2.6645	4.5314	7.196	1178.2	9.311	692.76
265.00	2.7517	4.6225	7.374	1225.0	9.408	729.19
270.00	2.8389	4.7120	7.551	1272.2	9.503	766.50
273.15	2.8939	4.7676	7.661	1302.3	9.561	790.46
275.00	2.9262	4.7999	7.726	1320.0	9.594	804.70
280.00	3.0134	4.8863	7.900	1368.2	9.683	843.76
285.00	3.1007	4.9713	8.072	1416.8	9.769	883.69
290.00	3.1879	5.0547	8.242	1465.9	9.851	924.48
295.00	3.2750	5.1366	8.412	1515.3	9.930	966.11
298.15	3.3298	5.1875	8.517	1546.7	9.978	992.78
300.00	3.3620	5.2172	8.579	1565.2	10.006	1008.6

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-25(CONT.)

THERMODYNAMIC FUNCTIONS FOR LITHIUM FLUORIDE (LI F)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.25.940 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	3.3620	5.2172	8.579	1565.2	10.006	1008.6
310.00	3.5356	5.3741	8.910	1666.0	10.153	1096.0
320.00	3.7086	5.5256	9.234	1768.2	10.294	1186.8
330.00	3.8809	5.6722	9.553	1871.8	10.429	1280.7
340.00	4.0524	5.8140	9.866	1976.7	10.554	1377.8
350.00	4.2229	5.9510	10.174	2082.9	10.668	1478.0
360.00	4.3924	6.0835	10.476	2190.1	10.772	1581.3
370.00	4.5608	6.2116	10.772	2298.3	10.871	1687.5
373.15	4.6137	6.2511	10.865	2332.6	10.902	1721.6
380.00	4.7282	6.3355	11.064	2407.5	10.966	1796.7
390.00	4.8943	6.4554	11.350	2517.6	11.056	1908.8
400.00	5.0592	6.5715	11.631	2628.6	11.142	2023.7
425.00	5.466	6.846	12.312	2909.7	11.341	2323.0
450.00	5.864	7.101	12.965	3195.5	11.520	2639.0
475.00	6.255	7.338	13.593	3485.5	11.682	2971.0
500.00	6.637	7.559	14.196	3779.5	11.831	3318.4
550.00	7.377	7.960	15.336	4377.8	12.098	4057.1
600.00	8.085	8.315	16.399	4988.8	12.336	4850.7
650.00	8.763	8.633	17.395	5611.2	12.557	5695.9
700.00	9.413	8.921	18.334	6244.4	12.770	6589.3
750.00	10.038	9.184	19.222	6888.2	12.982	7528.4
800.00	10.639	9.428	20.067	7542.7	13.200	8510.8
850.00	11.217	9.657	20.874	8208.4	13.430	9534.5
900.00	11.775	9.873	21.649	8886.0	13.677	10597.7
950.00	12.315	10.081	22.395	9576.5	13.945	11698.9
1000.00	12.837	10.281	23.118	10281.0	14.239	12836.8
1050.00	13.343	10.477	23.820	11000.9	14.563	14010.3
1100.00	13.835	10.671	24.506	11737.9	14.922	15218.5
1121.00	14.038	10.752	24.790	12052.9	15.083	15736.1
			(LIQUID)			
1121.00	14.038	16.524	30.561	18522.9	15.310	15736.1
1150.00	14.459	16.493	30.952	18966.9	15.310	16628.1
1200.00	15.160	16.444	31.604	19732.4	15.310	18192.1
1250.00	15.830	16.398	32.229	20497.9	15.310	19788.0
1300.00	16.473	16.356	32.829	21263.4	15.310	21414.6
1350.00	17.089	16.318	33.407	22028.9	15.310	23070.6
1400.00	17.682	16.282	33.964	22794.4	15.310	24754.9
1450.00	18.253	16.248	34.501	23559.9	15.310	26466.6
1500.00	18.803	16.217	35.020	24325.4	15.310	28204.7
1550.00	19.334	16.188	35.522	25090.9	15.310	29968.3
1600.00	19.848	16.160	36.008	25856.4	15.310	31756.7
1650.00	20.345	16.134	36.479	26621.9	15.310	33568.9
1700.00	20.826	16.110	36.936	27387.4	15.310	35404.3
1750.00	21.293	16.087	37.380	28152.9	15.310	37262.3
1800.00	21.746	16.066	37.811	28918.4	15.310	39142.1
1850.00	22.186	16.045	38.231	29683.9	15.310	41043.3
1900.00	22.613	16.026	38.639	30449.4	15.310	42965.1
1950.00	23.029	16.008	39.037	31214.9	15.310	44907.0
2000.00	23.434	15.990	39.424	31980.4	15.310	46868.6
2050.00	23.829	15.974	39.803	32745.9	15.310	48849.3
2100.00	24.214	15.958	40.171	33511.4	15.310	50848.7
2150.00	24.589	15.943	40.532	34276.9	15.310	52866.3
2200.00	24.955	15.928	40.884	35042.4	15.310	54901.7
2250.00	25.313	15.915	41.228	35807.9	15.310	56954.5
2300.00	25.663	15.901	41.564	36573.4	15.310	59024.4
2350.00	26.005	15.889	41.894	37338.9	15.310	61110.8
2400.00	26.339	15.877	42.216	38104.4	15.310	63213.6
2450.00	26.666	15.865	42.532	38869.9	15.310	65332.3
2500.00	26.987	15.854	42.841	39635.4	15.310	67466.6

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-26

THERMODYNAMIC FUNCTIONS FOR LITHIUM CHLORIDE (LI CL)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=42.397 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG-MOLE	$(H_T-H_0)/T$ CAL/DEG-MOLE	(S_T-S_0) CAL/DEG-MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG-MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0001	0.0004	0.000	0.002	0.002	0.000
10.00	0.0014	0.0051	0.007	0.051	0.021	0.014
15.00	0.0055	0.0169	0.022	0.253	0.065	0.082
20.00	0.0129	0.0378	0.051	0.756	0.143	0.259
25.00	0.0246	0.0706	0.095	1.764	0.269	0.616
30.00	0.0414	0.1179	0.159	3.538	0.450	1.243
35.00	0.0642	0.1819	0.246	6.366	0.691	2.246
40.00	0.0936	0.2635	0.357	10.540	0.988	3.743
45.00	0.1302	0.3627	0.493	16.320	1.332	5.858
50.00	0.1742	0.4783	0.653	23.914	1.711	8.711
55.00	0.2258	0.6085	0.834	33.467	2.113	12.419
60.00	0.2848	0.7510	1.036	45.062	2.526	17.087
65.00	0.3509	0.9035	1.254	58.724	2.938	22.806
70.00	0.4236	1.0633	1.487	74.431	3.343	29.653
75.00	0.5026	1.2283	1.731	92.124	3.732	37.694
80.00	0.5872	1.3965	1.984	111.72	4.102	46.977
85.00	0.6770	1.5660	2.243	133.11	4.452	57.542
90.00	0.7713	1.7356	2.507	156.21	4.781	69.415
95.00	0.8696	1.9041	2.774	180.89	5.090	82.616
100.00	0.9716	2.0707	3.042	207.07	5.380	97.156
105.00	1.0766	2.2349	3.311	234.66	5.652	113.04
110.00	1.1843	2.3961	3.580	263.57	5.910	130.27
115.00	1.2943	2.5542	3.849	293.73	6.154	148.84
120.00	1.4063	2.7091	4.115	325.09	6.386	168.75
125.00	1.5199	2.8606	4.381	357.58	6.609	189.99
130.00	1.6350	3.0089	4.644	391.16	6.823	212.56
135.00	1.7513	3.1541	4.905	425.80	7.031	236.43
140.00	1.8686	3.2961	5.165	461.46	7.232	261.61
145.00	1.9867	3.4352	5.422	498.11	7.428	288.07
150.00	2.1055	3.5716	5.677	535.74	7.621	315.82
155.00	2.2248	3.7052	5.930	574.31	7.809	344.84
160.00	2.3445	3.8364	6.181	613.82	7.994	375.12
165.00	2.4645	3.9651	6.430	654.25	8.176	406.65
170.00	2.5848	4.0916	6.676	695.57	8.355	439.41
175.00	2.7052	4.2159	6.921	737.79	8.530	473.41
180.00	2.8257	4.3382	7.164	780.87	8.703	508.62
185.00	2.9462	4.4585	7.405	824.81	8.873	545.04
190.00	3.0666	4.5768	7.644	869.60	9.039	582.66
195.00	3.1870	4.6933	7.880	915.20	9.201	621.47
200.00	3.3073	4.8080	8.115	961.60	9.360	661.46
205.00	3.4274	4.9209	8.348	1008.8	9.514	702.62
210.00	3.5474	5.0321	8.579	1056.7	9.664	744.94
215.00	3.6670	5.1415	8.809	1105.4	9.810	788.41
220.00	3.7865	5.2492	9.036	1154.8	9.952	833.03
225.00	3.9056	5.3553	9.261	1204.9	10.090	878.77
230.00	4.0245	5.4597	9.484	1255.7	10.223	925.63
235.00	4.1430	5.5624	9.705	1307.2	10.353	973.61
240.00	4.2612	5.6635	9.925	1359.2	10.479	1022.7
245.00	4.3790	5.7630	10.142	1411.9	10.599	1072.8
250.00	4.4964	5.8609	10.357	1465.2	10.715	1124.1
255.00	4.6134	5.9572	10.571	1519.1	10.824	1176.4
260.00	4.7300	6.0518	10.782	1573.5	10.928	1229.8
265.00	4.8462	6.1447	10.991	1628.3	11.026	1284.2
270.00	4.9619	6.2360	11.198	1683.7	11.117	1339.7
273.15	5.0345	6.2926	11.327	1718.8	11.171	1375.2
275.00	5.0771	6.3255	11.403	1739.5	11.202	1396.2
280.00	5.1919	6.4133	11.605	1795.7	11.282	1453.7
285.00	5.3062	6.4994	11.806	1852.3	11.356	1512.3
290.00	5.4199	6.5837	12.004	1909.3	11.424	1571.8
295.00	5.5332	6.6663	12.199	1966.6	11.487	1632.3
298.15	5.6043	6.7174	12.322	2002.8	11.524	1670.9
300.00	5.6459	6.7471	12.393	2024.1	11.545	1693.8

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-26(CONT.)

THERMODYNAMIC FUNCTIONS FOR LITHIUM CHLORIDE (LI CL)
SOLID AND LIQUID PHASES

GRAM MOLECULAR WT.=42.397 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
300.00	5.6459	6.7471	12.393	2024.1	11.545	1693.8
310.00	5.8697	6.9036	12.773	2140.1	11.648	1819.6
320.00	6.0913	7.0532	13.144	2257.0	11.733	1949.2
330.00	6.3105	7.1962	13.507	2374.7	11.805	2082.5
340.00	6.5274	7.3326	13.860	2493.1	11.867	2219.3
350.00	6.7418	7.4630	14.205	2612.0	11.922	2359.6
360.00	6.9538	7.5876	14.541	2731.5	11.977	2503.4
370.00	7.1634	7.7070	14.870	2851.6	12.033	2650.4
373.15	7.2289	7.7436	14.972	2889.5	12.052	2697.4
380.00	7.3704	7.8216	15.192	2972.2	12.092	2800.8
390.00	7.5750	7.9319	15.507	3093.4	12.153	2954.3
400.00	7.7772	8.0382	15.815	3215.3	12.212	3110.9
425.00	8.272	8.288	16.560	3522.5	12.358	3515.7
450.00	8.753	8.518	17.271	3833.2	12.501	3938.6
475.00	9.219	8.732	17.950	4147.5	12.640	4379.0
500.00	9.672	8.930	18.602	4465.2	12.777	4835.9
550.00	10.540	9.292	19.833	5110.8	13.045	5797.2
600.00	11.363	9.616	20.979	5769.5	13.306	6817.8
650.00	12.144	9.910	22.054	6441.3	13.562	7893.9
700.00	12.889	10.180	23.068	7125.7	13.815	9022.2
750.00	13.600	10.430	24.030	7822.7	14.064	10199.9
800.00	14.281	10.665	24.946	8532.1	14.311	11424.4
850.00	14.934	10.887	25.821	9253.8	14.556	12693.8
880.00	15.314	11.014	26.328	9692.7	14.702	13476.1
			(LIQUID)			
880.00	15.314	16.372	31.686	14407.7	15.731	13476.1
900.00	15.682	16.358	32.039	14722.0	15.701	14113.4
950.00	16.565	16.321	32.886	15505.1	15.625	15736.7
1000.00	17.401	16.285	33.686	16284.5	15.549	17401.2
1050.00	18.195	16.248	34.443	17060.1	15.473	19104.6
1100.00	18.950	16.211	35.161	17831.8	15.397	20844.8
1150.00	19.670	16.174	35.843	18599.8	15.321	22620.0
1200.00	20.357	16.137	36.494	19363.9	15.245	24428.6
1250.00	21.015	16.099	37.115	20124.3	15.169	26268.9
1300.00	21.646	16.062	37.708	20880.8	15.093	28139.6
1350.00	22.251	16.025	38.276	21633.6	15.017	30039.3
1400.00	22.833	15.988	38.821	22382.5	14.941	31966.8
1450.00	23.394	15.950	39.344	23127.7	14.865	33921.0
1500.00	23.934	15.913	39.847	23869.0	14.789	35900.9
1550.00	24.455	15.875	40.330	24606.6	14.713	37905.4
1600.00	24.959	15.838	40.796	25340.4	14.637	39933.6
1650.00	25.445	15.800	41.245	26070.3	14.561	41984.7
1700.00	25.916	15.763	41.679	26796.5	14.485	44057.9
1750.00	26.373	15.725	42.098	27518.8	14.409	46152.4
1800.00	26.815	15.687	42.503	28237.4	14.333	48267.5
1850.00	27.245	15.650	42.894	28952.1	14.257	50402.5
1900.00	27.661	15.612	43.274	29663.1	14.181	52556.7
1950.00	28.066	15.574	43.641	30370.2	14.105	54729.6
2000.00	28.460	15.537	43.997	31073.6	14.029	56920.6
2050.00	28.843	15.499	44.343	31773.2	13.953	59129.2
2100.00	29.217	15.461	44.678	32468.9	13.877	61354.7
2150.00	29.580	15.424	45.004	33160.9	13.801	63596.8
2200.00	29.934	15.386	45.320	33849.0	13.725	65854.9
2250.00	30.279	15.348	45.628	34533.4	13.649	68128.6
2300.00	30.616	15.310	45.927	35213.9	13.573	70417.5
2350.00	30.945	15.273	46.218	35890.7	13.497	72721.2
2400.00	31.266	15.235	46.501	36563.6	13.421	75039.2
2450.00	31.580	15.197	46.777	37232.8	13.345	77371.2
2500.00	31.887	15.159	47.046	37898.1	13.269	79716.8

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

TABLE 2-27

THERMODYNAMIC PROPERTIES FOR LITHIUM ALUMINATE (LI AL O_2)
SOLID PHASE

GRAM MOLECULAR WT.=65.920 GRAMS 1 CAL=4.1840 ABS J

T DEG K = 273.15 + T DEG C

T DEG K	$-(F_T-H_0)/T$ CAL/DEG MOLE	$(H_T-H_0)/T$ CAL/DEG MOLE	(S_T-S_0) CAL/DEG MOLE	(H_T-H_0) CAL/MOLE	C_P CAL/DEG MOLE	$-(F_T-H_0)$ CAL/MOLE
			(SOLID)			
0.00	0.0000	0.0000	0.000	0.000	0.000	0.000
5.00	0.0000	0.0002	0.000	0.001	0.001	0.000
10.00	0.0006	0.0022	0.003	0.022	0.009	0.006
15.00	0.0024	0.0075	0.010	0.112	0.029	0.036
20.00	0.0057	0.0171	0.023	0.341	0.066	0.115
25.00	0.0111	0.0326	0.044	0.815	0.128	0.277
30.00	0.0189	0.0557	0.075	1.672	0.220	0.568
35.00	0.0298	0.0879	0.118	3.077	0.348	1.043
40.00	0.0442	0.1302	0.174	5.209	0.511	1.768
45.00	0.0625	0.1831	0.246	8.239	0.707	2.811
50.00	0.0850	0.2466	0.332	12.328	0.934	4.248
55.00	0.1118	0.3204	0.432	17.620	1.188	6.151
60.00	0.1432	0.4041	0.547	24.244	1.466	8.593
65.00	0.1792	0.4972	0.676	32.316	1.767	11.647
70.00	0.2197	0.5992	0.819	41.943	2.088	15.379
75.00	0.2648	0.7096	0.974	53.223	2.427	19.857
80.00	0.3143	0.8280	1.142	66.238	2.782	25.144
85.00	0.3682	0.9536	1.322	81.058	3.148	31.299
90.00	0.4265	1.0860	1.512	97.737	3.524	38.381
95.00	0.4889	1.2243	1.713	116.31	3.907	46.441
100.00	0.5553	1.3681	1.923	136.81	4.294	55.528
105.00	0.6256	1.5167	2.142	159.25	4.683	65.689
110.00	0.6997	1.6695	2.369	183.64	5.073	76.964
115.00	0.7773	1.8259	2.603	209.98	5.463	89.393
120.00	0.8584	1.9855	2.844	238.27	5.852	103.01
125.00	0.9427	2.1479	3.091	268.49	6.239	117.84
130.00	1.0302	2.3127	3.343	300.65	6.623	133.92
135.00	1.1206	2.4794	3.600	334.72	7.004	151.28
140.00	1.2138	2.6477	3.862	370.68	7.381	169.93
145.00	1.3097	2.8174	4.127	408.52	7.754	189.90
150.00	1.4080	2.9881	4.396	448.21	8.121	211.21
155.00	1.5088	3.1595	4.668	489.73	8.484	233.87
160.00	1.6118	3.3315	4.943	533.04	8.841	257.90
165.00	1.7170	3.5038	5.221	578.13	9.192	283.31
170.00	1.8242	3.6762	5.500	624.96	9.537	310.11
175.00	1.9332	3.8485	5.782	673.49	9.876	338.31
180.00	2.0440	4.0206	6.065	723.71	10.209	367.93
185.00	2.1565	4.1923	6.349	775.57	10.535	398.96
190.00	2.2706	4.3634	6.634	829.05	10.854	431.42
195.00	2.3862	4.5338	6.920	884.10	11.166	465.30
200.00	2.5031	4.7035	7.207	940.70	11.472	500.62
205.00	2.6213	4.8722	7.494	998.81	11.771	537.37
210.00	2.7407	5.0400	7.781	1058.4	12.063	575.55
215.00	2.8613	5.2066	8.068	1119.4	12.348	615.18
220.00	2.9829	5.3721	8.355	1181.9	12.626	656.23
225.00	3.1054	5.5363	8.642	1245.7	12.898	698.73
230.00	3.2289	5.6993	8.928	1310.8	13.163	742.65
235.00	3.3532	5.8608	9.214	1377.3	13.421	788.01
240.00	3.4783	6.0210	9.499	1445.0	13.673	834.79
245.00	3.6041	6.1797	9.784	1514.0	13.919	883.00
250.00	3.7305	6.3369	10.067	1584.2	14.159	932.63
255.00	3.8575	6.4926	10.350	1655.6	14.393	983.67
260.00	3.9851	6.6467	10.632	1728.1	14.621	1036.1
265.00	4.1132	6.7992	10.912	1801.8	14.843	1090.0
270.00	4.2417	6.9502	11.192	1876.6	15.060	1145.2
273.15	4.3228	7.0445	11.367	1924.2	15.195	1180.8
275.00	4.3706	7.0996	11.470	1952.4	15.273	1201.9
280.00	4.4998	7.2474	11.747	2029.3	15.480	1259.9
285.00	4.6294	7.3936	12.023	2107.2	15.683	1319.4
290.00	4.7592	7.5383	12.298	2186.1	15.882	1380.2
295.00	4.8893	7.6814	12.571	2266.0	16.077	1442.3
298.15	4.9714	7.7707	12.742	2316.8	16.199	1482.2
300.00	5.0196	7.8229	12.843	2346.9	16.269	1505.9

H_0 AND S_0 APPLY TO THE REFERENCE STATE OF THE SOLID AT ZERO DEG K

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Frederick H. Mueller, *Secretary*

NATIONAL BUREAU OF STANDARDS
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