Refractive Index of Alkali Halides and Its Wavelength and Temperature Derivatives

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Refractive index data for 20 alkali halides are exhaustively surveyed, compiled, and analyzed. The most probable values at 293 K for the transparent region are generated for the materials for which experimental data are sufficiently abundant and reliable. Provisional values are also provided for the wavelength regions where available data are insufficient or missing. Reasonable estimations of refractive index for the very scantily measured materials were made by incorporating the dielectric constants and wavelengths of absorption peaks into a simplified dispersion equation. Temperature derivatives of refractive index for most of the alkali halides were unavailable. However, using the existing data for the five most commonly used alkali halides, novel empirical facts were discovered and dn/dT formulas were constructed for all of the alkali halides. The calculated dn/dT values agree remarkably well with the existing experimental data.

Key words: Alkali halides; optical constants; refractive index; temperature coefficient of refractive index.

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a	Constant
A, A_0, A_1, A_2	Constants of dispersion equations
b	Constant
B	Constant; oxygen line of wavelength 0.687 μm
c	Constant; velocity of light
C	Constant; hydrogen line of wavelength 0.656 μm
D	Code for deviation method; also sodium D doublet $\lambda \sim 0.5893$ μm
F	Code for focal length method; also hydrogen line of wavelength 0.486 μm
I	Code for interference method
L	Code for multilayer method
M	Code for immersion method
n	Refractive index
n_0	Refractive index of short (uv) wavelengths
N	Complex refractive index; also density of harmonic oscillator
P	Electrical polarizability; also code for Pulfrich or Abbe refractometer
R	Code for reflection method
T	Temperature; code for transmission method
v	Phase velocity of light in medium
V	Volume
α	Linear thermal expansion coefficient
γ	Damping factor
ϵ	Complex dielectric constant
ϵ_1	Real part of ϵ
ϵ_2	Imaginary part of ϵ
ϵ_s	Static dielectric constant
ϵ_{uv}	High-frequency dielectric constant
κ	Extinction coefficient; oscillator strength
λ	Wavelength of light
λ_i	Wavelength of the ith absorption band
λ_I	Wavelength of infrared absorption band
λ_u	Effective wavelength of ultraviolet absorption band

1. Introduction

The purpose of this work is to present and review the available data and information on the refractive index of alkali halides, to critically evaluate, analyze, and synthesize [1] the data, and to make recommendations for the most probable values of the refractive index, its wavelength derivative $dn/d\lambda$, and temperature derivative dn/dT.

The recommended and provisional values generated cover the widest possible transparent wavelength ranges and are for the purest form of alkali halide for which

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[1] The term is used to connote the prediction, derivation, or estimation of data based on sound theoretical grounds and related experimental evidence.

measurements have been made. However, for the materials which have been very scantily measured or have not been measured at all, reasonable estimations are made for wide wavelength ranges.

The introductory text describes the general procedures and methods for the evaluation and synthesis of the available data and for the generation of recommended values. It also discusses the present status of the experimental data and other considerations concerning the body of data.

In the theoretical background section, the general theory of the refractive index and its temperature derivative is discussed. Correlations of the dielectric constants and the refractive index are described. An important result in this work is the discovery of empirical relationships which enable us to calculate *dn*/*dT* data at 293 K for some materials on which no data are available.

In the data presentation section we treat each material separately, review the individual pieces of available data and information, and describe the considerations involved in arriving at the final assessment and recommendation and the theoretical guidelines or semi-empirical correlations on which the data analysis and synthesis are based. Figures and tables following the discussions present the recommended values, in addition to the original data, specimen characterization, and measurement information for the 283 sets of the data extracted from 100 documents in the primary literature. Distribution of the available data sets is shown in table 1.

In the conclusion, figures are presented in which all the recommended curves on the refractive index, $dn/d\lambda$ and dn/dT are grouped for visual comparison. The accomplishments in this work are discussed and the need for further measurements is suggested.

TABLE 1. AVAILABLE EXPERIMENTAL REFRACTIVE INDEX DATA AND ITS TEMPERATURE DERIVATIVE

	n			dn/dT		
	Data Sets	Transparent Region Wavelength Coverage	Quality of Data	Data Sets	Transparent Region Wavelength Coverage	Quality of Data
LiF	47	wide range	good	3	fair range	poor
LiCl	2	two wavelengths	poor	-	-	-
LiBr	2	two wavelengths	poor	-	-	-
LiI	1	single wavelength	poor	-	-	-
NaF	15	wide range	good	2	fair range	poor
NaCl	49	wide range	good	10	fair range	fair
NaBr	5	limited to 0.2-0.67 μm	fair	-	-	-
NaI	1	single wavelength	poor	-	-	-
KF	5	limited to 0.21-0.59 μm	fair	-	-	-
KCl	38	wide range	good	8	fair range	fair
KBr	27	wide range	good	5	limited to < 1 μm	poor
KI	21	wide range	fair	2	limited to < 1 μm	poor
RbF	1	single wavelength	poor	-	-	-
RbCl	3	limited to 0.19-0.66 μm	fair	1	single wavelength	bad
RbBr	2	limited to 0.21-0.66 μm	fair	-	-	-
RbI	3	limited to 0.18-0.66 μm	fair	-	-	-
CsF	1	single wavelength	poor	-	-	-
CsCl	6	limited to 0.22-0.67 μm	fair	-	-	-
CsBr	8	wide range	good	1	wide range	average value
CsI	13	wide range	good	1	wide range	fair

The last section consists of the source references used in the extraction of data and/or information. Only original sources of data have been used in the analysis. The effective cut-off date for literature research was March 1975, while the earliest referenced source was dated 1874. With such a comprehensive compilation of information and presentation of results, the author believes that any scientist or optical engineer will find this report a great help in regard to refractive index and its temperature derivative.

For a transparent material, the refractive index, n, is defined as the ratio of the velocity, c, of electromagnetic radiation in vacuum to the phase velocity, v, of the same radiation in the material, i.e.,

$$n = c/v. \tag{1}$$

Since the index of refraction of air is only about 1.0003, n is conventionally measured with respect to air instead of vacuum and no correction is made.

In non-absorbing media, the refractive index is a real quantity, while in absorbing media a complex index of refraction, N, is used. The complex index is defined as

$$N = n + i\kappa, \tag{2}$$

where κ is the extinction coefficient or absorption index. Both n and κ are frequency dependent. The real and imaginary parts of the square of the complex refractive index are the real and imaginary parts of the complex dielectric constant of the material, i.e.,

$$\epsilon = \epsilon_1 + i\epsilon_2 = N^2 = (n^2 - \kappa^2) + i2n\kappa. \tag{3}$$

The dispersion in an optical material is intimately related to the microscopic structure of the material. On the short wavelength side, transmission is restricted by electronic excitation, and for long wavelengths by molecular vibrations and rotations. The width of the transparent spectral range increases as the energy for electronic excitation is increased and that for molecular vibrations decreased. Theoretical and experimental studies on the ionic crystals indicate that crystals having small ions with strong bonding have a wide ultraviolet transparency; this is true for alkali halides.

The alkali halides are typical ionic compounds and their physical properties are in general well understood. The majority of the alkali halides crystallize in the rock salt sturcture in which each cation (alkali metal ion) is surrounded by six nearest-neighbor anions (halogen ions), and each anion by six nearest-neighbor cations. The cations and anions are each situated on the points of separate face-centered cubic lattices, and these two lattices are interleaved with each other.

This type of crystal is called the β-form. A few of the alkali halides normally crystallize in a slightly different arrangement, typified by the room-temperature structure of cesium chloride. In this structure, each cation is surrounded by eight nearest-neighbor anions and conversely. The cations and anions in this structure may be considered to occupy respectively the points of two interpenetrating simple cubic lattices. This type of crystal is called the α-form. A few physical properties of alkali-halide crystals are listed in table 2.

In order to utilize any dispersive medium, spectroscopists must have a knowledge of the index of refraction and $dn/d\lambda$ for all wavelengths transmitted by the medium. Such data are also useful to physicists for evaluating theoretical dispersion equations and for studying the forces between the constituents of the crystal. The alkaline halides, having the cubic structure, are favorable subjects for such studies.

In figure 1, we show a schematic view of the absorption spectrum of a typical alkali-halide crystal. At the right (~ 40 μm) are seen the absorption peaks associated with optical phonons while nearer to the left (~ 0.15 μm) are seen the absorption peaks associated with excitons. In the transparent region between these extremes the crystal absorbs little light and has a dispersion which can be characterized by a high-frequency dielectric constant $\epsilon_{\infty} = n_0^2$, where n_0 is the refractive index at short wavelength. In absorbing regions of the spectrum, the imaginary part of ϵ is non-zero. Both the real and imaginary parts of ϵ can be obtained from the experimental reflectivity (preferably over a wide range of wavelengths) and the use of the Kramers-Kronig relation or the Lorentz oscillator model. In optical technology, the refractive index is needed only for the transparent region of the material. One does not have to carry out a complicated analysis and calculation to obtain the refractive index. Direct methods are available for high precision measurements. The minimum deviation method is usually used to obtain the refractive index to the fourth decimal place, and the interference method to the third.

Although alkali halides are, in principle, good optical materials, only five of them (LiF, NaCl, KCl, KBr and CsI) are commonly used because the others lack mechanical strength or are chemically or thermally unstable.

The applications of high-power infrared lasers, which are now being developed at a rapid rate, are partly limited by the lack of suitable transparent optical materials. As a result, much of the high-power laser research is directed toward finding adequate high-temperature window and dome materials in the wavelength region of 2 μm to 6 μm and near 10.6 μm. The alkali halides have large transmission ranges spreading from the ultraviolet to the infrared and are available in large sizes and high purity. They are excellent materials for photochemists who are interested in ultraviolet transparency and for laser scientists who are concerned with infrared transmission. In spite of their intrinsic weaknesses, they are considered good window materials and are recommended by the National Materials Advisory Board [1]^2. Efforts are being made to improve their mechanical strength and thermal endurance without altering their optical properties, particularly the refractive index.

The refractive index of alkali halides and its temperature derivative have been surveyed and studied from time to time by a number of investigators, including Smakula [2], Ballard [3], Coblentz [4], and Winchell [5], to name just a few. Refractive index data are compiled in a number of handbooks such as those sponsored by Landolt-Börnstein [6], AIP [7], and CRC [8], etc. However, their main concern is to provide a general picture through a few particular sets of data. The purpose of the present work is quite different from that of the above-mentioned works. It has two major aims: (1) to exhaustively search the open literature so that a complete comphehensive bibliographic reference is compiled, and (2) to generate recommended values based on the existing experimental data on the refractive index

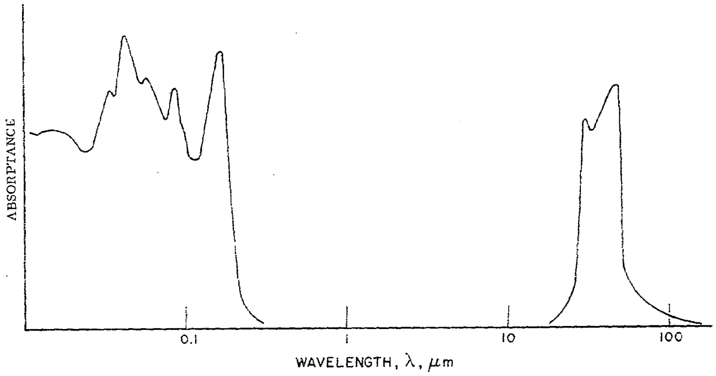

FIGURE 1. Absorption Spectrum of a Typical Alkali-Halide Crystal

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[2] Figures in brackets indicate literature references at the end of this paper.

TABLE 2. SOME PHYSICAL PROPERTIES OF ALKALI HALIDES

Material	Structure[a]	Space Group[a]	Density[a] (g cm^{-3})	Melting[c] Point (K)	Energy[d] Gap (ev)	Solubility[b] in Water at 298 K (10^2 g cm^{-3})	Molecular Weight[c]	Linear[a] Exp. Coef. at 293 K (10^{-6} K^{-1})	Thermal[e] Conductivity at 293 K (W m^{-1} K^{-1})	Specific[c] Heat at 298 K (cal $mole^{-1}$ K^{-1})	Transmission[e] Region (μm)	Young's[e] Modulus (10^{10} N m^{-2})	Hardness[e] (Knoop No.)
LiF	Cubic(NaCl)	Fm3m	2.601	1121.3	13.1	0.27	25.9374	33.2		9.994	0.12-9.0	6.481	102-113
LiCl	Cubic(NaCl)	Fm3m	2.06_8	883 ± 2	~10	63.7	42.397	43.8		11.479			
LiBr	Cubic(NaCl)	Fm3m	3.46_4	823	~ 8.5	145.0	86.848	49.8		11.692			
LiI	Cubic(NaCl)	Fm3m	4.06_1	742	≳ 5.9	165.0	133.8434	59.4		11.970			
NaF	Cubic(NaCl)	Fm3m	2.79	1269 ± 2	10.5	4.22	41.9882	31.7		11.198	0.19-15.0		
NaCl	Cubic	Fm3m	2.16_4	1073.8 ± 1.0	8.97	35.7	58.448	39.7	6.4	12.072	0.21-26.0	3.999	18.2
NaBr	Cubic(NaCl)	Fm3m	3.210	1020	7.7	116.0	102.907	42.3		12.285			
NaI	Cubic(NaCl	Fm3m	3.665	933	≳ 5.8	184.0	149.901	45.5		12.482			
KF	Cubic(NaCl)	Fm3m	2.505	1131	10.9	92.3	58.1004	34.8		11.707			
KCl	Cubic(NaCl)	Fm3m	1.9917	1044	8.5	34.7	74.555	37.1	7.0	12.258	0.21-30.0	2.965	9.3
KBr	Cubic(NaCl)	Fm3m	2.754	1007	7.6	53.48	119.011	38.7	5.0	12.500	0.25-40.0	2.689	7.0
KI	Cubic(NaCl)	Fm3m	3.114	954	6.2	127.5	166.0064	40.8	3.1	12.614	0.25-45.0	3.151	
RbF	Cubic(NaCl)	Fm3m	2.88	1033	10.4	130.6	104.47	27.5					
RbCl	Cubic(NaCl)	Fm3m	2.76	988	8.3	77.0	120.92	36.0					
RbBr	Cubic(NaCl)	Fm3m	3.35	955	7.7	98.0	165.38	37.5					
RbI	Cubic(NaCl)	Fm3m	3.55	915	5.83	152.0	212.37	41.5					
CsF	Cubic(NaCl)	Fm3m	3.58_6	976	10.0	367.0	151.9034	32.0		12.420			
CsCl	Cubic	Pm3m	3.988	tr. 743	≳ 8.0								
CsCl(β)	Cubic(NaCl)	Fm3m	3.54(calc.)	918	≥ 7.5	162.22	168.358	46.3		12.534			
CsBr	Cubic(CsCl)	Pm3m	4.43_3	909	7.0-8.0	124.3	212.81	47.4	0.94		0.3 -55.0	1.586	19.5
CsI	Cubic(CsCl)	Pm3m	4.51	894	≳ 6.3	44.0	259.81	49.0	1.2		0.25-80.0	0.530	

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[a] Information is taken from American Institute of Physics Handbook, 3rd Edition, Ref. [7], except the linear expansion coefficients of six materials; those of KF, RbF are from Ref. [11], while those of RbCl, RbBr, RbI, and CsF are from Ref. [12].

[b] Values are from Handbook of Chemistry and Physics, Ref. [8].

[c] Values are from JANAF Thermochemical Tables, Ref. [9].

[d] Values are obtained from Ref. [7,117].

[e] Values are obtained from Handbook of Military Infrared Technology, Ref. [10].

and a temperature derivative, *dn/dT*, so that critically evaluated numerical data are available for scientific and engineering use.

Scanning the open literature one finds that in most cases the measurements of refractive index were carried out at various temperatures and reduced to a reference temperature chosen according to the investigators' preference. Unfortunately, the temperature derivatives of refractive index for alkali halides are in general either only partially measured or not available. Therefore, it is highly desirable to reduce the existing refractive index data and present them at a uniform reference temperature. It is also important that the temperature derivative of refractive index be made available in the form of a function of wavelength constructed from existing *dn/dT* data and theory, so that the users can easily calculate the required values over a limited range of temperature.

The first task in generating recommended values was to analyze the data on the temperature derivative of refractive index. With the analyzed values of *dn/dT*, all the refractive index data were then reduced to the reference temperature of 293 K chosen for the present work. The corrected data were then subjected to evaluation and critical selection. Least-squares fitting of the selected data to a given equation was then carried out.

Recommended values for refractive index and the corresponding wavelength and temperature derivatives, *dn/dλ* and *dn/dT*, are calculated from the correlating equations where sufficient experimental values are available. However, for the region where experimental evidence is either insufficient or poor, only provisional or typical values are provided. Data are presented at integral wavelengths with small increments for the transparent region. Intermediate values can be obtained by the following linear interpolations:

$$\begin{aligned} n_{\lambda'} &= n_{\lambda} + \left(\frac{dn}{d\lambda}\right)_{\lambda}(\lambda' - \lambda), \\ n_{\lambda T'} &= n_{\lambda T} + \left(\frac{dn}{dT}\right)_{\lambda}(T' - T). \end{aligned} \tag{4}$$

The second expression in eq (4) is based on the fact that *dn/dT* is relatively independent of temperature over a fairly wide range of temperatures. However, the application of this expression should be limited to the temperature range 293 ± 50 K.

No attempt was made to analyze the refractive index data obtained at temperatues other than near room temperature, since the required data are generally inadequate. However, information and results belonging to this category are listed along with those at room temperature for the purpose of comparison and completeness. Moreover, some of the important physical parameters essential for the calculation of refractive indices at low temperatures is also given in a latter section.

Inherent in the character of this work is the fact that we have drawn most heavily upon the scientific literature and feel a debt of gratitude to the authors whose results have been used.

2. Theoretical Background and Empirical Relations

The study of the propagation of light through matter, particularly solids, comprises one of the important and interesting branches of optics. The many and varied optical phenomena exhibited by solids include selective absorption, dispersion, double refraction, polarization effects, and electro-optical and magneto-optical effects. Many of the optical properties of solids can be understood on the basis of classical electromagnetic theory.

The macroscopic electromagnetic state of matter at a given point is described by four quantities:

(1) The volume density of electric charge
(2) The volume density of electric dipoles, called the polarization
(3) The volume density of magnetic dipoles, called the magnetization
(4) The electric current per unit area, called the current density

All of these quantities are considered to be macroscopically averaged in order to smooth out the microscopic variations due to the atomic makeup of matter. They are related to the macroscopically averaged electric and magnetic fields by the well-known Maxwell equations [114].

Detailed discussion of Maxwell's equations is beyond the scope of the present work. What we should bear in mind is that the general solution of Maxwell's equations is a wave function for electric or magnetic field. In the treatment of the interaction of light and matter, the light is considered as an oscillating electric field that engulfs the component molecules of matter. Each of the molecules may be considered to be a charged simple harmonic oscillator. When these component oscillators are driven by the engulfing electric field of light they become excited by that field and emit Huygens-like spherical wavelets. In the early development of the theory of propagation of light in matter, there was no practical alternative to treating the matter as a collection of charged harmonic oscillators subject, perhaps, to damping forces. Fortunately, the modern developments in the theory of matter and its interaction with radiation have shown that this simple model has broad utility, and that it can be employed in the discussion of refractive indices.

In this section, only a brief review of the theoretical background on the refractive index and its temperature derivative is given. A two-oscillator model is used to estimate the refractive index for those materials on which the index is available only at a single wavelength. Effort was largely concentrated in finding means for estimating the *dn*/*dT* data for the materials without available data. Empirical evidence was found and formulas were constructed and used to make reasonable estimate for *dn*/*dT*.

2.1. Refractive Index

Maxwell's theory gives the relationship

$$n^2=\epsilon=1+P, \tag{5}$$

where *n* is the refractive index, ϵ the dielectric constant, and *P* the polarizability. If one treats the material as equivalent to a collection of harmonic oscillators resonant to radiation of various wavelengths λ_i, one can derive [114] the equation

$$n^2-1=\sum_i \frac{c_i\lambda^2}{\lambda^2-\lambda_i^2}, \tag{6}$$

where λ is the wavelength of the incident radiation, and c_i is a constant which depends on the number of oscillators per unit volume and the "oscillator strength" of the oscillators resonant at wavelength λ_i. Equation (6) is generally called the Sellmeier formula. It can be derived by modern quantum theory from more sophisticated models of the solid, with λ_i denoting the wavelengths of the various absorption bands of the material.

For the transparent region, it was traditionally believed that the dispersion formula of the Sellmeier type best fits the alkali halides. The consequence of this was that most of the early experimental workers adopted eq (6) with the λ_i's and c_i's as adjustable empirical constants chosen only to fit the data, with no other experimental and theoretical basis. Nevertheless, this equation, if used correctly, gives a good deal of information concerning the position of absorption band, oscillator strength and the dielectric constant for static field, ϵ_s.

For the transparent region, eq (6) can be written as

$$\epsilon=n^2=1+\sum_i \frac{a_i\lambda^2}{\lambda^2-\lambda_i^2}+\sum_j \frac{b_j\lambda^2}{\lambda^2-\lambda_j^2}. \tag{7}$$

Terms in the first summation are contributions from the ultraviolet absorption bands and those in the second from the infrared absorption bands. In the infrared region, however, the λ_i's of UV absorption peaks are much less than λ and eq (7) is reduced to

$$\epsilon=\epsilon_{uv}+\sum \frac{b_j\lambda^2}{\lambda^2=\lambda_j^2}, \tag{8}$$

where $\epsilon_{uv}=1+\sum a_i=\epsilon_s-\sum b_j$ is the high-frequency dielectric constant.

Real crystals are neither perfectly linear dielectrically, nor are they perfectly harmonic. The effect of nonlinearity and anharmonicity is to introduce a damping term [13]. Equation (8) is extended to become

$$\epsilon=\epsilon_1+i\epsilon_2=\epsilon_{\text{uv}}+\sum_j \frac{b_j\lambda^2}{\lambda^2-\lambda_j^2-i\gamma_j\lambda}. \tag{9}$$

Equation (9) is widely used in investigating the infrared optical properties of ionic crystals [14–16]. In the transparent wavelength region, the effects contributed from absorption bands are negligibly small. In such cases the damping terms can be omitted and eq (9) is reduced to the Sellmeier formula.

In an ideal application of eq (7), one would need to know the wavelength of all of the absorption peaks. This is very difficult in practice because of the large number of absorption peaks. In fact, only a few absorption peaks are accessible for experimental observation. In order to include the effects due to unobserved absorption bands on the refractive index in the transparent region, an equation similar to eq (7) is used to interpret the experimental data:

$$n^2=A+\sum_i \frac{a_i\lambda^2}{\lambda^2-\lambda_i^2}+\sum_j \frac{b_j\lambda^2}{\lambda^2-\lambda_j^2}, \tag{10}$$

where λ_i's and λ_j's are the observed wavelength of absorption bands. *A* is a constant which equals the quantity $1+\sum_k a_k$ where a_k's are the coefficients of the ultraviolet terms $\sum_k a_k\lambda^2/(\lambda^2-\lambda_k^2)$ with λ_k's much smaller than the wavelengths in the transparent region. In the infrared region, the dominant contribution to the refractive index in the transparent region comes from the fundamental absorption band while other absorption bands contribute little effect on the refractive index in the transparent region. As a result, in most cases, only one term due to the predominant contribution is included in eq (10). The relationships between the dielectric constants and the coefficients in the dispersion equation remain with no change:

$$\epsilon_{\text{uv}}=A+\Sigma a_i, \tag{11}$$

and

$$\epsilon_s=A+\Sigma a_i+\Sigma b_j. \tag{12}$$

Fortunately, a wealth of experimental data on ϵ_{uv}, ϵ_s, λ_i, and λ_j is available for alkali halide crystals. In some cases, good values of *a* and *b* are also available to initiate a least-squares calculation. Table 3 displays all the selected values of available parameters. The available values of $(1/\lambda_i)$ $(d\lambda_i/dT)$ are also listed for calculation of the temperature derivative of the refractive index. In addition, the available values of damping factors, γ_j in eq (9), are also included for the purpose of completeness.

TABLE 3. AVAILABLE PARAMETERS FOR DISPERSION EQUATIONS OF ALKALI HALIDES AT ROOM TEMPERATURE

Material	ϵ_s [a]	ϵ_{uv} [b]	Ultraviolet Absorption Peaks [c] (μm) λ_i	Infrared Absorption Peaks Wavelength λ_I (μm)	Infrared Absorption Peaks Oscillator Strength κ_I	Infrared Absorption Peaks Damping Factor γ_I (μm)	$\frac{1}{\lambda_I}\frac{d\lambda_I}{dT}$ [e] (10^{-4} K^{-1})
LiF	9.04	1.93		32.79, 19.88	6.80, 0.11	1.967, 3.578	1.3
LiCl	11.86	2.75	0.130, 0.143	49.26			~2.1
LiBr	13.23	3.16	0.156, 0.162, 0.173	57.80			~2.5
LiI	11.03	3.80	0.120. 0.140, 0.167, 0.176, 0.183, 0.197, 0.212	70.42			2.2
NaF	5.072	1.174	0.117	40.57			1.25
NaCl	5.90	2.33	0.050 0.100 0.128 0.158	60.98, 40.50, 120.34	3.2001, 0.0900, 0.334	2.281, 5.730, 198.39	~2.80
NaBr	6.396	2.60	0.125, 0.145, 0.176, 0.188	74.63			~3.20
NaI	7.28	3.01	0.122, 0.141, 0.170, 0.187, 0.228	86.21			~2.90
KF	5.50	1.85	0.126	51.55			~2.30
KCl	4.85	2.17	0.131, 0.162	70.42			~2.70
KBr	4.90	2.36	0.146, 0.173, 0.187	87.72, 60.61	2.4881, 0.1885	4.561, 13.940	3.60
KI	5.09	2.65	0.129, 0.175, 0.187, 0.219	98.04, 69.44	2.1363, 0.2765	8.235, 20.832	3.40
RbF	6.48	1.93	0.115, 0.132	63.29			2.5
RbCl	4.92	2.18	0.138, 0.166	85.84			3.40
RbBr	4.86	2.34	0.123, 0.146, 0.155, 0.178, 0.191	114.29			3.80
RbI	4.94	2.58	0.120, 0.134, 0.156, 0.179, 0.187, 0.223	132.45			3.6
CsF	8.08	2.16	0.110, 0.118, 0.136	78.74			2.5
CsCl	6.95	2.63	0.119, 0.137, 0.145, 0.162	100.50, 80.00	4.0212, 0.2513	7.538, 20.000	3.2
CsBr	6.38	2.78	0.120, 0.146, 0.160, 0.173, 0.187	136.05, 97.09	3.5688, 0.1131	8.163, 15.534	4.0
CsI	6.31	3.02	0.130, 0.147, 0.163, 0.177, 0.185, 0.206, 0.218	161.29, 117.65	3.2673, 0.0628	11.290, 17.648	3.4

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[a] Static dielectric constant data are from Ref. [13, 19, 20, 21, 118].

[b] High-frequency dielectric constant data are from Ref. [13, 21, 22].

[c] The ultraviolet absorption peaks are measured by Hilsch and Pohl [23], Schneider and O'Bryan [24], and Ramachandran [17].

[d] The order of κ_I's and γ_I's corresponds to the order of the λ_I's. Data sources: see Ref. [13, 21]; for LiF see Ref. [14]; for NaCl see Ref. [15]; for KBr see Ref. [16]; for KI see Ref. [25]; for CsCl, CsBr, and CsI see Ref. [26].

[e] Values of $(1/\lambda_I)$ $(d\lambda_I/dT)$ are from Tsay, et al. [18], except for LiI, RbF, RbI, and CsF, which are estimated from the pattern of $(1/\lambda_I)$ $(d\lambda_I/dT)$ variation of sodium and potassium halides. Values having an "~" sign in front are estimated from the Grüneisen approximation.

For some materials, experimental data on n are insufficient to perform the least-squares fitting. Examples are LiCl, LiBr, CsF, for which n has been measured at only a single wavelength, the mean of sodium D lines. For such cases a means should be developed to obtain reasonable estimates by use of the available data for other properties which are intimately related to n. The following simplified equation (two-oscillator model) of the Sellmeier type is proposed for this purpose:

$$n^2 = A + \frac{(\epsilon_{uv} - A)\lambda^2}{\lambda^2 - \lambda_u^2} + \frac{(\epsilon_s - \epsilon_{uv})\lambda^2}{\lambda^2 - \lambda_I^2}, \tag{13}$$

where A is an adjustable parameter, λ_u the unweighted averaged value of the wavelengths of the ultraviolet absorption peaks, and λ_I the wavelength of the fundamental infrared absorption peak. The adjustable parameter A in eq (13) can be determined even if only one measurement of n is available because the quantities ϵ_s, ϵ_{uv}, λ_u, and λ_I are available (see table 3).

Note that in the present work no attempt was made to analyze the refractive index data other than those obtained at temperatures near room temperature, because of insufficiency of data. However, information and data belonging to this category are listed along with those for room temperature (see section 3). In the far infrared region, the refractive indices at low temperatures are usually derived from the analysis on the reflection spectra. The static and high-frequency dielectric constants and the wavelengths of absorption peaks at low temperatures are either found by these analytic calculations or by direct measurements. In order to facilitate the calculation of the refractive indices at low temperatures, we have listed in table 4 the up-to-date values of important physical parameters which are essential in constructing the dispersion equation at low temperatures.

TABLE 4. SOME USEFUL PARAMETERS FOR DISPERSION EQUATIONS OF ALKALI HALIDES AT LIQUID HELIUM TEMPERATURE (T=4.2 K)

	ϵ_s [a]	ϵ_{uv} [b]	$\lambda_I(\mu m)$ [a]	λ_u [b]
LiF	8.50	1.93	31.45	0.0724
LiCl	10.83	2.79	45.25	-
LiBr	11.95	3.22	53.48	-
LiI		3.89	66.01	-
NaF	4.73	1.75	38.17	0.0808
NaCl	5.43	2.35	56.18	0.1169
NaBr	5.78	2.64	68.49	-
NaI	6.60	3.08	80.65	-
KF	5.11	1.86	49.63	-
KCl	4.49	2.20	66.23	0.1101
KBr	4.52	2.39	81.30	0.1305
KI	4.68	2.68	91.32	0.1598
RbF	5.99	1.94	61.35	-
RbCl	4.58	2.20	79.37	-
RbBr	4.51	2.36	105.82	-
RbI	4.55	2.61	122.70	-
CsF	7.27	2.17	74.63	-
CsCl	6.68	2.67	93.90	-
CsBr	6.38	2.83	127.39	-
CsI	6.32	3.09	152.67	-

[a] Static dielectric constants and the wavelengths of transverse phonon are taken from Ref. [21].

[b] High-frequency dielectric constants and λ_u are taken from Ref. [13].

2.2. Temperature Derivative of Refractive Index, *dn/dT*

For users of the refractive index, information on the temperature derivative, *dn/dT*, is indispensable. The temperature dependence of the refractive index of crystals is of considerable interest in connection with a wide variety of optics applications. In the area of high-power lasers, *dn/dT* plays an important role in thermal lensing problems. A great deal of research effort is spent in finding the magnitude of *dn/dT* and its frequency dependence in the laser wavelength regions.

With regard to the thermo-optical behavior of the alkali halides in general, the existing data are not so useful as might be expected. Although a sizable body of experimental work on *dn/dT* exists, much of the data is concentrated in limited spectral regions, usually in the visible and near ultraviolet. Useful data outside these regions, especially in the infrared, are very often unavailable—a very discouraging fact to workers in laser research. It is, therefore, highly desirable to obtain a theoretical prescription which allows prediction of *dn/dT* over a wide range of wavelengths, based on at most a small number of known measurements.

Ramachandran [17] presented a semiempirical theory of thermo-optical effects in crystals, in which the dispersion was fitted to experimental data, employing a series of oscillator frequencies and strengths as adjustable parameters. A close correlation was found between temperature shifts of various parameters and those of the fundamental oscillator frequencies. Unfortunately, the parameters chosen were rather numerous and often physically obscure or not unique; no general prescription was presented for determining their temperature variations, which are necessary for calculating *dn/dT*. Tsay, Bendow, and Mitra [18] introduced a two-oscillator model which accounts for the variation with temperature of the energy gap (electronic contribution to *dn/dT*) and the fundamental phonon frequency (lattice contribution to *dn/dT*). Although this model is useful in predicting valuable information, it fits the existing data rather poorly and is inadequate for generating recommended data. A somewhat modified approach is to formulate a semiempirical equation which serves the dual purpose of giving a good fit to existing data and a reasonable prediction of missing information.

For the transparent region where absorption can be ignored, the dispersion equation, eq (10), can be rewritten as

$$n^2-1=B+\sum_i \frac{\kappa_i\lambda^2}{\lambda^2-\lambda_i^2}, \qquad (14)$$

where $B=A-1$. If one differentiates eq (14) with respect to temperature, one can arrive at the equation

$$2n\frac{dn}{dT}=\frac{dB}{dT}+\left(\frac{1}{N}\cdot\frac{dN}{dT}\right)\sum_i\frac{\kappa_i\lambda^2}{\lambda^2-\lambda_i^2}$$

$$+\sum_i\frac{2\kappa_i\lambda^4}{(\lambda^2-\lambda_i^2)^2}\left(\frac{1}{\lambda_i}\frac{d\lambda_i}{dT}\right), \qquad (15)$$

since κ_i may be written as $\kappa_i' N\lambda_i^2$, where N is the number of oscillators per unit volume, and both N and λ_i are functions of temperature [108]. Since

$$-\frac{1}{N}\frac{dN}{dT}=\frac{1}{V}\frac{dV}{dT}=3\alpha, \qquad (16)$$

where α is the linear thermal expansion coefficient, eq (15) may be written:

$$2n\frac{dn}{dT}=C-3\alpha(n^2-1)+\sum_i F(\lambda,\lambda_i)\left(\frac{1}{\lambda_i}\frac{d\lambda_i}{dT}\right), \qquad (17)$$

where C is effectively a constant over a limited temperature range and

$$F(\lambda,\lambda_i)=\frac{2\kappa_i\lambda^4}{(\lambda^2-\lambda_i^2)^2}.$$

To this point, we have followed Ramachandran [17] closely. The second term on the right side of eq (17) expresses the change in refractive index resulting from a change in density, while the remaining terms give the change due to the shifting of the absorption bands with temperature.

In the following development, we will modify eq (17) to an empirical form which resembles Tsay's [18], but with adjustable parameters. As in arriving at eq (13), we replace the sum in eq (17) by two terms, one representing the effects of the bands in the ultraviolet region, associated with a mean wavelength λ_u, and the other arising from the fundamental infrared absorption band of wavelength λ_l. Thus eq (17) is simplified to

$$2n\frac{dn}{dT}=C-3\alpha(n^2-1)+F(\lambda,\lambda_u)\left(\frac{1}{\lambda_u}\frac{d\lambda_u}{dT}\right)$$

$$+F(\lambda,\lambda_l)\left(\frac{1}{\lambda_l}\frac{d\lambda_l}{dT}\right), \qquad (18)$$

on replacing C, $2\kappa_u(1/\lambda_u)(d\lambda_u/dT)$, and λ_u^2 by A_0, A_1, and A_2, respectively, we have

$$2n\frac{dn}{dT}=-3\alpha(n^2-1)+A_0$$

$$+\frac{A_1\lambda^4}{(\lambda^2-A_2)^2}+\frac{2\kappa_l\lambda^4}{(\lambda^2-\lambda_l^2)^2}\left(\frac{1}{\lambda_l}\frac{d\lambda_l}{dT}\right). \qquad (19)$$

Since the quantities κ_l, λ_l, and $(1/\lambda_l)\cdot(d\lambda_l/dT)$ are experimentally available, this leaves in eq (19) only three adjustable parameters, A_0, A_1, and A_2.

Although the adjustable parameters in eq (19) can be determined by a small number of experimental data, a wide wavelength range of the input data is required. Unfortunately, this condition is not satisfied by the existing data on the dn/dT of alkali halides. In fact, dn/dT has been measured for only seven of the alkali halides, in the following ranges.

LiF	0.21–1.08 μm and at 3.5 μm
NaF	0.21–1.08 μm and at 3.5 μm and 8.5 μm
NaCl	0.21–8.85 μm and at 10.6 μm
KCl	0.21–8.85 μm and at 10.6 μm and 21.0 μm
KBr	0.26–1.08 μm
KI	0.25–1.08 μm
CsI	0.30–46.24 μm

It is clear that meaningful least-squares calculations can only be carried out for the five materials (LiF, NaF, NaCl, KCl, and CsI) for which the available data cover a sizeable wavelength range. In the process of calculation we have found two empirical facts which gave clues to further reduce the unknown parameters in eq (19). The first is that the parameter A_2 in eq (19) turns out to be very close to the square of the wavelength of the uv absorption peak nearest the transparent region. The second relates to the quantity $(1/\lambda_u)(d\lambda_u/dT)=A_1/2\kappa_u$. In the case of NaF and NaCl this does not depend on the halide involved: a result that will be assumed to hold for the other alkali halides. This idea is also supported by the fact that a log-log plot of $(1/\lambda_u)\cdot(d\lambda_u/dT)$ against the atomic number Z of the four alkali ions for which data are available, is a straight line despite the variety of halide ions involved (see fig. 2). This figure shows that $(1/\lambda_u)(d\lambda_u/dT)$ and Z are connected by a power law, and thus a reasonable value for the former quantity can be predicted for Rb (a dot in the figure), for which a more direct determination is not presently available. Only one unknown parameter, A_0, in eq (19), then remains to be found in order to make a meaningful estimation for those materials on which no experimental data are available. This problem is solved and discussed in the next paragraph.

At an intermediate wavelength, λ, in the transparent region, the contribution from the infrared is negligible

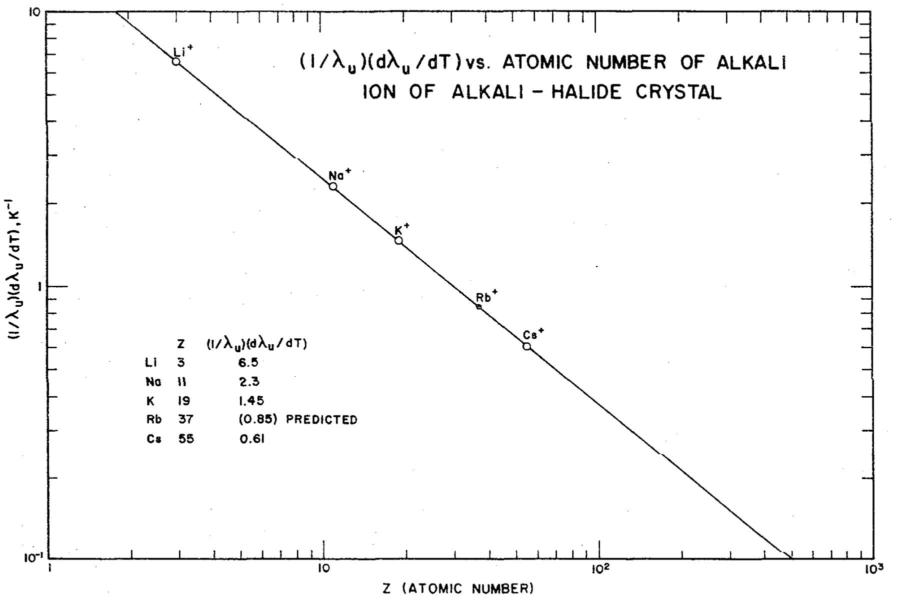

FIGURE 2. $(1/\lambda_u)$ $(d\lambda_u/dT)$ vs Atomic Number of Alkali Ion of Alkali-Halide Crystals

and A_2 is much smaller than λ^2. Equation (18) can then be reduced to

$$2n\frac{dn}{dT} = -3\alpha(n^2-1) + A_0 + 2(\epsilon_{uv}-1)\left(\frac{1}{\lambda_u}\frac{d\lambda_u}{dT}\right). \tag{20}$$

By treating the variation in index as due entirely to the change in density except at the extremes of the transmitting range, we define an effective linear thermal expansion coefficient α' such that

$$2n\frac{dn}{dT} = -3\alpha'(n^2-1). \tag{21}$$

The values of α' for LiF, NaCl, KCl, and CsI were evaluated at wavelength 1 μm. It is interesting to find that the ratio, α'/α, is linearly related to the atomic number of the positive ion of alkali halides, as shown in figure 3. The prediction for Rb is indicated by a dot. The constant A_0 in eq (20) can be calculated by combining eqs (20) and (21):

$$A_0 = 3(\alpha-\alpha')(n^2-1) - 2(\epsilon_{uv}-1)\left(\frac{1}{\lambda_u}\frac{d\lambda_u}{dT}\right). \tag{22}$$

With these empirical findings we are in a position to construct formulas of the form of eq (19) to calculate dn/dT for all alkali halides over a wide range of λ.

For convenience, we display in table 5 all the necessary parameter values for constructing dn/dT formulas, although some of the parameters are already listed in tables 2 and 3.

In view of the scantiness of dn/dT data and the nonunique temperature for observation, the dn/dT values calculated by the formulas constructed in this way agree remarkably well with the available data, as one can see in the next section. The prediction made for an unmeasured material can be considered as reasonable estimation. Here it should be emphasized that the dn/dT formulas developed in this work are only valid at 293 K. However, it seems reasonable to apply them in the range 293 ± 50 K.

3. Numerical Data

Reference data are generated through critical evaluation, analysis, and synthesis of the available experimental data. The procedure involves critical evaluation of the validity and accuracy of available data and information, resolution and reconciliation of disagreements in conflicting data, correlation of data in terms of various controlling parameters, curve fitting with theoretical or empirical equations, comparison of resulting values with theoretical predictions or with results derived from semi-theoretical relationships or from generalized empirical correlations, etc. Physical optical principles and semi-empirical techniques are employed to fill gaps and to extrapolate existing data so that the resulting recommended values are internally consistent and cover as wide a range of each of the controlling parameters as possible.

No attempt was made to analyze the thin film data and the reststrahlen region results because of scantiness of reliable information. However, experimental data of this sort are also presented in data tables along with those for the transparent region.

The compilation contains a number of figures and tables of refractive index and its derivatives as a func-

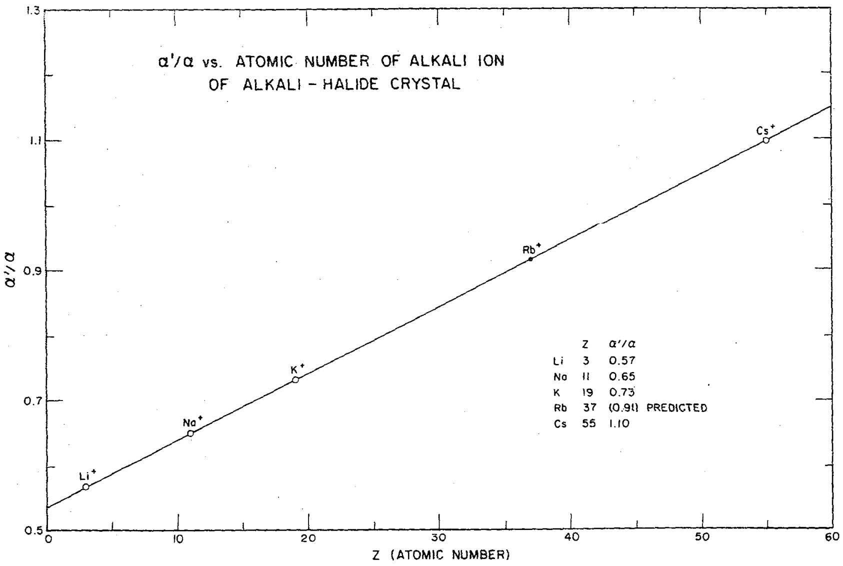

FIGURE 3. α'/α vs Atomic Number of Alkali Ion of Alkali-Halide Crystals

TABLE 5. PARAMETERS FOR THE dn/dT FORMULAS OF ALKALI HALIDES AT ROOM TEMPERATURE

	$\frac{1}{\lambda_u}\frac{d\lambda_u}{dT}^a$	α'/α^b	α^c	$\frac{1}{\lambda_I}\frac{d\lambda_I}{dT}^d$	$\epsilon_{uv}-1^d$	$\epsilon_s-\epsilon_{uv}^d$	λ_I^d	n^e	A_2^f	A_1^g	A_0^h
LiF	6.5	0.57	3.32	13.0	0.93	7.11	32.79	1.387	$(0.0738)^2$	12.09	-8.13
LiCl	6.5	0.57	4.38	21.0	1.75	9.11	49.26	1.659	$(0.143)^2$	22.75	-12.85
LiBr	6.5	0.57	4.98	25.0	2.16	10.07	57.80	1.779	$(0.173)^2$	28.08	-14.18
LiI	6.5	0.57	5.94	22.0	2.80	7.23	70.42	1.951	$(0.212)^2$	36.40	-14.90
NaF	2.3	0.65	3.17	12.5	0.74	3.332	40.57	1.322	$(0.117)^2$	3.404	-0.92
NaCl	2.3	0.65	3.97	28.0	1.33	3.56	60.98	1.532	$(0.158)^2$	6.118	-0.50
NaBr	2.3	0.65	4.23	32.0	1.60	3.796	74.63	1.622	$(0.188)^2$	7.360	-0.12
NaI	2.3	0.65	4.55	29.0	2.01	4.27	86.21	1.748	$(0.228)^2$	9.246	0.57
KF	1.45	0.73	3.48	23.0	0.85	3.65	51.55	1.358	$(0.126)^2$	2.465	-0.08
KCl	1.45	0.73	3.71	27.0	1.17	2.64	70.42	1.480	$(0.162)^2$	3.393	0.19
KBr	1.45	0.73	3.87	36.0	1.36	2.54	87.72	1.544	$(0.187)^2$	3.944	0.39
KI	1.45	0.73	4.08	34.0	1.65	2.44	98.04	1.640	$(0.219)^2$	4.785	0.80
RbF	0.85	0.91	2.75	25.0	0.93	4.55	63.29	1.392	$(0.132)^2$	1.581	-0.89
RbCl	0.85	0.91	3.60	34.0	1.18	2.74	85.84	1.483	$(0.166)^2$	2.006	-0.84
RbBr	0.85	0.91	3.75	38.0	1.34	2.52	114.29	1.540	$(0.191)^2$	2.278	-0.89
RbI	0.85	0.91	4.15	36.0	1.58	2.36	132.45	1.623	$(0.223)^2$	2.686	-0.85
CsF	0.61	1.10	3.20	25.0	1.16	5.92	78.74	1.472	$(0.136)^2$	1.415	-2.54
CsCl	0.61	1.10	4.63	32.0	1.63	4.32	100.50	1.625	$(0.162)^2$	1.989	-4.27
CsBr	0.61	1.10	4.74	40.0	1.78	3.88	136.05	1.678	$(0.187)^2$	2.172	-4.75
CsI	0.61	1.10	4.90	34.0	2.02	3.57	161.29	1.757	$(0.218)^2$	2.464	-5.53

a - From Figure 2.
b - From Figure 3.
c - From Table 2.
d - From Table 3.
e - n is evaluated at wavelength of 1 μm.
f - A_2 equals the square of the wavelength of the uv absorption peak (listed in Table 3) nearest the transparent region.
g - $A_1 = 2(\epsilon_{uv}-1)\,1/\lambda_u(d\lambda_u/dT)$.
h - obtained according to Eq. (22).

tion of wavelength. The conventions used in this presentation and special comments on the interpretation and use of the data are given below.

The refractive index of alkali halides and its wavelength and temperature derivatives are presented according to the material order listed in table 1. Original data are tabulated as they appear in the literature. However, energy expressed in units of wave number or electron volt was converted in all cases into wavelength in units of μm.

In all figures containing experimental data, a data set is denoted by a ringed number. These numbers correspond to those given in the accompanying tables on source and technical information and experimental data. When several sets of data are too close together to be distinguishable, some of the data sets, though listed in the table, are omitted from the figure for the sake of clarity. For each of those omitted data, an asterisk is placed after the value in the experimental data table. The much heavier curves drawn in the figures represent the proposed values of the property. These heavy curves may be continuous or dashed. Heavy continuous (solid) curves represent recommended reference values. Accompanying sections of heavy dashed curves are used to represent the provisional values.

For the index n and dn/dT figures, the wavelength is plotted on a logarithmic scale in order to cover a wide wavelength range in a single plot. For the $dn/d\lambda$ figure, both $dn/d\lambda$ and λ are logarithmically plotted. For the four materials LiF, NaCl, KCl, and KBr, the refractive index data for the transparent region are replotted on an enlarged scale in order to show the details in the variation of the property.

The tables on source and technical information give for each set of data the following information: the reference number, author's name (or names), year of publication, experimental method used for the measurement, wavelength range covered by the data, temperature of observation, and description and characterization of the specimen and information on measurement conditions that are contained in the original paper. In these tables the code designations used for the experimental methods for refractive index determinations are as follows:

D	Deviation method (prism method)
P	Pulfrich or Abbe refractometer
I	Interference method
T	Transmission method
R	Reflection method
M	Immersion method
L	Multilayer method
F	Focal length method

The methods listed above are arranged in the order of the inherent accuracy and the popularity of their usages. The deviation method is the most popular and accurate means of determining the refractive indices to the fifth decimal place or better. The Pulfrich refractometer and interference technique can be used up to the fourth decimal place. Transmission, reflection, and immersion methods yield results good to the third place, while the multilayer and focal length results are no better than two or three places. For a comprehensive yet concise review of all these methods, the reader is referred to the text in [3] and [4].

For some materials, dispersion equations have been proposed in a number of earlier works. In such cases, a table listing a few typical proposed equations is given. All equations are converted to the form of eq (10) whenever possible so as to facilitate a visual comparison. This table is by no means an exhaustive collection; however, it gives the reader a general picture on the evolution of the dispersion formula used in the calculation of the refractive index.

In the tables of recommended (including provisional) values, the values are presented with step-wise increasing increments in wavelength. The magnitudes of the increments vary with the slope and curvature of the curve to facilitate linear interpolations. The following scheme is uniformly adopted for this presentation.

Wavelength range	Increment
< 0.30 μm	0.002 μm
0.30– 0.40 μm	0.005 μm
0.40– 0.60 μm	0.01 μm
0.60– 1.00 μm	0.02 μm
1.00– 5.00 μm	0.05 μm
5.00–10.00 μm	0.10 μm
10.00–20.00 μm	0.20 μm
> 20.00 μm	0.50 μm

In the tables, values for each property are given to the same number of decimal places in order to show the variation of the property and for tabular smoothness; this should not be interpreted as indicative of the accuracy of the values. The uncertainties of the tabulated values on the refractive index and dn/dT for each material in different wavelength ranges is given in the discussion pertaining to the material. In connection with this, the tabulated values are classified as "recommended values" or "provisional values." The criteria of the classification depend upon the level of confidence of the values as given below:

Uncertainty range	Classification
For refractive index:	
≤ 0.005	recommended
> 0.005	provisional
For dn/dT (in units of 10^{-5} K^{-1}):	
≤ 0.3	recommended
> 0.3	provisional

It should be noted that recommendations are made only for the bulk material at 293 K in the transparent wavelength region.

In general, refractive indices obtained by the deviation method are reported to the fifth or sixth decimal place. However, detailed composition and characterization of the specimens are usually not clearly given by the researchers and impurities in the sample and conditions of the surfaces are decisive factors affecting the observed results. Therefore such highly accurate data can not be applied to a sample chosen at random. For this reason we do not attempt to recommend any particular set of data with the reported high accuracy, but to generate the most probable values for the pure crystals. As a result, the estimated uncertainties for the recommended values on the refractive index are higher than those of the reported data obtained by high-precision measurements. In this work, the highest estimated accuracy of refractive index is to the fourth decimal place.

In each of the next twenty subsections, data and information on an alkali halide are presented in this order:

a brief text discussing the available data,

a table of recommended (including provisional) values on n, $dn/d\lambda$, and dn/dT,

a figure of n (sometimes two figures for clarity),

a figure of $dn/d\lambda$,

a figure of dn/dT,

a table of source and technical information,

a table of experimental data on n,

a table of experimental data on dn/dT (if any),

a table for comparison of proposed dispersion equations (if any).

In constructing the dispersion equation for a given material, the number of terms in the equation depends upon the available information on the wavelengths of absorption peaks. No attempt was made to equalize the number of terms for all the materials by introducing terms with unknown absorption peak positions. Although there exist many absorption bands which have not been observed, their effects on the transparent region are likely to be negligible. The overall effective contribution from these unknown terms is included in the adjustable constant A of eq (10) of section 2 with the restriction that eqs (11) and (12) have to be satisfied. This was the standard procedure used in determining the number of terms in the dispersion equation of the materials NaF, NaCl, NaBr, KF, KCl, KBr, KI, RbCl, RbBr, and RbI for which available data were adequate. In the case of each of the four cesium halides, except CsF, only one of the two infrared absorption peaks was included in the calculation because the other contributed insignificantly to the refractive index. For each of the six materials, namely LiCl, LiBr, LiI, NaI, RbF, and CsF, the refractive index was measured for only a single wavelength, the means of the sodium D line. Therefore, in this case the dispersion equation was constructed based on the two oscillator model in which the effective ultraviolet absorption peak was derived from the linear average of the observed peaks. The weighted average was not used because the reported intensities were not reliable. The ultraviolet absorption peak of the remaining material, LiF, was not available; the effective uv peaks were therefore treated as an adjustable parameter. The result obtained in this case is in close agreement with that obtained by Tilton and Plyler [32].

3.1. Lithium Fluoride, LiF

Lithium fluoride is transparent from 0.12 to 9.0 μm. In the region 0.25–4.5 μm the dispersion is low and transmission is high. Less transmission and higher dispersion are found in the low ultraviolet and the infrared. In the low ultraviolet, optical components must be made very thin in order to obtain maximum transmission. Selected specimens of lithium fluoride, in moderately thin pieces, may be expected to transmit several percent of the light down to wavelengths as short as 0.11 μm. Impurities in the crystal, poor polish, and layers of foreign material on the surface may reduce the transmission in the Schumann region down to a negligible quantity. In the infrared, transmission begins to fall off rapidly at 7 μm, and a prism is useful to 5 μm.

Optically speaking, lithium fluoride closely resembles calcium fluoride. However, lithium fluoride is preferable to calcium fluoride for use in prismatic form because of its much greater dispersion in the infrared and greater transparency in the extreme ultraviolet.

Unlike the other alkali halides, lithium fluoride is practically insoluble, and advantage is taken of this fact in the purification of the salt. High purity single crystals of lithium fluoride up to 4 kg in weight are commercially available and are suitable for making optical components in various sizes.

Measurements of the refractive index of lithium fluoride date back to 1927. The existing data cover a spectral range from 0.00236 to 600 μm and at 2000 μm. Based on the optical behavior of the material and the experimental techniques, these data fall quite naturally into two categories: the transparent region (~0.11 to ~9.0 μm) and the absorption regions ($\lesssim$0.11 and $\gtrsim$9.0 μm).

For the transparent region, since large sizes of LiF are easily obtained, the deviation method is commonly used with the sample in prismatic form. This method was adopted by a number of researchers: Gyulai [27] in 1927, Schneider [28] in 1935, Hohls [29] in 1937, Harting [30] in 1943, Durie [31] in 1950, and Tilton and Plyler [32] in 1951. The deviation method, though the oldest, is often considered as the most accurate; less accurate data can be obtained by the interference method.

Due to the high absorption in the low uv and far IR regions, the deviation method and interferometry cannot be used. Refractive indices are obtained either by measuring transmission of thin films or by theoretical analysis of the reflection spectra from the bulk material. Rough data may be due to difficulties in thin film preparation and inaccuracy in the reflectivity measurements. While numerous publications are available for the refractive index in the IR regions, only three sets of data exist in the low uv regions, for 0.00236–0.0113 μm, 0.0496–0.1771 μm, and 0.0898–0.1240 μm. Collectively, these works give a spectrum of the refractive index of LiF from 0.00236 μm to 2000 μm.

Data obtained by deviation and interference methods are chosen for our data analysis and evaluation. Among the chosen sets, those measured by Tilton and Plyler [32] and Harting [30] are reliable, and heavy weights are therefore assigned to them. The accuracy of the values reported by Gyulai [27] is one unit in the third decimal place, although his values are given to the fourth place for the purpose of tabular smoothness. Hohls' data in the region 5.48–11.62 μm are for thin films, resulting in large uncertainties because the properties of thin films are not unique, but vary widely with surface conditions, the process of preparation and the aging of the film specimens. Schneider's data [28] are extracted from a figure, with uncertainties depending on the operator's judgment, and resulting values that may be either consistently high or low. Data sets with large uncertainties are assigned low weights.

Since the selected data sets were measured at various temperatures, corrections should be made to reduce all of the data to 293 K. Not much dn/dT data are available; however, the results of the least squares fitting of the dn/dT data to eq (19), together with the results obtained for NaF, NaCl, KCl, and CsI, lead to the parameter values listed in table 5. This enabled us to construct the following expression for dn/dT in units of $10^{-5}\,\mathrm{K}^{-1}$, valid in the temperature range 293±50K:

$$2n\frac{dn}{dT}=-9.96\,(n^2-1)-8.13+\frac{12.09\,\lambda^4}{(\lambda^2-0.00544)^2}+\frac{184.86\,\lambda^4}{(\lambda^2-1075.18)^2}, \qquad (23)$$

where λ is in units of μm. Close agreement of the values calculated by this equation and the experimental data can be seen in the dn/dT figure. By use of this equation, the refractive index data obtained at temperatures other than 293 K were reduced to 293 K, allowing construction of a dispersion equation for LiF.

Dispersion equations for LiF were proposed from time to time by a number of authors and appeared in different forms. Table 10 lists the dispersion equations in chronological order, to facilitate a close comparison and reveal clues for choosing initial parameter values for iterative fitting calculations. The other necessary input parameters can be found in table 3. With the aid of the available information, least-squares fitting of the reduced data to the form of eq (10) was readily carried out and resulted in a dispersion equation of LiF at 293 K in the wavelength region 0.10–11.0 μm.

$$n^2=1+\frac{0.92549\,\lambda^2}{\lambda^2-(0.07376)^2}+\frac{6.96747\,\lambda^2}{\lambda^2-(32.79)^2} \qquad (24)$$

where λ is in units of μm.

Equations (23) and (24) were used to generate the reference data given in the table of recommended values. The values of $dn/d\lambda$ were simply evaluated by the first derivative of eq (24). Although the values of n are given to the fifth decimal place and dn/dT to the second, they do not reflect the degree of accuracy and the extent of reliability. They are so given simply for smoothness of tabulation. For the proper use of the tabulated values the reader should follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.10– 0.15	2	0.01
0.15– 0.25	3	0.001
0.25– 0.35	4	0.0005
0.35– 3.00	4	0.0002
3.00– 5.00	4	0.0005
5.00– 7.00	3	0.001
7.00–11.0	3	0.006

For dn/dT:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.10– 0.15	1	0.9
0.15– 2.00	2	0.2
2.00–10.00	2	0.3
10.0 –11.00	1	0.9

TABLE 6. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiF AT 293 K*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.100	1.74062	13.91537	8.56	0.220	1.42912	0.42100	-1.11	0.400	1.39894	0.06212	-1.68
0.102	1.71461	12.15892	7.48	0.222	1.42829	0.40814	-1.12	0.410	1.39834	0.05770	-1.69
0.104	1.69178	10.71245	6.58	0.224	1.42749	0.39583	-1.14	0.420	1.39778	0.05371	-1.70
0.106	1.67160	9.50675	5.81	0.226	1.42671	0.38401	-1.16	0.430	1.39727	0.05011	-1.71
0.108	1.65363	8.49100	5.16	0.228	1.42595	0.37268	-1.17	0.440	1.39678	0.04684	-1.72
0.110	1.63753	7.62719	4.59	0.230	1.42522	0.36180	-1.19	0.450	1.39633	0.04388	-1.73
0.112	1.62304	6.88641	4.09	0.232	1.42450	0.35136	-1.20	0.460	1.39590	0.04118	-1.73
0.114	1.60992	6.24634	3.66	0.234	1.42381	0.34133	-1.21	0.470	1.39550	0.03871	-1.74
0.116	1.59800	5.68953	3.27	0.236	1.42314	0.33168	-1.23	0.480	1.39513	0.03646	-1.75
0.118	1.58711	5.20215	2.93	0.238	1.42248	0.32241	-1.24	0.490	1.39477	0.03440	-1.75
0.120	1.57715	4.77315	2.63	0.240	1.42185	0.31349	-1.25	0.500	1.39444	0.03251	-1.76
0.122	1.56799	4.39359	2.35	0.242	1.42123	0.30491	-1.26	0.510	1.39412	0.03077	-1.76
0.124	1.55955	4.05618	2.10	0.244	1.42063	0.29664	-1.28	0.520	1.39382	0.02918	-1.77
0.126	1.55174	3.75495	1.88	0.246	1.42004	0.28869	-1.29	0.530	1.39354	0.02770	-1.77
0.128	1.54450	3.48492	1.67	0.248	1.41947	0.28102	-1.30	0.540	1.39327	0.02634	-1.78
0.130	1.53778	3.24197	1.49	0.250	1.41892	0.27363	-1.31	0.550	1.39301	0.02509	-1.78
0.132	1.53152	3.02261	1.31	0.252	1.41838	0.26650	-1.32	0.560	1.39277	0.02393	-1.78
0.134	1.52568	2.82391	1.16	0.254	1.41785	0.25963	-1.33	0.570	1.39253	0.02285	-1.79
0.136	1.52021	2.64338	1.01	0.256	1.41734	0.25299	-1.34	0.580	1.39231	0.02185	-1.79
0.138	1.51509	2.47890	0.88	0.258	1.41684	0.24659	-1.35	0.590	1.39210	0.02092	-1.79
0.140	1.51029	2.32864	0.75	0.260	1.41635	0.24041	-1.36	0.600	1.39189	0.02006	-1.80
0.142	1.50577	2.19102	0.64	0.262	1.41588	0.23444	-1.37	0.620	1.39151	0.01851	-1.80
0.144	1.50152	2.06468	0.53	0.264	1.41542	0.22867	-1.38	0.640	1.39115	0.01716	-1.81
0.146	1.49751	1.94844	0.43	0.266	1.41496	0.22310	-1.39	0.660	1.39082	0.01599	-1.81
0.148	1.49372	1.84127	0.34	0.268	1.41452	0.21771	-1.39	0.680	1.39051	0.01496	-1.82
0.150	1.49013	1.74226	0.25	0.270	1.41409	0.21250	-1.40	0.700	1.39022	0.01406	-1.82
0.152	1.48674	1.65061	0.17	0.272	1.41367	0.20745	-1.41	0.720	1.38995	0.01327	-1.82
0.154	1.48353	1.56563	0.09	0.274	1.41326	0.20257	-1.42	0.740	1.38969	0.01258	-1.82
0.156	1.48048	1.48670	0.02	0.276	1.41286	0.19785	-1.43	0.760	1.38944	0.01196	-1.83
0.158	1.47758	1.41326	-0.05	0.278	1.41247	0.19328	-1.43	0.780	1.38921	0.01142	-1.83
0.160	1.47482	1.34482	-0.11	0.280	1.41209	0.18885	-1.44	0.800	1.38898	0.01094	-1.83
0.162	1.47220	1.28096	-0.18	0.282	1.41172	0.18456	-1.45	0.820	1.38877	0.01051	-1.83
0.164	1.46969	1.22128	-0.23	0.284	1.41135	0.18040	-1.46	0.840	1.38856	0.01014	-1.83
0.166	1.46731	1.16542	-0.29	0.286	1.41099	0.17637	-1.46	0.860	1.38836	0.00981	-1.84
0.168	1.46503	1.11309	-0.34	0.288	1.41065	0.17246	-1.47	0.880	1.38817	0.00951	-1.84
0.170	1.46285	1.06398	-0.39	0.290	1.41031	0.16867	-1.47	0.900	1.38798	0.00925	-1.84
0.172	1.46077	1.01786	-0.44	0.292	1.40997	0.16500	-1.48	0.920	1.38780	0.00902	-1.84
0.174	1.45878	0.97448	-0.48	0.294	1.40964	0.16143	-1.49	0.940	1.38762	0.00882	-1.84
0.176	1.45687	0.93365	-0.52	0.296	1.40933	0.15797	-1.49	0.960	1.38745	0.00864	-1.84
0.178	1.45504	0.89516	-0.56	0.298	1.40901	0.15461	-1.50	0.980	1.38728	0.00849	-1.84
0.180	1.45329	0.85885	-0.60	0.300	1.40871	0.15135	-1.50	1.000	1.38711	0.00835	-1.84
0.182	1.45161	0.82456	-0.64	0.305	1.40797	0.14359	-1.52	1.050	1.38670	0.00808	-1.84
0.184	1.44999	0.79215	-0.67	0.310	1.40727	0.13638	-1.53	1.100	1.38630	0.00791	-1.84
0.186	1.44844	0.76149	-0.71	0.315	1.40661	0.12965	-1.54	1.150	1.38591	0.00780	-1.84
0.188	1.44694	0.73245	-0.74	0.320	1.40597	0.12338	-1.56	1.200	1.38552	0.00775	-1.84
0.190	1.44551	0.70493	-0.77	0.325	1.40537	0.11751	-1.57	1.250	1.38513	0.00774	-1.84
0.192	1.44412	0.67882	-0.80	0.330	1.40480	0.11203	-1.58	1.300	1.38474	0.00777	-1.84
0.194	1.44279	0.65404	-0.83	0.335	1.40425	0.10689	-1.59	1.350	1.38435	0.00783	-1.84
0.196	1.44151	0.63049	-0.85	0.340	1.40373	0.10207	-1.60	1.400	1.38396	0.00791	-1.84
0.198	1.44027	0.60811	-0.88	0.345	1.40323	0.09755	-1.61	1.450	1.38356	0.00802	-1.84
0.200	1.43907	0.58681	-0.90	0.350	1.40275	0.09330	-1.61	1.500	1.38316	0.00814	-1.83
0.202	1.43792	0.56653	-0.93	0.355	1.40230	0.08930	-1.62	1.550	1.38275	0.00828	-1.83
0.204	1.43681	0.54720	-0.95	0.360	1.40186	0.08554	-1.63	1.600	1.38233	0.00843	-1.83
0.206	1.43573	0.52878	-0.97	0.365	1.40144	0.08200	-1.64	1.650	1.38190	0.00859	-1.83
0.208	1.43469	0.51121	-0.99	0.370	1.40104	0.07866	-1.64	1.700	1.38147	0.00876	-1.82
0.210	1.43368	0.49443	-1.02	0.375	1.40065	0.07550	-1.65	1.750	1.38103	0.00894	-1.82
0.212	1.43271	0.47840	-1.03	0.380	1.40028	0.07252	-1.66	1.800	1.38058	0.00913	-1.82
0.214	1.43177	0.46308	-1.05	0.385	1.39993	0.06970	-1.66	1.850	1.38011	0.00932	-1.82
0.216	1.43086	0.44844	-1.07	0.390	1.39959	0.06704	-1.67	1.900	1.37964	0.00952	-1.81
0.218	1.42998	0.43442	-1.09	0.395	1.39926	0.06451	-1.68	1.950	1.37916	0.00972	-1.81

TABLE 6. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiF AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
2.000	$1.3786\overline{7}$	$0.0099\overline{3}$	-1.80	3.950	$1.3502\overline{7}$	$0.0195\overline{8}$	-1.55	6.800	$1.269\overline{84}$	$0.037\overline{90}$	-0.69
2.050	$1.3781\overline{7}$	$0.0101\overline{4}$	-1.80	4.000	$1.3492\overline{8}$	$0.0198\overline{5}$	-1.54	6.900	$1.266\overline{01}$	$0.038\overline{68}$	-0.65
2.100	$1.3776\overline{6}$	$0.0103\overline{6}$	-1.80	4.050	$1.3482\overline{8}$	$0.0201\overline{3}$	-1.53	7.000	$1.262\overline{10}$	$0.039\overline{47}$	-0.60
2.150	$1.3771\overline{3}$	$0.0105\overline{7}$	-1.79	4.100	$1.3472\overline{7}$	$0.0204\overline{1}$	-1.52	7.100	$1.258\overline{12}$	$0.040\overline{27}$	-0.55
2.200	$1.3766\overline{0}$	$0.0107\overline{9}$	-1.79	4.150	$1.3462\overline{4}$	$0.0206\overline{8}$	-1.51	7.200	$1.254\overline{05}$	$0.041\overline{08}$	-0.50
2.250	$1.3760\overline{5}$	$0.0110\overline{2}$	-1.78	4.200	$1.3452\overline{0}$	$0.0209\overline{6}$	-1.50	7.300	$1.249\overline{90}$	$0.041\overline{91}$	-0.45
2.300	$1.3755\overline{0}$	$0.0112\overline{4}$	-1.78	4.250	$1.3441\overline{4}$	$0.0212\overline{4}$	-1.49	7.400	$1.245\overline{67}$	$0.042\overline{75}$	-0.40
2.350	$1.3749\overline{3}$	$0.0114\overline{7}$	-1.77	4.300	$1.3430\overline{7}$	$0.0215\overline{3}$	-1.48	7.500	$1.241\overline{35}$	$0.043\overline{60}$	-0.35
2.400	$1.3743\overline{5}$	$0.0117\overline{0}$	-1.77	4.350	$1.3419\overline{9}$	$0.0218\overline{1}$	-1.47	7.600	$1.236\overline{94}$	$0.044\overline{47}$	-0.29
2.450	$1.3737\overline{6}$	$0.0119\overline{4}$	-1.76	4.400	$1.3408\overline{9}$	$0.0221\overline{0}$	-1.46	7.700	$1.232\overline{45}$	$0.045\overline{36}$	-0.23
2.500	$1.3731\overline{6}$	$0.0121\overline{7}$	-1.76	4.450	$1.3397\overline{8}$	$0.0223\overline{8}$	-1.45	7.800	$1.227\overline{87}$	$0.046\overline{26}$	-0.17
2.550	$1.3725\overline{4}$	$0.0124\overline{1}$	-1.75	4.500	$1.3386\overline{6}$	$0.0226\overline{7}$	-1.44	7.900	$1.223\overline{20}$	$0.047\overline{18}$	-0.11
2.600	$1.3719\overline{2}$	$0.0126\overline{5}$	-1.75	4.550	$1.3375\overline{1}$	$0.0229\overline{6}$	-1.43	8.000	$1.218\overline{44}$	$0.048\overline{11}$	-0.05
2.650	$1.3712\overline{8}$	$0.0128\overline{9}$	-1.74	4.600	$1.3363\overline{6}$	$0.0232\overline{5}$	-1.42	8.100	$1.213\overline{58}$	$0.049\overline{06}$	0.01
2.700	$1.3706\overline{3}$	$0.0131\overline{3}$	-1.74	4.650	$1.3351\overline{9}$	$0.0235\overline{4}$	-1.41	8.200	$1.208\overline{62}$	$0.050\overline{04}$	0.08
2.750	$1.3699\overline{7}$	$0.0133\overline{7}$	-1.73	4.700	$1.3340\overline{1}$	$0.0238\overline{4}$	-1.39	8.300	$1.203\overline{57}$	$0.051\overline{02}$	0.15
2.800	$1.3692\overline{9}$	$0.0136\overline{1}$	-1.73	4.750	$1.3328\overline{1}$	$0.0241\overline{3}$	-1.38	8.400	$1.198\overline{42}$	$0.052\overline{03}$	0.22
2.850	$1.3686\overline{0}$	$0.0138\overline{6}$	-1.72	4.800	$1.3315\overline{9}$	$0.0244\overline{3}$	-1.37	8.500	$1.193\overline{16}$	$0.053\overline{06}$	0.29
2.900	$1.3679\overline{0}$	$0.0141\overline{1}$	-1.71	4.850	$1.3303\overline{6}$	$0.0247\overline{3}$	-1.36	8.600	$1.187\overline{80}$	$0.054\overline{11}$	0.37
2.950	$1.3671\overline{9}$	$0.0143\overline{6}$	-1.71	4.900	$1.3291\overline{2}$	$0.0250\overline{3}$	-1.34	8.700	$1.182\overline{34}$	$0.055\overline{19}$	0.45
3.000	$1.3664\overline{7}$	$0.0146\overline{0}$	-1.70	4.950	$1.327\overline{86}$	$0.025\overline{33}$	-1.33	8.800	$1.176\overline{77}$	$0.056\overline{28}$	0.53
3.050	$1.3657\overline{3}$	$0.0148\overline{6}$	-1.69	5.000	$1.326\overline{59}$	$0.025\overline{63}$	-1.32	8.900	$1.171\overline{08}$	$0.057\overline{40}$	0.61
3.100	$1.3649\overline{8}$	$0.0151\overline{1}$	-1.69	5.100	$1.323\overline{99}$	$0.026\overline{24}$	-1.29	9.000	$1.165\overline{28}$	$0.058\overline{54}$	0.70
3.150	$1.3642\overline{2}$	$0.0153\overline{6}$	-1.68	5.200	$1.321\overline{34}$	$0.026\overline{86}$	-1.26	9.100	$1.159\overline{37}$	$0.059\overline{71}$	0.79
3.200	$1.3634\overline{5}$	$0.0156\overline{2}$	-1.67	5.300	$1.318\overline{62}$	$0.027\overline{49}$	-1.24	9.200	$1.153\overline{34}$	$0.060\overline{91}$	0.88
3.250	$1.3626\overline{6}$	$0.0158\overline{7}$	-1.67	5.400	$1.315\overline{84}$	$0.028\overline{12}$	-1.21	9.300	$1.147\overline{19}$	$0.062\overline{13}$	0.97
3.300	$1.3618\overline{6}$	$0.0161\overline{3}$	-1.66	5.500	$1.313\overline{00}$	$0.028\overline{76}$	-1.18	9.400	$1.140\overline{91}$	$0.063\overline{39}$	1.07
3.350	$1.3610\overline{5}$	$0.0163\overline{9}$	-1.65	5.600	$1.310\overline{09}$	$0.029\overline{41}$	-1.15	9.500	$1.134\overline{51}$	$0.064\overline{67}$	1.17
3.400	$1.3602\overline{2}$	$0.0166\overline{5}$	-1.64	5.700	$1.307\overline{11}$	$0.030\overline{07}$	-1.11	9.600	$1.127\overline{98}$	$0.065\overline{98}$	1.27
3.450	$1.3593\overline{8}$	$0.0169\overline{1}$	-1.64	5.800	$1.304\overline{07}$	$0.030\overline{73}$	-1.08	9.700	$1.121\overline{31}$	$0.067\overline{33}$	1.38
3.500	$1.3585\overline{3}$	$0.0171\overline{7}$	-1.63	5.900	$1.300\overline{97}$	$0.031\overline{41}$	-1.05	9.800	$1.114\overline{51}$	$0.068\overline{71}$	1.49
3.550	$1.3576\overline{7}$	$0.0174\overline{3}$	-1.62	6.000	$1.297\overline{79}$	$0.032\overline{09}$	-1.01	9.900	$1.107\overline{57}$	$0.070\overline{13}$	1.61
3.600	$1.3567\overline{9}$	$0.0177\overline{0}$	-1.61	6.100	$1.294\overline{55}$	$0.032\overline{78}$	-0.98	10.000	$1.100\overline{48}$	$0.071\overline{59}$	$1.7\overline{3}$
3.650	$1.3559\overline{0}$	$0.0179\overline{6}$	-1.60	6.200	$1.291\overline{23}$	$0.033\overline{48}$	-0.94	10.200	$1.085\overline{87}$	$0.074\overline{62}$	$1.9\overline{8}$
3.700	$1.3549\overline{9}$	$0.0182\overline{3}$	-1.60	6.300	$1.287\overline{85}$	$0.034\overline{19}$	-0.90	10.400	$1.070\overline{63}$	$0.077\overline{82}$	$2.2\overline{5}$
3.750	$1.3540\overline{7}$	$0.0185\overline{0}$	-1.59	6.400	$1.284\overline{40}$	$0.034\overline{91}$	-0.86	10.600	$1.054\overline{73}$	$0.081\overline{22}$	$2.5\overline{4}$
3.800	$1.3531\overline{4}$	$0.0187\overline{7}$	-1.58	6.500	$1.280\overline{87}$	$0.035\overline{64}$	-0.82	10.800	$1.038\overline{12}$	$0.084\overline{83}$	$2.8\overline{5}$
3.850	$1.3522\overline{0}$	$0.0190\overline{4}$	-1.57	6.600	$1.277\overline{27}$	$0.036\overline{39}$	-0.78	11.000	$1.020\overline{78}$	$0.088\overline{67}$	$3.1\overline{9}$
3.900	$1.3512\overline{4}$	$0.0193\overline{1}$	-1.56	6.700	$1.273\overline{59}$	$0.037\overline{14}$	-0.74				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.1. The number of digits with an overstrike are not relevant to accuracy of the data.

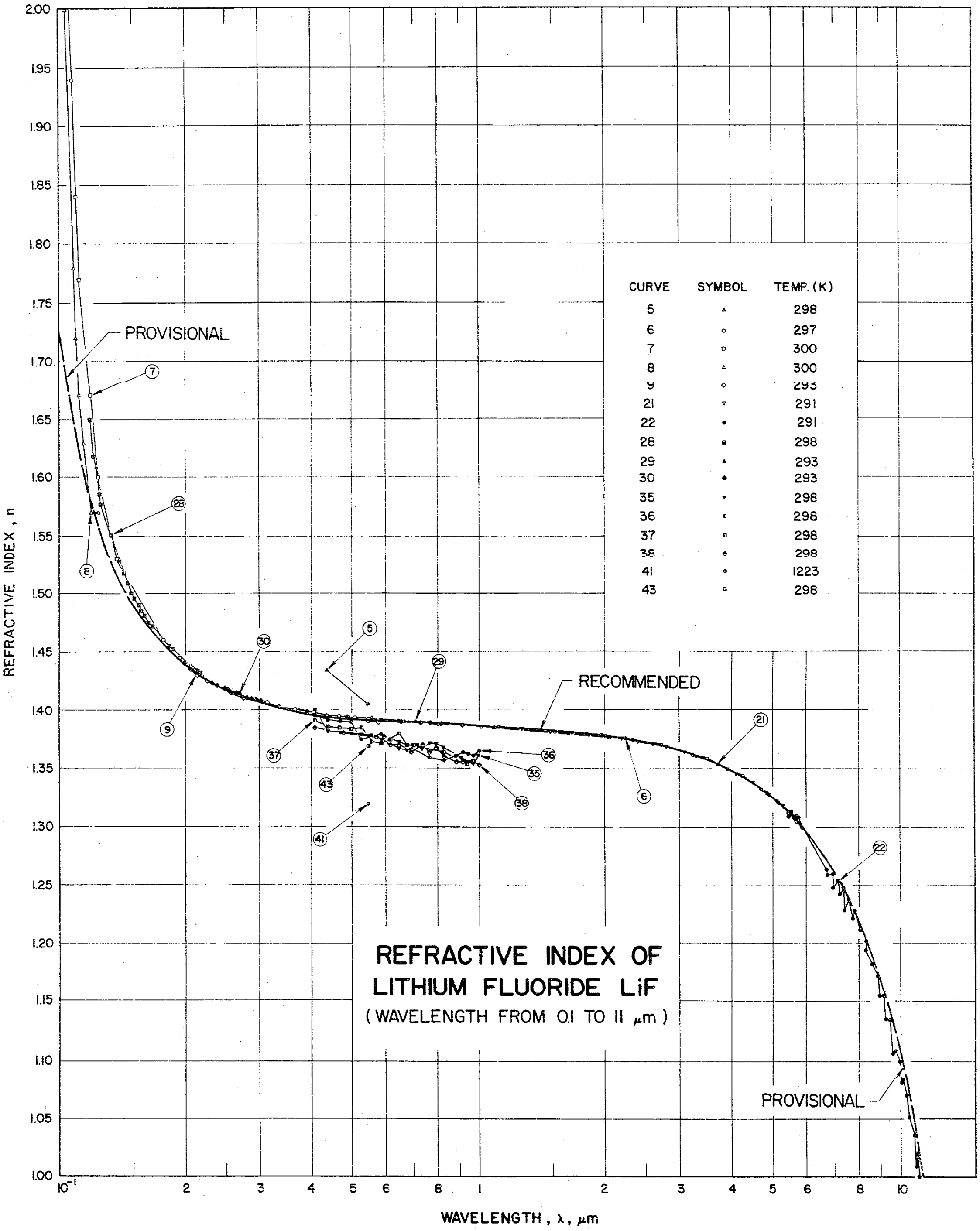

FIGURE 4. Refractive Index of LiF (transparent region)

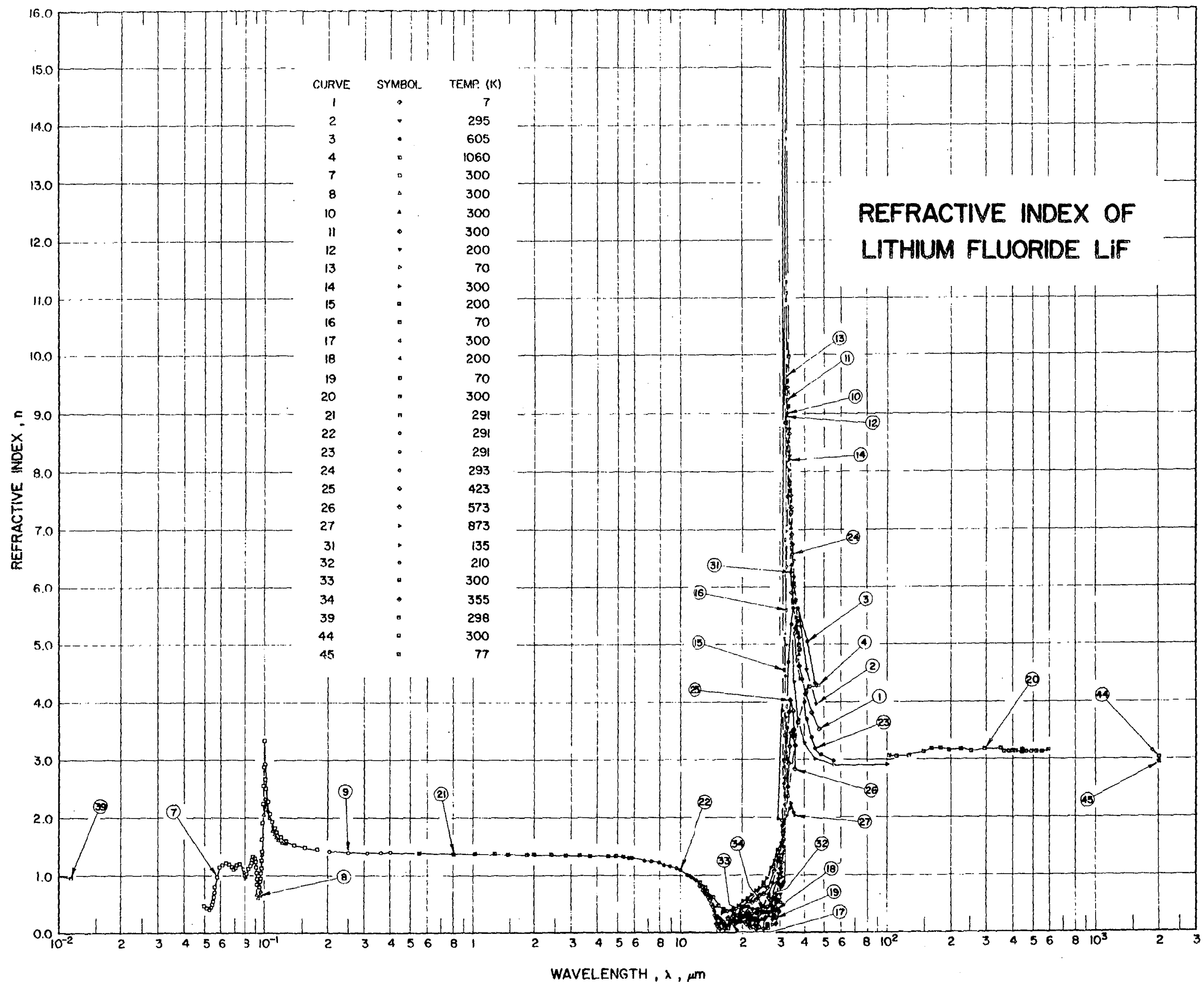

FIGURE 5. Refractive Index of LiF

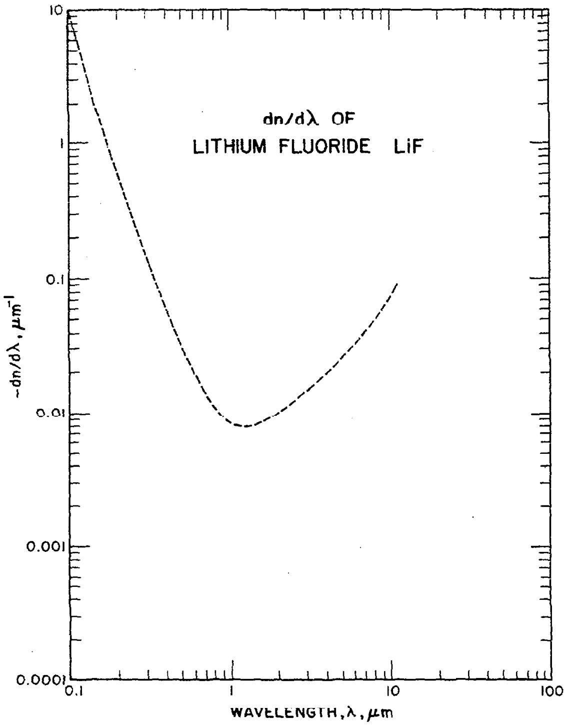

FIGURE 6. *dn/dλ* of LiF

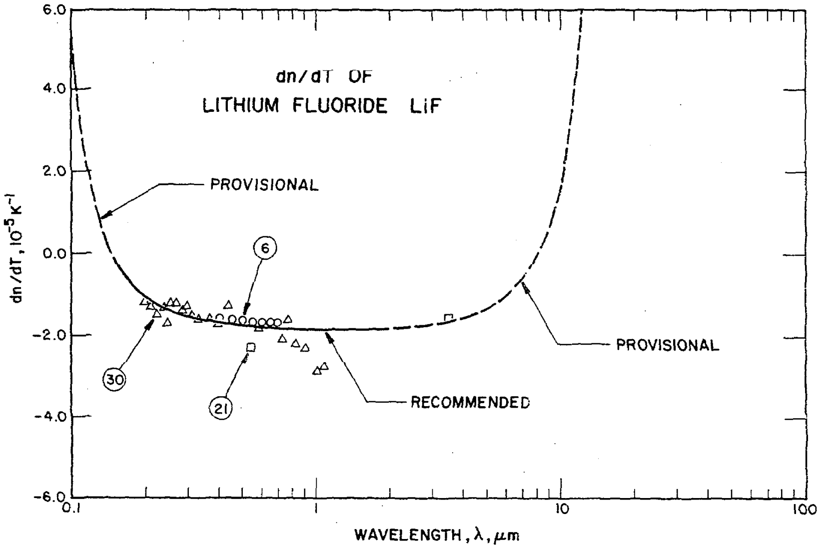

FIGURE 7. *dn/dT* of LiF

TABLE 7. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF LiF

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	14	Jasperse, J.R., Kahan, A., Plendl, J.N., and Mitra, S.S.	1966	R	12.5-50	7.5	Single crystal; high purity; specimen with hand polished surface optically flat to about 1/2 - wave of sodium D line and annealed in vacuum for two days at a temperature of about 3/4 of the melting temperature of the crystal; reflection spectrum analyzed by the Lorentz oscillator theory; data extracted from a smooth curve.
2	14	Jasperse, J.R., et al.	1966	R	12.5-50	295	Similar to above.
3	14	Jasperse, J.R., et al.	1966	R	12.5-50	605	Similar to above.
4	14	Jasperse, J.R., et al.	1966	R	12.5-50	1060	Similar to above.
5	33	Bispinck, H.	1967	R	0.4358, 0.5461	298	Thin films of LiF deposited on a Sb substrate; reflection spectrum was taken and refractive index derived by solutions to Vasicek formulae; the author made eleven measurements on n for each wavelength at various phase angles but only the linear averaged value was extracted.
6	32	Tilton, L.W. and Plyler, E.K.	1951	D	0.4-5.9	296.8	Synthetic crystal; prismatic specimens; digitized data were presented by the authors; the averaged temperature coefficient, dn/dT, was determined as -1.63×10^{-5} (constant within $\pm 0.05 \times 10^{-5}$) for the visible region (0.4 to 0.7 μm) in the temperature range of 293.2 to 333.2 K; a table of dn/dT was also given.
7	34	Roessler, D.M. and Walker, W.C.	1967	R	0.0496-0.1771	300	Crystal; specimen with freshly cleared reflective surface; reflection spectrum of near-normal incidence was analyzed by Kramers-Kronig method; digitized data were given by the authors.
8	35	Kato, R.	1961	R	0.0898-0.1240	300	Single crystal; pure; specimens freshly cleaved; reflection spectrum at 15° incident angle was analyzed by Kramers-Kronig relation; data extracted from a figure.
9	27	Gyulai, Z.	1927	D	0.1935-0.5770	293	Crystal, prismatic specimen with faces of 12 x 15 mm^2 and apex angle of 30°48'30"; digitized data were presented by the author; accuracy of this set of data is one unit of the third decimal place.
10	36	Fröhlich, D.	1962	L	23.2-37.9	300	Crystal; specimens were coated with CsBr or Se whose refractive indices were known; reflectivities were measured before and after the coating; refractive index of LiF was then calculated by an equation where n was explicitly expressed in terms of the measured reflectivities and the known refractive index and thickness of coating materials; this method is called the multilayer method and is designated by L; uncertainty of the measuremen amounted to 10%; data extracted from a figure.
11	37	Fröhlich, D.	1964	L	27.5-38.0	300	Crystal; plate specimen; coating material was Se; multilayer method was used to deduce refractive index of LiF; data extracted from a figure.
12	37	Fröhlich, D.	1964	L	27.5-38.0	200	Similar to above.
13	37	Fröhlich, D.	1964	L	27.5-38.0	70	Similar to above.
14	37	Fröhlich, D.	1964	R	27.5-38.0	300	Crystal; plate specimen; reflection spectrum was analyzed by Kramers-Kronig relation; data extracted from a smooth curve.
15	37	Fröhlich, D.	1964	R	27.5-38.0	200	Similar to above.
16	37	Fröhlich, D.	1964	R	27.5-38.0	70	Similar to above.

TABLE 7. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF LiF (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
17	37	Fröhlich, D.	1964	R	14.0-28.0	300	Similar to above.
18	37	Fröhlich, D.	1964	R	14.0-28.0	200	Similar to above.
19	37	Fröhlich, D.	1964	R	14.0-28.0	70	Similar to above.
20	38	Genzel, L. and Klier, M.	1956	T	100-600	300	Crystal; plate specimens with thickness of 145 μm, 726 μm and 4.1 mm; transmission method was used to determine n; data extracted from a figure.
21	29	Hohls, H.W.	1937	D	0.546-5.70	291	Crystal; prismatic specimen with faces of 3.1 x 3.4 cm^2 and apex angle of 60°0'20"; estimated uncertainties in n were ≤0.0003; digitized data were given; dn/dT for two lines were determined by measuring n at 291 K and 353 K.
22	29	Hohls, H.W.	1937	I	5.48-11.62	291	Crystal; plate specimens of 79.5, 69.5 and 148 μm in thickness; estimated uncertainties in refractive indices were ≤0.009; digitized data were given by the author.
23	29	Hohls, H.W.	1937	R	13.0-55.0	291	Plate specimens; refractive indices were calculated from experimental information of reflection and absorption; digitized data were given by the author.
24	39	Heilmann, G.	1958	R	15.0-36.0	293	Single crystal; plate specimen with polished surface of 3 x 7 cm; reflection spectra of polarized light at incident angles of 20° and 70° were reduced by graphical solution to Fresnel formulae; data extracted from a figure.
25	39	Heilmann, G.	1958	R	15.0-36.0	423	Similar to above.
26	39	Heilmann, G.	1958	R	15.0-36.0	573	Similar to above.
27	39	Heilmann, G.	1958	R	15.0-36.0	873	Similar to above.
28	28	Schneider, E.G.	1935	D	0.11-0.22	298	Single crystal; high purity; grown by the method of Bridgman; prismatic specimen with apex angle of 26°; data extracted from a figure.
29	31	Durie, D.S.L.	1950	D	0.30-2.06	293	Crystal; prismatic specimen with apex angle of 30°; uncertainties of 3×10^{-5} in the region 0.30 to 0.59 μm and 1.0×10^{-4} in 0.66 to 2.06 μm; digitized data were presented by the author.
30	30	Harting, H.	1943	D	0.20-1.083	293	Crystal; the author stated that the refractive indices were measured by F. Wolf on the specimen supplied by A. Smakula but no references were cited; digitized data were presented; dn/dT at 293 K for each wavelength was also given.
31	40	Gottlieb, M.	1960	R	16.0-100.0	135	Single crystal; obtained from the Harshaw Chemical Company; specimens with polished surfaces; reflection spectrum of 5° incident angle was analyzed by the Kramers-Kronig method; data extracted from a smooth curve.
32	40	Gottlieb, M.	1960	R	16.0-100.0	210	Similar to above.
33	40	Gottlieb, M.	1960	R	16.0-100.0	300	Similar to above.
34	40	Gottlieb, M.	1960	R	16.0-100.0	355	Similar to above.
35	41	Shklyarevskii, I.N., El-Shazli, A.F.A., and Govorushchenko, A.I.	1971	T	0.4-1.0	298	Film specimens; film thickness was not specifically given but in the range of 0.117 to 0.634 μm; deposited by vacuum evaporation on glass substrates and sealed between glass plates; uncertainties of n were within 0.1%; data extracted from a figure in which experimental data points were plotted; the authors stated that the refractive index was independent of film thickness in the above mentioned range.

TABLE 7. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF LiF (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
36	41	Shklyarevskii, I. N., El-Shazli, A. F. A., and Govorushchenko, A. I.	1971	T	0.4-1.0	298	Similar to above but for a different film thickness.
37	41	Shklyarevskii, I. N., et al.	1971	T	0.4-1.0	298	Similar to above but for a different film thickness.
38	41	Shklyarevskii, I. N., et al.	1971	T	0.4-1.0	298	Similar to above but for a different film thickness.
39	42	Lukirskii, A. P., Savinov, E. P., Ershov, O. A., and Shepelev, Yu. F.	1964	R	0.00236-0.0113	298	Film specimens; evaporated on Au or Al substrates; reflection spectra were analyzed by using Fresnel's formulae; digitized data were presented by the authors.
40	43	Ramaseshan, S.	1947	P	0.4358-0.5893	~298	Crystal; obtained from Harshaw Chemical Co.; polished specimen of size approximately 3 x 2 x 2 cm; specimen was cemented to the prism of a Pulfrich refractometer by a suitable liquid in determining refractive indices; reported uncertainty 2 units in the fifth place of decimal; digitized data presented.
41	44	Zarzycki, J. and Nandin, F.	1963	D	0.5461	1223	Molten LiF; liquid prism formed by the top surface of the molten and an immersed inclined platinum mirror; estimated uncertainty of 0.01 in refractive index; digitized data were presented.
42	45	Spangenberg, K.	1923	M	0.5893	295	Crystal; grown by slowly cooling of molten; cleaved specimens were immersed into various liquids with known refractive indices and viewed under a microscope; contour of crystal grains disappeared when the refractive indices of the liquid and crystal matched closely; it was found, for sodium D line, $1.391 < n_{LiF} < 1.392$; therefore the value 1.3915 ±0.0005 was taken.
43	46	Abeles, F.	1950	R, T	0.546	298	Thin film of LiF deposited on a glass substrate; refractive index was derived from information of reflection, transmission and Brewster angle; reported uncertainty 0.002 in n; digitized value was presented.
44	47	Dianov, E. M. and Irisova, N. A.	1967	I	2000	300	Plate specimens with various thicknesses; refractive index was determined from the information of the transmitted interferograms; digitized value was presented with uncertainty of 0.02.
45	47	Dianov, E. M. and Irisova, N. A.	1967	I	2000	77	Similar to above.
46	13	Lowndes, R. P. and Martin, D. H.	1968	D	0.4358-0.6438	290	Single crystal; prismatic sample; digitized data were given with uncertainty of ±0.0004.
47	13	Lowndes, R. P. and Martin, D. H.	1968	D	0.4358-0.6438	4	Similar to above.

TABLE 8. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiF

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 7.5 K	
12.50	0.82
13.00	0.73
13.35	0.67
13.68	0.62
13.85	0.57
14.12	0.50
14.33	0.45
14.66	0.31
14.90	0.14
15.08	0.11
15.43	0.07
16.37	0.07
18.98	0.19
19.49	0.19
20.62	0.13
21.60	0.08
22.94	0.05
25.00	0.05
28.25	0.14
29.41	0.35
30.30	0.82
30.77	1.95
21.15	20.00
33.11	7.55
34.72	5.90
36.10	5.27
37.74	4.61
40.16	4.14
43.10	3.82
46.95	3.54
CURVE 2 T = 295.0 K	
12.50	0.81*
12.99	0.75*
13.39	0.68*
13.68	0.62*
13.85	0.57*
14.12	0.50*
14.33	0.45*
14.90	0.22
15.13	0.18*
15.46	0.15
16.03	0.12
16.67	0.12
CURVE 2 (cont.) T = 295.0 K	
17.36	0.15
18.18	0.20
19.57	0.30
20.20	0.29
20.96	0.25
21.88	0.21
22.52	0.19
23.64	0.19
25.00	0.21
27.47	0.39
28.82	0.64
29.85	1.02
30.58	1.34
31.45	2.34
32.79	8.14
33.56	8.71
35.97	6.17
38.02	5.29
41.15	4.54
45.45	3.97
CURVE 3 T = 605.0 K	
12.50	0.81*
12.99	0.75*
13.39	0.68*
13.85	0.57*
14.12	0.50*
14.64	0.37
15.04	0.29
15.41	0.24
15.97	0.21
17.24	0.21
18.76	0.30
19.53	0.36
20.24	0.47
21.19	0.47
22.03	0.41
23.31	0.41
25.00	0.47
26.53	0.67
27.70	0.87
29.24	1.22
30.86	1.88
32.57	3.13
CURVE 3 (cont.) T = 605.0 K	
33.78	4.69
34.84	5.33
35.71	5.63
37.04	5.63
40.16	5.03
44.64	4.33
CURVE 4 T = 1060.0 K	
12.50	0.88
13.21	0.78
13.74	0.71
14.39	0.61
15.29	0.47
16.03	0.40
16.89	0.37
18.12	0.37
19.92	0.45
21.10	0.53
25.00	0.81
29.50	1.32
31.55	1.80
33.11	2.37
37.31	3.65
40.32	4.19
42.19	4.27
46.30	4.27
CURVE 5 T = 298.0 K	
0.4358	1.434
0.5461	1.405
CURVE 6 T = 296.8 K	
0.4047	1.39844
0.4358	1.39678
0.4678	1.39542
0.4800	1.39497
0.5086	1.39403
0.5461	1.39300
0.5780	1.39226
0.6438	1.39102
CURVE 6 (cont.) T = 296.8 K	
1.0140	1.38699
1.1287	1.38610
1.5295	1.38296
1.8131	1.38051
1.9701	1.37904
2.2493	1.37613
2.3254	1.37530
2.7144	1.37063
3.2432	1.36290
3.5078	1.35856
4.258	1.34413
4.866	1.32992
5.1456	1.32277
5.4638	1.31394
5.7637	1.30494
5.894	1.30089
CURVE 7 T = 300.0 K	
0.0496	0.47*
0.0506	0.44*
0.0517	0.43*
0.0523	0.42*
0.0525	0.43*
0.0530	0.43*
0.0532	0.44*
0.0534	0.45*
0.0537	0.46*
0.0538	0.47*
0.0539	0.48*
0.0540	0.50*
0.0541	0.51*
0.0544	0.55*
0.0549	0.62*
0.0553	0.70*
0.0558	0.80*
0.0564	0.91*
0.0569	0.99*
0.0574	1.04*
0.0594	1.08*
0.0590	1.14*
0.0605	1.18*
0.0620	1.20*
0.0636	1.21*
0.0653	1.19*
CURVE 7 (cont.) T = 300.0 K	
0.0667	1.17*
0.0670	1.15*
0.0674	1.14*
0.0677	1.13*
0.0689	1.11*
0.0700	1.13*
0.0704	1.14*
0.0710	1.16*
0.0713	1.18*
0.0717	1.19*
0.0734	1.20*
0.0756	1.16*
0.0765	1.12*
0.0770	1.09*
0.0775	1.06*
0.0780	1.02*
0.0785	0.99*
0.0790	0.98*
0.0800	1.00*
0.0810	1.04*
0.0821	1.08*
0.0822	1.12*
0.0843	1.17*
0.0849	1.19*
0.0855	1.22*
0.0861	1.25*
0.0867	1.27*
0.0873	1.30*
0.0879	1.32*
0.0886	1.32*
0.0888	1.32*
0.0892	1.32*
0.0895	1.31*
0.0898	1.29*
0.0902	1.24*
0.0905	1.15*
0.0908	1.05*
0.0912	0.95*
0.0915	0.88*
0.0918	0.84*
0.0922	0.82*
0.0925	0.81*
0.0928	0.80*
0.0932	0.80*
0.0936	0.80*
0.0939	0.81*
CURVE 7 (cont.) T = 300.0 K	
0.0943	0.84*
0.0946	0.91*
0.0950	0.97*
0.0954	1.04*
0.0957	1.13*
0.0961	1.26*
0.0965	1.42*
0.0969	1.64*
0.0972	1.92*
0.0976	2.24*
0.0980	2.57*
0.0984	2.89*
0.0992	3.34*
0.0999	2.93*
0.1008	2.68*
0.1016	2.51*
0.1033	2.28*
0.1055	2.08*
0.1078	1.94
0.1102	1.84
0.1127	1.77
0.1181	1.67
0.1240	1.60
0.1378	1.53
0.1550	1.49
0.1771	1.46
CURVE 8 T = 300.0 K	
0.0898	0.96*
0.0905	0.95*
0.0912	0.84*
0.0919	0.67*
0.0925	0.61*
0.0932	0.62*
0.0939	0.62*
0.0947	0.65*
0.0954	0.72*
0.0958	0.75*
0.0961	0.82*
0.0964	0.96*
0.0968	1.25*
0.0972	1.37*
0.0976	1.62*
0.0982	1.94*

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* Not shown in figure.

TABLE 8. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiF (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 8 (cont.) T = 300.0 K	
0.0984	2.06*
0.0992	2.32*
0.1000	2.32*
0.1008	2.28*
0.1016	2.20*
0.1026	2.14*
0.1033	2.06*
0.1041	2.00
0.1087	1.78
0.1107	1.72
0.1126	1.67
0.1148	1.63
0.1192	1.57
0.1240	1.57
CURVE 9 T = 293.2 K	
0.1935	1.4450
0.1990	1.4413
0.2026	1.4390
0.2063	1.4367
0.2100	1.4346
0.2144	1.4319
0.2194	1.4300
0.2265	1.4268
0.2312	1.4244
0.257	1.4162
0.275	1.4118
0.313	1.4070
0.334	1.4039
0.365	1.4013
0.405	1.3983*
0.436	1.3967*
0.546	1.3929
0.577	1.3919
CURVE 10 T = 300.0 K	
23.2	0.12
24.5	0.21
25.5	0.27
26.3	0.29
27.5	0.40*
28.7	0.66*
29.4	0.95
CURVE 10 (cont.) T = 300.0 K	
30.1	1.51
31.1	2.61
32.0	5.18
32.7	8.09
32.9	9.00
33.2	8.51
33.9	7.83
34.4	7.01
34.8	6.75
34.9	6.38
36.7	5.31
37.9	4.81
CURVE 11 T = 300.0 K	
27.6	0.34
28.1	0.44
28.5	0.51
29.0	0.66*
29.5	0.83
30.0	1.28
30.4	1.56
31.5	2.69
32.0	4.46
32.6	6.34
32.9	9.24
33.4	8.63
34.4	7.37
34.8	6.90
35.9	6.00
37.0	5.39
37.9	5.10
CURVE 12 T = 200.0 K	
27.5	0.21
28.0	0.29
29.0	0.36*
29.5	0.64*
30.0	0.65
30.4	1.04
31.0	1.68
31.5	2.64*
32.4	8.95
32.9	9.22*
CURVE 12 (cont.) T = 200.0 K	
33.4	8.71*
33.9	8.25
34.4	7.56
35.0	6.71
36.2	5.73
37.3	5.19
CURVE 13 T = 70.0 K	
27.5	0.13
28.0	0.24*
30.0	0.93
30.5	1.21
30.9	1.68
31.5	5.09
32.4	9.65
33.0	9.44
33.5	8.21*
34.0	7.23
34.4	6.51
35.0	6.00*
35.9	5.18
36.9	4.72
38.0	4.41
CURVE 14 T = 300.0 K	
26.0	0.27*
27.8	0.39*
29.4	0.58
30.0	0.76
30.4	0.98
30.8	1.20*
31.2	1.50
31.7	2.41
32.2	3.73
32.5	4.99
32.8	6.98
33.3	8.01
33.5	8.19
34.0	8.18*
34.7	7.24*
35.3	6.47
36.3	5.80
36.7	5.47
37.7	5.14*
CURVE 15 T = 200.0 K	
26.0	0.15
28.3	0.30*
29.7	0.60*
30.3	0.94*
31.1	1.91
31.7	3.43
31.9	4.53
32.0	6.81
32.7	9.01*
33.2	9.12
34.5	7.27
35.5	6.05
36.7	5.34*
37.9	4.90
CURVE 16 T = 70.0 K	
26.0	0.08
29.2	0.39*
30.0	0.62*
30.4	0.94*
30.9	1.90*
31.2	3.00
31.5	5.59
31.9	8.84
32.2	10.97
32.5	11.08
32.8	10.97
33.2	9.98
33.9	7.77
34.9	6.08
35.9	5.24
36.7	4.81
37.7	4.49
CURVE 17 T = 300.0 K	
14.0	0.548*
14.5	0.343*
15.0	0.154*
15.2	0.120*
15.6	0.100*
16.2	0.100*
16.8	0.109
17.4	0.132
17.9	0.157
CURVE 17 (cont.) T = 300.0 K	
18.6	0.202*
19.3	0.256
19.7	0.275*
20.1	0.275*
21.2	0.227*
22.4	0.194*
23.0	0.185*
23.6	0.185*
24.5	0.198*
25.2	0.220*
25.9	0.247*
26.6	0.284*
27.4	0.340*
28.1	0.411*
29.0	0.514*
CURVE 18 T = 200.0 K	
14.0	0.548*
14.5	0.343*
15.0	0.148*
15.2	0.115*
15.8	0.086*
16.4	0.086*
17.2	0.103
17.9	0.138*
18.9	0.201*
19.5	0.240*
19.6	0.240*
20.5	0.185
21.4	0.154
22.4	0.132
23.6	0.132*
25.1	0.160*
26.1	0.195*
26.8	0.225*
27.4	0.265
27.9	0.317*
28.4	0.374
29.0	0.456*
CURVE 19 T = 70.0 K	
14.0	0.548*
14.5	0.352*
15.0	0.129*
CURVE 19 (cont.) T = 70.0 K	
15.3	0.093*
15.9	0.073*
16.4	0.073*
17.0	0.085
18.1	0.121*
18.8	0.164*
19.2	0.192*
19.4	0.192*
20.6	0.141*
22.1	0.101*
23.8	0.076
25.4	0.076*
26.6	0.096*
27.4	0.131*
27.9	0.178*
28.5	0.243
29.0	0.300*
CURVE 20 T = 300.0 K	
101	3.08
111	3.06
128	3.07
150	3.13
163	3.09
180	3.10
197	3.06
224	3.08
255	3.05
297	3.08
355	3.08
368	3.04
384	3.04
399	3.05
419	3.04
442	3.04
443	3.07
463	3.04
490	3.04
519	3.04
550	3.04
593	3.07

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* Not shown in figure.

TABLE 8. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiF (continued)

[Wavelength, λ, μm; Refractive Index, n]

CURVE 21
T = 291.2 K

λ	n
0.546	1.3928*
0.80	1.3881
1.02	1.3863*
1.27	1.3846
1.48	1.3828
1.67	1.3811
1.83	1.3797
2.00	1.3782
2.20	1.3763
2.40	1.3736
2.60	1.3717
2.80	1.3691
3.10	1.3649
3.30	1.3618
3.50	1.3585*
3.70	1.3544
3.90	1.3507
4.10	1.3468
4.50	1.3384
4.70	1.3336
4.90	1.3282
5.10	1.3233
5.30	1.3183
5.50	1.3124
5.70	1.3058

CURVE 22
T = 291.2 K

λ	n
5.48	1.310*
5.53	1.314*
5.62	1.308*
5.68	1.311*
5.78	1.308*
5.83	1.303*
6.70	1.264*
6.73	1.259*
6.91	1.260*
6.94	1.248*
7.13	1.255*
7.20	1.243*
7.35	1.248*
7.40	1.229*
7.58	1.239*
7.73	1.222*
7.81	1.228*
8.02	1.213*

CURVE 22 (cont.)
T = 291.2 K

λ	n
8.05	1.215*
8.30	1.195*
8.32	1.203*
8.60	1.183*
8.88	1.173*
8.92	1.155*
9.18	1.155*
9.29	1.136*
9.48	1.135*
9.62	1.107*
9.79	1.109*
9.9	1.100*
10.02	1.081*
10.12	1.083*
10.3	1.070*
10.39	1.046*
10.46	1.051*
10.7	1.037*
10.79	1.009*
10.82	1.022*
11.0	1.000
11.21	0.990*
11.23	0.970*
11.6	0.961*
11.62	0.952*
12.0	0.919*
12.5	0.873*
12.8	0.827*

CURVE 23
T = 291.2 K

λ	n
13.0	0.75*
13.5	0.65*
14.0	0.50*
14.5	0.40*
15.0	0.20*
15.25	0.15*
15.50	0.10*
15.75	0.09*
39.	4.4
40.	4.0
41.	3.7
43.	3.4
45.	3.2
48.	3.1
55.	3.0

CURVE 24
T = 293.2 K

λ	n
15.0	0.22*
16.0	0.12*
17.0	0.12*
18.0	0.21*
19.0	0.25*
20.0	0.27
21.0	0.25*
22.0	0.22*
23.0	0.19*
23.7	0.16*
25.0	0.19*
26.0	0.19*
27.0	0.22*
27.9	0.28*
29.0	0.41*
30.0	0.52
31.0	0.87
31.9	1.42
32.9	3.01
33.0	3.57
33.9	7.02*
34.5	7.23*
35.0	6.56
35.5	6.03*
36.0	5.75*

CURVE 25
T = 423.2 K

λ	n
16.1	0.17
17.0	0.18*
18.0	0.22*
19.0	0.32*
20.0	0.37*
21.0	0.37
22.0	0.33
23.0	0.35
24.0	0.40*
25.0	0.42*
26.0	0.47
27.0	0.55
28.0	0.67*
28.9	0.83*
30.0	1.11
31.0	1.61
31.9	2.23
33.4	3.83

CURVE 25 (cont.)
T = 423.2 K

λ	n
34.0	4.03
34.4	4.03
35.0	3.84
35.5	3.53
36.0	3.24

CURVE 26
T = 573.2 K

λ	n
16.1	0.23*
17.0	0.25
18.0	0.30
19.0	0.32*
20.0	0.39*
21.0	0.45*
22.0	0.54
23.0	0.57
24.0	0.63
25.0	0.68
26.0	0.79
27.0	0.86*
28.0	1.09
29.0	1.33*
30.0	1.52*
31.0	1.74
33.0	2.53
33.5	2.94
33.9	3.23
34.4	3.49
35.0	3.42
35.5	3.24*
36.0	2.84

CURVE 27
T = 873.2 K

λ	n
15.0	0.46*
16.0	0.34
17.0	0.39*
18.1	0.42
19.0	0.47
20.0	0.55
21.0	0.60
22.0	0.66
23.0	0.72
24.0	0.77
25.0	0.87

CURVE 27 (cont.)
T = 873.2 K

λ	n
26.0	0.96
27.0	1.13
28.0	1.22
29.0	1.43
30.0	1.62*
31.0	1.80*
32.0	1.97
32.9	2.03
33.4	2.02*
33.9	2.15
34.3	2.23
34.9	2.23*
35.5	2.10
35.9	2.03

CURVE 28
T = 298.0 K

λ	n
0.1183	1.650
0.1216	1.619
0.1234	1.609
0.1252	1.586
0.1269	1.577
0.1332	1.551
0.1396	1.529
0.1434	1.517
0.1462	1.509
0.1490	1.500
0.1515	1.496
0.1545	1.490
0.1578	1.486
0.1603	1.481
0.1639	1.475
0.1674	1.472
0.1788	1.461*
0.1835	1.455
0.1872	1.452
0.1941	1.446*
0.2046	1.440*
0.2134	1.434
0.2174	1.432

CURVE 29
T = 293.2 K

λ	n
0.3021	1.40811
0.3341	1.40408*

CURVE 29 (cont.)
T = 293.2 K

λ	n
0.4046	1.39845*
0.4358	1.39681*
0.5461	1.3902
0.5875	1.39209
0.6678	1.3907
0.7065	1.3901
0.8408	1.3887
1.0830	1.3865
2.0581	1.3782

CURVE 30
T = 293.2 K

λ	n
0.19905	1.4402*
0.21360	1.4323*
0.22470	1.4275*
0.23998	1.42195
0.24828	1.41942
0.25365	1.41792
0.26537	1.41504
0.26993	1.41402
0.28035	1.41188
0.28936	1.41025
0.29676	1.40903
0.30215	1.40818*
0.31317	1.40669*
0.33415	1.40423*
0.36631	1.40121*
0.39064	1.39937
0.40466	1.39851*
0.43583	1.39684*
0.48613	1.39480
0.54607	1.39300
0.58756	1.39209*
0.58930	1.39204*
0.65628	1.39085
0.70652	1.39005*
0.72814	1.38978
0.76820	1.38927
0.81095	1.38877
0.84247	1.38844*
0.91230	1.38780
1.01398	1.38702
1.08303	1.38657

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* Not shown in figure.

TABLE 8. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiF (continued)

[Wavelength, λ, μm; Refractive Index, n]

CURVE 31
T = 135.0 K

λ	n
16.31	0.090*
16.95	0.090*
17.67	0.109*
18.62	0.156
19.23	0.172*
19.80	0.172*
23.98	0.104*
25.00	0.104*
26.04	0.127*
26.60	0.163*
27.70	0.413*
28.17	1.04
29.33	1.99
30.77	3.85
32.36	17.83
34.60	6.24
35.71	4.36
37.45	3.69
40.00	3.29
45.45	3.01
55.55	2.90
100.00	2.90

CURVE 32
T = 210.0 K

λ	n
16.10	0.112*
16.45	0.103*
16.72	0.103*
17.42	0.118*
18.15	0.152*
19.08	0.204*
19.69	0.219*
20.62	0.219*
21.98	0.199*
22.78	0.187*
23.70	0.187*
24.81	0.207*
25.08	0.249*
26.74	0.360
27.17	0.484
28.17	1.04*
29.33	1.99*
30.77	3.85*
32.47	13.78
34.60	6.24*
35.71	4.36*
37.45	3.69*
40.00	3.29*
45.45	3.01*
55.56	2.90*
100.00	2.90*

CURVE 33
T = 300.0 K

λ	n
16.34	0.119*
16.84	0.119*
17.39	0.138*
18.38	0.190*
19.72	0.283*
20.37	0.298*
20.70	0.298*
21.74	0.253*
22.27	0.237
23.04	0.237
24.10	0.257*
25.00	0.299*
25.77	0.355
26.88	0.542*
28.17	1.04*
29.33	1.99*
30.77	3.85*
32.57	11.26
34.60	6.24*
35.71	4.36*
37.45	3.69*
40.00	3.29*
45.45	3.01*
55.56	2.90*
100.00	2.90*

CURVE 34
T = 355.0 K

λ	n
16.37	0.129*
16.81	0.129*
17.61	0.161*
18.59	0.232*
19.92	0.339*
20.41	0.352*
20.88	0.352*
21.37	0.327*
22.42	0.299*
23.26	0.299
23.98	0.318
24.94	0.369
25.71	0.445*
26.46	0.602
28.17	1.04*
29.33	1.99*
30.77	3.85*
32.68	9.80
34.60	6.24*
35.71	4.36*
37.45	3.69*
40.00	3.29*
45.45	3.01*
55.56	2.90*
100.00	2.90*

CURVE 35
T = 298.0 K

λ	n
0.408	1.400
0.438	1.382
0.468	1.381
0.498	1.380
0.526	1.379
0.556	1.378
0.586	1.375
0.646	1.367
0.678	1.366
0.711	1.370
0.732	1.367
0.762	1.372
0.792	1.371
0.821	1.368
0.909	1.359
0.949	1.356
0.970	1.354
0.998	1.361

CURVE 36
T = 298.0 K

λ	n
0.408	1.396
0.438	1.392
0.468	1.391
0.498	1.390
0.526	1.375
0.586	1.380
0.646	1.373
0.762	1.359
0.824	1.357
0.880	1.361
0.914	1.364
0.942	1.363
0.970	1.362
1.001	1.366

CURVE 37
T = 298.0 K

λ	n
0.408	1.391
0.438	1.386
0.468	1.385
0.498	1.384
0.526	1.385
0.556	1.373
0.586	1.372
0.614	1.375
0.646	1.380
0.678	1.370
0.700	1.370
0.824	1.364
0.880	1.359*
0.909	1.359*
0.938	1.354
0.970	1.356
0.990	1.361*

CURVE 38
T = 298.0 K

λ	n
0.408	1.385
0.478	1.381
0.570	1.377
0.597	1.377
0.618	1.370
0.646	1.369
0.690	1.364
0.737	1.370
0.768	1.364
0.798	1.368
0.824	1.360
0.884	1.356
0.914	1.356
0.942	1.357*
0.981	1.355*
1.003	1.353

CURVE 39
T = 298.0 K

λ	n
0.00236	0.99886*
0.00314	0.99814*
0.0044	0.99592*
0.0067	0.99180
0.0113	0.9833

CURVE 40
T = 298.0 K

λ	n
0.4358	1.39724
0.5461	1.39341
0.5893	1.39260

CURVE 41
T = 1223.2 K

λ	n
0.5461	1.32

CURVE 42
T = 295.2 K

λ	n
0.5893	1.3915

CURVE 43
T = 298.0 K

λ	n
0.546	1.369

CURVE 44
T = 300.0 K

λ	n
2000.	3.02

CURVE 45
T = 77.0 K

λ	n
2000.	2.93

CURVE 46*
T = 290.0 K

λ	n
0.4358	1.3964
0.4678	1.3953
0.4800	1.3948
0.5086	1.3941
0.5461	1.3929
0.5780	1.3922
0.5893	1.3917
0.6438	1.3912

CURVE 47*
T = 4.0 K

λ	n
0.4358	1.3993
0.4678	1.3981
0.4800	1.3974
0.5086	1.3968
0.5461	1.3957
0.5780	1.3947
0.5893	1.3945
0.6438	1.3938

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* Not shown in figure.

TABLE 9. EXPERIMENTAL DATA ON dn/dT OF LiF

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 6 T_m = 313.0 K	
0.40	-1.58
0.41	-1.58
0.42	-1.59
0.43	-1.59
0.44	-1.60
0.45	-1.60
0.46	-1.61
0.47	-1.61
0.48	-1.62
0.49	-1.62
0.50	-1.63
0.51	-1.63
0.52	-1.63
0.53	-1.64
0.54	-1.64
0.55	-1.65
CURVE 6 (cont.) T_m = 313.0 K	
0.56	-1.65
0.57	-1.65
0.58	-1.66
0.59	-1.66
0.60	-1.66
0.61	-1.66
0.62	-1.67
0.63	-1.67
0.64	-1.67
0.65	-1.67
0.66	-1.67
0.67	-1.67
0.68	-1.67
0.69	-1.67
0.70	-1.67
CURVE 21 T_m = 322.0 K	
0.546	2.3
3.50	1.6
CURVE 30 T_m = 293.0 K	
0.19905	-1.2
0.21360	-1.3
0.22470	-1.5
0.23998	-1.3
0.24828	-1.7
0.25365	-1.2
0.26537	-1.2
0.26993	-1.2
0.28035	-1.4
0.28936	-1.4
CURVE 30 (cont.) T_m = 293.0 K	
0.29676	-1.3
0.30215	-1.4
0.31317	-1.5
0.33415	-1.6
0.36631	-1.6
0.39064	-1.7
0.40466	-1.7
0.43583	-1.3
0.48613	-1.6
0.54607	-1.7
0.58756	-1.8
0.58930	-1.8
0.65628	-1.8
0.70652	-1.8
0.72814	-2.1
0.76820	-1.6
CURVE 30 (cont.) T_m = 293.0 K	
0.81095	-2.2
0.84247	-2.2
0.91230	-2.3
1.01398	-2.9
1.08303	-2.8

TABLE 10. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR LiF

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Harting, H. [30] 1943	0.199-1.083 μm 293 K	$n = 1.38282 + \frac{0.00405}{(\lambda - 0.1137)^{1.1}}$
Radhakrishnan, T. [48] 1948	0.1935-15.0 μm 293 K	$n^2 = 1.34880 + \frac{0.57862\,\lambda^2}{\lambda^2 - (0.09022)^2} + \frac{7.34258\,\lambda^2}{\lambda^2 - (33.266)^2}$
Tilton, L.W. and Plyler, E.K. [32] 1951	0.4-5.9 μm 297 K	$n^2 = 1 + \frac{0.92556295\,\lambda^2}{\lambda^2 - (0.07291)^2} + \frac{5.1281966\,\lambda^2}{\lambda^2 - (28.247)^2}$
Herzberger, M. and Salzberg, C.D. 1962 [115]	0.5-6.0 μm 298 K	$n = 1.38761 + \frac{0.001796}{\lambda^2 - (0.16733)^2} - \frac{0.000041}{[\lambda^2 - (0.16733)^2]^2}$ $- 0.0023045\,\lambda^2 - 0.00000557\,\lambda^4$
Jasperse, J.R., Kahan, A., Plendl, J.N., and Mitra, S.S. [14] 1966	12.5-50.0 μm 295 K	$n^2 - k^2 = \epsilon_{uv} + \sum_i \frac{4\pi\rho_i\,\nu_i^2\,(\nu_i^2 - \nu^2)}{(\nu_i^2 - \nu^2)^2 + (\gamma_i\,\nu)^2}$ $2nk = \sum_i \frac{4\pi\rho_i\,\nu_i^2\,(\gamma_i\,\nu)}{(\nu_i^2 - \nu^2)^2 + (\gamma_i\,\nu)^2}$ *
Present work 1975	0.10-11.0 μm 293 K	$n^2 = 1 + \frac{0.92549\,\lambda^2}{\lambda^2 - (0.07376)^2} + \frac{6.96747\,\lambda^2}{\lambda^2 - (32.790)^2}$

*$i = 1, 2$; $\nu_1 = 306$ cm^{-1}, $\nu_2 = 503$ cm^{-1}; $\gamma_1/\nu_1 = 0.0600$, $\gamma_2/\nu_2 = 0.180$; $4\pi\rho_1 = 6.80$, $4\pi\rho_2 = 0.110$; $\epsilon_{uv} = 1.90$, $\epsilon_s = 8.81$.

3.2. Lithium Chloride, LiCl

The only available measurement on the refractive index of solid LiCl was made for one spectral line, the sodium D line, by Spangenberg [45] in 1923 using the immersion method. For molten LiCl, Zarzyski and Naudin [44] determined the index for the Hg green line at a temperature of 888 K.

The reasons for the scantiness of the data are the difficulties in crystal growing and sample preparation. A number of other physical properties of LiCl were investigated; values are given in tables 2 and 3. Although there is only one value of n available, a dispersion equation can be based on the knowledge of the dielectric constants and the characteristic absorption peaks. Using the values of known parameters from table 3 and the value of Spangenberg, we obtain

$\epsilon_s = 11.86,$
$\epsilon_{uv} = 2.75,$
$\lambda_u = 0.137$ μm (averaged value of two peaks),

$\lambda_l = 49.26$ μm,

$n = 1.662$ for $\lambda = 0.5893$ μm.

The adjustable parameter A of eq (13) was found to be 2.51. This leads to a dispersion equation of LiCl which is valid at 293 K in the transparent region, 0.17 to 16.0 μm:

$$n^2 = 2.51 + \frac{0.24\ \lambda^2}{\lambda^2 - (0.137)^2} + \frac{9.11\ \lambda^2}{\lambda^2 - (49.26)^2}, \qquad (25)$$

where λ is in units of μm.

No experimental data on dn/dT are available. However, our empirical parameter values in table 5 were used to construct a formula for estimating dn/dT in the transparent region:

$$2n\frac{dn}{dT} = -13.14\,(n^2 - 1) - 12.85 + \frac{22.75\ \lambda^4}{(\lambda^2 - 0.02045)^2} + \frac{382.62\ \lambda^4}{(\lambda^2 - 2426.55)^2}, \qquad (26)$$

where dn/dT is in units of 10^{-5} K^{-1} and λ in μm.

Equations (25) and (26) were used to generate the reference data given in the table of recommended values. As noted, these equations are based totally on the available data on the thermal linear expansion, dielectric constants, the wavelengths of absorption peaks, and the empirical parameters. Consequently, the accuracies of the estimated values are governed by the uncertainties of the above mentioned parameters. The following criteria are indicated by careful studies of the parameters.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.17– 0.30	2	0.05
0.30– 1.00	3	0.005
1.00– 5.00	3	0.008
5.00– 9.00	2	0.01
9.00–16.00	2	0.02

For dn/dT:

0.17– 0.32	1	0.9
0.32–12.0	1	0.4
12.0 –16.0	1	0.9

TABLE 11. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiCl AT 293 K*

λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.170	1.78732	4.17475	62.78	0.290	1.67888	0.18295	0.88	0.900	1.65911	0.00594	-3.60
0.172	1.77944	3.72295	55.45	0.292	1.67852	0.17788	0.79	0.920	1.65899	0.00573	-3.61
0.174	1.77239	3.34016	49.37	0.294	1.67817	0.17301	0.69	0.940	1.65888	0.00554	-3.63
0.176	1.76604	3.01301	44.26	0.296	1.67783	0.16832	0.60	0.960	1.65877	0.00537	-3.64
0.178	1.76030	2.73122	39.92	0.298	1.67749	0.16381	0.51	0.980	1.65867	0.00522	-3.65
0.180	1.75509	2.48678	36.20	0.300	1.67717	0.15947	0.42	1.000	1.65856	0.00509	-3.66
0.182	1.75034	2.27337	32.97	0.305	1.67640	0.14931	0.22	1.050	1.65832	0.00481	-3.69
0.184	1.74598	2.08597	30.16	0.310	1.67568	0.14005	0.03	1.100	1.65808	0.00460	-3.71
0.186	1.74198	1.92051	27.69	0.315	1.67500	0.13157	-0.14	1.150	1.65786	0.00445	-3.73
0.188	1.73829	1.77371	25.51	0.320	1.67436	0.12381	-0.31	1.200	1.65764	0.00434	-3.74
0.190	1.73487	1.64286	23.57	0.325	1.67376	0.11667	-0.46	1.250	1.65742	0.00426	-3.76
0.192	1.73170	1.52574	21.84	0.330	1.67319	0.11010	-0.60	1.300	1.65721	0.00421	-3.77
0.194	1.72876	1.42050	20.26	0.335	1.67266	0.10405	-0.73	1.350	1.65700	0.00419	-3.78
0.196	1.72602	1.32560	18.88	0.340	1.67215	0.09845	-0.86	1.400	1.65679	0.00419	-3.79
0.198	1.72345	1.23971	17.60	0.345	1.67167	0.09327	-0.98	1.450	1.65658	0.00420	-3.79
0.200	1.72105	1.16174	16.45	0.350	1.67122	0.08846	-1.09	1.500	1.65637	0.00423	-3.80
0.202	1.71880	1.09076	15.39	0.355	1.67079	0.08400	-1.19	1.550	1.65616	0.00426	-3.81
0.204	1.71668	1.02594	14.42	0.360	1.67038	0.07984	-1.29	1.600	1.65594	0.00431	-3.81
0.206	1.71469	0.96661	13.53	0.365	1.66999	0.07598	-1.38	1.650	1.65573	0.00436	-3.82
0.208	1.71281	0.91215	12.71	0.370	1.66962	0.07237	-1.47	1.700	1.65551	0.00443	-3.82
0.210	1.71104	0.86206	11.96	0.375	1.66926	0.06899	-1.55	1.750	1.65528	0.00449	-3.82
0.212	1.70936	0.81588	11.26	0.380	1.66893	0.06584	-1.63	1.800	1.65506	0.00457	-3.83
0.214	1.70778	0.77322	10.61	0.385	1.66860	0.06288	-1.70	1.850	1.65483	0.00464	-3.83
0.216	1.70627	0.73373	10.01	0.390	1.66830	0.06011	-1.77	1.900	1.65459	0.00473	-3.83
0.218	1.70484	0.69710	9.44	0.395	1.66800	0.05751	-1.84	1.950	1.65436	0.00481	-3.83
0.220	1.70348	0.66308	8.92	0.400	1.66772	0.05507	-1.90	2.000	1.65411	0.00490	-3.83
0.222	1.70218	0.63141	8.42	0.410	1.66719	0.05060	-2.02	2.050	1.65387	0.00499	-3.83
0.224	1.70095	0.60188	7.96	0.420	1.66671	0.04663	-2.13	2.100	1.65361	0.00508	-3.83
0.226	1.69978	0.57432	7.53	0.430	1.66626	0.04309	-2.23	2.150	1.65336	0.00518	-3.83
0.228	1.69865	0.54855	7.12	0.440	1.66584	0.03992	-2.32	2.200	1.65310	0.00527	-3.83
0.230	1.69756	0.52441	6.74	0.450	1.66546	0.03707	-2.40	2.250	1.65283	0.00537	-3.83
0.232	1.69655	0.50178	6.38	0.460	1.66510	0.03450	-2.48	2.300	1.65256	0.00547	-3.83
0.234	1.69557	0.48054	6.04	0.470	1.66477	0.03219	-2.55	2.350	1.65228	0.00558	-3.83
0.236	1.69463	0.46057	5.71	0.480	1.66446	0.03009	-2.62	2.400	1.65200	0.00568	-3.83
0.238	1.69373	0.44177	5.41	0.490	1.66417	0.02818	-2.68	2.450	1.65171	0.00578	-3.83
0.240	1.69286	0.42406	5.12	0.500	1.66389	0.02644	-2.74	2.500	1.65142	0.00589	-3.83
0.242	1.69203	0.40736	4.84	0.510	1.66364	0.02486	-2.79	2.550	1.65113	0.00599	-3.83
0.244	1.69123	0.39158	4.58	0.520	1.66340	0.02341	-2.84	2.600	1.65082	0.00610	-3.82
0.246	1.69047	0.37667	4.33	0.530	1.66317	0.02209	-2.88	2.650	1.65052	0.00621	-3.82
0.248	1.68973	0.36256	4.09	0.540	1.66295	0.02087	-2.93	2.700	1.65020	0.00632	-3.82
0.250	1.68901	0.34920	3.87	0.550	1.66275	0.01975	-2.97	2.750	1.64988	0.00643	-3.82
0.252	1.68833	0.33653	3.65	0.560	1.66256	0.01872	-3.01	2.800	1.64956	0.00654	-3.82
0.254	1.68767	0.32451	3.45	0.570	1.66238	0.01777	-3.04	2.850	1.64923	0.00665	-3.81
0.256	1.68703	0.31310	3.25	0.580	1.66220	0.01689	-3.08	2.900	1.64889	0.00676	-3.81
0.258	1.68642	0.30225	3.06	0.590	1.66204	0.01608	-3.11	2.950	1.64855	0.00687	-3.81
0.260	1.68582	0.29193	2.88	0.600	1.66188	0.01532	-3.14	3.000	1.64821	0.00699	-3.81
0.262	1.68525	0.28211	2.71	0.620	1.66159	0.01397	-3.19	3.050	1.64786	0.00710	-3.80
0.264	1.68469	0.27276	2.54	0.640	1.66132	0.01281	-3.24	3.100	1.64750	0.00721	-3.80
0.266	1.68416	0.26384	2.38	0.660	1.66108	0.01179	-3.29	3.150	1.64713	0.00733	-3.80
0.268	1.68364	0.25533	2.23	0.680	1.66085	0.01091	-3.33	3.200	1.64676	0.00744	-3.79
0.270	1.68313	0.24721	2.08	0.700	1.66064	0.01013	-3.36	3.250	1.64639	0.00756	-3.79
0.272	1.68265	0.23945	1.94	0.720	1.66044	0.00945	-3.40	3.300	1.64601	0.00767	-3.79
0.274	1.68218	0.23203	1.81	0.740	1.66026	0.00885	-3.43	3.350	1.64562	0.00779	-3.78
0.276	1.68172	0.22494	1.68	0.760	1.66009	0.00832	-3.46	3.400	1.64523	0.00790	-3.78
0.278	1.68128	0.21815	1.55	0.780	1.65993	0.00785	-3.48	3.450	1.64483	0.00802	-3.78
0.280	1.68085	0.21165	1.43	0.800	1.65977	0.00744	-3.50	3.500	1.64443	0.00814	-3.77
0.282	1.68043	0.20542	1.31	0.820	1.65963	0.00707	-3.53	3.550	1.64402	0.00825	-3.77
0.284	1.68003	0.19945	1.20	0.840	1.65949	0.00673	-3.55	3.600	1.64360	0.00837	-3.76
0.286	1.67963	0.19373	1.09	0.860	1.65936	0.00644	-3.56	3.650	1.64318	0.00849	-3.76
0.288	1.67925	0.18823	0.99	0.880	1.65923	0.00618	-3.58	3.700	1.64275	0.00861	-3.76

TABLE 11. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiCl AT 293 K (continued)*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
3.750	1.64232	0.00872	-3.75	6.100	1.61501	0.01464	-3.44	9.700	1.54355	0.02554	-2.47
3.800	1.64188	0.00884	-3.75	6.200	1.61353	0.01491	-3.42	9.800	1.54098	0.02589	-2.43
3.850	1.64144	0.00896	-3.74	6.300	1.61203	0.01518	-3.40	9.900	1.53838	0.02624	-2.40
3.900	1.64099	0.00908	-3.74	6.400	1.61049	0.01545	-3.39	10.000	1.53573	0.02660	-2.36
3.950	1.64053	0.00920	-3.73	6.500	1.60894	0.01572	-3.37	10.200	1.53034	0.02732	-2.27
4.000	1.64007	0.00932	-3.73	6.600	1.60735	0.01599	-3.35	10.400	1.52481	0.02805	-2.19
4.050	1.63960	0.00944	-3.72	6.700	1.60574	0.01627	-3.33	10.600	1.51912	0.02880	-2.10
4.100	1.63912	0.00956	-3.72	6.800	1.60410	0.01655	-3.31	10.800	1.51328	0.02957	-2.00
4.150	1.63864	0.00968	-3.71	6.900	1.60243	0.01683	-3.28	11.000	1.50729	0.03035	-1.91
4.200	1.63815	0.00980	-3.71	7.000	1.60073	0.01711	-3.26	11.200	1.50114	0.03115	-1.81
4.250	1.63766	0.00993	-3.70	7.100	1.59901	0.01739	-3.24	11.400	1.49483	0.03197	-1.70
4.300	1.63716	0.01005	-3.70	7.200	1.59725	0.01768	-3.22	11.600	1.48835	0.03280	-1.59
4.350	1.63665	0.01017	-3.69	7.300	1.59547	0.01796	-3.20	11.800	1.48171	0.03365	-1.48
4.400	1.63614	0.01029	-3.69	7.400	1.59366	0.01825	-3.17	12.000	1.47489	0.03452	-1.36
4.450	1.63563	0.01041	-3.68	7.500	1.59182	0.01854	-3.15	12.200	1.46790	0.03542	-1.24
4.500	1.63510	0.01054	-3.67	7.600	1.58995	0.01884	-3.12	12.400	1.46072	0.03633	-1.11
4.550	1.63457	0.01066	-3.67	7.700	1.58805	0.01913	-3.10	12.600	1.45336	0.03727	-0.98
4.600	1.63404	0.01078	-3.66	7.800	1.58612	0.01943	-3.07	12.800	1.44582	0.03823	-0.84
4.650	1.63349	0.01091	-3.66	7.900	1.58417	0.01973	-3.05	13.000	1.43807	0.03921	-0.69
4.700	1.63295	0.01103	-3.65	8.000	1.58218	0.02003	-3.02	13.200	1.43013	0.04022	-0.54
4.750	1.63239	0.01116	-3.64	8.100	1.58016	0.02033	-2.99	13.400	1.42198	0.04126	-0.38
4.800	1.63183	0.01128	-3.64	8.200	1.57811	0.02064	-2.97	13.600	1.41362	0.04233	-0.22
4.850	1.63126	0.01141	-3.63	8.300	1.57603	0.02095	-2.94	13.800	1.40505	0.04342	-0.04
4.900	1.63069	0.01153	-3.63	8.400	1.57392	0.02126	-2.91	14.000	1.39625	0.04455	0.14
4.950	1.63011	0.01166	-3.62	8.500	1.57178	0.02157	-2.88	14.200	1.38723	0.04571	0.32
5.000	1.62952	0.01178	-3.61	8.600	1.56961	0.02189	-2.85	14.400	1.37796	0.04691	0.52
5.100	1.62833	0.01204	-3.60	8.700	1.56740	0.02221	-2.82	14.600	1.36846	0.04814	0.73
5.200	1.62712	0.01229	-3.58	8.800	1.56516	0.02253	-2.79	14.800	1.35871	0.04941	0.94
5.300	1.62587	0.01255	-3.57	8.900	1.56290	0.02285	-2.75	15.000	1.34869	0.05073	1.16
5.400	1.62461	0.01280	-3.56	9.000	1.56059	0.02318	-2.72	15.200	1.33841	0.05208	1.40
5.500	1.62331	0.01306	-3.54	9.100	1.55826	0.02351	-2.69	15.400	1.32786	0.05349	1.64
5.600	1.62199	0.01332	-3.52	9.200	1.55589	0.02384	-2.65	15.600	1.31701	0.05494	1.90
5.700	1.62065	0.01358	-3.51	9.300	1.55349	0.02417	-2.62	15.800	1.30588	0.05644	2.17
5.800	1.61928	0.01384	-3.49	9.400	1.55106	0.02451	-2.58	16.000	1.29443	0.05800	2.45
5.900	1.61788	0.01411	-3.48	9.500	1.54859	0.02485	-2.55				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.2. The number of digits with an overstrike are not relevant to accuracy of the data.

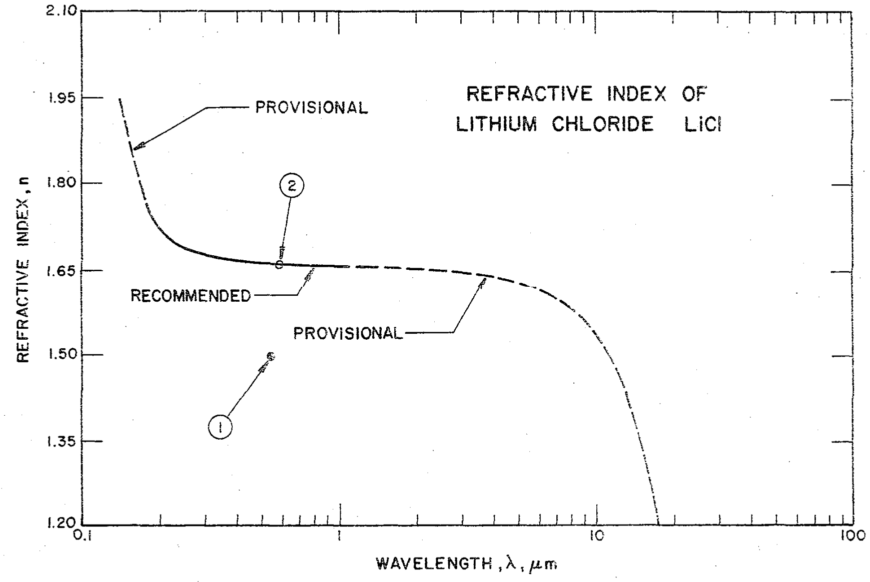

FIGURE 8. Refractive Index of LiCl

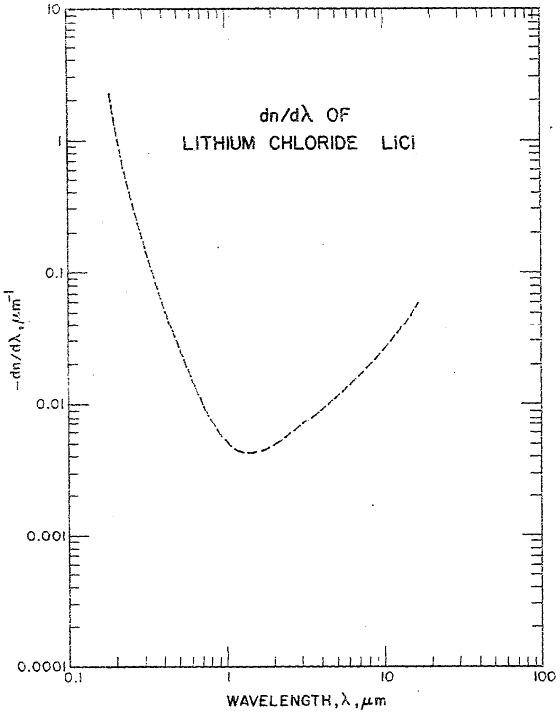

FIGURE 9. $dn/d\lambda$ of LiCl

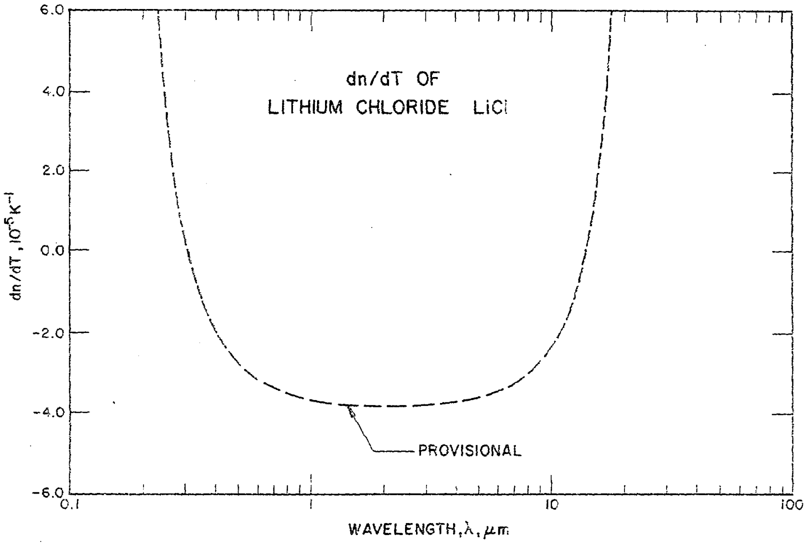

FIGURE 10. dn/dT of LiCl

TABLE 12. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF LiCl

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	888	Molten LiCl; filled into a 60° prismatic platinum container with silica glass windows of 4 mm diameter; uncertainty of 0.001 in measured n; digitized data were presented.
2	45	Spangenberg, K.	1923	M	0.5893	295	LiCl was formed by slowly cooling the melt in a Pt crucible; refractive index for mean of sodium D lines was measured by the immersion method.

TABLE 13. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiCl

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 888.2 K	
0.5461	1.500
CURVE 2 T = 295.2 K	
0.5893	1.662

3.3. Lithium Bromide, LiBr

The only available measurement on the refractive index of crystalline LiBr was made for one spectral line, the sodium D line, by Spangenberg [45] using the immersion method. For molten LiBr, Zarzyski and Naudin [44] determined the index for the Hg green line at a temperature of 843 K.

The reasons for the scantiness of the data are the difficulties in crystal growing and sample preparation. A number of other physical properties of LiBr were investigated; values are given in tables 2 and 3. Although there is only one value of n available, a dispersion equation can be constructed by incorporating the available data on the dielectric constants, the wavelengths of absorption peaks, etc., into a two-oscillator dispersion equation. Using the values of known parameters listed in table 3 and the available refractive index, we obtain

$\epsilon_s = 13.23,$

$\epsilon_{uv} = 3.16,$

$\lambda_u = 0.164$ μm (averaged value of three peaks),

$\lambda_i = 57.80$ μm,

$n = 1.784$ for $\lambda = 0.5893$ μm.

The constant A of eq (13) is found to be 2.88. This leads to a dispersion equation for LiBr valid at 293 K in the transparent region, 0.21–20 μm:

$$n^2 = 2.88 + \frac{0.28\,\lambda^2}{\lambda^2 - (0.164)^2} + \frac{10.07\,\lambda^2}{\lambda^2 - (57.80)^2}, \qquad (27)$$

where λ is in units of μm.

No experimental data on dn/dT are available. However, our empirical findings in table 5 were used to assemble a formula of LiBr for the transparent region:

$$2n\frac{dn}{dT} = -14.94(n^2-1) - 14.18 + \frac{28.08\,\lambda^4}{(\lambda^2 - 0.02993)^2} + \frac{503.50\,\lambda^4}{(\lambda^2 - 3340.84)^2}, \qquad (28)$$

where dn/dT is in units of 10^{-5} K^{-1} and λ in μm.

Equations (27) and (28) were used to generate the reference data given in the table of recommended values. Since these equation are based totally on the data on the thermal linear expansion, the dielectric constants, the wavelengths of absorption peaks, and the empirical parameters, the accuracies of the calculated values are controlled by the uncertainties in these quantities. The following criteria were established after these correlated parameters were carefully studied.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.21– 0.30	2	0.01
0.30– 1.00	3	0.005
1.00– 6.00	3	0.008
6.00–11.00	2	0.01
11.00–20.00	2	0.05

For dn/dT:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.21– 0.40	1	0.9
0.40–13.0	1	0.4
13.00–20.0	1	0.9

TABLE 14. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiBr AT 293 K *

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.210	1.89674	2.81741	57.73	0.375	1.79605	0.12220	-0.59	1.750	1.77574	0.00378	-4.99
0.212	1.89133	2.59187	52.59	0.380	1.79545	0.11608	-0.76	1.800	1.77555	0.00380	-4.99
0.214	1.88635	2.39208	48.12	0.385	1.79489	0.11038	-0.91	1.850	1.77536	0.00383	-5.00
0.216	1.88175	2.21428	44.20	0.390	1.79435	0.10507	-1.06	1.900	1.77516	0.00386	-5.00
0.218	1.87748	2.05535	40.74	0.395	1.79384	0.10012	-1.20	1.950	1.77497	0.00390	-5.01
0.220	1.87352	1.91273	37.67	0.400	1.79335	0.09548	-1.34	2.000	1.77477	0.00394	-5.01
0.222	1.86982	1.78425	34.93	0.410	1.79244	0.08709	-1.58	2.050	1.77458	0.00399	-5.02
0.224	1.86637	1.66811	32.47	0.420	1.79160	0.07969	-1.80	2.100	1.77438	0.00404	-5.02
0.226	1.86314	1.56278	30.25	0.430	1.79084	0.07315	-2.00	2.150	1.77417	0.00409	-5.02
0.228	1.86011	1.46696	28.25	0.440	1.79014	0.06735	-2.19	2.200	1.77397	0.00415	-5.02
0.230	1.85727	1.37955	26.43	0.450	1.78949	0.06217	-2.35	2.250	1.77376	0.00421	-5.03
0.232	1.85459	1.29958	24.77	0.460	1.78889	0.05754	-2.50	2.300	1.77354	0.00427	-5.03
0.234	1.85207	1.22625	23.25	0.470	1.78834	0.05338	-2.64	2.350	1.77333	0.00434	-5.03
0.236	1.84968	1.15883	21.86	0.480	1.78782	0.04963	-2.77	2.400	1.77311	0.00440	-5.03
0.238	1.84743	1.09671	20.57	0.490	1.78734	0.04625	-2.89	2.450	1.77289	0.00447	-5.03
0.240	1.84529	1.03936	19.39	0.500	1.78690	0.04318	-3.00	2.500	1.77266	0.00454	-5.03
0.242	1.84327	0.98629	18.30	0.510	1.78648	0.04039	-3.10	2.550	1.77243	0.00461	-5.03
0.244	1.84134	0.93710	17.29	0.520	1.78609	0.03785	-3.19	2.600	1.77220	0.00468	-5.03
0.246	1.83952	0.89141	16.34	0.530	1.78572	0.03554	-3.28	2.650	1.77197	0.00476	-5.03
0.248	1.83778	0.84891	15.47	0.540	1.78538	0.03342	-3.36	2.700	1.77173	0.00483	-5.03
0.250	1.83612	0.80930	14.65	0.550	1.78505	0.03148	-3.43	2.750	1.77148	0.00491	-5.03
0.252	1.83454	0.77233	13.88	0.560	1.78475	0.02969	-3.50	2.800	1.77124	0.00498	-5.03
0.254	1.83303	0.73777	13.17	0.570	1.78446	0.02805	-3.57	2.850	1.77098	0.00506	-5.03
0.256	1.83158	0.70541	12.49	0.580	1.78419	0.02654	-3.63	2.900	1.77073	0.00514	-5.03
0.258	1.83020	0.67509	11.86	0.590	1.78393	0.02514	-3.69	2.950	1.77047	0.00522	-5.02
0.260	1.82888	0.64662	11.27	0.600	1.78368	0.02384	-3.75	3.000	1.77021	0.00529	-5.02
0.262	1.82762	0.61986	10.71	0.620	1.78323	0.02153	-3.85	3.050	1.76994	0.00537	-5.02
0.264	1.82640	0.59468	10.18	0.640	1.78282	0.01954	-3.94	3.100	1.76967	0.00545	-5.02
0.266	1.82524	0.57096	9.68	0.660	1.78245	0.01781	-4.02	3.150	1.76940	0.00554	-5.02
0.268	1.82412	0.54859	9.21	0.680	1.78211	0.01630	-4.09	3.200	1.76912	0.00562	-5.02
0.270	1.82304	0.52746	8.76	0.700	1.78179	0.01498	-4.16	3.250	1.76883	0.00570	-5.01
0.272	1.82201	0.50749	8.33	0.720	1.78150	0.01382	-4.22	3.300	1.76855	0.00578	-5.01
0.274	1.82101	0.48860	7.93	0.740	1.78124	0.01279	-4.27	3.350	1.76826	0.00586	-5.01
0.276	1.82005	0.47071	7.54	0.760	1.78099	0.01188	-4.32	3.400	1.76796	0.00595	-5.01
0.278	1.81913	0.45375	7.18	0.780	1.78076	0.01108	-4.37	3.450	1.76766	0.00603	-5.00
0.280	1.81824	0.43766	6.83	0.800	1.78055	0.01036	-4.41	3.500	1.76736	0.00611	-5.00
0.282	1.81738	0.42237	6.50	0.820	1.78035	0.00971	-4.45	3.550	1.76705	0.00620	-5.00
0.284	1.81655	0.40785	6.18	0.840	1.78016	0.00914	-4.48	3.600	1.76674	0.00628	-5.00
0.286	1.81574	0.39404	5.88	0.860	1.77998	0.00862	-4.52	3.650	1.76642	0.00637	-4.99
0.288	1.81497	0.38089	5.59	0.880	1.77981	0.00815	-4.55	3.700	1.76610	0.00645	-4.99
0.290	1.81422	0.36836	5.31	0.900	1.77966	0.00774	-4.57	3.750	1.76578	0.00654	-4.99
0.292	1.81350	0.35641	5.04	0.920	1.77950	0.00736	-4.60	3.800	1.76545	0.00662	-4.98
0.294	1.81279	0.34502	4.79	0.940	1.77936	0.00701	-4.62	3.850	1.76512	0.00671	-4.98
0.296	1.81212	0.33414	4.55	0.960	1.77922	0.00670	-4.65	3.900	1.76478	0.00679	-4.98
0.298	1.81146	0.32375	4.31	0.980	1.77909	0.00642	-4.67	3.950	1.76444	0.00688	-4.97
0.300	1.81082	0.31381	4.09	1.000	1.77897	0.00617	-4.69	4.000	1.76409	0.00697	-4.97
0.305	1.80931	0.29081	3.56	1.050	1.77867	0.00562	-4.73	4.050	1.76374	0.00705	-4.97
0.310	1.80791	0.27015	3.09	1.100	1.77840	0.00519	-4.77	4.100	1.76338	0.00714	-4.96
0.315	1.80660	0.25152	2.65	1.150	1.77815	0.00485	-4.80	4.150	1.76302	0.00723	-4.96
0.320	1.80539	0.23468	2.25	1.200	1.77792	0.00458	-4.83	4.200	1.76266	0.00732	-4.96
0.325	1.80426	0.21940	1.88	1.250	1.77769	0.00437	-4.86	4.250	1.76229	0.00740	-4.95
0.330	1.80319	0.20550	1.55	1.300	1.77748	0.00420	-4.88	4.300	1.76192	0.00749	-4.95
0.335	1.80220	0.19282	1.24	1.350	1.77727	0.00407	-4.90	4.350	1.76154	0.00758	-4.94
0.340	1.80126	0.18123	0.95	1.400	1.77707	0.00397	-4.91	4.400	1.76116	0.00767	-4.94
0.345	1.80038	0.17060	0.68	1.450	1.77688	0.00389	-4.93	4.450	1.76078	0.00776	-4.93
0.350	1.79956	0.16084	0.43	1.500	1.77668	0.00383	-4.94	4.500	1.76039	0.00785	-4.93
0.355	1.79877	0.15185	0.20	1.550	1.77649	0.00380	-4.95	4.550	1.75999	0.00794	-4.93
0.360	1.79804	0.14355	-0.02	1.600	1.77630	0.00378	-4.96	4.600	1.75959	0.00802	-4.92
0.365	1.79734	0.13588	-0.22	1.650	1.77611	0.00377	-4.97	4.650	1.75919	0.00811	-4.92
0.370	1.79666	0.12878	-0.41	1.700	1.77593	0.00377	-4.98	4.700	1.75878	0.00820	-4.91

TABLE 14. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiBr AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
4.750	1.75837	0.00829	-4.91	8.100	1.72000	0.01478	-4.40	13.400	1.60875	0.02804	-2.55
4.800	1.75795	0.00838	-4.90	8.200	1.71851	0.01499	-4.38	13.600	1.60308	0.02866	-2.44
4.850	1.75753	0.00847	-4.90	8.300	1.71700	0.01520	-4.35	13.800	1.59728	0.02929	-2.33
4.900	1.75711	0.00856	-4.89	8.400	1.71547	0.01541	-4.33	14.000	1.59136	0.02993	-2.21
4.950	1.75667	0.00865	-4.89	8.500	1.71392	0.01562	-4.31	14.200	1.58531	0.03058	-2.09
5.000	1.75624	0.00875	-4.88	8.600	1.71234	0.01584	-4.29	14.400	1.57913	0.03125	-1.96
5.100	1.75536	0.00893	-4.87	8.700	1.71075	0.01605	-4.26	14.600	1.57281	0.03193	-1.83
5.200	1.75445	0.00911	-4.86	8.800	1.70913	0.01627	-4.24	14.800	1.56636	0.03262	-1.70
5.300	1.75353	0.00929	-4.85	8.900	1.70750	0.01649	-4.22	15.000	1.55976	0.03333	-1.56
5.400	1.75260	0.00948	-4.84	9.000	1.70584	0.01671	-4.19	15.200	1.55303	0.03405	-1.42
5.500	1.75164	0.00966	-4.82	9.100	1.70415	0.01693	-4.17	15.400	1.54614	0.03479	-1.27
5.600	1.75066	0.00985	-4.81	9.200	1.70245	0.01715	-4.14	15.600	1.53911	0.03554	-1.12
5.700	1.74967	0.01004	-4.80	9.300	1.70072	0.01738	-4.12	15.800	1.53193	0.03631	-0.96
5.800	1.74866	0.01022	-4.79	9.400	1.69897	0.01760	-4.09	16.000	1.52458	0.03710	-0.79
5.900	1.74762	0.01041	-4.77	9.500	1.69720	0.01783	-4.06	16.200	1.51708	0.03791	-0.62
6.000	1.74657	0.01060	-4.76	9.600	1.69541	0.01805	-4.03	16.400	1.50942	0.03874	-0.44
6.100	1.74550	0.01079	-4.75	9.700	1.69359	0.01828	-4.01	16.600	1.50159	0.03958	-0.26
6.200	1.74441	0.01098	-4.73	9.800	1.69175	0.01851	-3.98	16.800	1.49358	0.04045	-0.07
6.300	1.74331	0.01117	-4.72	9.900	1.68989	0.01875	-3.95	17.000	1.48540	0.04134	0.13
6.400	1.74218	0.01137	-4.70	10.000	1.68800	0.01898	-3.92	17.200	1.47705	0.04225	0.34
6.500	1.74103	0.01156	-4.69	10.200	1.68416	0.01945	-3.86	17.400	1.46850	0.04319	0.55
6.600	1.73987	0.01175	-4.67	10.400	1.68022	0.01993	-3.80	17.600	1.45977	0.04415	0.78
6.700	1.73868	0.01195	-4.66	10.600	1.67619	0.02042	-3.73	17.800	1.45084	0.04514	1.01
6.800	1.73748	0.01214	-4.64	10.800	1.67206	0.02091	-3.66	18.000	1.44171	0.04615	1.25
6.900	1.73625	0.01234	-4.62	11.000	1.66782	0.02141	-3.60	18.200	1.43238	0.04719	1.50
7.000	1.73501	0.01254	-4.61	11.200	1.66349	0.02191	-3.52	18.400	1.42283	0.04827	1.76
7.100	1.73375	0.01274	-4.59	11.400	1.65906	0.02243	-3.45	18.600	1.41307	0.04937	2.03
7.200	1.73246	0.01294	-4.57	11.600	1.65452	0.02295	-3.37	18.800	1.40308	0.05051	2.31
7.300	1.73116	0.01314	-4.55	11.800	1.64988	0.02348	-3.29	19.000	1.39286	0.05168	2.60
7.400	1.72983	0.01334	-4.54	12.000	1.64513	0.02401	-3.21	19.200	1.38241	0.05289	2.91
7.500	1.72849	0.01354	-4.52	12.200	1.64027	0.02456	-3.12	19.400	1.37170	0.05414	3.23
7.600	1.72713	0.01374	-4.50	12.400	1.63531	0.02512	-3.04	19.600	1.36075	0.05543	3.56
7.700	1.72574	0.01395	-4.48	12.600	1.63023	0.02568	-2.94	19.800	1.34953	0.05677	3.90
7.800	1.72434	0.01415	-4.46	12.800	1.62503	0.02626	-2.85	20.000	1.33804	0.05814	4.26
7.900	1.72291	0.01436	-4.44	13.000	1.61972	0.02684	-2.75				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.3. The number of digits with an overstrike are not relevant to accuracy of the data.

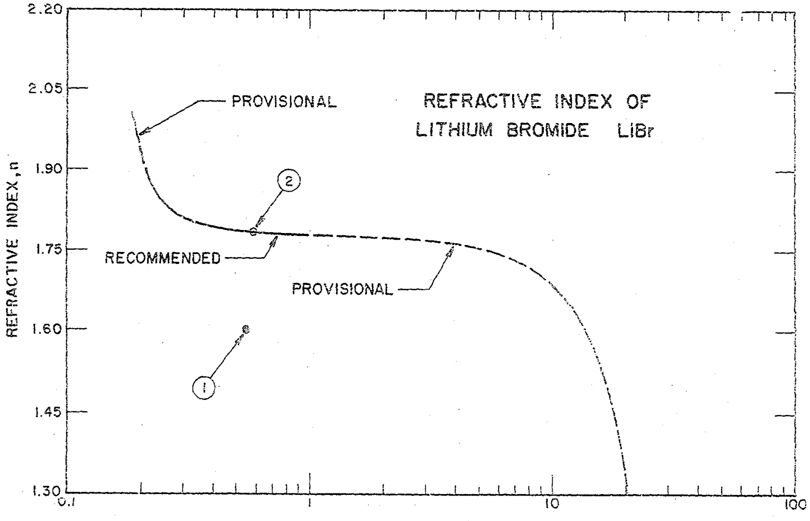

FIGURE 11. Refractive Index of LiBr

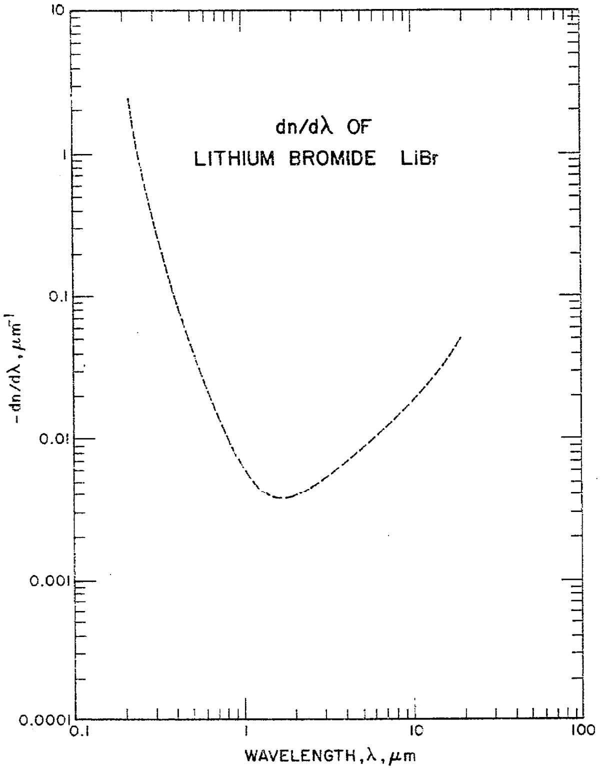

FIGURE 12. $dn/d\lambda$ of LiBr

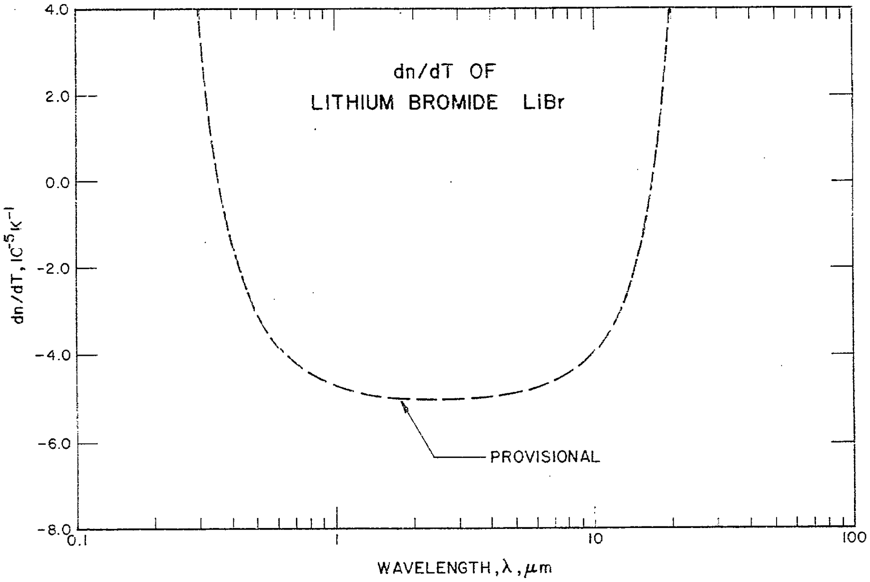

FIGURE 13. dn/dT of LiBr

TABLE 15. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF LiBr

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications and Remarks
1	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	843	Molten LiBr; filled into a 60° prismatic Pt container with silica glass windows of 4 mm diameter; estimated uncertainty of 0.005 in measured n; digitized data were presented.
2	45	Spangenberg, K.	1923	M	0.5893	295	LiBr was formed by slow cooling of the melt on the lid of a Pt crucible and then peeled off; refractive index for mean of sodium D lines was measured by the immersion method.

TABLE 16. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiBr

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 843.2 K	
0.5461	1.600
CURVE 2 T = 295.2 K	
0.5893	1.784

3.4. Lithium Iodide, LiI

Only one value of the refractive index of LiI is available, measured by Spangenberg [45] in 1923. Such scantiness of data is probably due to difficulties in crystal growing and sample preparation. A number of other physical properties of LiI are known; some values are given in tables 2 and 3. With this single value of n, the dispersion equation can still be constructed by utilizing the available information on the dielectric constants and the wavelengths of absorption peaks.

Using the values of known parameters listed in table 3 and the available value of n, we find

$\epsilon_s = 11.03$,

$\epsilon_{uv} = 3.80$,

$\lambda_u = 0.171$ μm (averaged value of 7 peaks)

$\lambda_I = 70.42$ μm,

$n = 1.955$ for $\lambda = 0.5893$ μm.

The value of the parameter A of eq (13) was found to be 3.55. This leads to a dispersion equation for LiI which is valid at 293 K in the transparent region, 0.25–25 μm:

$$n^2 = 3.55 + \frac{0.25\,\lambda^2}{\lambda^2 - (0.171)^2} + \frac{7.23\,\lambda^2}{\lambda^2 - (70.42)^2}, \qquad (29)$$

where λ is in units of μm.

No experimental data on dn/dT are available. However, our empirical parameters in table 5 lead to a formula for dn/dT in the transparent region:

$$2n\frac{dn}{dT} = -17.82\,(n^2 - 1) - 14.90 + \frac{36.40\,\lambda^4}{(\lambda^2 - 0.04494)^2} + \frac{318.12\,\lambda^4}{(\lambda^2 - 4958.98)^2}, \qquad (30)$$

where dn/dT is in units of $10^{-5}\,\mathrm{K}^{-1}$ and λ in μm.

Equations (29) and (30) were used to generate the recommended values. Since the construction of these equations is based totally on the available data on the thermal linear expansion, the dielectric constants, the wavelengths of absorption peaks, and the empirical parameters, the reliability of the calculated values is governed by the uncertainties of these quantities. The following accuracies were estimated after carefully studying the correlated properties:

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.25– 0.30	2	0.01
0.30– 1.00	3	0.005
1.00– 8.00	3	0.008
8.00–13.00	2	0.01
13.00–25.00	2	0.03

For dn/dT:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.25– 0.55	1	0.9
0.55–20.00	1	0.5
20.00–25.00	1	0.9

TABLE 17. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiI AT 293 K*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.250	2.00492	0.82424	97.86	0.550	1.95610	0.02794	-3.85	2.750	1.94677	0.00225	-7.13
0.252	2.00331	0.78349	89.19	0.560	1.95582	0.02630	-4.00	2.800	1.94666	0.00228	-7.14
0.254	2.00178	0.74563	81.64	0.570	1.95557	0.02480	-4.14	2.850	1.94655	0.00231	-7.14
0.256	2.00033	0.71038	75.03	0.580	1.95533	0.02342	-4.28	2.900	1.94643	0.00233	-7.14
0.258	1.99894	0.67752	69.19	0.590	1.95510	0.02214	-4.40	2.950	1.94631	0.00236	-7.14
0.260	1.99762	0.64682	64.02	0.600	1.95489	0.02096	-4.52	3.000	1.94619	0.00240	-7.14
0.262	1.99635	0.61812	59.40	0.620	1.95449	0.01885	-4.73	3.050	1.94607	0.00243	-7.15
0.264	1.99514	0.59123	55.26	0.640	1.95413	0.01703	-4.91	3.100	1.94595	0.00246	-7.15
0.266	1.99399	0.56602	51.53	0.660	1.95381	0.01545	-5.08	3.150	1.94583	0.00249	-7.15
0.268	1.99288	0.54234	48.16	0.680	1.95351	0.01407	-5.23	3.200	1.94570	0.00252	-7.15
0.270	1.99182	0.52007	45.10	0.700	1.95324	0.01286	-5.36	3.250	1.94557	0.00256	-7.15
0.272	1.99080	0.49911	42.32	0.720	1.95299	0.01180	-5.48	3.300	1.94545	0.00259	-7.15
0.274	1.98982	0.47935	39.77	0.740	1.95277	0.01086	-5.59	3.350	1.94532	0.00262	-7.15
0.276	1.98888	0.46071	37.44	0.760	1.95256	0.01003	-5.69	3.400	1.94518	0.00266	-7.15
0.278	1.98798	0.44310	35.29	0.780	1.95237	0.00929	-5.78	3.450	1.94505	0.00269	-7.15
0.280	1.98711	0.42645	33.31	0.800	1.95219	0.00863	-5.86	3.500	1.94491	0.00272	-7.15
0.282	1.98627	0.41070	31.49	0.820	1.95202	0.00804	-5.94	3.550	1.94478	0.00276	-7.15
0.284	1.98546	0.39577	29.79	0.840	1.95187	0.00750	-6.01	3.600	1.94464	0.00279	-7.15
0.286	1.98469	0.38161	28.22	0.860	1.95172	0.00703	-6.07	3.650	1.94450	0.00283	-7.15
0.288	1.98394	0.36817	26.76	0.880	1.95158	0.00659	-6.13	3.700	1.94436	0.00286	-7.15
0.290	1.98321	0.35541	25.39	0.900	1.95146	0.00620	-6.19	3.750	1.94421	0.00290	-7.15
0.292	1.98251	0.34327	24.12	0.920	1.95134	0.00585	-6.24	3.800	1.94407	0.00294	-7.15
0.294	1.98184	0.33173	22.92	0.940	1.95122	0.00553	-6.28	3.850	1.94392	0.00297	-7.15
0.296	1.98119	0.32073	21.81	0.960	1.95111	0.00523	-6.33	3.900	1.94377	0.00301	-7.15
0.298	1.98056	0.31025	20.75	0.980	1.95101	0.00497	-6.37	3.950	1.94362	0.00304	-7.15
0.300	1.97995	0.30026	19.77	1.000	1.95092	0.00472	-6.41	4.000	1.94346	0.00308	-7.15
0.305	1.97850	0.27722	17.54	1.050	1.95069	0.00420	-6.49	4.050	1.94331	0.00312	-7.15
0.310	1.97717	0.25664	15.60	1.100	1.95049	0.00378	-6.57	4.100	1.94315	0.00315	-7.14
0.315	1.97593	0.23818	13.91	1.150	1.95031	0.00344	-6.63	4.150	1.94299	0.00319	-7.14
0.320	1.97478	0.22156	12.41	1.200	1.95015	0.00316	-6.68	4.200	1.94283	0.00323	-7.14
0.325	1.97371	0.20655	11.09	1.250	1.95000	0.00293	-6.73	4.250	1.94267	0.00326	-7.14
0.330	1.97272	0.19296	9.91	1.300	1.94986	0.00274	-6.77	4.300	1.94251	0.00330	-7.14
0.335	1.97178	0.18060	8.85	1.350	1.94972	0.00258	-6.81	4.350	1.94234	0.00334	-7.14
0.340	1.97091	0.16935	7.90	1.400	1.94960	0.00246	-6.84	4.400	1.94217	0.00337	-7.14
0.345	1.97009	0.15906	7.03	1.450	1.94948	0.00235	-6.87	4.450	1.94200	0.00341	-7.14
0.350	1.96932	0.14964	6.25	1.500	1.94936	0.00226	-6.90	4.500	1.94183	0.00345	-7.13
0.355	1.96859	0.14100	5.53	1.550	1.94925	0.00219	-6.92	4.550	1.94166	0.00349	-7.13
0.360	1.96791	0.13304	4.88	1.600	1.94914	0.00213	-6.94	4.600	1.94148	0.00352	-7.13
0.365	1.96726	0.12571	4.28	1.650	1.94904	0.00209	-6.96	4.650	1.94131	0.00356	-7.13
0.370	1.96665	0.11893	3.73	1.700	1.94893	0.00205	-6.98	4.700	1.94113	0.00360	-7.13
0.375	1.96607	0.11267	3.22	1.750	1.94883	0.00202	-7.00	4.750	1.94095	0.00364	-7.13
0.380	1.96552	0.10685	2.75	1.800	1.94873	0.00200	-7.01	4.800	1.94077	0.00367	-7.12
0.385	1.96500	0.10146	2.31	1.850	1.94863	0.00199	-7.02	4.850	1.94058	0.00371	-7.12
0.390	1.96450	0.09644	1.90	1.900	1.94853	0.00198	-7.03	4.900	1.94039	0.00375	-7.12
0.395	1.96403	0.09176	1.52	1.950	1.94843	0.00198	-7.05	4.950	1.94021	0.00379	-7.12
0.400	1.96359	0.08739	1.17	2.000	1.94833	0.00197	-7.06	5.000	1.94002	0.00383	-7.12
0.410	1.96275	0.07950	0.53	2.050	1.94823	0.00198	-7.06	5.100	1.93963	0.00390	-7.11
0.420	1.96199	0.07257	-0.03	2.100	1.94814	0.00199	-7.07	5.200	1.93923	0.00398	-7.11
0.430	1.96130	0.06647	-0.54	2.150	1.94804	0.00199	-7.08	5.300	1.93883	0.00406	-7.10
0.440	1.96066	0.06106	-0.98	2.200	1.94794	0.00201	-7.09	5.400	1.93842	0.00413	-7.10
0.450	1.96008	0.05624	-1.38	2.250	1.94784	0.00202	-7.09	5.500	1.93801	0.00421	-7.09
0.460	1.95954	0.05195	-1.74	2.300	1.94773	0.00204	-7.10	5.600	1.93758	0.00429	-7.09
0.470	1.95904	0.04809	-2.07	2.350	1.94763	0.00206	-7.11	5.700	1.93715	0.00437	-7.08
0.480	1.95857	0.04463	-2.36	2.400	1.94753	0.00208	-7.11	5.800	1.93671	0.00445	-7.08
0.490	1.95814	0.04151	-2.63	2.450	1.94742	0.00210	-7.11	5.900	1.93626	0.00452	-7.07
0.500	1.95774	0.03868	-2.88	2.500	1.94732	0.00212	-7.12	6.000	1.93580	0.00460	-7.06
0.510	1.95737	0.03612	-3.11	2.550	1.94721	0.00214	-7.12	6.100	1.93534	0.00468	-7.06
0.520	1.95702	0.03379	-3.31	2.600	1.94710	0.00217	-7.13	6.200	1.93487	0.00476	-7.05
0.530	1.95669	0.03166	-3.51	2.650	1.94700	0.00219	-7.13	6.300	1.93439	0.00484	-7.05
0.540	1.95638	0.02972	-3.68	2.700	1.94689	0.00222	-7.13	6.400	1.93390	0.00492	-7.04

TABLE 17. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR LiI AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
6.500	1.93340	0.00500	-7.03	9.700	1.91318	0.00768	-6.73	15.800	1.84845	0.01382	-5.59
6.600	1.93290	0.00508	-7.02	9.800	1.91240	0.00777	-6.72	16.000	1.84566	0.01405	-5.53
6.700	1.93239	0.00516	-7.02	9.900	1.91162	0.00786	-6.71	16.200	1.84283	0.01429	-5.48
6.800	1.93187	0.00524	-7.01	10.000	1.91083	0.00795	-6.69	16.400	1.83995	0.01453	-5.42
6.900	1.93134	0.00532	-7.00	10.200	1.90922	0.00813	-6.67	16.600	1.83702	0.01477	-5.36
7.000	1.93080	0.00540	-7.00	10.400	1.90758	0.00831	-6.64	16.800	1.83404	0.01502	-5.30
7.100	1.93026	0.00548	-6.99	10.600	1.90590	0.00849	-6.61	17.000	1.83101	0.01526	-5.24
7.200	1.92971	0.00557	-6.98	10.800	1.90418	0.00868	-6.59	17.200	1.82793	0.01552	-5.18
7.300	1.92914	0.00565	-6.97	11.000	1.90243	0.00886	-6.56	17.400	1.82480	0.01577	-5.11
7.400	1.92858	0.00573	-6.96	11.200	1.90064	0.00905	-6.53	17.600	1.82162	0.01603	-5.05
7.500	1.92800	0.00581	-6.96	11.400	1.89881	0.00923	-6.50	17.800	1.81839	0.01629	-4.98
7.600	1.92741	0.00589	-6.95	11.600	1.89694	0.00942	-6.47	18.000	1.81511	0.01655	-4.91
7.700	1.92682	0.00598	-6.94	11.800	1.89504	0.00961	-6.43	18.200	1.81177	0.01682	-4.84
7.800	1.92622	0.00606	-6.93	12.000	1.89310	0.00981	-6.40	18.400	1.80838	0.01709	-4.77
7.900	1.92561	0.00614	-6.92	12.200	1.89112	0.01000	-6.37	18.600	1.80494	0.01736	-4.69
8.000	1.92499	0.00623	-6.91	12.400	1.88910	0.01019	-6.33	18.800	1.80144	0.01764	-4.61
8.100	1.92436	0.00631	-6.90	12.600	1.88704	0.01039	-6.30	19.000	1.79788	0.01792	-4.54
8.200	1.92373	0.00639	-6.89	12.800	1.88494	0.01059	-6.26	19.200	1.79427	0.01821	-4.46
8.300	1.92308	0.00648	-6.88	13.000	1.88280	0.01079	-6.22	19.400	1.79060	0.01850	-4.37
8.400	1.92243	0.00656	-6.87	13.200	1.88063	0.01099	-6.19	19.600	1.78687	0.01879	-4.29
8.500	1.92177	0.00665	-6.86	13.400	1.87841	0.01120	-6.15	19.800	1.78308	0.01909	-4.20
8.600	1.92110	0.00673	-6.85	13.600	1.87615	0.01140	-6.11	20.000	1.77923	0.01939	-4.11
8.700	1.92043	0.00682	-6.84	13.800	1.87385	0.01161	-6.06	20.500	1.76934	0.02017	-3.88
8.800	1.91974	0.00690	-6.83	14.000	1.87150	0.01182	-6.02	21.000	1.75906	0.02097	-3.63
8.900	1.91904	0.00699	-6.82	14.200	1.86912	0.01204	-5.98	21.500	1.74837	0.02180	-3.37
9.000	1.91834	0.00707	-6.81	14.400	1.86669	0.01225	-5.93	22.000	1.73725	0.02267	-3.05
9.100	1.91763	0.00716	-6.80	14.600	1.86421	0.01247	-5.89	22.500	1.72569	0.02358	-2.79
9.200	1.91691	0.00725	-6.79	14.800	1.86170	0.01269	-5.84	23.000	1.71367	0.02452	-2.47
9.300	1.91618	0.00733	-6.78	15.000	1.85914	0.01291	-5.79	23.500	1.70116	0.02551	-2.13
9.400	1.91544	0.00742	-6.77	15.200	1.85654	0.01313	-5.74	24.000	1.68815	0.02653	-1.77
9.500	1.91470	0.00751	-6.75	15.400	1.85389	0.01336	-5.69	24.500	1.67462	0.02761	-1.38
9.600	1.91394	0.00760	-6.74	15.600	1.85119	0.01359	-5.64	25.000	1.66054	0.02874	-0.96

* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.4. The number of digits with an overstrike are not relevant to accuracy of the data.

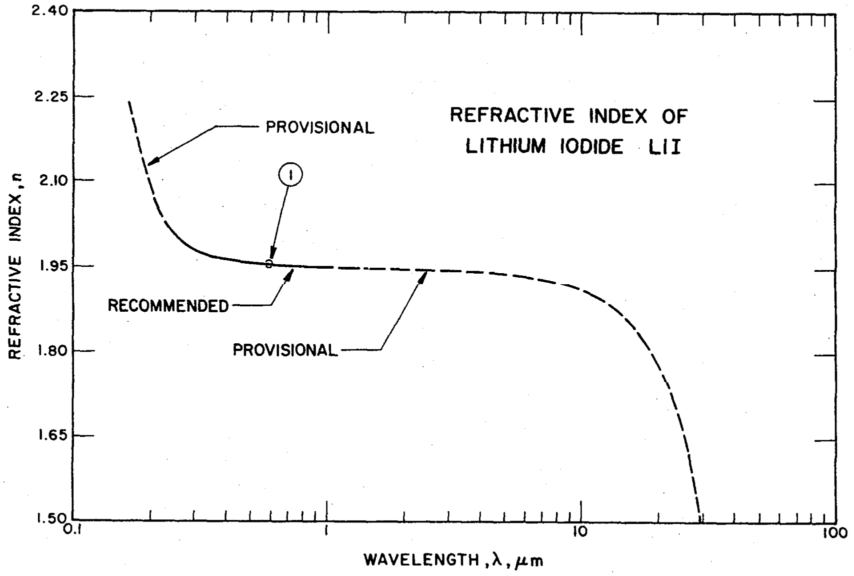

FIGURE 14. Refractive Index of LiI

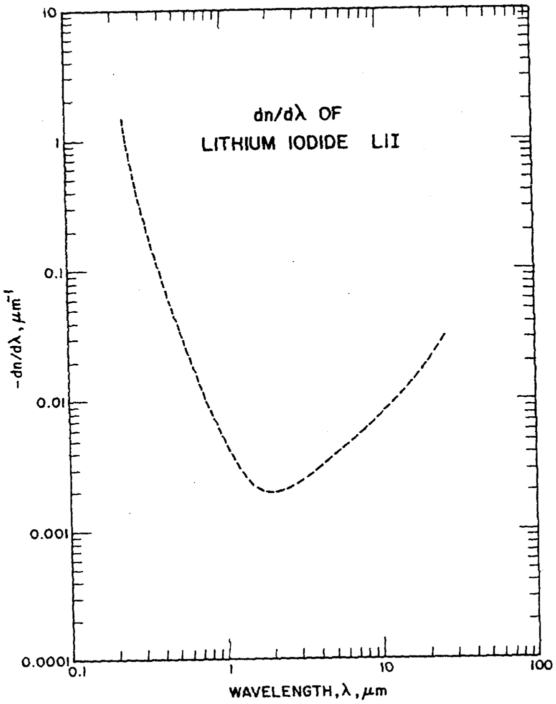

FIGURE 15. $dn/d\lambda$ of LiI

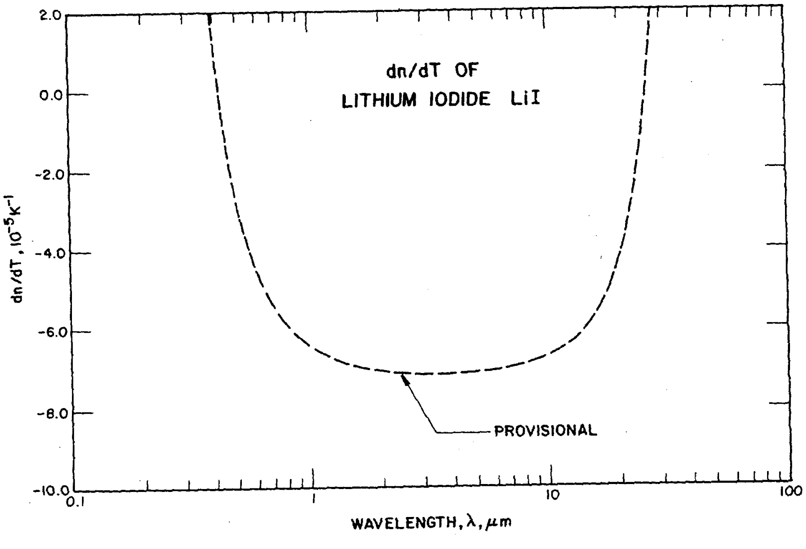

FIGURE 16. dn/dT of LiI

TABLE 18. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF LiI

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications and Remarks
1	45	Spangenberg, K.	1923	M	0.5893	295	LiI was produced by the reaction of $2HI + 2LiCo_3 \rightarrow 2LiI + H_2CO_3$ and then slowly solidified; refractive index for mean of sodium D lines was measured by the immersion method.

TABLE 19. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF LiI

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 295.2 K	
0.5893	1.955

3.5. Sodium Fluoride, NaF

Sodium fluoride is less hygroscopic than the other alkali halides, with the exception of lithium fluoride. It is transparent over the same range as calcium fluoride, a wider range than that of lithium fluoride. It is not satisfactory mechanically, but it has some uses in cases where a particularly low refractive index is needed. It can be easily evaporated as a thin film and can be used for reflection-reducing coatings, since it has one of the simple crystal structures. A number of the characteristic physical properties have been measured; those related to the dispersion of NaF are listed in table 3.

Available data on the refractive index of NaF are not abundant, mainly because of its mechanical weakness. The ultraviolet absorption region was investigated by Sano [49], the transparent region by Hohls [29], Harting [30], Kublitzky [50], and Spangenberg [45], and the infrared region by Randall [51]. Zarzyski and Naudin [44] obtained n for molten NaF at the Hg green line at a temperature of 1273 K. After carefully reviewing of all of these investigations, we selected the data reported by Hohls [29], Harting [30], Kublitzky [50], and Spangenberg [45] as the basis for the generation of reference data. Among the selected data, those of Harting [30] and Hohls [29] (curve 3 in fig. 17) are reliable and receive heavy weight in the analysis. The accuracy of Kublitzky's value is one unit of the third decimal place, although his values are reported to the fourth place. Three sets (curves 4, 5, and 6) of Hohls' measurements are for thin films and therefore are not consistent with those of bulk materials. Values reported by Spangenberg are inaccurate. Low weights were given to the data sets with low accuracies.

It appears that all the chosen data were obtained at temperatures close to 293 K and that the dn/dT values are small (less than $-1.5\times10^{-5}\mathrm{K}^{-1}$), so that corrections to the chosen data are not significant. However, knowledge of dn/dT is indispensable for reducing the n values to other temperatures. Limited experimental data on dn/dT were reported by Hohls and Harting. The results of the least squares fitting of the dn/dT data to eq (19), together with the results obtained for LiF, NaCl, KCl and CsI, lead to the empirical parameter values listed in table 5. These enable us to construct a formula

$$2n\frac{dn}{dT}=-9.51(n^2-1)-0.92+\frac{3.404\lambda^4}{(\lambda^2-0.01369)^2}+\frac{83.30\lambda^4}{(\lambda^2-1645.92)^2}, \quad (31)$$

for estimating dn/dT of NaF in units of $10^{-5}\mathrm{K}^{-1}$. Values calculated by this equation agree very well with the available data as shown in figure 19.

Radhakrishnan [48] worked out a formula to correlate the dispersion and the characteristic absorption peaks. His formula gives values of 6.00, 0.114 μm and 45 μm for the static dielectric constant, and the wavelengths of ultraviolet absorption and infrared absorption peaks, respectively, in considerable disagreement with the values now available (see table 3).

After making temperature corrections to the chosen data on n, the resulting values were least-squares fitted to eq (10) with the aid of appropriate parameters from table 3. We get as the dispersion equation of NaF at 293 K in the transparent region, 0.15–17.00 μm,

$$n^2=1.41572+\frac{0.32785\,\lambda^2}{\lambda^2-(0.117)^2}+\frac{3.18248\,\lambda^2}{\lambda^2-(40.57)^2}, \quad (32)$$

where λ is in units of μm.

Equations (31) and (32) were used to generate the reference data given in table 17; $dn/d\lambda$ values were evaluated by taking the first derivative of eq (32). The generated values are given to extra decimal places for the purpose of tabular smoothness. The uncertainties in the values are as follows:

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.15– 0.20	3	0.006
0.20–11.00	4	0.0005
11.00–17.00	3	0.006
For dn/dT:		
0.15– 0.18	1	0.9
0.18– 3.00	1	0.1
3.00–13.00	1	0.4
13.00–17.00	1	0.9

TABLE 20. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaF AT 293 K *

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.150	1.50096	5.77746	3.12	0.270	1.34879	0.25664	-1.32	0.700	1.32365	0.01148	-1.69
0.152	1.49004	5.16504	2.68	0.272	1.34828	0.24943	-1.32	0.720	1.32343	0.01064	-1.69
0.154	1.48024	4.64425	2.30	0.274	1.34779	0.24251	-1.33	0.740	1.32322	0.00989	-1.69
0.156	1.47141	4.19767	1.97	0.276	1.34731	0.23585	-1.34	0.760	1.32303	0.00922	-1.70
0.158	1.46341	3.81182	1.68	0.278	1.34684	0.22945	-1.35	0.780	1.32285	0.00862	-1.70
0.160	1.45613	3.47617	1.43	0.280	1.34639	0.22329	-1.36	0.800	1.32269	0.00809	-1.70
0.162	1.44948	3.18237	1.20	0.282	1.34595	0.21735	-1.36	0.820	1.32253	0.00761	-1.70
0.164	1.44338	2.92374	1.00	0.284	1.34552	0.21164	-1.37	0.840	1.32238	0.00718	-1.70
0.166	1.43776	2.69490	0.83	0.286	1.34510	0.20613	-1.38	0.860	1.32224	0.00680	-1.70
0.168	1.43258	2.49144	0.67	0.288	1.34470	0.20082	-1.38	0.880	1.32211	0.00645	-1.70
0.170	1.42778	2.30975	0.52	0.290	1.34430	0.19570	-1.39	0.900	1.32198	0.00614	-1.71
0.172	1.42333	2.14684	0.39	0.292	1.34391	0.19076	-1.40	0.920	1.32186	0.00585	-1.71
0.174	1.41918	2.00022	0.27	0.294	1.34354	0.18600	-1.40	0.940	1.32175	0.00559	-1.71
0.176	1.41532	1.86778	0.17	0.296	1.34317	0.18140	-1.41	0.960	1.32164	0.00536	-1.71
0.178	1.41170	1.74777	0.07	0.298	1.34281	0.17695	-1.41	0.980	1.32153	0.00515	-1.71
0.180	1.40832	1.63868	-0.02	0.300	1.34246	0.17266	-1.42	1.000	1.32143	0.00496	-1.71
0.182	1.40514	1.53923	-0.11	0.305	1.34163	0.16254	-1.43	1.050	1.32120	0.00455	-1.71
0.184	1.40216	1.44832	-0.18	0.310	1.34084	0.15323	-1.45	1.100	1.32098	0.00422	-1.71
0.186	1.39934	1.36501	-0.25	0.315	1.34009	0.14464	-1.46	1.150	1.32077	0.00397	-1.71
0.188	1.39669	1.28848	-0.32	0.320	1.33939	0.13671	-1.47	1.200	1.32058	0.00376	-1.71
0.190	1.39419	1.21802	-0.38	0.325	1.33872	0.12938	-1.48	1.250	1.32039	0.00361	-1.71
0.192	1.39182	1.15300	-0.44	0.330	1.33809	0.12257	-1.49	1.300	1.32022	0.00348	-1.71
0.194	1.38957	1.09289	-0.49	0.335	1.33750	0.11626	-1.50	1.350	1.32005	0.00338	-1.71
0.196	1.38744	1.03720	-0.54	0.340	1.33693	0.11039	-1.51	1.400	1.31988	0.00331	-1.71
0.198	1.38542	0.98552	-0.59	0.345	1.33639	0.10492	-1.51	1.450	1.31971	0.00326	-1.71
0.200	1.38350	0.93747	-0.63	0.350	1.33588	0.09982	-1.52	1.500	1.31955	0.00322	-1.71
0.202	1.38167	0.89272	-0.67	0.355	1.33539	0.09506	-1.53	1.550	1.31939	0.00320	-1.71
0.204	1.37992	0.85099	-0.71	0.360	1.33493	0.09061	-1.54	1.600	1.31923	0.00319	-1.71
0.206	1.37826	0.81200	-0.75	0.365	1.33449	0.08644	-1.54	1.650	1.31907	0.00319	-1.71
0.208	1.37668	0.77553	-0.78	0.370	1.33407	0.08253	-1.55	1.700	1.31891	0.00320	-1.71
0.210	1.37516	0.74136	-0.81	0.375	1.33366	0.07886	-1.55	1.750	1.31875	0.00322	-1.71
0.212	1.37371	0.70931	-0.84	0.380	1.33328	0.07542	-1.56	1.800	1.31859	0.00324	-1.71
0.214	1.37232	0.67921	-0.87	0.385	1.33291	0.07218	-1.57	1.850	1.31843	0.00327	-1.71
0.216	1.37099	0.65090	-0.90	0.390	1.33255	0.06913	-1.57	1.900	1.31826	0.00330	-1.71
0.218	1.36972	0.62425	-0.93	0.395	1.33222	0.06626	-1.58	1.950	1.31810	0.00334	-1.71
0.220	1.36849	0.59913	-0.95	0.400	1.33189	0.06354	-1.58	2.000	1.31793	0.00338	-1.71
0.222	1.36732	0.57543	-0.97	0.410	1.33128	0.05857	-1.59	2.050	1.31776	0.00342	-1.71
0.224	1.36619	0.55305	-0.00	0.420	1.33072	0.05411	-1.60	2.100	1.31759	0.00347	-1.71
0.226	1.36510	0.53188	-1.02	0.430	1.33020	0.05012	-1.60	2.150	1.31741	0.00352	-1.70
0.228	1.36406	0.51185	-1.04	0.440	1.32971	0.04652	-1.61	2.200	1.31724	0.00357	-1.70
0.230	1.36306	0.49287	-1.06	0.450	1.32927	0.04327	-1.62	2.250	1.31706	0.00362	-1.70
0.232	1.36209	0.47488	-1.08	0.460	1.32885	0.04033	-1.62	2.300	1.31687	0.00368	-1.70
0.234	1.36116	0.45781	-1.09	0.470	1.32846	0.03766	-1.63	2.350	1.31669	0.00374	-1.70
0.236	1.36026	0.44160	-1.11	0.480	1.32809	0.03524	-1.63	2.400	1.31650	0.00380	-1.70
0.238	1.35939	0.42619	-1.13	0.490	1.32775	0.03302	-1.64	2.450	1.31631	0.00386	-1.70
0.240	1.35855	0.41153	-1.14	0.500	1.32743	0.03100	-1.64	2.500	1.31611	0.00392	-1.70
0.242	1.35774	0.39757	-1.16	0.510	1.32713	0.02915	-1.65	2.550	1.31592	0.00398	-1.69
0.244	1.35696	0.38428	-1.17	0.520	1.32685	0.02745	-1.65	2.600	1.31572	0.00405	-1.69
0.246	1.35621	0.37160	-1.19	0.530	1.32658	0.02588	-1.65	2.650	1.31551	0.00411	-1.69
0.248	1.35547	0.35951	-1.20	0.540	1.32633	0.02445	-1.66	2.700	1.31531	0.00418	-1.69
0.250	1.35477	0.34797	-1.21	0.550	1.32609	0.02312	-1.66	2.750	1.31509	0.00425	-1.69
0.252	1.35408	0.33694	-1.22	0.560	1.32587	0.02189	-1.66	2.800	1.31488	0.00431	-1.69
0.254	1.35342	0.32640	-1.24	0.570	1.32566	0.02076	-1.66	2.850	1.31466	0.00438	-1.68
0.256	1.35278	0.31632	-1.25	0.580	1.32545	0.01970	-1.67	2.900	1.31444	0.00445	-1.68
0.258	1.35215	0.30667	-1.26	0.590	1.32526	0.01873	-1.67	2.950	1.31422	0.00452	-1.68
0.260	1.35155	0.29743	-1.27	0.600	1.32508	0.01782	-1.67	3.000	1.31399	0.00459	-1.68
0.262	1.35096	0.28858	-1.28	0.620	1.32474	0.01619	-1.68	3.050	1.31376	0.00466	-1.68
0.264	1.35040	0.28009	-1.29	0.640	1.32443	0.01477	-1.68	3.100	1.31352	0.00473	-1.68
0.266	1.34984	0.27195	-1.30	0.660	1.32415	0.01353	-1.68	3.150	1.31329	0.00480	-1.67
0.268	1.34931	0.26414	-1.31	0.680	1.32389	0.01244	-1.69	3.200	1.31304	0.00488	-1.67

TABLE 20. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaF AT 293 K (continued)*

λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}
3.250	1.31280	0.00495	-1.67	5.600	1.29688	0.00870	-1.53	9.700	1.24525	0.01695	-0.98
3.300	1.31255	0.00502	-1.67	5.700	1.29600	0.00887	-1.52	9.800	1.24355	0.01719	-0.96
3.350	1.31230	0.00510	-1.67	5.800	1.29511	0.00904	-1.51	9.900	1.24182	0.01743	-0.94
3.400	1.31204	0.00517	-1.66	5.900	1.29419	0.00922	-1.50	10.000	1.24006	0.01768	-0.92
3.450	1.31178	0.00524	-1.66	6.000	1.29326	0.00939	-1.50	10.200	1.23648	0.01818	-0.88
3.500	1.31152	0.00532	-1.66	6.100	1.29231	0.00957	-1.49	10.400	1.23279	0.01869	-0.83
3.550	1.31125	0.00539	-1.66	6.200	1.29135	0.00975	-1.48	10.600	1.22900	0.01921	-0.78
3.600	1.31098	0.00547	-1.65	6.300	1.29037	0.00993	-1.47	10.800	1.22510	0.01975	-0.73
3.650	1.31070	0.00554	-1.65	6.400	1.28936	0.01011	-1.46	11.000	1.22110	0.02029	-0.68
3.700	1.31042	0.00562	-1.65	6.500	1.28834	0.01029	-1.45	11.200	1.21698	0.02085	-0.63
3.750	1.31014	0.00570	-1.65	6.600	1.28731	0.01047	-1.44	11.400	1.21276	0.02143	-0.57
3.800	1.30985	0.00577	-1.65	6.700	1.28625	0.01066	-1.43	11.600	1.20841	0.02202	-0.51
3.850	1.30956	0.00585	-1.64	6.800	1.28517	0.01084	-1.42	11.800	1.20395	0.02262	-0.45
3.900	1.30927	0.00593	-1.64	6.900	1.28408	0.01103	-1.41	12.000	1.19936	0.02324	-0.38
3.950	1.30897	0.00600	-1.64	7.000	1.28297	0.01122	-1.39	12.200	1.19465	0.02387	-0.32
4.000	1.30867	0.00608	-1.63	7.100	1.28184	0.01141	-1.38	12.400	1.18981	0.02452	-0.25
4.050	1.30836	0.00616	-1.63	7.200	1.28069	0.01160	-1.37	12.600	1.18484	0.02519	-0.17
4.100	1.30805	0.00624	-1.63	7.300	1.27952	0.01179	-1.36	12.800	1.17974	0.02588	-0.09
4.150	1.30774	0.00631	-1.63	7.400	1.27833	0.01199	-1.35	13.000	1.17449	0.02658	-0.01
4.200	1.30742	0.00639	-1.62	7.500	1.27712	0.01218	-1.34	13.200	1.16910	0.02731	0.07
4.250	1.30710	0.00647	-1.62	7.600	1.27589	0.01238	-1.32	13.400	1.16357	0.02806	0.16
4.300	1.30677	0.00655	-1.62	7.700	1.27465	0.01258	-1.31	13.600	1.15788	0.02883	0.25
4.350	1.30644	0.00663	-1.62	7.800	1.27338	0.01278	-1.30	13.800	1.15204	0.02962	0.35
4.400	1.30611	0.00671	-1.61	7.900	1.27209	0.01298	-1.28	14.000	1.14603	0.03044	0.45
4.450	1.30577	0.00679	-1.61	8.000	1.27078	0.01318	-1.27	14.200	1.13986	0.03128	0.55
4.500	1.30543	0.00687	-1.61	8.100	1.26945	0.01339	-1.26	14.400	1.13351	0.03216	0.66
4.550	1.30508	0.00695	-1.60	8.200	1.26810	0.01360	-1.24	14.600	1.12699	0.03306	0.78
4.600	1.30474	0.00703	-1.60	8.300	1.26673	0.01381	-1.23	14.800	1.12029	0.03399	0.90
4.650	1.30438	0.00711	-1.60	8.400	1.26534	0.01402	-1.21	15.000	1.11340	0.03495	1.03
4.700	1.30402	0.00719	-1.59	8.500	1.26393	0.01423	-1.20	15.200	1.10631	0.03595	1.16
4.750	1.30366	0.00727	-1.59	8.600	1.26250	0.01445	-1.18	15.400	1.09901	0.03699	1.31
4.800	1.30330	0.00736	-1.59	8.700	1.26104	0.01466	-1.16	15.600	1.09151	0.03806	1.45
4.850	1.30293	0.00744	-1.58	8.800	1.25956	0.01488	-1.15	15.800	1.08379	0.03917	1.61
4.900	1.30255	0.00752	-1.58	8.900	1.25806	0.01510	-1.13	16.000	1.07584	0.04033	1.77
4.950	1.30217	0.00760	-1.58	9.000	1.25654	0.01532	-1.11	16.200	1.06765	0.04153	1.94
5.000	1.30179	0.00768	-1.57	9.100	1.25500	0.01555	-1.10	16.400	1.05922	0.04278	2.13
5.100	1.30102	0.00785	-1.57	9.200	1.25343	0.01578	-1.08	16.600	1.05054	0.04408	2.32
5.200	1.30022	0.00802	-1.56	9.300	1.25184	0.01601	-1.06	16.800	1.04159	0.04543	2.52
5.300	1.29941	0.00819	-1.55	9.400	1.25023	0.01624	-1.04	17.000	1.03236	0.04685	2.73
5.400	1.29859	0.00836	-1.55	9.500	1.24860	0.01647	-1.02				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.5. The number of digits with an overstrike are not relevant to accuracy of the data.

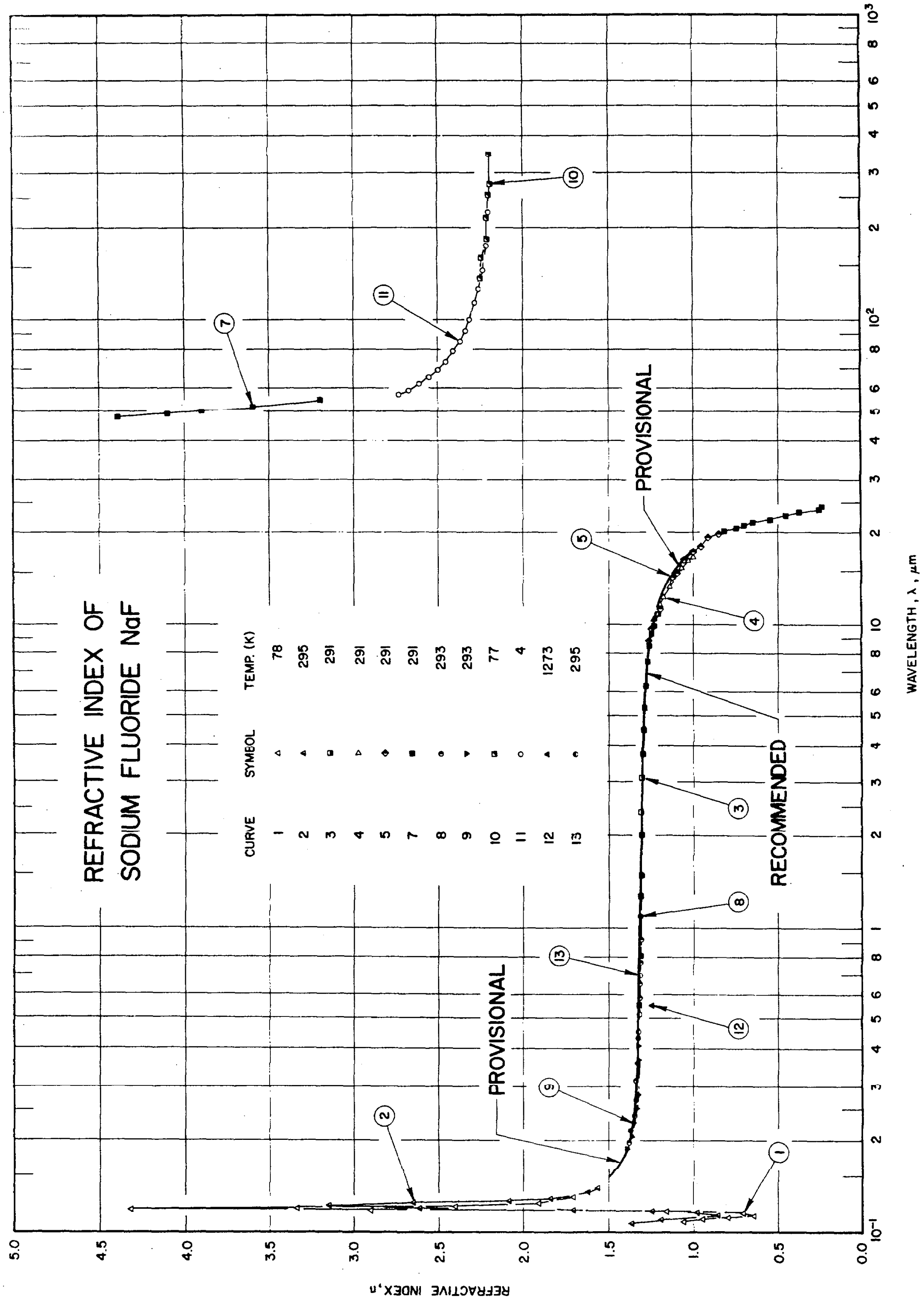

FIGURE 17. Refractive Index of NaF

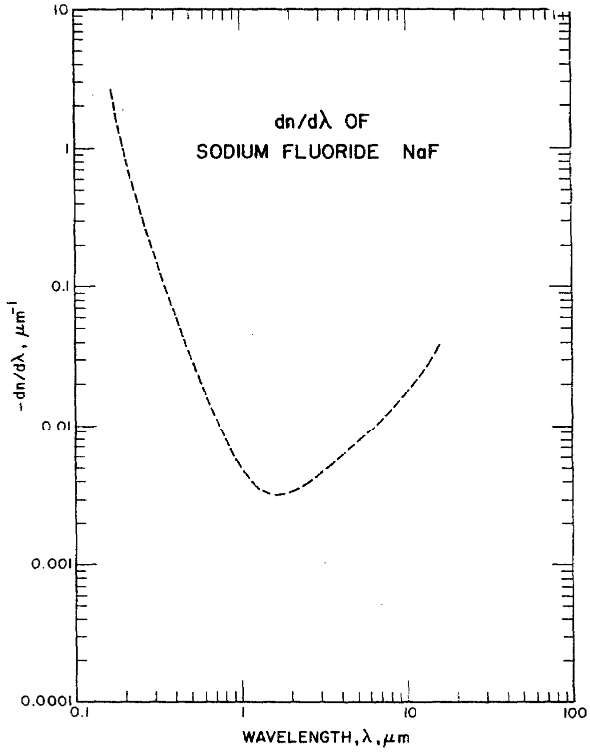

FIGURE 18. $dn/d\lambda$ of NaF

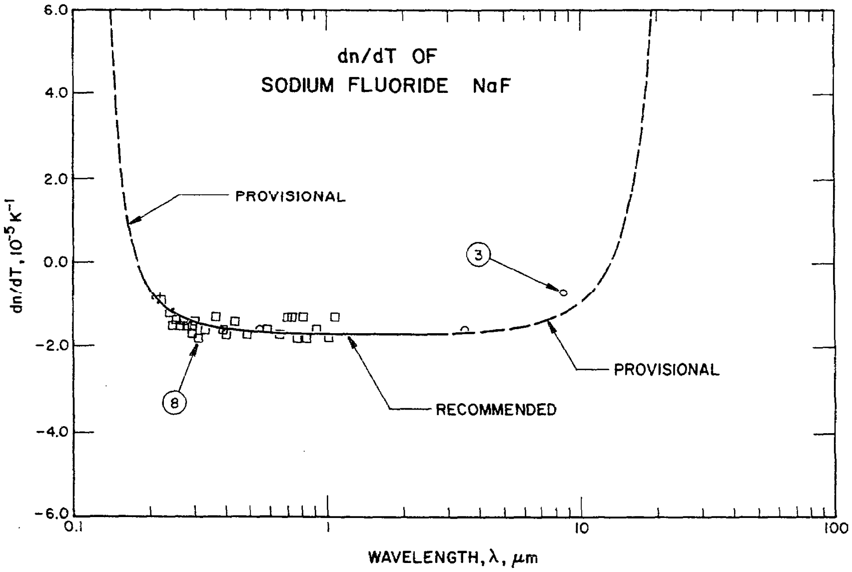

FIGURE 19. dn/dT of NaF

TABLE 21. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaF

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	49	Sano, R.	1969	T,R	0.10-0.13	78	Single crystal; obtained from the Harshaw Chemical Co.; cleaved specimens with dimensions of 10 mm x 15 mm x 0.17 ~ 2.50 mm; also used a thinner specimen of 0.08 mm thickness prepared by melting a fairly thin flake of cleaved crystal between two parallel Glassy Carbon plates and pressed in high vacuum; transmission and near-normal reflection spectra were analyzed by Kramers-Kronig method; data extracted from a figure.
2	49	Sano, R.	1969	T,R	0.10-0.14	295	Similar to above.
3	29	Hohls, H.W.	1937	D	0.546-10.90	291	Crystal; prismatic specimen with faces of 2.7 x 3.4 cm^2 and apex angle of 60°1'6"; digitized data were presented; dn/dT for three lines were determined by measuring n at 291 K and 353 K.
4	29	Hohls, H.W.	1937	I	9.30-16.98	291	Crystal; plate specimen of 93 μm used as interferometer plate; digitized data were presented.
5	29	Hohls, H.W.	1937	I	8.8-19.7	291	Crystal; plate specimen of 270 μm thickness; refractive indices were determined by observing the Talbot's interference fringes; digitized data were presented.
6	29	Hohls, H.W.	1937	I	9.1-19.7	291	Similar to above but specimen of thickness 243 μm.
7	29	Hohls, H.W.	1937	I	20.0-55	291	Crystal; plate specimens; refractive indices were derived from experimental information of reflection and absorption; digitized data were presented.
8	30	Harting, H.	1943	D	0.199-1.083	293	Crystal; the author stated the refractive indices were measured by F. Wolf on the specimen supplied by A. Smakula but no references were cited; digitized data were presented; dn/dT at 293 K for each wavelength was also given.
9	50	Kublitzky, A.	1934	D	0.186-0.578	293	Crystal; grown by Kyropoules method; prismatic specimen with height of 15 mm, side of 20 mm and apex angle of 55°25'13"; digitized data were presented with accuracy of one unit of the third decimal place.
10	51, 52	Randall, C.M.	1970, 1971	I	137-344	77	Crystal; plate specimen of 0.5639 cm thickness; refractive indices were determined from channel spectra obtained by Fourier spectroscopy; data extracted from a curve.
11	51, 52	Randall, C.M.	1970, 1971	I	57-222	4.2	Similar to above.
12	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	1273	Molten NaF; liquid prism formed by the top surface of the melt and an immersed, inclined platinum mirror; estimated uncertainty of 0.01 in measured n; digitized data were presented.
13	45	Spangenberg, K.	1923	D	0.436-0.668	295	Crystal; prismatic specimen; digitized data were presented.
14	13	Lowndes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	290	Single crystal; prismatic sample; digitized data were given with uncertainty of ±0.0004.
15	13	Lowndes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	4	Similar to above.

TABLE 22. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaF

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 78.0 K	
0.10847	1.06
0.10962	0.95
0.11030	0.80
0.1119	0.64
0.11220	0.64*
0.11312	0.71
0.11512	1.16
0.11652	2.92
0.11707	4.33
0.11741	4.28*
0.11808	3.34
0.11864	2.87*
0.11956	2.40
0.12084	2.13*
0.12275	1.92
0.12625	1.77*
0.12834	1.71
CURVE 2 T = 295.0 K	
0.09918	1.41*
0.10744	1.37
0.10866	1.31*
0.10972	1.19
0.11149	0.96*
0.11250	0.85
0.11343	0.85*
0.11448	0.98
0.11565	1.25
0.11696	1.72
0.11841	2.63
0.11944	3.11*
0.11979	3.15
0.12025	3.09*
0.12119	2.65
0.12215	2.33*
0.12336	2.08
0.12448	1.93*
0.12574	1.84
0.12874	1.70*
0.13246	1.62
0.13505	1.58*
0.13776	1.56
CURVE 3 T = 291.2 K	
0.546	1.3253
0.80	1.3227
1.02	1.3209
1.27	1.3202
1.48	1.3195
1.67	1.3185*
1.83	1.3183*
2.00	1.3179
2.20	1.3172*
2.40	1.3165
2.60	1.3157*
2.80	1.3149*
3.10	1.3134
3.30	1.3125*
3.50	1.3115*
3.70	1.3099
3.90	1.3091*
4.10	1.3080*
4.50	1.3055
4.70	1.3039*
4.90	1.3025*
5.10	1.3010*
5.30	1.2994
5.50	1.2978*
5.70	1.2957*
5.90	1.2940*
6.10	1.2925*
6.30	1.2904
6.50	1.2883*
6.70	1.2863*
6.90	1.2842*
7.10	1.2819*
7.30	1.2794*
7.50	1.2771
7.70	1.2747*
7.90	1.2721*
8.10	1.2694*
8.30	1.2665*
8.50	1.2638
8.68	1.2618*
8.90	1.2583*
9.10	1.2552*
9.30	1.2520
9.50	1.2486*
9.70	1.2453*
9.90	1.2418
10.10	1.2382
CURVE 3 (cont.) T = 291.2 K	
10.30	1.2346*
10.50	1.2309*
10.70	1.2273*
10.90	1.2231
CURVE 4 T = 291.2 K	
9.30	1.248*
9.65	1.245*
10.03	1.240
10.41	1.232*
10.81	1.220*
11.26	1.211*
11.74	1.200
12.23	1.183
12.75	1.165*
13.35	1.148
13.97	1.126*
15.37	1.070
16.10	1.044
16.98	1.004
CURVE 5 T = 291.2 K	
8.8	1.261
9.7	1.251
10.0	1.241*
10.3	1.229*
10.8	1.220*
11.2	1.207
11.8	1.197*
12.3	1.182*
13.0	1.168*
13.5	1.150*
14.2	1.131
14.7	1.109
15.5	1.086*
16.2	1.060
16.8	1.031*
17.3	1.000
18.0	0.967
18.7	0.931*
19.2	0.893
19.7	0.854
CURVE 6 T = 291.2 K	
9.1	1.262
9.4	1.251
9.8	1.241
10.3	1.233
10.8	1.222
11.3	1.209
11.7	1.193
12.5	1.180
13.2	1.163
13.8	1.142
14.3	1.18
15.1	1.093
15.9	1.065
16.7	1.034
17.3	1.000
18.1	0.963
18.6	0.924
19.3	0.881
19.7	0.838
CURVE 7 T = 291.2 K	
20.0	0.82
20.5	0.75
21.0	0.70
21.5	0.65
22.0	0.55
22.5	0.45
23.0	0.38
23.5	0.25
24.0	0.24
48	4.4
49	4.1
50	3.9
52	3.6
55	3.2
CURVE 8 T = 293.2 K	
0.19905	1.3806
0.21360	1.3704
0.22470	1.3645*
0.23998	1.35793
0.24828	1.35500*
0.25365	1.35325*
CURVE 8 (cont.) T = 293.2 K	
0.26537	1.34999*
0.26993	1.34881
0.28035	1.34645*
0.29836	1.34462*
0.29676	1.34328*
0.30215	1.34232*
0.31317	1.34062
0.33415	1.33795*
0.36631	1.33482*
0.39064	1.33290*
0.40466	1.33194*
0.43583	1.33025
0.48613	1.32818*
0.54607	1.32640*
0.58756	1.32552
0.58930	1.32549*
0.65628	1.32436
0.70652	1.32372*
0.72814	1.32349*
0.76820	1.32307
0.81095	1.32272*
0.84247	1.32247*
0.91230	1.32198
1.01398	1.32150*
1.08303	1.32125
CURVE 9 T = 293.2 K	
0.186	1.3980
0.193	1.3854*
0.199	1.3805*
0.20255	1.3772
0.206	1.3745*
0.21005	1.3718*
0.21444	1.3691*
0.21946	1.3665*
0.227	1.3630
0.231	1.3606*
0.237	1.3586*
0.2537	1.3525
0.2573	1.3512*
0.265	1.3491*
0.27488	1.3469
0.30215	1.3417*
0.313	1.3401*
0.366	1.3342
CURVE 9 (cont.) T = 293.2 K	
0.405	1.3314
0.435	1.3300*
0.5461	1.3260*
0.578	1.3251*
CURVE 10 T = 77.0 K	
137.5	2.25
160.3	2.24
185.2	2.22
215.1	2.22
255.1	2.21
277.8	2.20
343.6	2.20
CURVE 11 T = 4.2 K	
57.5	2.74
59.7	2.67
62.3	2.61
65.9	2.55
69.4	2.50
73.3	2.45
78.9	2.41
85.1	2.37
92.3	2.34
100.9	2.31
113.1	2.28
126.7	2.26
145.8	2.24
175.4	2.22
222.2	2.21
CURVE 12 T = 1273.2 K	
0.5461	1.25
CURVE 13 T = 295.2 K	
0.436	1.33059*
0.447	1.33006
0.501	1.32801
0.5877	1.32580*
0.688	1.32447

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* Not shown in figure.

TABLE 22. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaF (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 14*	
T = 290.0 K	
0.4358	1.3299
0.4678	1.3284
0.4800	1.3280
0.5086	1.3271
0.5461	1.3259
0.5780	1.3252
0.5893	1.3250
0.6438	1.3241
CURVE 15*	
T = 4.0 K	
0.4358	1.3331*
0.4678	1.3317
0.4800	1.3311
0.5086	1.3302
CURVE 15 (cont.)*	
T = 4.0 K	
0.5461	1.3293
0.5730	1.3286
0.5893	1.3282
0.6438	1.3271

TABLE 23. EXPERIMENTAL DATA ON dn/dT OF NaF

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 3	
T_m = 322.0 K	
0.546	-1.6
3.5	-1.6
8.5	-0.7
CURVE 8	
T_m = 293.0 K	
0.21360	-0.8
0.22470	-0.9
0.23998	-1.2
0.24828	-1.5
0.25365	-1.4
0.26537	-1.5
0.26993	-1.4
0.28035	-1.5
0.29836	-1.5
0.29676	-1.7
0.30215	-1.4
CURVE 8 (cont.)	
T_m = 293.0 K	
0.31317	-1.8
0.33415	-1.6
0.36631	-1.3
0.39064	-1.6
0.40466	-1.7
0.43583	-1.4
0.48613	-1.7
0.54607	-1.6
0.58756	-1.6
0.58930	-1.6
0.65628	-1.7
0.70652	-1.3
0.72814	-1.3
0.76820	-1.8
0.81095	-1.3
0.84247	-1.8
0.91230	-1.6
CURVE 8 (cont.)	
T_m = 293.0 K	
1.01398	-1.8
1.08303	-1.3

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* Not shown in figure.

TABLE 24. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR NaF

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Harting, H. [30] 1943	0.199-1.083 μm 293 K	$n = 1.31862 + \frac{0.00252}{(\lambda - 0.1000)^{1.4}}$
Radhakrishnan, T. [48] 1948	0.1860-10.10 μm 293 K	$n^2 = 1.42664 + \frac{0.32052\,\lambda^2}{\lambda^2 - 0.013056} + \frac{4.25284\,\lambda^2}{\lambda^2 - 2044.8}$
Present work 1975	0.15-17.00 μm 293 K	$n^2 = 1.41572 + \frac{0.32785\,\lambda^2}{\lambda^2 - (0.117)^2} + \frac{3.18248\,\lambda^2}{\lambda^2 - (40.57)^2}$

3.6. Sodium Chloride, NaCl

Rock salt is uniformly transparent from 0.2 μm in the ultraviolet to 12 μm in the infrared. In the region of 15 μm the absorption increases rapidly. Rock salt in moderately thin pieces may be expected to transmit several percent of the light up to wavelengths as long as 26.0 μm. However, a plate 1 cm in thickness is completely opaque to radiation of wavelengths greater than 20 μm.

Rock salt has long been a favorite material for infrared spectroscopy. It polishes easily and, although hygroscopic, can be protected by evaporated plastic coatings. It shows excellent dispersion over its entire transmission range. It has been difficult, however, to obtain natural rock salt crystals of sufficient size and purity for making optical components. As crystal-growing techniques advanced, synthetic sodium chloride crystals have been grown up to 11.3 kg in weight commercially, making this material readily available for large optical parts and stimulating the design and construction of infrared instruments.

Measurement of the refractive index of sodium chloride dates back to 1871, when Stefan [53] determined the refractive indices of a rock salt prism for lines B, D, and F. Since then, a large amount of data in the transparent region has been contributed by a number of investigators, among them are Martens [54], Paschen [55], and Langley [56]. They used either the deviation method or interferometry in their experiments. It was not until 1929 that measurements were carried out beyond the transparent region. Kellner [57] determined refractive indices of NaCl in 23–35 μm region, based on information on transmission and reflection of thin specimens. Data in the infrared region are now available up to 300 μm and at 2000 μm. Most of the IR data were determined from the analysis of the reflection spectra.

After a careful review of the available data, six data sets measured by Martens [54], Paschen [55], Hohls [29], Harting [30], Rubens and Nichols [58], and Rubens and Trowbridge [59], were selected as the basis for reference data generation because of the consistency of their results. Data sets which are not selected were either reported as poor values or were determined by inadequate methods. Data for the absorption regions were not included in the analysis but are given here for completeness of data presentation. Note that the selected data, except those of Harting, were obtained at a temperature of 291 K. A temperature correction should be made to reduce them to 293 K.

The temperature coefficient dn/dT is available over a large part of the transmission region of NaCl. Based on the existing data on dn/dT and the parameters from tables 2 and 3, a least-squares fitting of the data to eq (19) was made. The results, together with those obtained for LiF, NaF, KCl and CsI, provided clues that led to the parameters listed in table 5. With the aid of these parameters we were able to construct a formula for calculating dn/dT for NaCl:

$$2n\frac{dn}{dT} = -11.91\,(n^2-1) - 0.50 + \frac{6.118\,\lambda^4}{(\lambda^2-0.02496)^2} + \frac{199.36\,\lambda^4}{(\lambda^2-3718.56)^2}, \qquad (33)$$

where dn/dT is in units of 10^{-5} K^{-1} and λ in μm.

In figure 23, values calculated by eq (33) are compared with the experimental data. It appears that for wavelengths less than 2 microns the calculated values are higher than experimental data, while for longer wavelengths the reverse is true. After a careful review of the data on dn/dT and the table of source and technical information, we find that data sets 34, 42, 43 and 45 were obtained at mean temperatures of about 330 K, which is about 40 degrees higher than 293 K, while data set 44 was obtained at temperatures about 20 degrees lower than 293 K. Although we stated in connection with eq (4) that dn/dT is found to be relatively independent of temperature over a fairly wide range of temperatures, it has been in fact observed in halide crystals that the absolute value of dn/dT increases somewhat with increasing temperature. This fact is demonstrated clearly by eq (33), as can be seen in figure 23 in the wavelength region below 2 μm. In the higher wavelength region, the existing data are insufficient to test the dn/dT formula, but the correctness of this formula can be substantiated by two facts. The first is that the calculated curve is approximately parallel to curve 44, which is consistent with the observed dn/dT behaviors. The second is that the empirically constructed formula for CsI predicts correct values for CsI in the long wavelength region, as is discussed in subsection 3.20 and is assumed to be generally the case here.

Equation (33) was used to make temperature corrections to the selected data sets which were obtained at temperatures other than the selected reference temperature, 293 K.

Various dispersion formulas have been reported by a number of authors, in different forms. Table 29 contains a number of typical formulae. They have all been reduced, wherever possible, to standard forms so that a close comparison can be easily made. From the information in tables 29 and 3, input parameters for least-squares fitting were obtained. The calculation yielded the following dispersion equation for NaCl at 293 K in the transparent region, 0.20–30.00 μm,

$$n^2 = 1.00055 + \frac{0.19800\lambda^2}{\lambda^2-(0.050)^2} + \frac{0.48398\lambda^2}{\lambda^2-(0.100)^2} + \frac{0.38696\lambda^2}{\lambda^2-(0.128)^2} + \frac{0.25998\lambda^2}{\lambda^2-(0.158)^2} + \frac{0.08796\lambda^2}{\lambda^2-(40.50)^2} + \frac{3.17064\lambda^2}{\lambda^2-(60.98)^2} + \frac{0.30038\lambda^2}{\lambda^2-(120.34)^2}, \tag{34}$$

where λ is in units of μm.

Equations (33) and (34) were used to generate the reference data given in the table of recommended values; $dn/d\lambda$ values were evaluated from the first derivative of eq (34). The numbers in the table of recommended values do not reflect the degree of accuracy and extent of reliability; extra decimal places are given for tabular smoothness. Actual uncertainites are as follows.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.20– 0.25	3	0.006
0.25– 0.35	4	0.0005
0.35–10.00	4	0.0001
10.00–15.00	4	0.0003
15.00–25.00	3	0.006
25.00–30.00	3	0.02

For dn/dT:

0.20– 0.24	1	0.8
0.24– 4.00	1	0.2
4.00–15.00	1	0.4
15.00–20.00	1	0.6
20.00–30.00	1	0.9

TABLE 25. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaCl AT 293 K*

λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.200	1.78999	5.11759	4.62	0.350	1.58202	0.36791	-2.76	1.500	1.52824	0.00449	-3.32
0.202	1.78012	4.75888	4.00	0.355	1.58023	0.34950	-2.79	1.550	1.52802	0.00418	-3.32
0.204	1.77093	4.43848	3.46	0.360	1.57852	0.33236	-2.81	1.600	1.52782	0.00391	-3.32
0.206	1.76234	4.15114	2.98	0.365	1.57690	0.31636	-2.84	1.650	1.52763	0.00368	-3.32
0.208	1.75431	3.89222	2.55	0.370	1.57536	0.30142	-2.86	1.700	1.52745	0.00348	-3.32
0.210	1.74676	3.65792	2.16	0.375	1.57389	0.28744	-2.87	1.750	1.52728	0.00331	-3.32
0.212	1.73966	3.44506	1.81	0.380	1.57248	0.27435	-2.89	1.800	1.52712	0.00316	-3.32
0.214	1.73297	3.25098	1.50	0.385	1.57114	0.26207	-2.91	1.850	1.52697	0.00302	-3.32
0.216	1.72665	3.07344	1.21	0.390	1.56986	0.25053	-2.93	1.900	1.52682	0.00291	-3.32
0.218	1.72066	2.91051	0.96	0.395	1.56864	0.23969	-2.94	1.950	1.52668	0.00281	-3.32
0.220	1.71499	2.76058	0.72	0.400	1.56746	0.22949	-2.95	2.000	1.52654	0.00272	-3.32
0.222	1.70961	2.62223	0.50	0.410	1.56526	0.21081	-2.98	2.050	1.52640	0.00264	-3.32
0.224	1.70450	2.49426	0.30	0.420	1.56324	0.19417	-3.00	2.100	1.52627	0.00257	-3.32
0.226	1.69963	2.37561	0.12	0.430	1.56137	0.17929	-3.03	2.150	1.52615	0.00252	-3.32
0.228	1.69499	2.26536	-0.05	0.440	1.55965	0.16593	-3.04	2.200	1.52602	0.00247	-3.32
0.230	1.69056	2.16271	-0.21	0.450	1.55805	0.15390	-3.06	2.250	1.52590	0.00242	-3.32
0.232	1.68634	2.06696	-0.35	0.460	1.55657	0.14304	-3.08	2.300	1.52578	0.00239	-3.32
0.234	1.68229	1.97747	-0.49	0.470	1.55519	0.13320	-3.09	2.350	1.52566	0.00236	-3.32
0.236	1.67842	1.89370	-0.61	0.480	1.55390	0.12427	-3.11	2.400	1.52554	0.00233	-3.32
0.238	1.67471	1.81516	-0.73	0.490	1.55270	0.11614	-3.12	2.450	1.52543	0.00231	-3.32
0.240	1.67116	1.74140	-0.84	0.500	1.55157	0.10872	-3.13	2.500	1.52531	0.00229	-3.32
0.242	1.66774	1.67204	-0.94	0.510	1.55052	0.10193	-3.14	2.550	1.52520	0.00228	-3.32
0.244	1.66447	1.60671	-1.04	0.520	1.54953	0.09571	-3.15	2.600	1.52509	0.00227	-3.32
0.246	1.66132	1.54512	-1.13	0.530	1.54861	0.09000	-3.16	2.650	1.52497	0.00226	-3.32
0.248	1.65828	1.48697	-1.21	0.540	1.54773	0.08474	-3.17	2.700	1.52486	0.00226	-3.32
0.250	1.65537	1.43200	-1.29	0.550	1.54691	0.07989	-3.17	2.750	1.52475	0.00225	-3.32
0.252	1.65255	1.37999	-1.36	0.560	1.54613	0.07542	-3.18	2.800	1.52463	0.00226	-3.32
0.254	1.64984	1.33071	-1.43	0.570	1.54540	0.07128	-3.19	2.850	1.52452	0.00226	-3.32
0.256	1.64723	1.28398	-1.50	0.580	1.54471	0.06744	-3.20	2.900	1.52441	0.00226	-3.32
0.258	1.64471	1.23963	-1.56	0.590	1.54405	0.06388	-3.20	2.950	1.52429	0.00227	-3.32
0.260	1.64227	1.19748	-1.62	0.600	1.54343	0.06058	-3.21	3.000	1.52418	0.00228	-3.31
0.262	1.63991	1.15740	-1.68	0.620	1.54228	0.05463	-3.22	3.050	1.52407	0.00229	-3.31
0.264	1.63764	1.11925	-1.73	0.640	1.54124	0.04945	-3.23	3.100	1.52395	0.00230	-3.31
0.266	1.63544	1.08291	-1.79	0.660	1.54030	0.04493	-3.23	3.150	1.52384	0.00231	-3.31
0.268	1.63331	1.04826	-1.83	0.680	1.53944	0.04095	-3.24	3.200	1.52372	0.00232	-3.31
0.270	1.63124	1.01520	-1.88	0.700	1.53865	0.03744	-3.25	3.250	1.52361	0.00234	-3.31
0.272	1.62924	0.98363	-1.92	0.720	1.53794	0.03433	-3.25	3.300	1.52349	0.00235	-3.31
0.274	1.62731	0.95347	-1.97	0.740	1.53728	0.03156	-3.26	3.350	1.52337	0.00237	-3.31
0.276	1.62543	0.92462	-2.01	0.760	1.53667	0.02909	-3.26	3.400	1.52325	0.00239	-3.31
0.278	1.62361	0.89702	-2.04	0.780	1.53611	0.02689	-3.27	3.450	1.52313	0.00241	-3.31
0.280	1.62184	0.87060	-2.08	0.800	1.53560	0.02490	-3.27	3.500	1.52301	0.00242	-3.31
0.282	1.62012	0.84528	-2.12	0.820	1.53512	0.02312	-3.28	3.550	1.52289	0.00244	-3.31
0.284	1.61846	0.82100	-2.15	0.840	1.53467	0.02150	-3.28	3.600	1.52277	0.00246	-3.30
0.286	1.61684	0.79772	-2.18	0.860	1.53426	0.02004	-3.28	3.650	1.52264	0.00249	-3.30
0.288	1.61527	0.77537	-2.21	0.880	1.53387	0.01872	-3.29	3.700	1.52252	0.00251	-3.30
0.290	1.61374	0.75391	-2.24	0.900	1.53351	0.01752	-3.29	3.750	1.52239	0.00253	-3.30
0.292	1.61225	0.73329	-2.27	0.920	1.53317	0.01642	-3.29	3.800	1.52226	0.00255	-3.30
0.294	1.61080	0.71347	-2.30	0.940	1.53285	0.01542	-3.29	3.850	1.52214	0.00257	-3.30
0.296	1.60940	0.69441	-2.32	0.960	1.53255	0.01450	-3.30	3.900	1.52201	0.00260	-3.30
0.298	1.60803	0.67606	-2.35	0.980	1.53227	0.01366	-3.30	3.950	1.52188	0.00262	-3.30
0.300	1.60669	0.65840	-2.37	1.000	1.53200	0.01289	-3.30	4.000	1.52174	0.00265	-3.30
0.305	1.60350	0.61701	-2.43	1.050	1.53140	0.01121	-3.30	4.050	1.52161	0.00267	-3.29
0.310	1.60052	0.57923	-2.48	1.100	1.53088	0.00984	-3.31	4.100	1.52148	0.00270	-3.29
0.315	1.59771	0.54465	-2.53	1.150	1.53041	0.00871	-3.31	4.150	1.52134	0.00272	-3.29
0.320	1.59506	0.51291	-2.57	1.200	1.53000	0.00777	-3.31	4.200	1.52121	0.00275	-3.29
0.325	1.59257	0.48373	-2.61	1.250	1.52963	0.00698	-3.31	4.250	1.52107	0.00277	-3.29
0.330	1.59022	0.45683	-2.64	1.300	1.52930	0.00631	-3.32	4.300	1.52093	0.00280	-3.29
0.335	1.58800	0.43199	-2.68	1.350	1.52900	0.00574	-3.32	4.350	1.52079	0.00283	-3.29
0.340	1.58590	0.40900	-2.71	1.400	1.52873	0.00526	-3.32	4.400	1.52065	0.00285	-3.29
0.345	1.58391	0.38769	-2.74	1.450	1.52847	0.00484	-3.32	4.450	1.52050	0.00288	-3.28

TABLE 25. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaCl AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
4.500	1.52036	0.00291	-3.28	8.400	1.50432	0.00541	-3.11	15.600	1.44466	0.01158	-2.20
4.550	1.52021	0.00293	-3.28	8.500	1.50377	0.00548	-3.10	15.800	1.44233	0.01179	-2.15
4.600	1.52006	0.00296	-3.28	8.600	1.50322	0.00555	-3.09	16.000	1.43995	0.01201	-2.11
4.650	1.51992	0.00299	-3.28	8.700	1.50266	0.00562	-3.09	16.200	1.43753	0.01223	-2.06
4.700	1.51977	0.00302	-3.28	8.800	1.50210	0.00570	-3.08	16.400	1.43506	0.01245	-2.02
4.750	1.51961	0.00305	-3.28	8.900	1.50152	0.00577	-3.07	16.600	1.43255	0.01268	-1.97
4.800	1.51946	0.00308	-3.27	9.000	1.50094	0.00584	-3.06	16.800	1.42999	0.01291	-1.92
4.850	1.51931	0.00310	-3.27	9.100	1.50036	0.00591	-3.06	17.000	1.42738	0.01314	-1.86
4.900	1.51915	0.00313	-3.27	9.200	1.49976	0.00599	-3.05	17.200	1.42473	0.01338	-1.81
4.950	1.51899	0.00316	-3.27	9.300	1.49916	0.00606	-3.04	17.400	1.42203	0.01362	-1.75
5.000	1.51883	0.00319	-3.27	9.400	1.49855	0.00613	-3.03	17.600	1.41928	0.01386	-1.70
5.100	1.51851	0.00325	-3.26	9.500	1.49793	0.00621	-3.03	17.800	1.41649	0.01411	-1.64
5.200	1.51818	0.00331	-3.26	9.600	1.49731	0.00628	-3.02	18.000	1.41364	0.01437	-1.58
5.300	1.51785	0.00337	-3.26	9.700	1.49668	0.00636	-3.01	18.200	1.41074	0.01463	-1.51
5.400	1.51751	0.00343	-3.25	9.800	1.49604	0.00643	-3.00	18.400	1.40779	0.01489	-1.45
5.500	1.51716	0.00349	-3.25	9.900	1.49539	0.00651	-2.99	18.600	1.40478	0.01516	-1.38
5.600	1.51681	0.00355	-3.25	10.000	1.49473	0.00658	-2.99	18.800	1.40173	0.01543	-1.31
5.700	1.51645	0.00361	-3.24	10.200	1.49340	0.00674	-2.97	19.000	1.39861	0.01570	-1.24
5.800	1.51609	0.00368	-3.24	10.400	1.49204	0.00689	-2.95	19.200	1.39544	0.01599	-1.16
5.900	1.51572	0.00374	-3.24	10.600	1.49065	0.00705	-2.93	19.400	1.39222	0.01627	-1.09
6.000	1.51534	0.00380	-3.23	10.800	1.48922	0.00720	-2.91	19.600	1.38893	0.01657	-1.01
6.100	1.51496	0.00387	-3.23	11.000	1.48776	0.00736	-2.89	19.800	1.38559	0.01686	-0.93
6.200	1.51457	0.00393	-3.22	11.200	1.48628	0.00752	-2.87	20.000	1.38219	0.01717	-0.84
6.300	1.51417	0.00399	-3.22	11.400	1.48476	0.00769	-2.85	20.500	1.37341	0.01795	-0.62
6.400	1.51377	0.00406	-3.21	11.600	1.48320	0.00785	-2.83	21.000	1.36423	0.01878	-0.38
6.500	1.51336	0.00412	-3.21	11.800	1.48162	0.00802	-2.81	21.500	1.35462	0.01965	-0.11
6.600	1.51294	0.00419	-3.21	12.000	1.48000	0.00818	-2.78	22.000	1.34457	0.02057	0.17
6.700	1.51252	0.00425	-3.20	12.200	1.47834	0.00835	-2.76	22.500	1.33404	0.02154	0.48
6.800	1.51209	0.00432	-3.20	12.400	1.47665	0.00852	-2.73	23.000	1.32302	0.02257	0.82
6.900	1.51166	0.00439	-3.19	12.600	1.47493	0.00870	-2.71	23.500	1.31147	0.02366	1.15
7.000	1.51122	0.00445	-3.19	12.800	1.47318	0.00887	-2.68	24.000	1.29935	0.02482	1.58
7.100	1.51077	0.00452	-3.18	13.000	1.47138	0.00905	-2.65	24.500	1.28663	0.02606	2.02
7.200	1.51031	0.00458	-3.18	13.200	1.46956	0.00923	-2.62	25.000	1.27328	0.02738	2.50
7.300	1.50985	0.00465	-3.17	13.400	1.46769	0.00941	-2.59	25.500	1.25923	0.02880	3.02
7.400	1.50938	0.00472	-3.17	13.600	1.46579	0.00960	-2.56	26.000	1.24445	0.03033	3.59
7.500	1.50891	0.00479	-3.16	13.800	1.46385	0.00978	-2.53	26.500	1.22888	0.03198	4.21
7.600	1.50842	0.00486	-3.15	14.000	1.46188	0.00997	-2.50	27.000	1.21246	0.03376	4.90
7.700	1.50794	0.00492	-3.15	14.200	1.45986	0.01016	-2.47	27.500	1.19510	0.03570	5.65
7.800	1.50744	0.00499	-3.14	14.400	1.45781	0.01036	-2.43	28.000	1.17673	0.03781	6.49
7.900	1.50694	0.00506	-3.14	14.600	1.45572	0.01055	-2.39	28.500	1.15725	0.04013	7.41
8.000	1.50643	0.00513	-3.13	14.800	1.45359	0.01075	-2.36	29.000	1.13656	0.04269	8.43
8.100	1.50591	0.00520	-3.13	15.000	1.45142	0.01095	-2.32	29.500	1.11451	0.04553	9.58
8.200	1.50539	0.00527	-3.12	15.200	1.44921	0.01116	-2.28	30.000	1.09097	0.04870	10.85
8.300	1.50486	0.00534	-3.11	15.400	1.44696	0.01136	-2.24				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.6. The number of digits with an overstrike are not relevant to accuracy of the data.

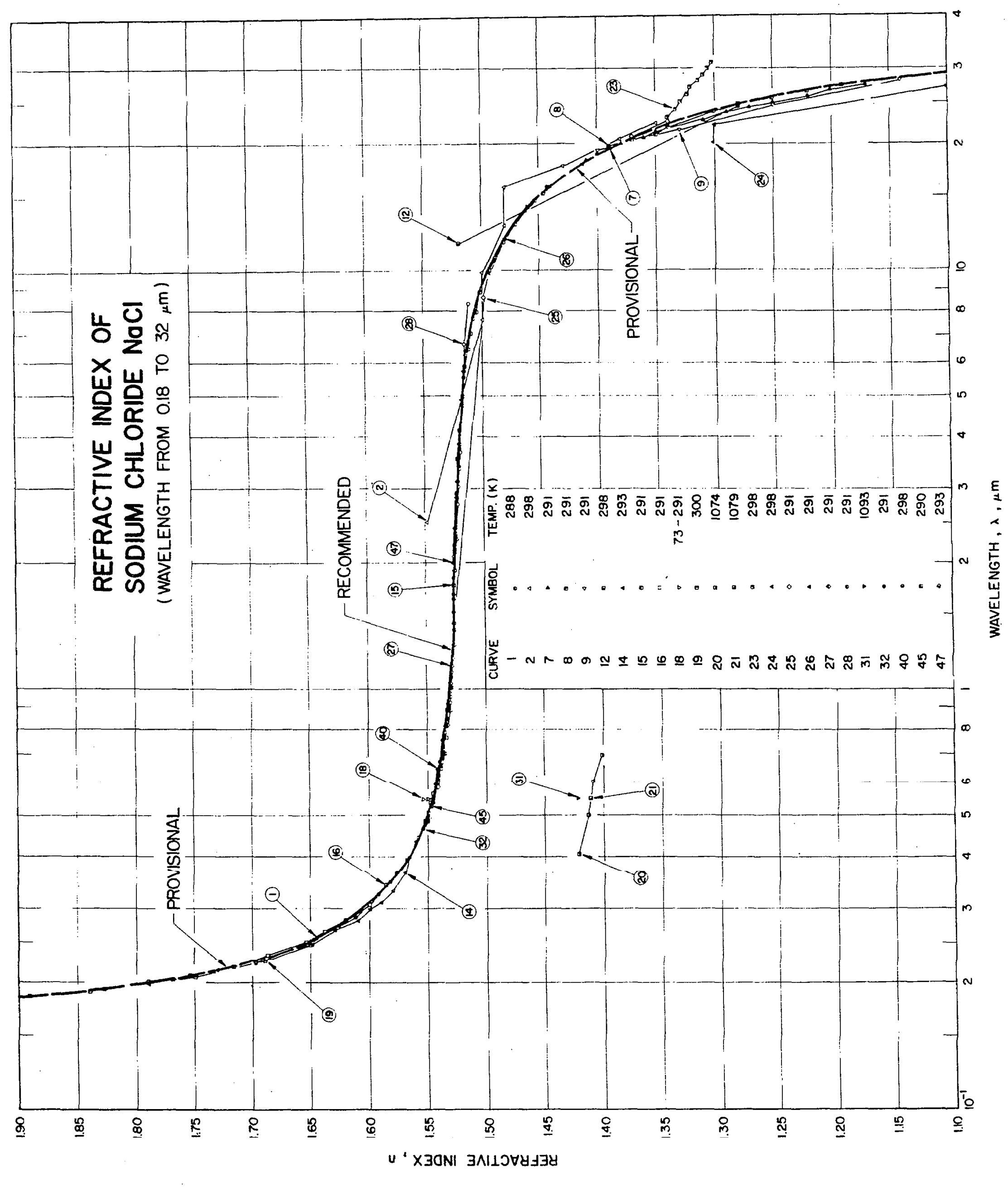

FIGURE 20. Refractive Index of NaCl (transparent region)

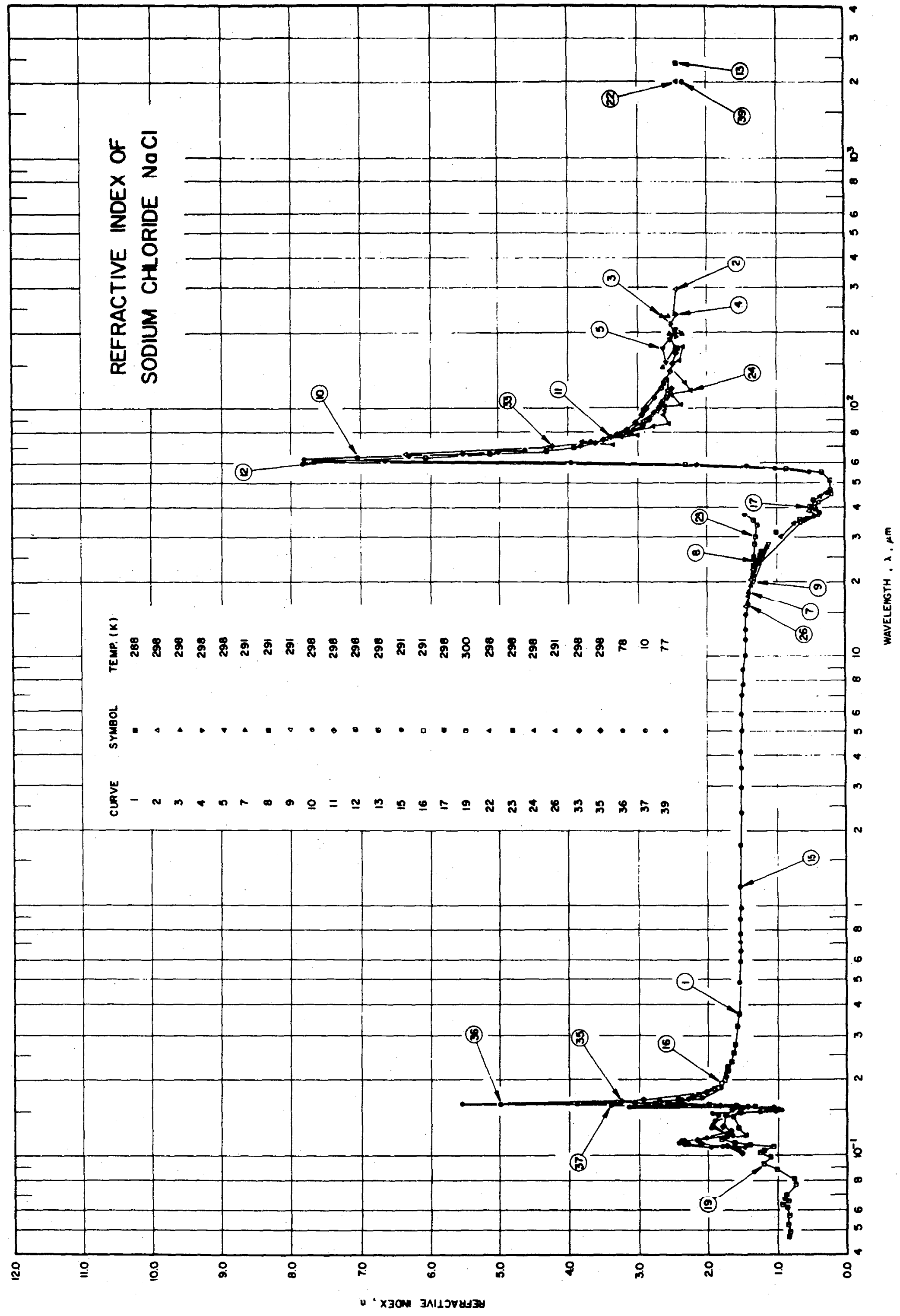

FIGURE 21. Refractive Index of NaCl

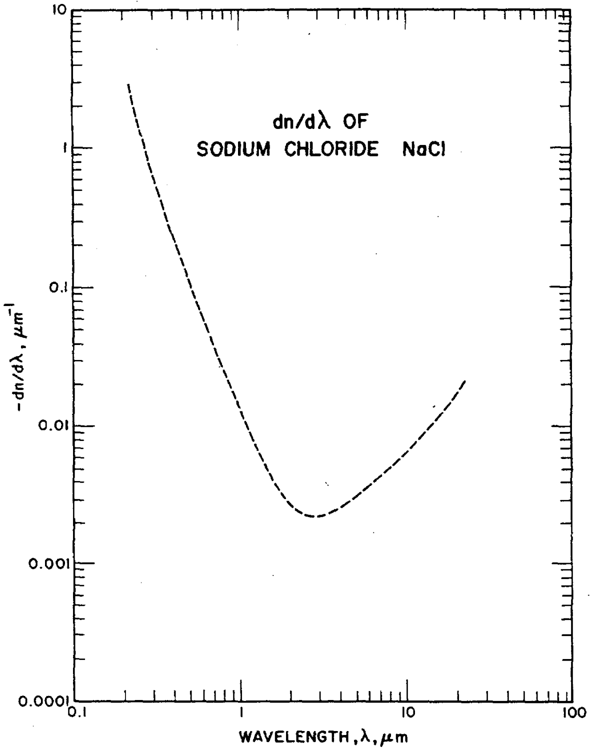

FIGURE 22. $dn/d\lambda$ of NaCl

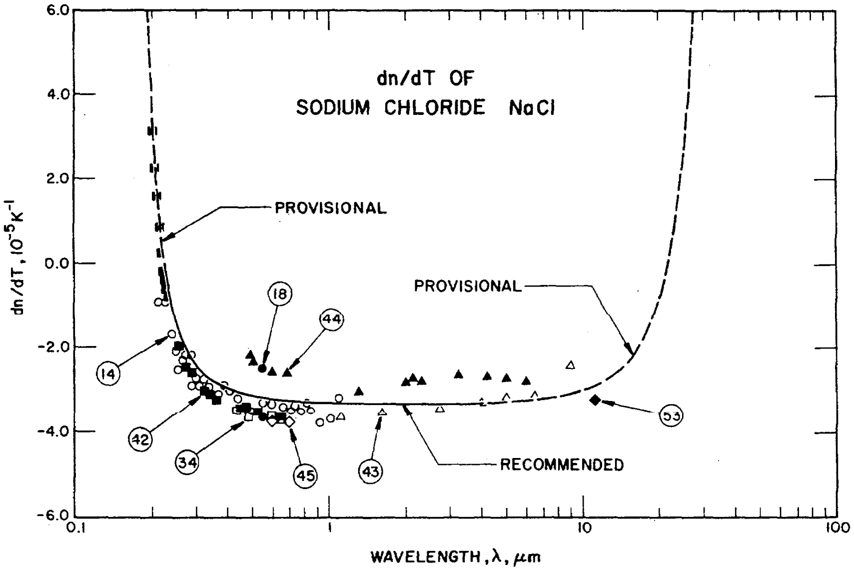

FIGURE 23. dn/dT of NaCl

TABLE 26. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaCl

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	60	Borel, G.A.	1895	D	0.214-0.589	288	Crystal; prismatic specimen; digitized data were presented.
2	15	Genzel, L., Happ, H., and Weber, R.	1959	T	2.50-300.0	298	Plate specimens of various thickness; absorption coefficients and reflections were determined from transmitted intensities, refractive indices were then calculated by using the Lorentz formulae; data extracted from a figure.
3	61	Cartwright, C.H. and Czerny, M.	1934	R	145.0-231.0	298	Thin plate specimen; refractive indices were obtained from analysis of the reflection spectrum; data extracted from a figure.
4	61	Cartwright, C.H. and Czerny, M.	1934	T	193.0-232.0	298	Thin plate specimen of 237 μm in thickness, refractive indices were deduced from information of transmission; data extracted from a figure.
5	61	Cartwright, C.H. and Czerny, M.	1934	T	152.0-208.0	298	Similar to above but specimen of 147 μm in thickness.
6	61	Cartwright, C.H. and Czerny, M.	1934	T	163.0-201.0	298	Similar to above but specimen of 97 μm in thickness.
7	29	Hohls, H.W.	1937	I	18.1-27.3	291	Crystal; thin plate specimen of 394 μm in thickness; digitized data were presented by the author.
8	29	Hohls, H.W.	1937	I	18.3-27.2	291	Similar to above but specimen of 354 μm in thickness.
9	29	Hohls, H.W.	1937	I	19.2-28.0	291	Similar to above but specimen of 190 μm in thickness.
10	62	Geick, R.	1962	T,R	55,67	298	Crystal; film specimen; formed by vacuum evaporation onto polyethylene glycol or cellulose membrane substrate; transmission curve of the specimen was obtained; reflection curve from a NaCl plate was also measured; based on the above experimental information, refractive indices were deduced by a graphical method (see this reference for detailed discussion); inaccuracy of this method resulted in very large errors in n; Δn ranges from 0.21 to 0.38; digitized data were presented by the author.
11	62	Geick, R.	1962	T,R	70-166	298	Similar to above but specimen of 40 μm in thickness was cut from a NaCl plate; uncertainty in n about 3%.
12	62	Geick, R.	1962	R	11.6-202.3	298	Crystal; plate specimen; reflection spectrum of normal incidence was analyzed by Kramers-Kronig relation; data extracted from a smooth curve.
13	63	Vinogradov, E.A., Dianov, E.M., and Irisova, N.A.	1965	I	2000	298	Plate specimens with thicknesses of 1.5 to 9.0 mm and diameter of 50 mm; refractive index was determined from the transmission of a Michelson interferometer; digitized datum was presented by the author; uncertainty in n was 0.014.
14	30	Harting, H.	1943	D	0.20-1.083	293	Crystal; the author stated that the refractive indices were measured by F. Wolf on the specimen supplied by A. Smakula but no references were cited; digitized data were presented by the author; dn/dT at 293 K for each wavelength was also given.
15	55	Paschen, F.	1908	D	0.486-15.920	291	Crystal; prismatic specimen with height of 6 cm, width of 7.5 cm and apex angle of 50°; digitized data were presented by the author; dn/dT at temperature 285-294 K was found to be -3.5×10^{-5} K^{-1} for the wavelength 0.58932 μm.

TABLE 26. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaCl (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
16	54	Martens, F. F.	1901	D	0.185-0.768	291	Crystal; prismatic specimens; dimension of two prisms as follows: heights of 3.8 and 5.4 cm respectively, sides of 3.8 x 2.0 cm and 5.4 x 2.9 cm, apex angles of $40^{\circ}4'27''$ and $60^{\circ}9'23''$; averaged digitized values of the results obtained from these two prisms were presented by the author.
17	64	Czerny, M.	1930	T, R	35-46	298	Crystal; plate specimens of various thicknesses; refractive indices were deduced from the measurements of transmission reflection; digitized data were presented; details of calculation method can be found in this reference.
18	65	Barbaron, M.	1951	D	0.546	73.2-291	Crystal; prismatic specimen with 1.2 cm in height, 1.3 cm in width and about 60° apex angle; measurements performed at $\lambda = 0.546$ μm; dn/dT was found to be -3.67×10^{-5} K^{-1} and remaining as a constant in the temperature range from 291.2 K down to 173.2 K; dn/dT at temperature 73.2 K was found to be -2.5×10^{-5} K^{-1}; digitized data were presented by the author.
19	66	Roessler, D. M. and Walker, W. C.	1968	R	0.0476-0.2480	300	Crystal; obtained from the Harshaw Chemical Company, Cleveland, Ohio; specimens with cleaved surfaces; reflection spectrum were reduced by Kramers-Kronig analysis; digitized data were presented by the authors.
20	67	Marccux, J.	1971	F	0.4-0.7	1074	Molten salt; Vycor tube filled with the molten salt formed a cylindrical lens; refractive indices were determined by finding the focal lengths of the lens at given wavelengths; uncertainty of 0.005 was estimated in each n; digitized data were presented by the author.
21	67	Marcoux, J.	1971	F	0.5460	1079	Similar to above.
22	68	Dianov, E. M. and Irisova, N. A.	1966	T	2000	298	Natural crystal; plate specimens of 1.2 and 1.8 cm in thickness and 5.0 cm in diameter; refractive index at wavelength 2000 μm was deduced from the information of transmitted interferograms through the specimens; digitized datum with an uncertainty of 0.014 was presented by the author.
23	57	Kellner, L.	1929	T, R	23-38	298	Crystal; plate specimens of thicknesses 55, 181 and 346 μm; information of transmission and reflection was used to deduce refractive indices; digitized data were presented by the author.
24	69	Mitskevich, V. V.	1962		21-179	298	No specifications and data source were given; data extracted from a figure; this set of data is listed in data table for the purpose of completeness.
25	58	Rubens, H. and Nichols, E. F.	1897	D	0.434-22.3	291	Crystal; thin, sharp prismatic specimen with apex angle of $10^{\circ}53'$; digitized data were presented by the authors.
26	59	Rubens, H. and Trowbridge, A.	1897	D	9.95-17.93	291	Crystal; thin, sharp prismatic specimen with apex angle of $10^{\circ}53'$; digitized data were presented.
27	70	Rubens, H.	1892	D	0.434-5.746	291	Crystal; prismatic specimen with apex angle of $60^{\circ}2'$; digitized data were presented.
28	71	Rubens, H. and Snow, B. W.	1892, 1901	D	0.434-8.307	291	Crystal; prismatic specimen with height of 4.5 cm, edge of 3.5 cm and apex angle of $60^{\circ}2'$; digitized data were presented.
29	72, 73	Rubens, H.	1895, 1894	D	0.434-8.67	291	Crystal; prismatic specimen with apex angle of $60^{\circ}2'$; digitized data were presented by the author; this paper contained the same set of data in the author's 1894 paper but with revised wavelengths.

TABLE 26. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaCl (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
30	43	Ramaseshan, S.	1947	P	0.4358-0.5893	298	Crystal; plate specimen with large, clear cleavage faces; specimen was cemented to the prism of a Pulfrich refractometer by a suitable liquid in the measurement of refractive index; digitized data were presented.
31	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	1093	Molten salt; filled into a 60° prismatic Pt container with silica glass windows of 4 mm diameter; estimated uncertainty of 0.001 in n; digitized values were presented by the author.
32	74	Martens, F.F.	1902	D	0.441-0.768	291	Crystal; prismatic specimen with apex angle of 59°37'16 1/2"; digitized data were presented.
33	75	Cartwright, C.H. and Czerny, M.	1933	T	70-120	298	Crystal; plate specimens of thicknesses ranging from 21.5 to 147 μm cut from bulk; refractive indices were derived from information on transmission through specimens of various thicknesses; the authors presented digitized data read from a best fit curve.
34	76	Pulfrich, C.	1892	D	0.589	290	Natural crystal; prismatic specimen of apex angle 26°17'20"; refractive index of sodium D line was determined by the Abbe autocollimating spectrometer; digitized value was presented; dn/dT of lines, C, D, F and G' in the temperature range from 18.2 to 99.4 C were also given.
35	77, 78	Miyata, T. and Tomiki, T.	1968, 1967	R	0.10-0.25	298	Single crystal; obtained from Harshaw Chemical Co. or grown by the method of vacuum distillation followed by a zone melting in an atmosphere of chlorine using a quartz ampoule; cleaved specimens of 8 mm x 10 mm x 0.2 ~4mm in dimension; thinner specimen (~0.08 mm) was prepared by melting and pressing small pieces of zone-refined crystals between two parallel glassy carbon plates in vacuum; reflection spectra were obtained at incident angle of 10° and transmission spectra at normal incidence; refractive indices were deduced by Kramers-Kronig method; data extracted from a figure.
36	77, 78	Miyata, T. and Tomiki, T.	1968, 1967	R	0.10-0.25	78	Similar to above.
37	77, 78	Miyata, T. and Tomiki, T.	1968, 1967	R	0.10-0.25	10	Similar to above.
38	47	Dianov, E.M. and Irisova, N.A.	1967	I	2000	300	Plate specimens with various thicknesses; refractive index was determined from the information of transmitted interferograms; digitized value was presented with uncertainty of 0.01.
39	47	Dianov, E.M. and Irisova, N.A.	1967	I	2000	77	Similar to above.
40	79	Joubin, P.	1889	D	0.2143-0.6437	298	Prismatic specimen with apex angle of about 60°; temperature not specified, room temperature assumed; digitized data presented.
41	80	Dufet, M.H.	1891	D	0.589	291	Prismatic specimen of 60° apex angle; measurements were made at various temperatures ranging from 15 to 20.5 C and then reduced to 18 C by using the then known dn/dT = -0.0000373; the averaged value was presented.
42	81	Micheli, F.J.	1902	D	0.202-0.643	296.6-373.6	Crystal; prismatic specimen with apex angle of 39°33', height of 38 mm; surface of 38 x 20 mm^2; specimen was placed in a heating chamber; measurements were made at various temperatures ranging from 23.4 to 100.4 C and dn/dT were deduced; averaged results were presented in digitized values; this reference contains dn/dT only.

TABLE 26. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaCl (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
43	82	Liebreich, E.	1911	D	0.656-8.85	291-373	Prismatic specimen with apex angle of 59°38'17", height of 6 cm and edge of 3 cm; specimen was placed inside a heating chamber regulated to ±0.5 C; measurements were made at various temperatures ranging from 18 to 100 C and dn/dT's were deduced; results of dn/dT were presented in digitized values; refractive indices at 18 and 100 C were plotted, however, they were not extracted because it was impossible to read accurately to be consistent with given dn/dT's.
44	83	Liebreich, E.	1911	D	0.492-5.95	247-293	Prismatic specimen placed in a temperature regulated chamber; measurements were made at various temperatures ranging from -26 C to 20 C; digitized data were given; this paper contains dn/dT data only.
45	53	Stefan, J.M.	1871	D	0.397-0.760	290	Prismatic specimen with apex angle of 56°9'32"; refractive indices were measured by the minimum deviation method; temperature coefficients of refractive index for three lines, B, D, and F were also determined in the range from 12.2 to 91.6 C by heating the prism; digitized data were presented.
46	53	Stefan, J.M.	1871	D	0.397-0.687	295	Similar to above but a different prism with apex angle of 42°2'49"; the temperature range in determining the temperature coefficients was from 20.5 to 93.7 C.
47	56	Langley, S.P.	1900	D	0.7604-3.4090	293	Prismatic specimen with apex angle of about 59.9°; digitized data were presented.
48	56	Langley, S.P.	1900	D	0.4861-6.4790	293	Similar to above.
49	84	Langley, S.P.	1886	D	0.396-5.30	272-300	Prismatic specimen with apex angle of about 60°; measurements were made at various temperatures depended on weather conditions; digitized data were presented.
50	13	Lowdes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	290	Single crystal; prismatic sample; digitized data were given with uncertainty of ±0.0004.
51	13	Lowdes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	4	Similar to above.
52	112	Fedyukina, G.N. and Zlenko, V.Ya.	1972	M	0.589	281-308	Single crystal; disc specimens of 1-18 mm in thickness; refractive index for sodium D line was determined by immersion method; digitized value was reported with uncertainty of ±0.0005; temperature was not specified but a range was given.
53	113	Kolosovskii, O.A. and Ustimenko, L.N.	1972	I	10.6	293-308	Plate specimen placed in a CO_2 laser resonator; the temperature coefficient of refractive index was determined by measuring the drift of resonator optical length, casused by a definite change of sample temperature (cooled from about 308 K to 293 K); digitized value presented with less than 1% error.

TABLE 27. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaCl

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 288.2 K	
0.214	1.73216*
0.219	1.71709*
0.226	1.69914*
0.231	1.68837*
0.257	1.64624
0.274	1.62704
0.325	1.59304
0.340	1.58627
0.346	1.58365
0.361	1.57855
0.589	1.54443
CURVE 2 T = 298.0 K	
2.51	1.56
4.91	1.53
7.66	1.51
9.82	1.51
12.88	1.49
15.89	1.49
17.62	1.44*
20.32	1.39
22.23	1.36
34.36	0.66
35.73	0.50*
36.98	0.40
38.02	0.47*
38.90	0.53
40.27	0.48
42.46	0.41
45.50	0.20
64.42	6.38
68.71	4.32
74.13	3.50
78.70	3.23
88.31	2.92
97.50	2.74
108.14	2.65
119.40	2.59
297.17	2.48*
CURVE 3 T = 298.0 K	
146.9	2.66
146.9	2.56*
CURVE 3 (cont.) T = 298.0 K	
174.2	2.48
199.8	2.56
199.8	2.36
230.9	2.65*
230.9	2.55*
CURVE 4 T = 298.0 K	
193.9	2.46
215.7	2.52
231.7	2.45
CURVE 5 T = 298.0 K	
152.9	2.60
171.0	2.63
187.2	2.55
207.2	2.49*
CURVE 6 T = 298.0 K	
163.0	2.52
200.8	2.60
CURVE 7 T = 291.2 K	
18.1	1.413
18.7	1.403*
19.4	1.394
20.0	1.381*
20.7	1.368*
21.3	1.352
22.8	1.318*
23.6	1.299*
24.2	1.278
25.0	1.254*
25.8	1.229*
26.6	1.208*
27.3	1.175
CURVE 8 T = 291.2 K	
18.3	1.414*
18.9	1.400*
19.8	1.391*
20.4	1.375*
21.1	1.358*
21.9	1.340*
23.9	1.304
24.8	1.283*
25.4	1.251
26.5	1.225
27.2	1.192*
CURVE 9 T = 291.2 K	
19.2	1.405*
20.3	1.374*
21.5	1.339*
24.6	1.259*
28.0	1.148
CURVE 10 T = 298.0 K	
55	0.54
56	0.74*
57	1.02
58	1.45
59	2.18
60	3.99
61	6.67
62	7.81
63	7.05
64	6.31
65	5.52
66	5.00
67	4.61
CURVE 11 T = 298.0 K	
70	3.83
72	3.63
74	3.51
76	3.40
78	3.31
80	3.24*
CURVE 11 (cont.) T = 298.0 K	
82	3.18
84	3.13*
86	3.09*
88	3.05
90	3.01*
92	2.98*
94	2.95
96	2.92*
98	2.90
100	2.87
102	2.85*
104	2.83*
106	2.81*
108	2.79*
110	2.76
112	2.74*
114	2.72*
116	2.71*
118	2.69*
120	2.67
122	2.66*
124	2.64*
126	2.63*
128	2.61*
130	2.60
132	2.59*
134	2.58*
136	2.57*
138	2.56*
140	2.54
142	2.53*
144	2.52*
146	2.51*
148	2.51*
150	2.50
152	2.49*
154	2.49*
156	2.48*
158	2.48*
160	2.47*
162	2.47*
164	2.47*
166	2.46
CURVE 12 T = 298.0 K	
11.6	1.52*
24.7	1.28*
31.6	1.01
35.2	0.67
36.1	0.49
42.9	0.49
47.9	0.21
51.3	0.21
55.1	0.36
56.9	0.88
59.0	2.34
60.7	7.69
62.2	7.65*
63.5	6.07
65.3	5.12
66.9	4.32
69.1	3.93
72.8	3.52*
80.4	3.22
99.0	2.90
127.6	2.62
174.3	2.42
202.3	2.42*
CURVE 13 T = 298.0 K	
2310.	2.43
CURVE 14 T = 293.2 K	
0.19905	1.7963
0.21360	1.7355
0.22470	1.7038
0.23998	1.6721*
0.24828	1.65878
0.25365	1.65112*
0.26537	1.63680*
0.26993	1.63202
0.28035	1.62214*
0.28936	1.61479
0.29676	1.60943*
0.30215	1.60578
0.31317	1.59915
0.33415	1.58874
0.36631	1.57684
CURVE 14 (cont.) T = 293.2 K	
0.39064	1.56996*
0.40466	1.56660
0.43583	1.56050
0.48613	1.55327
0.54607	1.54730
0.58756	1.54428*
0.58930	1.54416
0.65628	1.54052
0.70652	1.53851
0.72814	1.53777
0.76820	1.53654
0.81095	1.53547
0.84247	1.53476
0.91230	1.53346
1.01398	1.53191
1.08303	1.53116
CURVE 15 T = 291.2 K	
0.486149	1.553399*
0.58932	1.544313*
0.656304	1.540672*
0.706548	1.538633
0.766529	1.536712*
0.78576	1.536138
0.88398	1.534011
0.98220	1.532435
1.1786	1.530372*
1.7680	1.527440
2.3573	1.525863
2.9466	1.524534
3.5359	1.523173
4.12524	1.521648
5.0092	1.518978
5.8932	1.516014
6.4825	1.513628
7.0718	1.511062
7.6611	1.508318
7.9558	1.506804
8.8398	1.502035
10.0184	1.494722
11.7864	1.481816
12.9650	1.471720
14.1436	1.460547
14.7330	1.454404
15.3223	1.447494
15.9116	1.441032

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* Not shown in figure.

TABLE 27. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaCl (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 16 T = 291.2 K	
0.185	1.89332
0.186	1.88558*
0.193	1.82809
0.197	1.80254*
0.198	1.79580*
0.200	1.79016
0.204	1.76948
0.208	1.75413
0.211	1.74355
0.214	1.73221*
0.219	1.71711
0.224	1.70516*
0.231	1.68840
0.242	1.66699*
0.250	1.65541
0.257	1.64604*
0.263	1.63904
0.267	1.63417*
0.274	1.62687*
0.281	1.62083
0.291	1.61309*
0.308	1.60187
0.312	1.59954*
0.340	1.58601
0.358	1.57916*
0.394	1.56889
0.410	1.56530*
0.434	1.56072*
0.441	1.55947
0.467	1.55554*
0.486	1.55317
0.508	1.55071
0.533	1.54829
0.546	1.54724*
0.560	1.54607
0.589	1.54413*
0.627	1.54185
0.643	1.54105
0.656	1.54047*
0.670	1.53982
0.768	1.53644
CURVE 17 T = 298.0 K	
35	0.64
36	0.50*
CURVE 17 (cont.) T = 298.0 K	
37	0.42*
38	0.40
39	0.47
40	0.52
41	0.48*
43	0.40*
46	0.20
CURVE 18 T =	
0.546	1.55514
0.546	1.55381*
0.546	1.55224*
0.546	1.55040
0.546	1.54857*
0.546	1.54792*
CURVE 19 T = 300.0 K	
0.047685	0.83
0.048430	0.82*
0.048811	0.83*
0.049198	0.83*
0.049592	0.83*
0.049791	0.82
0.050194	0.82*
0.05121	0.81*
0.051658	0.81*
0.051658	0.82*
0.051874	0.82*
0.052092	0.83*
0.052983	0.85
0.053210	0.85*
0.053440	0.85*
0.053671	0.83*
0.053904	0.82*
0.054377	0.80*
0.054858	0.79*
0.055102	0.80*
0.055348	0.80*
0.055596	0.81*
0.055847	0.82*
0.056355	0.83
0.056612	0.84*
0.056872	0.85*
CURVE 19 (cont.) T = 300.0 K	
0.057665	0.87*
0.058788	0.88*
0.059321	0.88*
0.059606	0.88*
0.060184	0.88*
0.060478	0.87*
0.061376	0.87*
0.061682	0.88*
0.061990	0.88*
0.062302	0.89
0.062616	0.91
0.063255	0.92
0.063579	0.92*
0.063907	0.91*
0.064238	0.90*
0.064573	0.88*
0.064911	0.87*
0.065598	0.86
0.065947	0.86*
0.066299	0.87*
0.06656	0.88*
0.067016	0.89*
0.067380	0.90
0.067749	0.90*
0.068121	0.90*
0.068878	0.89*
0.070045	0.87
0.070846	0.85*
0.071665	0.84*
0.072503	0.82*
0.072929	0.82*
0.073361	0.82*
0.073798	0.82*
0.074240	0.82*
0.075139	0.80*
0.075598	0.79*
0.076061	0.77*
0.076531	0.74*
0.077006	0.74*
0.077975	0.74*
0.078968	0.74*
0.079987	0.75*
0.080506	0.76*
0.081033	0.76*
0.081566	0.77
0.083208	0.77*
0.083770	0.76*
CURVE 19 (cont.) T = 300.0 K	
0.084340	0.78*
0.084628	0.79*
0.084918	0.81
0.085210	0.82*
0.085503	0.84*
0.085799	0.85*
0.086097	0.86*
0.086699	0.88*
0.087004	0.89*
0.087310	0.91*
0.087929	0.94*
0.088557	0.98*
0.089194	1.02
0.089841	1.06*
0.090496	1.10*
0.091837	1.16*
0.093218	1.20
0.094641	1.21*
0.09537	1.19*
0.09574	1.17*
0.09611	1.16*
0.09648	1.14*
0.09686	1.12*
0.09762	1.10
0.09840	1.10
0.09879	1.14*
0.09958	1.15*
0.09998	1.17*
0.10039	1.19*
0.10080	1.21*
0.10162	1.24
0.10246	1.24*
0.10332	1.22*
0.10418	1.20
0.10507	1.16*
0.10597	1.12*
0.10642	1.10*
0.10688	1.07*
0.10734	1.09
0.10781	1.15*
0.10828	1.24*
0.10875	1.32*
0.10923	1.40
0.10972	1.49*
0.11020	1.57*
0.11070	1.64
0.11169	1.75
CURVE 19 (cont.) T = 300.0 K	
0.11271	1.82*
0.11374	1.82
0.11696	1.67
0.11808	1.58
0.11864	1.54
0.11921	1.51
0.11979	1.49
0.12215	1.50
0.12275	1.52
0.12324	1.54
0.12398	1.55
0.12651	1.59
0.12915	1.63
0.13189	1.65
0.13476	1.66
0.13776	1.67
0.13930	1.66
0.14089	1.66
0.14169	1.66
0.14251	1.66
0.14416	1.65
0.14586	1.64
0.14672	1.64
0.14760	1.63
0.14848	1.61
0.14937	1.59
0.15028	1.55
0.15120	1.50
0.15212	1.44
0.15306	1.38
0.15344	1.36
0.15401	1.33
0.15440	1.34
0.15498	1.38
0.15536	1.42
0.15595	1.51
0.15634	1.60
0.15694	1.74
0.15734	1.84
0.15794	2.00
0.15834	2.12
0.15895	2.30
0.15996	2.42
0.15997	2.59
0.16099	2.72
0.16101	2.91
0.16207	2.90
CURVE 19 (cont.) T = 300.0 K	
0.16313	2.69
0.16421	2.55
0.16531	2.46
0.16642	2.40
0.16754	2.34
0.16984	2.25
0.17219	2.17
0.17711	2.03*
0.18367	1.91
0.19074	1.84*
0.20663	1.75
0.22542	1.69
0.24796	1.65
CURVE 20 T = 1074.2 K	
0.4047	1.423
0.5000	1.414
0.6000	1.410
0.6943	1.402
CURVE 21 T = 1079.2 K	
0.5460	1.413
CURVE 22 T = 298.0 K	
2000.	2.43
CURVE 23 T = 298.0 K	
23	1.340
24	1.334
25	1.330
26	1.324
27	1.321
28	1.315
29	1.310
30	1.306
31	1.302
32	1.299
33	1.299
34	1.310

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* Not shown in figure.

TABLE 27. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaCl (continued)

[Wavelength, λ, μm; Refractive Index, n]

CURVE 23 (cont.)
T = 298.0 K

λ	n
35	1.330
36	1.376*
37	1.461

CURVE 24
T = 298.0 K

λ	n
21	1.36
23	1.34
28	1.19
30	0.96
35	0.79
37	0.57
39	0.40
40	0.47
41	0.50
42	0.47
44	0.40
46	0.20
72	3.39
74	3.81
75	3.52
76	3.26
77	3.43
78	3.01
80	3.30
81	3.10
85	2.80
88	2.72
88	2.58
95	2.65
97	2.79
98	2.63
102	2.63
105	2.40
108	2.53
114	2.53
119	2.50
119	2.26
126	2.33
129	2.45
148	2.52
155	2.40
179	2.37

CURVE 25
T = 291.2 K

λ	n
0.434	1.5607*
0.589	1.5441*
8.67	1.5030
20.57	1.3735
22.3	1.340

CURVE 26
T = 291.2 K

λ	n
9.95	1.4951
11.88	1.4805
13.96	1.4627
15.89	1.4410
17.93	1.4148

CURVE 27
T = 291.2 K

λ	n
0.434	1.5607*
0.485	1.5531
0.590	1.5441
0.656	1.5404*
0.819	1.5350
0.883	1.5335
0.955	1.5323
1.043	1.5313
1.147	1.5302
1.275	1.5292
1.434	1.5283
1.640	1.5273
1.914	1.5265
2.296	1.5255
2.870	1.5242
3.826	1.5221
5.746	1.5179

CURVE 28
T = 291.2 K

λ	n
0.434	1.5607*
0.485	1.5531*
0.589	1.5441*
0.656	1.5404
0.755	1.5370
0.790	1.5358
0.831	1.5347
0.876	1.5337

CURVE 28 (cont.)
T = 291.2 K

λ	n
0.923	1.5329
0.978	1.5321*
1.035	1.5313*
1.107	1.5305
1.186	1.5299
1.277	1.5293*
1.384	1.5286
1.511	1.5280
1.660	1.5275
1.845	1.5270
2.076	1.5264
2.372	1.5257*
2.771	1.5247
3.022	1.5239
3.320	1.5230
3.690	1.5217
4.150	1.5208*
4.745	1.5197
5.540	1.5184
6.647	1.5163
8.307	1.5138

CURVE 29
T = 291.2 K

λ	n
0.434	1.5607
0.485	1.5531
0.589	1.5441
0.656	1.5404
0.840	1.5345
1.281	1.5291
1.761	1.5271
2.35	1.5255
3.34	1.5233
4.01	1.5216
4.65	1.5197
5.22	1.5180
5.79	1.5159
6.78	1.5121
7.22	1.5102
7.59	1.5085
8.04	1.5064
8.67	1.5030

CURVE 30
T = 298.0 K

λ	n
0.4358	1.5605
0.5461	1.5475
0.5893	1.5443

CURVE 31
T = 1093.2 K

λ	n
0.5461	1.424

CURVE 32
T = 291.2 K

λ	n
0.441	1.55962*
0.467	1.5570
0.486	1.55338*
0.508	1.55089*
0.533	1.54848
0.546	1.54745*
0.560	1.54629*
0.589	1.54431*
0.627	1.54207*
0.643	1.54125*
0.656	1.54067*
0.670	1.54002
0.768	1.53666*

CURVE 33
T = 298.0 K

λ	n
70.	4.25
72.5	3.68
75.	3.42
77.5	3.25
80.	3.11
85.	2.94
90.	2.83
95.	2.76
100.	2.70
105.	2.65
110.	2.60
115.	2.55
120.	2.51

CURVE 34
T = 290.7 K

λ	n
0.589	1.5440

CURVE 35
T = 298.0 K

λ	n
0.1033	1.51
0.1039	1.48*
0.1050	1.48*
0.1057	1.51*
0.1066	1.56*
0.1081	1.72
0.1091	1.88*
0.1104	2.11
0.1113	2.18*
0.1131	2.18
0.1143	2.08*
0.1152	1.92*
0.1169	1.79*
0.1197	1.69*
0.1235	1.69
0.1263	1.78*
0.1289	1.78
0.1298	1.80
0.1318	1.77*
0.1338	1.77*
0.1349	1.78*
0.1379	1.78*
0.1398	1.76*
0.1420	1.76
0.1449	1.71*
0.1487	1.71*
0.1501	1.67
0.1521	1.48*
0.1531	1.43*
0.1540	1.43
0.1552	1.55*
0.1566	1.85
0.1602	3.08
0.1610	3.27
0.1619	3.23*
0.1627	2.96
0.1649	2.64*
0.1664	2.43*
0.1694	2.26*
0.1725	2.14*
0.1761	2.03
0.1813	1.94*
0.1893	1.86*
0.1980	1.80*
0.2053	1.77
0.2142	1.72*
0.2309	2.68*
0.2480	2.67*

CURVE 36
T = 78.0 K

λ	n
0.1058	1.58
0.1079	1.99
0.1094	2.34
0.1103	2.44
0.1109	2.46*
0.1117	2.46*
0.1128	2.36
0.1142	2.18*
0.1151	2.02
0.1163	1.82*
0.1173	1.72*
0.1190	1.72
0.1234	1.91*
0.1292	1.91*
0.1303	1.97
0.1325	1.97*
0.1373	1.88*
0.1430	1.88
0.1440	1.94*
0.1452	1.94
0.1462	1.85*
0.1487	1.25
0.1498	1.04
0.1509	0.96
0.1520	1.07
0.1529	1.43*
0.1542	3.14
0.1550	2.60
0.1562	5.00
0.1568	3.90
0.1578	3.40*
0.1588	3.03*
0.1600	2.78
0.1619	2.52*
0.1645	2.30
0.1673	2.17*
0.1710	2.06
0.1766	1.96*
0.1851	1.87
0.2102	1.77*
0.2480	1.68*

CURVE 37
T = 10.0 K

λ	n
0.1040	1.50*
0.1046	1.48
0.1050	1.48*

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* Not shown in figure.

TABLE 27. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaCl (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 37 (cont.) T = 10.0 K	
0.1059	1.55*
0.1066	1.66*
0.1074	1.80
0.1083	2.03*
0.1090	2.18*
0.1096	2.30
0.1108	2.45*
0.1119	2.45*
0.1127	2.40
0.1142	2.19*
0.1161	1.85*
0.1169	1.73*
0.1179	1.67
0.1227	1.82*
0.1239	1.92*
0.1256	1.92*
0.1278	1.99
0.1301	1.92*
0.1312	1.93*
0.1323	1.98*
0.1343	1.93
0.1416	1.93*
0.1429	1.96*
0.1435	1.93*
0.1445	1.98*
0.1457	1.98*
0.1476	1.52
0.1496	1.08*
0.1509	1.00
0.1523	1.26*
0.1531	1.68
0.1537	3.41
0.1550	2.35
0.1558	5.57
0.1572	3.79*
0.1592	3.02*
0.1606	2.74*
0.1632	2.40
0.1649	2.25*
0.1687	2.10
0.1737	2.01*
0.1805	1.92*
0.1917	1.85*
0.2033	1.79*
0.2214	1.73
0.2441	1.69*
CURVE 38 T = 300.0 K	
2000.	2.43
CURVE 39 T = 77.0 K	
2000.	2.35
CURVE 40 T = 298.0 K	
0.22645	1.69900
0.23125	1.68855
0.25713	1.64870
0.27467	1.62790
0.288	1.61465
0.298	1.61226
0.32470	1.59330
0.34015	1.58641
0.34655	1.58391
0.36090	1.57877
0.39856	1.56810
0.44145	1.55982
0.46765	1.55596
0.47986	1.55436
0.50844	1.55116
0.53363	1.54875
0.53771	1.54839
0.64370	1.54151
CURVE 41 T = 291.2 K	
0.589	1.54433
CURVE 45 T = 290.0 K	
0.397	1.56823*
0.431	1.56129*
0.486	1.55324*
0.527	1.54901
0.589	1.54418*
0.656	1.54050*
0.687	1.53918
0.760	1.53663*
CURVE 46 T = 295.0 K	
0.397	1.56806
0.431	1.56108
0.486	1.55304
0.527	1.54882
0.589	1.54400
0.656	1.54032
0.687	1.53902
CURVE 47 T = 293.0 K	
0.7604	1.536818*
0.7627	1.536747*
0.8162	1.535360*
0.8227	1.535206*
0.8538	1.534526*
0.8658	1.534287*
0.8992	1.533676*
0.9090	1.533520*
0.9135	1.533427*
0.9232	1.533274*
0.9357	1.533075*
0.9443	1.532940*
0.9759	1.532494*
1.0041	1.532116*
1.0728	1.531319*
1.1240	1.530796*
1.1399	1.530649*
1.1481	1.530574*
1.1833	1.530277*
1.2016	1.530132*
1.2658	1.529666*
1.3306	1.529261*
1.4333	1.528709*
1.4692	1.528536*
1.5734	1.528074*
1.6017	1.527953*
1.6362	1.527815*
2.0000	1.526668
2.0556	1.526534*
2.1172	1.526375*
2.1658	1.526255*
2.2016	1.526166
2.2900	1.525930*
2.3508	1.525808*
2.3846	1.525729*
2.4160	1.525656
CURVE 47 (cont.) T = 293.0 K	
2.4496	1.525578*
2.9575	1.524413*
3.0430	1.524226*
3.0900	1.524118*
3.1340	1.524022
3.2100	1.523853*
3.2610	1.523739*
3.3000	1.523625*
3.4090	1.523399
CURVE 48 T = 293.0 K	
0.4861	1.553339
0.4920	1.552646
0.4937	1.552456
0.4983	1.551940
0.5173	1.550006
0.5184	1.549862
0.5273	1.549081
0.5372	1.548175
0.5530	1.546855
0.5660	1.545800
0.5710	1.545546
0.5758	1.545194
0.5786	1.545002
0.5860	1.544505
0.5893	1.544273
0.6105	1.543000
0.6400	1.541405
0.6563	1.540635
0.6874	1.539307
0.7190	1.538150
0.7604	1.536818
0.7992	1.535691
0.8424	1.534778
0.8835	1.533952
0.9033	1.533613
0.9724	1.532532
0.9916	1.532278
1.0084	1.532057
1.0368	1.531695
1.0540	1.531521
1.0810	1.531234
1.1058	1.530979
1.1420	1.530633
1.1780	1.530312
CURVE 48 (cont.) T = 293.0 K	
1.2016	1.530139
1.2604	1.529699
1.3126	1.529368
1.4874	1.528452
1.5552	1.528144
1.6368	1.527813
1.6848	1.527638
1.7670	1.527377
2.0736	1.526487
2.1824	1.526213
2.2464	1.526058
2.3560	1.525785
2.6505	1.524897
2.8080	1.524566
2.9450	1.524359
3.1104	1.524008
3.2736	1.523712
3.3696	1.523481
3.6288	1.522856
3.8192	1.522372
4.1230	1.521564
4.1720	1.519789
5.3009	1.517874
5.8900	1.515497
6.4790	1.513413
CURVE 49 T = 272.0-300.0 K	
0.39687	1.56833
0.48614	1.55323
0.51838	1.54975
0.58901	1.54418
0.58961	1.54414
0.65630	1.54051
0.75940	1.53670
1.1780	1.5301
1.7670	1.5272
2.3560	1.5254
2.9451	1.5243
3.5341	1.5227
4.1231	1.5215
4.7121	1.5201
5.3011	1.5286
CURVE 50* T = 290.0 K	
0.4358	1.5606
0.4678	1.5555
0.4800	1.5541
0.5086	1.5507
0.5461	1.5475
0.5780	1.5451
0.5893	1.5443
0.6438	1.5411
CURVE 51* T = 4.0 K	
0.4358	1.5670
0.4678	1.5625
0.4800	1.5606
0.5086	1.5577
0.5461	1.5543
0.5780	1.5518
0.5893	1.5511
0.6438	1.5481
CURVE 52* T = 281.0-308.0 K	
0.589	5436

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* Not shown in figure.

TABLE 28. EXPERIMENTAL DATA ON dn/dT OF NaCl

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/cT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 14	
T_m = 293.0 K	
0.21360	-0.9
0.22470	-0.9
0.23998	-1.7
0.24828	-2.1
0.25365	-2.5
0.26537	-2.3
0.26993	-2.2
0.28035	-2.2
0.28936	-2.9
0.29676	-2.8
0.30215	-2.9
0.31317	-2.8
0.33415	-2.9
0.36631	-3.1
0.39064	-2.9
0.40466	-3.0
0.43583	-3.2
0.48613	-3.5
0.54607	-3.3
0.58756	-3.3
0.58930	-3.3*
0.65628	-3.4
0.70652	-3.5
0.72814	-3.4
0.76820	-3.5
0.81095	-3.3
0.84247	-3.5
0.91230	-3.8
1.01398	-3.7
1.08303	-3.2
CURVE 15	
T_m = 290.0 K	
0.58932	-3.35
CURVE 18	
T_m = 232.0 K	
0.546	-3.67
CURVE 34	
T_m = 332.0 K	
0.434	-3.473
0.486	-3.537
CURVE 34 (cont.)	
T_m = 332.0 K	
0.589	-3.629
0.656	-3.639
CURVE 42	
T_m = 335.0 K	
0.202	2.987
0.206	2.085
0.210	1.428
0.214	0.712
0.219	0.097
0.224	-0.324
0.226	-0.516
0.228	-0.732
0.231	-0.890
0.257	-2.105
0.274	-2.493
0.288	-2.724
0.298	-2.848
0.313	-2.981
0.325	-3.105
0.340	-3.184
0.361	-3.309
0.441	-3.537
0.467	-3.566
0.480	-3.579
0.508	-3.628
0.589	-3.733*
0.643	-3.747
CURVE 43	
T_m = 332.0 K	
0.656	-3.764
1.1	-3.751
1.6	-3.664
2.7	-3.535
3.96	-3.390
4.96	-3.281
6.4	-3.241
8.85	-2.523
CURVE 44	
T_m = 270.0 K	
0.492	-2.30
CURVE 44 (cont.)	
T_m = 270.0 K	
0.502	-2.42
0.589	-2.46
0.589	-2.67
0.589	-2.66
0.678	-2.70
1.3	-3.14
1.3	-3.34
2.0	-2.91
2.0	-3.07
2.1	-2.85
2.3	-2.89
3.2	-2.75
4.15	-2.80
4.15	-3.13
5.0	-2.83
5.95	-2.91
5.95	-3.23
CURVE 45	
T_m = 325.0 K	
0.486	-3.65*
0.589	-3.76
0.687	-3.74
CURVE 46*	
T_m = 330.0 K	
0.486	-3.62
0.589	-3.70
0.687	-3.74
CURVE 53	
T_m = 300.0 K	
10.6	-3.2

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* Not shown in figure.

TABLE 29. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR NaCl

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Rubens, H. and Nichols, E. F. [58] 1897	0.434-22.3 μm 291 K	$n^2 = 1.1875 + \frac{1.1410\,\lambda^2}{\lambda^2 - (0.1273)^2} + \frac{2.8505\,\lambda^2}{\lambda^2 - (56.119)^2}$
Martens, F. F. [54] 1901	0.185-0.768 μm 291 K	$n^2 = 1.155992 + \frac{0.855461\,\lambda^2}{\lambda^2 - (0.110725)^2} + \frac{0.317791\,\lambda^2}{\lambda^2 - (0.156320)^2} + \frac{1.620760\,\lambda^2}{\lambda^2 - (51.2)^2} - 0.000309178\,\lambda^2$
Paschen, F. [55] 1908	0.48-15.92 μm 291 K	$n^2 = 1.2593 + \frac{0.8611\,\lambda^2}{\lambda^2 - (0.1219)^2} + \frac{0.2098\,\lambda^2}{\lambda^2 - (0.1596)^2} + \frac{3.350\,\lambda^2}{\lambda^2 - (60.0)^2}$
Czerny, M. [64] 1930	35.0-46.0 μm 298 K	$n^2 = 1 + \frac{0.05217\,\lambda^2}{\lambda^2 - (0.03470)^2} + \frac{1.00447\,\lambda^2}{\lambda^2 - (0.10850)^2} + \frac{0.27095\,\lambda^2}{\lambda^2 - (0.15839)^2} + \frac{0.5375\,\lambda^2}{\lambda^2 - (61.674)^2}$
Harting, H. [30] 1943	0.199-1.083 μm 293 K	$n = 1.52448 + \frac{0.00626}{(\lambda - 0.1010)^{1.60}}$
Rammachandran, N. [17] 1947	0.185-22.3 μm 291 K	$n^2 = 1 + \frac{0.187895\,\lambda^2}{\lambda^2 - (0.0500)^2} + \frac{0.497649\,\lambda^2}{\lambda^2 - (0.1000)^2} + \frac{0.384897\,\lambda^2}{\lambda^2 - (0.1280)^2} + \frac{0.259500\,\lambda^2}{\lambda^2 - (0.1580)^2} + \frac{3.4740\,\lambda^2}{\lambda^2 - (61.1)^2}$
Genzel, L., Happ, H., and Weber, R. [15] 1958	2.5-300.0 μm	$n^2 - k^2 = \epsilon_{uv} + \sum_i \frac{c_i(\nu_i^2 - \nu^2)}{(\nu_i^2 - \nu^2)^2 + (\gamma_i \nu)^2}$, $2nk = \sum_i \frac{c_i \gamma_i \nu}{(\nu_i^2 - \nu^2)^2 + (\gamma_i \nu)^2}$ *
Present work 1975	0.20-30.00 μm 293 K	$n^2 = 1.00055 + \frac{0.19800\,\lambda^2}{\lambda^2 - (0.050)^2} + \frac{0.48398\,\lambda^2}{\lambda^2 - (0.100)^2} + \frac{0.38696\,\lambda^2}{\lambda^2 - (0.128)^2} + \frac{0.25998\,\lambda^2}{\lambda^2 - (0.158)^2} + \frac{0.08796\,\lambda^2}{\lambda^2 - (40.50)^2} + \frac{3.17064\,\lambda^2}{\lambda^2 - (60.98)^2} + \frac{0.30038\,\lambda^2}{\lambda^2 - (120.34)^2}$

*$i = 1, 2, 3$; $\nu_1 = 246.9$ cm^{-1}, $\nu_2 = 163.9$ cm^{-1}, $\nu_3 = 83.1$ cm^{-1}; $\gamma_1 = 34.933$ cm^{-1}, $\gamma_2 = 6.133$ cm^{-1}, $\gamma_3 = 137.000$ cm^{-1}; $c_1 = 0.55 \times 10^4$ (cm^{-1})^2, $c_2 = 8.60 \times 10^4$ (cm^{-1})^2, $c_3 = 0.23 \times 10^4$ (cm^{-1})^2.

3.7. Sodium Bromide, NaBr

Sodium bromide is very hygroscopic and highly soluble in water and is therefore not a useful material for making optical components despite its transparency over a wide wavelength region from about 0.25 to more than 30 μm. While NaBr is not useful for ordinary applications, it is an interesting material for scientific research. The wavelength of ultraviolet absorption peaks has been measured by Hilsch and Pohl [23] and by Schneider and O'Bryan [24] and that in the infrared was reported by Lowndes and Martin [13], who also investigated the dielectric constants. The results obtained by these investigators are shown in table 3.

Experimental work on the refractive index of NaBr is very scanty and is limited in the near ultraviolet and visible regions. Only five documents could be found in the open literature. By a careful review of the available data sets one finds that only two sets of data, those of Gyulai [27] and Wulff and Schaller [85], can be used to carry out analysis; the others are either inaccurate or otherwise unsuitable. The accuracy of the data of Gyulai is one unit of the third decimal place, though the values in his paper are given to the fourth for the purpose of tabular smoothness. The uncertainty of the single value of Wulff and Schaller is 0.0001. Bauer's film data appears too low in comparison with the bulk material data and Spangenberg's values [45] are clearly inaccurate, probably because of the hygroscopic character of NaBr and the use of an inadequate method. The single measurement of Zarzyski and Naudin [44] is for molten NaBr.

Gyulai's data were obtained at a temperature of 339 K, 46 degrees higher than the temperature chosen for reference data generation. Since the temperature derivative of refractive index of NaBr in the visible region is of the order of $-4.0\times10^{-5}\,\mathrm{K}^{-1}$ [18], temperature corrections to Gyulai's values are significant, about two units in the third decimal place. Information on dn/dT is needed to carry out these corrections, but it is unavailable. Reasonable estimation of dn/dT can be made by the following formula, constructed from the parameters listed in table 5.

$$2n\frac{dn}{dT}=-12.69(n^2-1)-0.12+\frac{7.36\lambda^4}{(\lambda^2-0.03534)^2}+\frac{242.94\lambda^2}{(\lambda^2-5569.64)^2},\qquad(35)$$

where dn/dT is in units of $10^{-5}\,\mathrm{K}^{-1}$ and λ is μm. dn/dT values in the visible region given by eq (35) are about $-4.0\times10^{-5}\,\mathrm{K}^{-1}$, close to those proposed by Tsay [18].

By use of eq (35), data reported by Gyulai and Wulff and Schaller were reduced to 293 K, ready for the least-squares calculations. The other necessary input parameters were taken from table 3. The result of the curve fitting calculations is a dispersion equation for NaBr at 293 K in the transparent region, 0.21–34.0 μm.

$$n^2=1.06728+\frac{1.10463\lambda^2}{\lambda^2-(0.125)^2}+\frac{0.18816\lambda^2}{\lambda^2-(0.145)^2}+\frac{0.00243\lambda^2}{\lambda^2-(0.176)^2}+\frac{0.24454\lambda^2}{\lambda^2-(0.188)^2}+\frac{3.7960\lambda^2}{\lambda^2-(74.63)^2},\qquad(36)$$

where λ is in units of μm.

Equations (35) and (36) were used to generate the recommended values on the refractive index and its wavelength and temperature derivatives. Note that in the table of recommended values the values are given to more decimal places than their accuracies, for the purpose of tabular smoothness and visual continuity. In order to use the values properly, the readers should follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.21– 0.24	2	0.02
0.24– 0.40	3	0.002
0.40– 0.70	3	0.001
0.70– 8.00	3	0.002
8.00–20.00	3	0.006
20.00–25.00	3	0.008
25.00–34.00	2	0.02

For dn/dT:

0.21– 0.28	1	0.9
0.28–22.00	1	0.4
22.00–34.00	1	0.9

TABLE 30. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaBr AT 293 K*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.210	2.09223	14.24150	34.31	0.375	1.69142	0.48064	-3.13	1.750	1.61704	0.00424	-4.04
0.212	2.06563	12.43524	28.95	0.380	1.68907	0.45759	-3.18	1.800	1.61683	0.00398	-4.04
0.214	2.04225	10.98874	24.69	0.385	1.68684	0.43607	-3.22	1.850	1.61664	0.00374	-4.05
0.216	2.02149	9.80870	21.23	0.390	1.68471	0.41595	-3.25	1.900	1.61646	0.00354	-4.05
0.218	2.00288	8.83064	18.38	0.395	1.68268	0.39710	-3.29	1.950	1.61628	0.00335	-4.05
0.220	1.98607	8.00877	16.01	0.400	1.68074	0.37943	-3.32	2.000	1.61612	0.00319	-4.05
0.222	1.97077	7.30980	14.01	0.410	1.67711	0.34724	-3.38	2.050	1.61596	0.00304	-4.05
0.224	1.95676	6.70985	12.31	0.420	1.67378	0.31874	-3.43	2.100	1.61582	0.00291	-4.05
0.226	1.94388	6.18786	10.84	0.430	1.67072	0.29339	-3.47	2.150	1.61567	0.00279	-4.05
0.228	1.93197	5.73192	9.58	0.440	1.66790	0.27076	-3.51	2.200	1.61554	0.00269	-4.05
0.230	1.92091	5.33008	8.47	0.450	1.66530	0.25048	-3.55	2.250	1.61540	0.00259	-4.05
0.232	1.91062	4.97354	7.50	0.460	1.66288	0.23224	-3.58	2.300	1.61528	0.00251	-4.05
0.234	1.90099	4.65529	6.64	0.470	1.66065	0.21578	-3.61	2.350	1.61515	0.00243	-4.05
0.236	1.89197	4.36965	5.88	0.480	1.65856	0.20089	-3.64	2.400	1.61503	0.00237	-4.05
0.238	1.88350	4.11200	5.20	0.490	1.65662	0.18738	-3.66	2.450	1.61492	0.00231	-4.05
0.240	1.87551	3.87855	4.59	0.500	1.65481	0.17509	-3.69	2.500	1.61480	0.00225	-4.05
0.242	1.86797	3.66614	4.04	0.510	1.65312	0.16388	-3.71	2.550	1.61469	0.00220	-4.05
0.244	1.86083	3.47215	3.54	0.520	1.65153	0.15363	-3.72	2.600	1.61458	0.00216	-4.05
0.246	1.85407	3.29434	3.09	0.530	1.65004	0.14424	-3.74	2.650	1.61448	0.00212	-4.05
0.248	1.84765	3.13085	2.68	0.540	1.64864	0.13562	-3.76	2.700	1.61437	0.00209	-4.05
0.250	1.84154	2.98006	2.31	0.550	1.64733	0.12769	-3.77	2.750	1.61427	0.00206	-4.05
0.252	1.83572	2.84062	1.97	0.560	1.64609	0.12038	-3.79	2.800	1.61416	0.00204	-4.05
0.254	1.83017	2.71132	1.65	0.570	1.64492	0.11363	-3.80	2.850	1.61406	0.00201	-4.05
0.256	1.82487	2.59115	1.36	0.580	1.64381	0.10739	-3.81	2.900	1.61396	0.00199	-4.05
0.258	1.81980	2.47920	1.10	0.590	1.64277	0.10161	-3.82	2.950	1.61386	0.00198	-4.05
0.260	1.81495	2.37471	0.85	0.600	1.64178	0.09624	-3.83	3.000	1.61376	0.00196	-4.05
0.262	1.81029	2.27697	0.62	0.620	1.63995	0.08661	-3.85	3.050	1.61367	0.00195	-4.05
0.264	1.80583	2.18539	0.41	0.640	1.63831	0.07825	-3.87	3.100	1.61357	0.00194	-4.05
0.266	1.80155	2.09942	0.21	0.660	1.63682	0.07095	-3.88	3.150	1.61347	0.00193	-4.04
0.268	1.79743	2.01859	0.03	0.680	1.63546	0.06455	-3.90	3.200	1.61338	0.00193	-4.04
0.270	1.79347	1.94249	-0.15	0.700	1.63423	0.05891	-3.91	3.250	1.61328	0.00192	-4.04
0.272	1.78966	1.87071	-0.31	0.720	1.63310	0.05392	-3.92	3.300	1.61318	0.00192	-4.04
0.274	1.78599	1.80294	-0.46	0.740	1.63207	0.04949	-3.93	3.350	1.61309	0.00192	-4.04
0.276	1.78245	1.73885	-0.60	0.760	1.63112	0.04555	-3.94	3.400	1.61299	0.00192	-4.04
0.278	1.77903	1.67818	-0.73	0.780	1.63024	0.04201	-3.94	3.450	1.61290	0.00192	-4.04
0.280	1.77573	1.62067	-0.86	0.800	1.62944	0.03885	-3.95	3.500	1.61280	0.00192	-4.04
0.282	1.77254	1.56610	-0.98	0.820	1.62869	0.03600	-3.96	3.550	1.61270	0.00192	-4.04
0.284	1.76946	1.51426	-1.09	0.840	1.62799	0.03343	-3.96	3.600	1.61261	0.00193	-4.04
0.286	1.76649	1.46497	-1.19	0.860	1.62735	0.03110	-3.97	3.650	1.61251	0.00193	-4.04
0.288	1.76360	1.41805	-1.29	0.880	1.62675	0.02899	-3.97	3.700	1.61242	0.00194	-4.04
0.290	1.76081	1.37335	-1.39	0.900	1.62619	0.02707	-3.98	3.750	1.61232	0.00195	-4.04
0.292	1.75811	1.33073	-1.47	0.920	1.62567	0.02532	-3.98	3.800	1.61222	0.00195	-4.04
0.294	1.75549	1.29006	-1.56	0.940	1.62517	0.02373	-3.99	3.850	1.61212	0.00196	-4.04
0.296	1.75295	1.25121	-1.64	0.960	1.62472	0.02227	-3.99	3.900	1.61202	0.00197	-4.04
0.298	1.75048	1.21407	-1.72	0.980	1.62428	0.02093	-3.99	3.950	1.61193	0.00198	-4.03
0.300	1.74809	1.17854	-1.79	1.000	1.62388	0.01970	-4.00	4.000	1.61183	0.00199	-4.03
0.305	1.74241	1.09617	-1.96	1.050	1.62296	0.01703	-4.01	4.050	1.61173	0.00200	-4.03
0.310	1.73711	1.02201	-2.10	1.100	1.62217	0.01485	-4.01	4.100	1.61163	0.00201	-4.03
0.315	1.73217	0.95497	-2.24	1.150	1.62147	0.01304	-4.02	4.150	1.61152	0.00203	-4.03
0.320	1.72755	0.89416	-2.36	1.200	1.62086	0.01153	-4.02	4.200	1.61142	0.00204	-4.03
0.325	1.72322	0.83882	-2.46	1.250	1.62031	0.01026	-4.02	4.250	1.61132	0.00205	-4.03
0.330	1.71916	0.78830	-2.56	1.300	1.61983	0.00918	-4.03	4.300	1.61122	0.00207	-4.03
0.335	1.71533	0.74216	-2.65	1.350	1.61939	0.00827	-4.03	4.350	1.61111	0.00208	-4.03
0.340	1.71173	0.69961	-2.73	1.400	1.61900	0.00748	-4.03	4.400	1.61101	0.00209	-4.03
0.345	1.70833	0.66057	-2.80	1.450	1.61864	0.00681	-4.04	4.450	1.61091	0.00211	-4.03
0.350	1.70512	0.62457	-2.87	1.500	1.61832	0.00622	-4.04	4.500	1.61080	0.00212	-4.03
0.355	1.70208	0.59130	-2.93	1.550	1.61802	0.00571	-4.04	4.550	1.61069	0.00214	-4.02
0.360	1.69920	0.56049	-2.99	1.600	1.61774	0.00527	-4.04	4.600	1.61059	0.00215	-4.02
0.365	1.69647	0.53192	-3.04	1.650	1.61749	0.00488	-4.04	4.650	1.61048	0.00217	-4.02
0.370	1.69388	0.50536	-3.09	1.700	1.61725	0.00454	-4.04	4.700	1.61037	0.00218	-4.02

TABLE 30. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaBr AT 293 K (continued)*

λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}	λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}	λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}
4.750	1.61026	0.00220	-4.02	9.000	1.59731	0.00398	-3.88	17.000	1.54900	0.00832	-3.16
4.800	1.61015	0.00222	-4.02	9.100	1.59691	0.00403	-3.87	17.200	1.54732	0.00845	-3.13
4.850	1.61004	0.00223	-4.02	9.200	1.59650	0.00407	-3.87	17.400	1.54562	0.00858	-3.10
4.900	1.60993	0.00225	-4.02	9.300	1.59609	0.00412	-3.86	17.600	1.54389	0.00872	-3.07
4.950	1.60981	0.00227	-4.02	9.400	1.59568	0.00417	-3.86	17.800	1.54213	0.00885	-3.04
5.000	1.60970	0.00229	-4.01	9.500	1.59526	0.00422	-3.85	18.000	1.54035	0.00898	-3.00
5.100	1.60947	0.00232	-4.01	9.600	1.59484	0.00426	-3.85	18.200	1.53854	0.00912	-2.97
5.200	1.60923	0.00236	-4.01	9.700	1.59441	0.00431	-3.84	18.400	1.53670	0.00925	-2.93
5.300	1.60900	0.00239	-4.01	9.800	1.59397	0.00436	-3.84	18.600	1.53484	0.00939	-2.90
5.400	1.60876	0.00243	-4.01	9.900	1.59354	0.00441	-3.83	18.800	1.53295	0.00953	-2.86
5.500	1.60851	0.00247	-4.00	10.000	1.59309	0.00445	-3.83	19.000	1.53102	0.00967	-2.82
5.600	1.60826	0.00251	-4.00	10.200	1.59219	0.00455	-3.81	19.200	1.52908	0.00982	-2.79
5.700	1.60801	0.00255	-4.00	10.400	1.59127	0.00465	-3.80	19.400	1.52710	0.00996	-2.75
5.800	1.60775	0.00258	-4.00	10.600	1.59033	0.00475	-3.79	19.600	1.52509	0.01011	-2.71
5.900	1.60749	0.00262	-3.99	10.800	1.58937	0.00485	-3.78	19.800	1.52305	0.01026	-2.66
6.000	1.60723	0.00266	-3.99	11.000	1.58839	0.00495	-3.77	20.000	1.52099	0.01040	-2.62
6.100	1.60696	0.00270	-3.99	11.200	1.58739	0.00505	-3.75	20.500	1.51569	0.01079	-2.51
6.200	1.60669	0.00274	-3.98	11.400	1.58638	0.00515	-3.74	21.000	1.51020	0.01118	-2.39
6.300	1.60641	0.00279	-3.98	11.600	1.58534	0.00525	-3.73	21.500	1.50451	0.01158	-2.26
6.400	1.60613	0.00283	-3.98	11.800	1.58428	0.00535	-3.71	22.000	1.49861	0.01200	-2.12
6.500	1.60585	0.00287	-3.98	12.000	1.58319	0.00545	-3.70	22.500	1.49251	0.01243	-1.98
6.600	1.60556	0.00291	-3.97	12.200	1.58209	0.00556	-3.68	23.000	1.48618	0.01288	-1.82
6.700	1.60526	0.00295	-3.97	12.400	1.58097	0.00566	-3.67	23.500	1.47962	0.01334	-1.66
6.800	1.60497	0.00300	-3.97	12.600	1.57983	0.00577	-3.65	24.000	1.47283	0.01382	-1.48
6.900	1.60466	0.00304	-3.96	12.800	1.57866	0.00588	-3.63	24.500	1.46580	0.01431	-1.29
7.000	1.60436	0.00308	-3.96	13.000	1.57748	0.00598	-3.62	25.000	1.45852	0.01482	-1.09
7.100	1.60405	0.00312	-3.96	13.200	1.57627	0.00609	-3.60	25.500	1.45098	0.01535	-0.88
7.200	1.60373	0.00317	-3.95	13.400	1.57504	0.00620	-3.58	26.000	1.44316	0.01591	-0.65
7.300	1.60341	0.00321	-3.95	13.600	1.57379	0.00631	-3.56	26.500	1.43507	0.01648	-0.40
7.400	1.60309	0.00326	-3.95	13.800	1.57252	0.00642	-3.54	27.000	1.42668	0.01708	-0.14
7.500	1.60276	0.00330	-3.94	14.000	1.57122	0.00653	-3.52	27.500	1.41799	0.01770	0.15
7.600	1.60243	0.00334	-3.94	14.200	1.56991	0.00664	-3.50	28.000	1.40897	0.01835	0.45
7.700	1.60209	0.00339	-3.93	14.400	1.56857	0.00676	-3.48	28.500	1.39963	0.01902	0.77
7.800	1.60175	0.00343	-3.93	14.600	1.56720	0.00687	-3.46	29.000	1.38995	0.01973	1.11
7.900	1.60141	0.00348	-3.93	14.800	1.56582	0.00699	-3.44	29.500	1.37990	0.02047	1.49
8.000	1.60106	0.00352	-3.92	15.000	1.56441	0.00710	-3.42	30.000	1.36947	0.02124	1.88
8.100	1.60070	0.00357	-3.92	15.200	1.56298	0.00722	-3.40	30.500	1.35865	0.02205	2.31
8.200	1.60034	0.00361	-3.91	15.400	1.56152	0.00734	-3.37	31.000	1.34742	0.02290	2.77
8.300	1.59998	0.00366	-3.91	15.600	1.56004	0.00746	-3.35	31.500	1.33574	0.02380	3.26
8.400	1.59961	0.00370	-3.91	15.800	1.55854	0.00758	-3.32	32.000	1.32361	0.02474	3.79
8.500	1.59924	0.00375	-3.90	16.000	1.55701	0.00770	-3.30	32.500	1.31100	0.02573	4.36
8.600	1.59886	0.00379	-3.90	16.200	1.55546	0.00782	-3.27	33.000	1.29787	0.02678	4.97
8.700	1.59848	0.00384	-3.89	16.400	1.55388	0.00795	-3.24	33.500	1.28421	0.02788	5.63
8.800	1.59810	0.00389	-3.89	16.600	1.55228	0.00807	-3.22	34.000	1.26998	0.02906	6.35
8.900	1.59770	0.00393	-3.88	16.800	1.55065	0.00820	-3.19				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.7. The number of digits with an overstrike are not relevant to accuracy of the data.

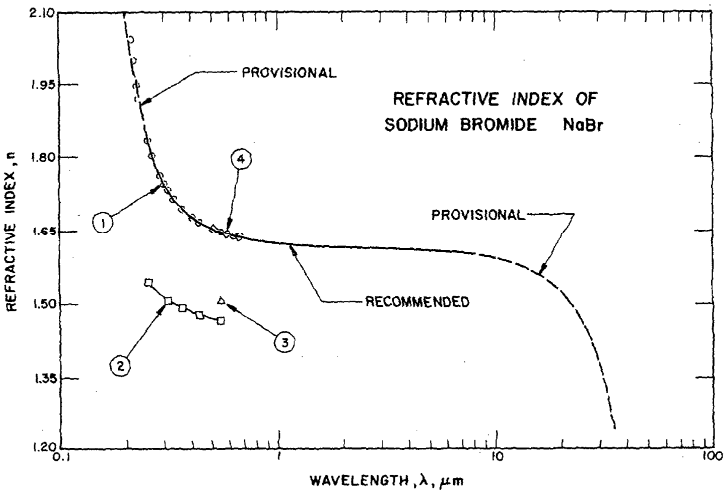

FIGURE 24. Refractive Index of NaBr

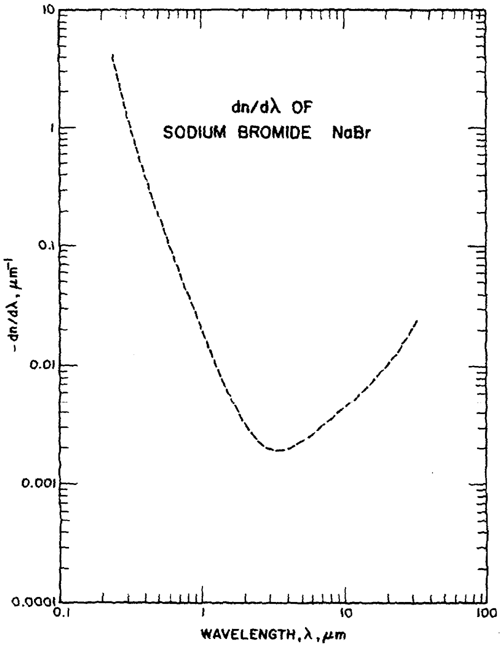

FIGURE 25. $dn/d\lambda$ of NaBr

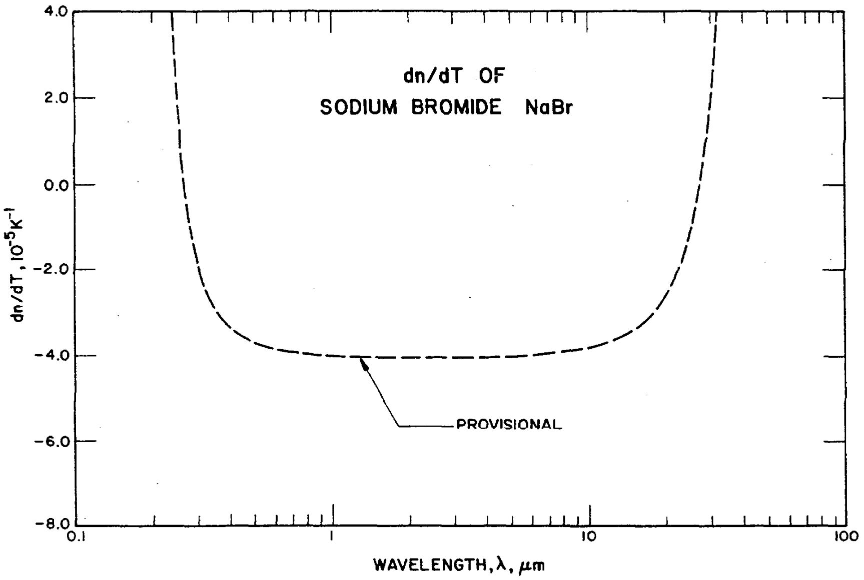

FIGURE 26. *dn/dT* of NaBr

TABLE 31. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaBr

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	27	Gyulai, Z.	1927	D	0.206-0.615	339	Crystal; prismatic specimens with faces of 15 x 24 mm^2 and apex angle of 37°14'; digitized data were presented with accuracy of one unit of the third decimal place.
2	86	Bauer, G.	1934	R	0.254-0.546	298	Crystal; thin film specimen with slight wedge shape by vacuum evaporation onto a quartz substrate and then sintered; reflectance was determined from reflected Newton's interference pattern; refractive indices were then derived and digitized values were presented.
3	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	1053	Molten NaBr; filled into a 60° prismatic platinum container with silica glass windows of 4 mm diameter; uncertainty of 0.001 in measured n; digitized values were presented.
4	45	Spangenberg, K.	1923, 1934	P	0.5016-0.6678	298	Crystal; grown by slow evaporation from pure solution; cubic specimen with edge of 1 cm; polished specimen was cemented to the prism of a Pulfrich refractometer by a monobromonaphthalene methylene iodide mixture; because of hydration of the crystal, the specimen was polished frequently during experimental measurements; digitized data were presented.
5	85	Wulff, P. and Schaller, D.	1934	P	0.5896	298	Crystal; specimen was suspended in a mixture of $C_{10}H_7Br + C_6H_5Cl$ during refractive index determination; digitized value were presented with uncertainty of 0.0001.

TABLE 32. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaBr

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 339.2 K	
0.2063	2.1226
0.2100	2.1006
0.2144	2.0450
0.2194	1.9971
0.2265	1.9456
0.2312	1.9176
0.254	1.8323
0.265	1.8033
0.289	1.7611
0.296	1.7515
0.302	1.7452*
0.313	1.7334
0.334	1.7146
0.365	1.6950
0.405	1.6775
0.436	1.6673
0.492	1.6547
CURVE 1 (cont.) T = 339.2 K	
0.546	1.6462
0.577	1.6424
0.615	1.6382
CURVE 2 T = 298.0 K	
0.254	1.543
0.313	1.505
0.366	1.490
0.435	1.477
0.546	1.465
CURVE 3 T = 1053.2 K	
0.5461	1.505
CURVE 4 T = 298.0 K	
0.5016	1.6524
0.546	1.6459*
0.5877	1.6416
0.5893	1.6412
0.6678	1.6347*
CURVE 5 T = 298.0 K	
0.5896	1.6439

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* Not shown in figure.

3.8. Sodium Iodide, NaI

Refractive index data of NaI are available only for a single line, mean of sodium D lines, reported by Spangenberg [45] in 1923. The reasons for such scantiness of data are probably the difficulties in crystal growing and sample preparation. It is fortunate that the essential parameters for constructing a dispersion equation of NaI are available through the literature, as listed in table 3. Using the values from table 3 and the available value of n:

$\epsilon_s=7.28$,

$\epsilon_{uv}=3.01$,

$\lambda_u=0.170$ μm (averaged value of 5 peaks),

$\lambda_l=86.21$ μm,
$n=1.7745$ for $\lambda=0.5893$ μm,

the adjustable parameter A of eq (13) is computed to be 1.478. This leads to the dispersion equation for NaI at 293 K in the transparent region, 0.25–40.00 μm.

$$n^2=1.478+\frac{1.532\lambda^2}{\lambda^2-(0.170)^2}+\frac{4.27\lambda^2}{\lambda^2-(86.21)^2}, \qquad (37)$$

where n is in units of μm.

No experimental data on dn/dT for NaI are available, but, with our empirical findings, reasonable estimations on dn/dT can be made by a formula constructed by using the predicted parameters of table 5,

$$2n\frac{dn}{dT}=-13.65\,(n^2-1)+0.57+\frac{9.246\lambda^4}{(\lambda^2-0.05198)^2}+\frac{247.66\lambda^4}{(\lambda^2-7432.16)^2}, \qquad (38)$$

where dn/dT is in units of $10^{-5}\ \mathrm{K}^{-1}$ and λ in μm.

Equations (37) and (38) were used to generate the recommended values. Since these equations were derived from the available data on the thermal linear expansion, the dielectric constants, the wavelengths of absorption peaks, and the empirical parameters, the accuracies of the generated values are controlled by the uncertainties of these component properties. In order to properly use the recommended data table, we have carefully reviewed each of the correlated properties and set up the following criteria that the readers should follow.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.25– 0.40	2	0.02
0.40– 1.00	3	0.005
1.00–20.00	2	0.01
20.00–40.00	2	0.02

For dn/dT:

0.25– 0.35	0	>1
0.35–30.00	1	0.8
30.00–40.00	0	>1

TABLE 33. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaI AT 293 K*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.250	2.08030	4.71300	67.66	0.550	1.78091	0.18284	-4.38	2.750	1.73538	0.00215	-5.05
0.252	2.07109	4.49895	57.08	0.560	1.77914	0.17211	-4.41	2.800	1.73527	0.00210	-5.05
0.254	2.06230	4.29888	48.75	0.570	1.77747	0.16223	-4.45	2.850	1.73517	0.00206	-5.05
0.256	2.05389	4.11160	42.05	0.580	1.77589	0.15311	-4.48	2.900	1.73506	0.00202	-5.05
0.258	2.04585	3.93603	36.59	0.590	1.77440	0.14468	-4.50	2.950	1.73496	0.00198	-5.05
0.260	2.03814	3.77123	32.06	0.600	1.77300	0.13687	-4.53	3.000	1.73487	0.00195	-5.05
0.262	2.03075	3.61632	28.27	0.620	1.77040	0.12289	-4.58	3.050	1.73477	0.00192	-5.05
0.264	2.02367	3.47053	25.06	0.640	1.76807	0.11079	-4.62	3.100	1.73467	0.00189	-5.05
0.266	2.01687	3.33316	22.31	0.660	1.76596	0.10025	-4.65	3.150	1.73458	0.00187	-5.05
0.268	2.01033	3.20357	19.94	0.680	1.76405	0.09104	-4.68	3.200	1.73449	0.00185	-5.05
0.270	2.00405	3.08119	17.88	0.700	1.76231	0.08294	-4.71	3.250	1.73440	0.00183	-5.05
0.272	1.99800	2.96549	16.08	0.720	1.76072	0.07580	-4.74	3.300	1.73430	0.00181	-5.05
0.274	1.99218	2.85600	14.49	0.740	1.75927	0.06946	-4.76	3.350	1.73421	0.00180	-5.05
0.276	1.98657	2.75228	13.09	0.760	1.75794	0.06382	-4.78	3.400	1.73412	0.00178	-5.05
0.278	1.98117	2.65393	11.83	0.780	1.75672	0.05879	-4.80	3.450	1.73404	0.00177	-5.04
0.280	1.97595	2.56060	10.71	0.800	1.75559	0.05429	-4.81	3.500	1.73395	0.00176	-5.04
0.282	1.97092	2.47194	9.71	0.820	1.75454	0.05024	-4.83	3.550	1.73386	0.00175	-5.04
0.284	1.96606	2.38765	8.80	0.840	1.75357	0.04659	-4.84	3.600	1.73377	0.00175	-5.04
0.286	1.96137	2.30746	7.98	0.860	1.75268	0.04329	-4.85	3.650	1.73368	0.00174	-5.04
0.288	1.95683	2.23109	7.23	0.880	1.75184	0.04031	-4.87	3.700	1.73360	0.00174	-5.04
0.290	1.95244	2.15832	6.55	0.900	1.75106	0.03759	-4.88	3.750	1.73351	0.00173	-5.04
0.292	1.94820	2.08892	5.93	0.920	1.75033	0.03512	-4.89	3.800	1.73342	0.00173	-5.04
0.294	1.94408	2.02268	5.35	0.940	1.74966	0.03287	-4.89	3.850	1.73334	0.00173	-5.04
0.296	1.94010	1.95943	4.83	0.960	1.74902	0.03081	-4.90	3.900	1.73325	0.00173	-5.04
0.298	1.93625	1.89898	4.34	0.980	1.74842	0.02892	-4.91	3.950	1.73316	0.00173	-5.04
0.300	1.93251	1.84118	3.89	1.000	1.74786	0.02719	-4.92	4.000	1.73308	0.00173	-5.04
0.305	1.92364	1.70727	2.91	1.050	1.74660	0.02344	-4.93	4.050	1.73299	0.00173	-5.04
0.310	1.91541	1.58688	2.09	1.100	1.74551	0.02036	-4.95	4.100	1.73290	0.00174	-5.04
0.315	1.90775	1.47827	1.46	1.150	1.74455	0.01782	-4.96	4.150	1.73282	0.00174	-5.04
0.320	1.90061	1.37997	0.80	1.200	1.74372	0.01570	-4.97	4.200	1.73273	0.00175	-5.04
0.325	1.89394	1.29073	0.29	1.250	1.74298	0.01391	-4.98	4.250	1.73264	0.00175	-5.04
0.330	1.88769	1.20947	-0.15	1.300	1.74232	0.01240	-4.99	4.300	1.73256	0.00176	-5.04
0.335	1.88183	1.13530	-0.54	1.350	1.74173	0.01111	-4.99	4.350	1.73247	0.00176	-5.04
0.340	1.87633	1.06741	-0.88	1.400	1.74121	0.01001	-5.00	4.400	1.73238	0.00177	-5.04
0.345	1.87115	1.00513	-1.18	1.450	1.74073	0.00906	-5.00	4.450	1.73229	0.00177	-5.04
0.350	1.86627	0.94787	-1.45	1.500	1.74030	0.00823	-5.01	4.500	1.73220	0.00178	-5.03
0.355	1.86166	0.89511	-1.69	1.550	1.73991	0.00751	-5.01	4.550	1.73211	0.00179	-5.03
0.360	1.85731	0.84640	-1.91	1.600	1.73955	0.00689	-5.02	4.600	1.73202	0.00180	-5.03
0.365	1.85319	0.80133	-2.10	1.650	1.73922	0.00633	-5.02	4.650	1.73193	0.00181	-5.03
0.370	1.84929	0.75958	-2.28	1.700	1.73891	0.00585	-5.02	4.700	1.73184	0.00182	-5.03
0.375	1.84559	0.72081	-2.44	1.750	1.73863	0.00542	-5.03	4.750	1.73175	0.00182	-5.03
0.380	1.84208	0.68477	-2.59	1.800	1.73837	0.00504	-5.03	4.800	1.73166	0.00183	-5.03
0.385	1.83874	0.65120	-2.72	1.850	1.73813	0.00470	-5.03	4.850	1.73157	0.00184	-5.03
0.390	1.83556	0.61989	-2.84	1.900	1.73790	0.00440	-5.03	4.900	1.73148	0.00185	-5.03
0.395	1.83254	0.59065	-2.95	1.950	1.73768	0.00413	-5.03	4.950	1.73138	0.00186	-5.03
0.400	1.82965	0.56330	-3.06	2.000	1.73748	0.00389	-5.03	5.000	1.73129	0.00188	-5.03
0.410	1.82427	0.51367	-3.24	2.050	1.73729	0.00368	-5.04	5.100	1.73110	0.00190	-5.03
0.420	1.81936	0.46992	-3.40	2.100	1.73712	0.00348	-5.04	5.200	1.73091	0.00192	-5.02
0.430	1.81486	0.43119	-3.54	2.150	1.73695	0.00331	-5.04	5.300	1.73072	0.00194	-5.02
0.440	1.81072	0.39676	-3.66	2.200	1.73678	0.00315	-5.04	5.400	1.73052	0.00197	-5.02
0.450	1.80691	0.36602	-3.77	2.250	1.73663	0.00301	-5.04	5.500	1.73032	0.00200	-5.02
0.460	1.80339	0.33848	-3.86	2.300	1.73648	0.00288	-5.04	5.600	1.73012	0.00202	-5.02
0.470	1.80013	0.31373	-3.94	2.350	1.73634	0.00276	-5.04	5.700	1.72992	0.00205	-5.01
0.480	1.79711	0.29141	-4.02	2.400	1.73621	0.00266	-5.04	5.800	1.72971	0.00208	-5.01
0.490	1.79430	0.27122	-4.09	2.450	1.73608	0.00256	-5.04	5.900	1.72950	0.00210	-5.01
0.500	1.79168	0.25291	-4.15	2.500	1.73595	0.00248	-5.04	6.000	1.72929	0.00213	-5.01
0.510	1.78923	0.23626	-4.20	2.550	1.73583	0.00240	-5.04	6.100	1.72908	0.00216	-5.01
0.520	1.78695	0.22108	-4.25	2.600	1.73571	0.00233	-5.04	6.200	1.72886	0.00219	-5.00
0.530	1.78481	0.20720	-4.30	2.650	1.73560	0.00226	-5.05	6.300	1.72864	0.00222	-5.00
0.540	1.78280	0.19450	-4.34	2.700	1.73548	0.00220	-5.05	6.400	1.72842	0.00225	-5.00

TABLE 33. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR NaI AT 293 K (continued)*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
6.500	1.72819	0.00228	-5.00	11.400	1.71299	0.00398	-4.82	19.800	1.66503	0.00762	-4.09
6.600	1.72796	0.00231	-4.99	11.600	1.71219	0.00405	-4.81	20.000	1.66350	0.00772	-4.06
6.700	1.72773	0.00234	-4.99	11.800	1.71137	0.00413	-4.80	20.500	1.65957	0.00798	-3.99
6.800	1.72749	0.00237	-4.99	12.000	1.71054	0.00421	-4.78	21.000	1.65552	0.00824	-3.91
6.900	1.72725	0.00240	-4.99	12.200	1.70969	0.00428	-4.77	21.500	1.65133	0.00851	-3.83
7.000	1.72701	0.00243	-4.98	12.400	1.70882	0.00436	-4.76	22.000	1.64701	0.00878	-3.75
7.100	1.72677	0.00247	-4.98	12.600	1.70794	0.00444	-4.75	22.500	1.64255	0.00906	-3.66
7.200	1.72652	0.00250	-4.98	12.800	1.70705	0.00452	-4.74	23.000	1.63795	0.00935	-3.57
7.300	1.72627	0.00253	-4.98	13.000	1.70614	0.00460	-4.73	23.500	1.63320	0.00965	-3.47
7.400	1.72601	0.00256	-4.97	13.200	1.70521	0.00467	-4.71	24.000	1.62830	0.00995	-3.37
7.500	1.72575	0.00260	-4.97	13.400	1.70427	0.00475	-4.70	24.500	1.62324	0.01026	-3.26
7.600	1.72549	0.00263	-4.97	13.600	1.70331	0.00483	-4.69	25.000	1.61803	0.01058	-3.15
7.700	1.72523	0.00266	-4.96	13.800	1.70233	0.00492	-4.67	25.500	1.61266	0.01091	-3.02
7.800	1.72496	0.00270	-4.96	14.000	1.70134	0.00500	-4.66	26.000	1.60712	0.01125	-2.90
7.900	1.72469	0.00273	-4.96	14.200	1.70034	0.00508	-4.65	26.500	1.60141	0.01160	-2.76
8.000	1.72441	0.00276	-4.96	14.400	1.69931	0.00516	-4.63	27.000	1.59552	0.01195	-2.62
8.100	1.72414	0.00280	-4.95	14.600	1.69827	0.00524	-4.62	27.500	1.58945	0.01232	-2.47
8.200	1.72385	0.00283	-4.95	14.800	1.69721	0.00533	-4.60	28.000	1.58320	0.01270	-2.31
8.300	1.72357	0.00286	-4.95	15.000	1.69614	0.00541	-4.59	28.500	1.57675	0.01309	-2.14
8.400	1.72328	0.00290	-4.94	15.200	1.69505	0.00550	-4.57	29.000	1.57010	0.01349	-1.96
8.500	1.72299	0.00293	-4.94	15.400	1.69394	0.00558	-4.55	29.500	1.56325	0.01391	-1.77
8.600	1.72270	0.00297	-4.94	15.600	1.69282	0.00567	-4.54	30.000	1.55619	0.01434	-1.57
8.700	1.72240	0.00300	-4.93	15.800	1.69168	0.00575	-4.52	30.500	1.54891	0.01478	-1.36
8.800	1.72210	0.00304	-4.93	16.000	1.69052	0.00584	-4.50	31.000	1.54141	0.01524	-1.14
8.900	1.72179	0.00307	-4.92	16.200	1.68934	0.00593	-4.49	31.500	1.53367	0.01572	-0.90
9.000	1.72148	0.00311	-4.92	16.400	1.68815	0.00601	-4.47	32.000	1.52568	0.01621	-0.65
9.100	1.72117	0.00314	-4.92	16.600	1.68693	0.00610	-4.45	32.500	1.51745	0.01672	-0.38
9.200	1.72085	0.00318	-4.91	16.800	1.68570	0.00619	-4.43	33.000	1.50896	0.01725	-0.10
9.300	1.72053	0.00321	-4.91	17.000	1.68446	0.00628	-4.41	33.500	1.50020	0.01780	0.19
9.400	1.72021	0.00325	-4.91	17.200	1.68319	0.00637	-4.39	34.000	1.49116	0.01837	0.51
9.500	1.71988	0.00328	-4.90	17.400	1.68191	0.00646	-4.37	34.500	1.48182	0.01896	0.84
9.600	1.71955	0.00332	-4.90	17.600	1.68061	0.00656	-4.35	35.000	1.47219	0.01958	1.20
9.700	1.71922	0.00335	-4.89	17.800	1.67929	0.00665	-4.33	35.500	1.46224	0.02023	1.58
9.800	1.71888	0.00339	-4.89	18.000	1.67795	0.00674	-4.31	36.000	1.45196	0.02090	1.98
9.900	1.71854	0.00343	-4.89	18.200	1.67659	0.00684	-4.28	36.500	1.44133	0.02160	2.40
10.000	1.71820	0.00346	-4.88	18.400	1.67521	0.00693	-4.26	37.000	1.43035	0.02233	2.85
10.200	1.71750	0.00353	-4.87	18.600	1.67382	0.00703	-4.24	37.500	1.41900	0.02310	3.34
10.400	1.71678	0.00361	-4.86	18.800	1.67240	0.00712	-4.21	38.000	1.40725	0.02390	3.85
10.600	1.71606	0.00368	-4.86	19.000	1.67097	0.00722	-4.19	38.500	1.39509	0.02474	4.40
10.800	1.71531	0.00375	-4.85	19.200	1.66951	0.00732	-4.16	39.000	1.38250	0.02562	4.98
11.000	1.71455	0.00383	-4.84	19.400	1.66804	0.00742	-4.14	39.500	1.36946	0.02655	5.61
11.200	1.71378	0.00390	-4.83	19.600	1.66655	0.00752	-4.11	40.000	1.35595	0.02752	6.27

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.8. The number of digits with an overstrike are not relevant to accuracy of the data.

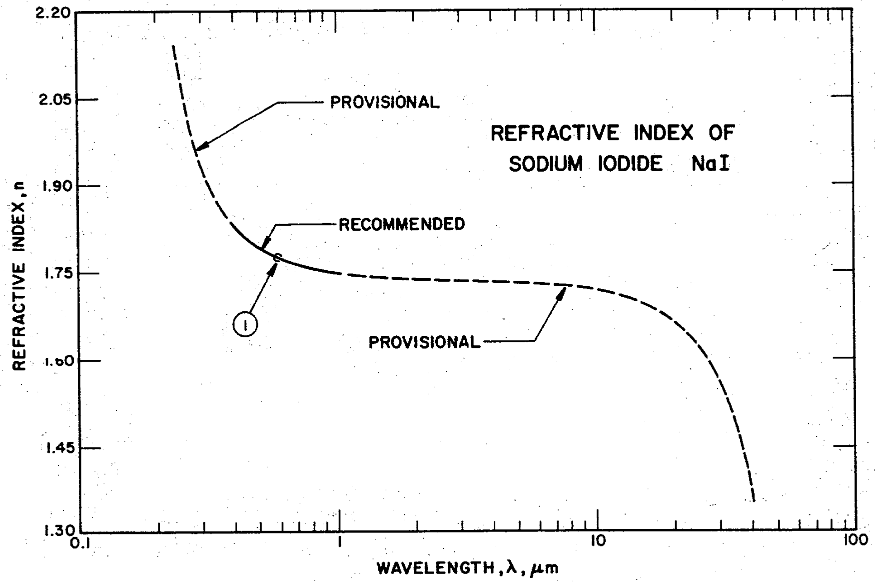

FIGURE 27. Refractive Index of NaI

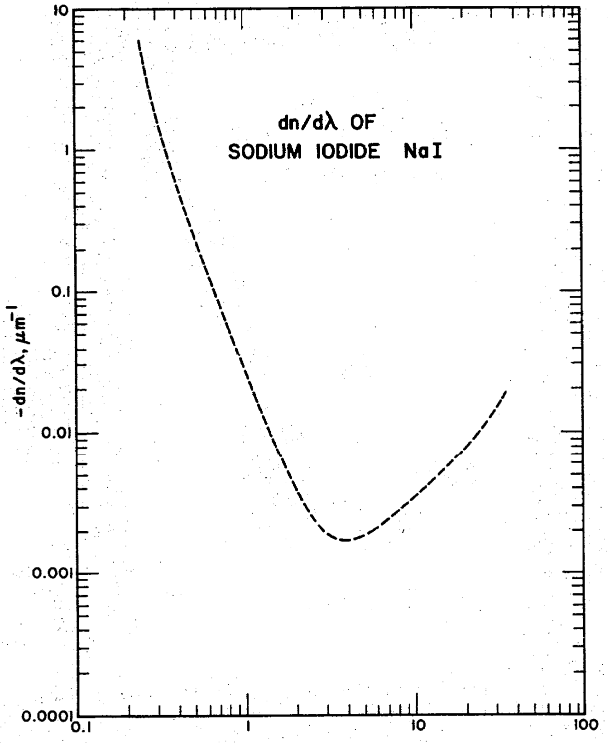

FIGURE 28. $dn/d\lambda$ of NaI

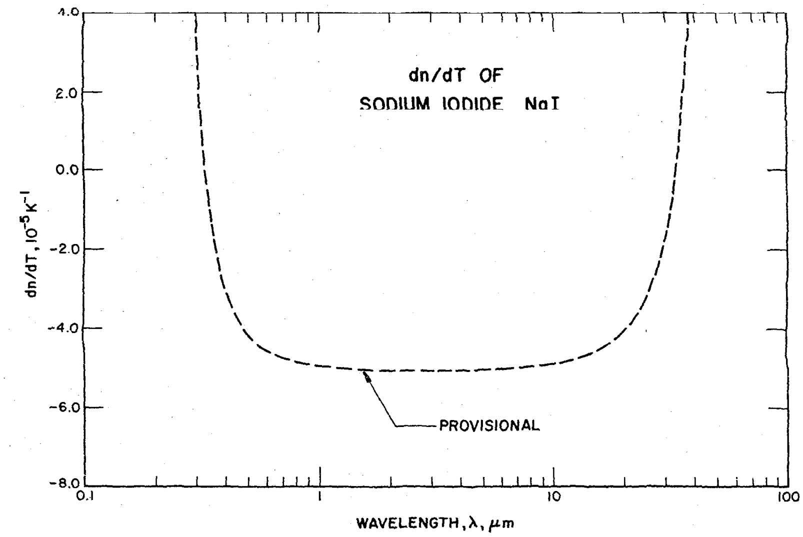

FIGURE 29. dn/dT of NaI

TABLE 34. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF NaI

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	45	Spangenberg, K.	1923	M	0.5893	295	Clear, cubic and good crystal produced by slow evaporation of NaI-alcoholic solution at 70 C; refractive index for mean of sodium D lines was measured by the immersion method.

TABLE 35. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF NaI

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 295.2 K	
0.5893	1.7745

3.9. Potassium Fluoride, KF

Potassium fluoride is not a suitable material for optical components beacuse of its hygroscopic character and the difficulty of growing crystals. However, it is an interesting subject for basic research and scientific studies because of its simple crystal structure and its transparency in the ultraviolet region. The wavelengths of the characteristic absorption peaks and the electrical properties have been studied by many investigators. Listed in table 3 are a few important results which were used in out analysis of data.

The refractive index of KF has not been extensively measured. Among the five sets of refractive index data found in the literature, three were measured for a single spectral line, the sodium D line, one for the melt, and one for a limited spectral range from 0.21 to 0.58 μm.

Upon careful examination of the available data, we found the following: (1) Kublitzky's values [50] are reported to the fourth decimal place, although the accuracy is one unit in the third decimal place. We have used his reported values as the basis of our work. (2) Results of Spangenberg [45] and of Wulff [87] are inconsistent, although the same experimental method was used. The discrepancy cannot be accounted for by the temperature difference, because dn/dT (about $-1.2\times 10^{-5}\,K^{-1}$ [18]) is too small to account for such a big deviation, about 0.0019, in n nor can the discrepancies between the results of Kublitzky and those of Wulff be accounted in this way. (3) There are no dn/dT data available.

Since the data of Kublitzky were obtained at a temperature of 330 K, they had to be reduced to 293 K. Since no dn/dT data was available, the empirical parameters in table 5 were used to construct the following expression for dn/dT in units of $10^{-5}\,K^{-1}$, valid in the temperature range 293 ± 50 K:

$$2n\frac{dn}{dT}=-10.44\,(n^2-1)-0.08+\frac{2.465\lambda^4}{(\lambda^2-0.01588)^2}+\frac{167.90\lambda^4}{(\lambda^2-2657.40)^2}, \tag{39}$$

where λ is in units of μm. The dn/dT values calculated by eq (39) for the visible region are about $-2.0\times 10^{-5}\,K^{-1}$. Compared with Tsay's [18] value, our value is about $0.8\times 10^{-5}\,K^{-1}$ too large, but there is no direct experimental evidence to substantiate either one of the predictions. However, since the dn/dT formulas constructed by our empirical parameters lead to predictions for the material in agreement with experimental data, we have reason to believe that eq (39) gives reasonable dn/dT value for KF. By use of this equation, Kublitzky's values were reduced to 293 K.

A dispersion equation of KF at 330 K was proposed by Radhakrishnan [48] on the basis of Kublitzky's measurements. Since the wavelength of the fundamental phonon was not known then, the adjustable constants in his equation were chosen to fit the data without reference to the infrared absorption peak, as shown in table 39. With the available information in table 3, the least-squares fitting of the reduced data to eq (10) led to our dispersion equation for KF at 293 K in the transparent region, 0.15–22.0 μm.

$$n^2=1.55083+\frac{0.29162\lambda^2}{\lambda^2-(0.126)^2}+\frac{3.60001\lambda^2}{\lambda^2-(51.55)^2}, \tag{40}$$

where λ is in units of μm.

Equations (39) and (40) are used to generate the recommended values. Since more decimal places than needed are given to the property values for the purpose of tabular smoothness, the readers are advised to follow the criteria given below in order to use the recommended values properly.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.15– 0.18	2	0.05
0.18– 0.21	3	0.005
0.21– 1.00	3	0.002
1.00– 6.00	3	0.004
6.00–14.00	3	0.008
14.00–22.00	2	0.05

For dn/dT:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.15–17.00	1	0.5
17.00–22.00	1	0.9

TABLE 36. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KF AT 293 K*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.150	1.59417	9.92854	3.86	0.270	1.38692	0.27744	-2.05	0.700	1.36072	0.01129	-2.33
0.152	1.57574	8.54854	3.06	0.272	1.38637	0.26928	-2.06	0.720	1.36050	0.01042	-2.33
0.154	1.55979	7.43690	2.42	0.274	1.38584	0.26146	-2.07	0.740	1.36030	0.00965	-2.33
0.156	1.54586	6.52809	1.89	0.276	1.38533	0.25395	-2.07	0.760	1.36012	0.00896	-2.33
0.158	1.53358	5.77548	1.44	0.278	1.38483	0.24674	-2.08	0.780	1.35994	0.00834	-2.33
0.160	1.52268	5.14514	1.07	0.280	1.38434	0.23982	-2.08	0.800	1.35978	0.00779	-2.34
0.162	1.51293	4.61192	0.75	0.282	1.38387	0.23316	-2.09	0.820	1.35963	0.00730	-2.34
0.164	1.50418	4.15681	0.48	0.284	1.38341	0.22677	-2.10	0.840	1.35949	0.00685	-2.34
0.166	1.49626	3.76526	0.24	0.286	1.38296	0.22062	-2.10	0.860	1.35936	0.00645	-2.34
0.168	1.48908	3.42594	0.03	0.288	1.38252	0.21470	-2.11	0.880	1.35923	0.00609	-2.34
0.170	1.48253	3.12997	-0.15	0.290	1.38210	0.20900	-2.11	0.900	1.35911	0.00576	-2.34
0.172	1.47654	2.87027	-0.31	0.292	1.38169	0.20351	-2.12	0.920	1.35900	0.00546	-2.34
0.174	1.47103	2.64114	-0.45	0.294	1.38129	0.19822	-2.12	0.940	1.35889	0.00519	-2.34
0.176	1.46595	2.43798	-0.58	0.296	1.38090	0.19312	-2.13	0.960	1.35879	0.00495	-2.34
0.178	1.46126	2.25700	-0.69	0.298	1.38051	0.18820	-2.13	0.980	1.35870	0.00472	-2.34
0.180	1.45691	2.09511	-0.80	0.300	1.38014	0.18346	-2.13	1.000	1.35860	0.00452	-2.34
0.182	1.45287	1.94970	-0.89	0.305	1.37925	0.17231	-2.14	1.050	1.35839	0.00408	-2.34
0.184	1.44911	1.81862	-0.97	0.310	1.37842	0.16209	-2.15	1.100	1.35819	0.00373	-2.34
0.186	1.44559	1.70006	-1.05	0.315	1.37763	0.15269	-2.16	1.150	1.35802	0.00344	-2.34
0.188	1.44230	1.59247	-1.12	0.320	1.37689	0.14404	-2.17	1.200	1.35785	0.00322	-2.35
0.190	1.43921	1.49455	-1.18	0.325	1.37619	0.13606	-2.18	1.250	1.35769	0.00303	-2.35
0.192	1.43631	1.40517	-1.24	0.330	1.37553	0.12868	-2.19	1.300	1.35755	0.00288	-2.35
0.194	1.43359	1.32338	-1.30	0.335	1.37490	0.12185	-2.19	1.350	1.35740	0.00276	-2.35
0.196	1.43102	1.24834	-1.35	0.340	1.37431	0.11551	-2.20	1.400	1.35727	0.00266	-2.35
0.198	1.42859	1.17933	-1.39	0.345	1.37375	0.10962	-2.21	1.450	1.35714	0.00259	-2.35
0.200	1.42630	1.11573	-1.44	0.350	1.37321	0.10414	-2.21	1.500	1.35701	0.00253	-2.35
0.202	1.42412	1.05699	-1.48	0.355	1.37270	0.09904	-2.22	1.550	1.35689	0.00248	-2.34
0.204	1.42206	1.00263	-1.51	0.360	1.37222	0.09427	-2.22	1.600	1.35676	0.00244	-2.34
0.206	1.42011	0.95223	-1.55	0.365	1.37176	0.08982	-2.23	1.650	1.35664	0.00242	-2.34
0.208	1.41825	0.90541	-1.58	0.370	1.37132	0.08565	-2.23	1.700	1.35652	0.00240	-2.34
0.210	1.41649	0.86185	-1.61	0.375	1.37090	0.08175	-2.24	1.750	1.35640	0.00240	-2.34
0.212	1.41480	0.82126	-1.64	0.380	1.37050	0.07809	-2.24	1.800	1.35628	0.00239	-2.34
0.214	1.41320	0.78336	-1.67	0.385	1.37012	0.07465	-2.24	1.850	1.35616	0.00240	-2.34
0.216	1.41167	0.74794	-1.69	0.390	1.36976	0.07142	-2.25	1.900	1.35604	0.00241	-2.34
0.218	1.41021	0.71478	-1.72	0.395	1.36941	0.06838	-2.25	1.950	1.35592	0.00242	-2.34
0.220	1.40881	0.68369	-1.74	0.400	1.36907	0.06552	-2.25	2.000	1.35580	0.00243	-2.34
0.222	1.40747	0.65451	-1.76	0.410	1.36844	0.06027	-2.26	2.050	1.35568	0.00245	-2.34
0.224	1.40619	0.62709	-1.78	0.420	1.36787	0.05558	-2.27	2.100	1.35555	0.00248	-2.34
0.226	1.40496	0.60128	-1.80	0.430	1.36733	0.05139	-2.27	2.150	1.35543	0.00250	-2.34
0.228	1.40378	0.57697	-1.82	0.440	1.36684	0.04762	-2.28	2.200	1.35530	0.00253	-2.34
0.230	1.40265	0.55405	-1.83	0.450	1.36638	0.04423	-2.28	2.250	1.35518	0.00256	-2.34
0.232	1.40157	0.53241	-1.85	0.460	1.36595	0.04116	-2.28	2.300	1.35505	0.00259	-2.34
0.234	1.40052	0.51195	-1.87	0.470	1.36555	0.03838	-2.29	2.350	1.35492	0.00262	-2.33
0.236	1.39952	0.49260	-1.88	0.480	1.36518	0.03585	-2.29	2.400	1.35478	0.00266	-2.33
0.238	1.39855	0.47428	-1.89	0.490	1.36484	0.03355	-2.29	2.450	1.35465	0.00269	-2.33
0.240	1.39762	0.45691	-1.91	0.500	1.36451	0.03145	-2.30	2.500	1.35451	0.00273	-2.33
0.242	1.39672	0.44044	-1.92	0.510	1.36421	0.02953	-2.30	2.550	1.35438	0.00277	-2.33
0.244	1.39586	0.42480	-1.93	0.520	1.36392	0.02776	-2.30	2.600	1.35424	0.00281	-2.33
0.246	1.39502	0.40994	-1.94	0.530	1.36365	0.02615	-2.30	2.650	1.35410	0.00285	-2.33
0.248	1.39422	0.39581	-1.96	0.540	1.36340	0.02466	-2.31	2.700	1.35395	0.00289	-2.33
0.250	1.39344	0.38236	-1.97	0.550	1.36316	0.02328	-2.31	2.750	1.35381	0.00293	-2.33
0.252	1.39269	0.36955	-1.98	0.560	1.36293	0.02202	-2.31	2.800	1.35366	0.00298	-2.32
0.254	1.39196	0.35734	-1.99	0.570	1.36272	0.02085	-2.31	2.850	1.35351	0.00302	-2.32
0.256	1.39126	0.34570	-2.00	0.580	1.36251	0.01976	-2.31	2.900	1.35336	0.00306	-2.32
0.258	1.39058	0.33458	-2.01	0.590	1.36232	0.01875	-2.32	2.950	1.35320	0.00311	-2.32
0.260	1.38992	0.32397	-2.01	0.600	1.36214	0.01782	-2.32	3.000	1.35305	0.00315	-2.32
0.262	1.38928	0.31382	-2.02	0.620	1.36180	0.01614	-2.32	3.050	1.35289	0.00320	-2.32
0.264	1.38866	0.30412	-2.03	0.640	1.36149	0.01468	-2.32	3.100	1.35273	0.00324	-2.32
0.266	1.38806	0.29484	-2.04	0.660	1.36121	0.01340	-2.32	3.150	1.35256	0.00329	-2.32
0.268	1.38748	0.28596	-2.05	0.680	1.36095	0.01228	-2.33	3.200	1.35240	0.00334	-2.31

TABLE 36. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KF AT 293 K (continued)*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
3.250	1.35223	0.00338	-2.31	6.200	1.33781	0.00648	-2.18	11.800	1.28196	0.01389	-1.49
3.300	1.35206	0.00343	-2.31	6.300	1.33716	0.00659	-2.17	12.000	1.27915	0.01421	-1.45
3.350	1.35189	0.00348	-2.31	6.400	1.33649	0.00671	-2.16	12.200	1.27628	0.01453	-1.41
3.400	1.35171	0.00352	-2.31	6.500	1.33582	0.00682	-2.16	12.400	1.27334	0.01486	-1.36
3.450	1.35154	0.00357	-2.31	6.600	1.33513	0.00693	-2.15	12.600	1.27033	0.01520	-1.32
3.500	1.35136	0.00362	-2.31	6.700	1.33443	0.00705	-2.14	12.800	1.26726	0.01554	-1.27
3.550	1.35117	0.00367	-2.30	6.800	1.33372	0.00716	-2.13	13.000	1.26412	0.01589	-1.22
3.600	1.35099	0.00372	-2.30	6.900	1.33300	0.00728	-2.13	13.200	1.26090	0.01624	-1.17
3.650	1.35080	0.00377	-2.30	7.000	1.33226	0.00740	-2.12	13.400	1.25762	0.01660	-1.12
3.700	1.35061	0.00382	-2.30	7.100	1.33152	0.00752	-2.11	13.600	1.25426	0.01697	-1.06
3.750	1.35042	0.00387	-2.30	7.200	1.33076	0.00763	-2.10	13.800	1.25083	0.01734	-1.00
3.800	1.35022	0.00392	-2.30	7.300	1.32999	0.00775	-2.09	14.000	1.24732	0.01772	-0.94
3.850	1.35003	0.00397	-2.29	7.400	1.32921	0.00787	-2.09	14.200	1.24374	0.01811	-0.88
3.900	1.34983	0.00402	-2.29	7.500	1.32842	0.00799	-2.08	14.400	1.24008	0.01851	-0.82
3.950	1.34963	0.00407	-2.29	7.600	1.32761	0.00811	-2.07	14.600	1.23633	0.01891	-0.75
4.000	1.34942	0.00412	-2.29	7.700	1.32679	0.00823	-2.06	14.800	1.23251	0.01932	-0.68
4.050	1.34921	0.00417	-2.29	7.800	1.32596	0.00835	-2.05	15.000	1.22861	0.01974	-0.61
4.100	1.34900	0.00422	-2.28	7.900	1.32512	0.00848	-2.04	15.200	1.22461	0.02017	-0.53
4.150	1.34879	0.00427	-2.28	8.000	1.32427	0.00860	-2.03	15.400	1.22054	0.02061	-0.46
4.200	1.34858	0.00432	-2.28	8.100	1.32340	0.00872	-2.02	15.600	1.21637	0.02105	-0.38
4.250	1.34836	0.00437	-2.28	8.200	1.32252	0.00885	-2.01	15.800	1.21211	0.02151	-0.29
4.300	1.34814	0.00442	-2.28	8.300	1.32163	0.00897	-2.00	16.000	1.20776	0.02198	-0.21
4.350	1.34792	0.00448	-2.27	8.400	1.32073	0.00910	-1.99	16.200	1.20332	0.02246	-0.11
4.400	1.34769	0.00453	-2.27	8.500	1.31981	0.00922	-1.98	16.400	1.19878	0.02294	-0.02
4.450	1.34746	0.00458	-2.27	8.600	1.31888	0.00935	-1.97	16.600	1.19414	0.02344	0.08
4.500	1.34723	0.00463	-2.27	8.700	1.31794	0.00948	-1.96	16.800	1.18940	0.02395	0.18
4.550	1.34700	0.00468	-2.27	8.800	1.31699	0.00961	-1.95	17.000	1.18456	0.02448	0.29
4.600	1.34677	0.00474	-2.26	8.900	1.31602	0.00974	-1.94	17.200	1.17961	0.02501	0.40
4.650	1.34653	0.00479	-2.26	9.000	1.31504	0.00987	-1.92	17.400	1.17456	0.02556	0.51
4.700	1.34629	0.00484	-2.26	9.100	1.31405	0.01000	-1.91	17.600	1.16939	0.02613	0.63
4.750	1.34604	0.00489	-2.26	9.200	1.31304	0.01013	-1.90	17.800	1.16410	0.02670	0.75
4.800	1.34580	0.00495	-2.25	9.300	1.31202	0.01026	-1.89	18.000	1.15870	0.02730	0.88
4.850	1.34555	0.00500	-2.25	9.400	1.31099	0.01040	-1.88	18.200	1.15319	0.02790	1.02
4.900	1.34530	0.00505	-2.25	9.500	1.30994	0.01053	-1.86	18.400	1.14754	0.02853	1.16
4.950	1.34504	0.00511	-2.25	9.600	1.30888	0.01067	-1.85	18.600	1.14177	0.02917	1.30
5.000	1.34479	0.00516	-2.24	9.700	1.30781	0.01080	-1.84	18.800	1.13587	0.02983	1.46
5.100	1.34427	0.00527	-2.24	9.800	1.30672	0.01094	-1.82	19.000	1.12984	0.03051	1.61
5.200	1.34373	0.00538	-2.23	9.900	1.30562	0.01108	-1.81	19.200	1.12367	0.03121	1.78
5.300	1.34319	0.00548	-2.23	10.000	1.30450	0.01122	-1.80	19.400	1.11736	0.03192	1.95
5.400	1.34264	0.00559	-2.22	10.200	1.30223	0.01150	-1.77	19.600	1.11090	0.03266	2.13
5.500	1.34207	0.00570	-2.22	10.400	1.29991	0.01178	-1.74	19.800	1.10429	0.03343	2.32
5.600	1.34150	0.00581	-2.21	10.600	1.29752	0.01207	-1.70	20.000	1.09753	0.03421	2.52
5.700	1.34091	0.00592	-2.21	10.800	1.29508	0.01236	-1.67	20.500	1.07991	0.03629	3.04
5.800	1.34031	0.00603	-2.20	11.000	1.29258	0.01266	-1.64	21.000	1.06121	0.03854	3.64
5.900	1.33970	0.00614	-2.19	11.200	1.29001	0.01296	-1.60	21.500	1.04134	0.04099	4.30
6.000	1.33908	0.00625	-2.19	11.400	1.28739	0.01326	-1.57	22.000	1.02018	0.04367	5.04
6.100	1.33845	0.00637	-2.18	11.600	1.28471	0.01357	-1.53				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.9. The number of digits with an overstrike are not relevant to accuracy of the data.

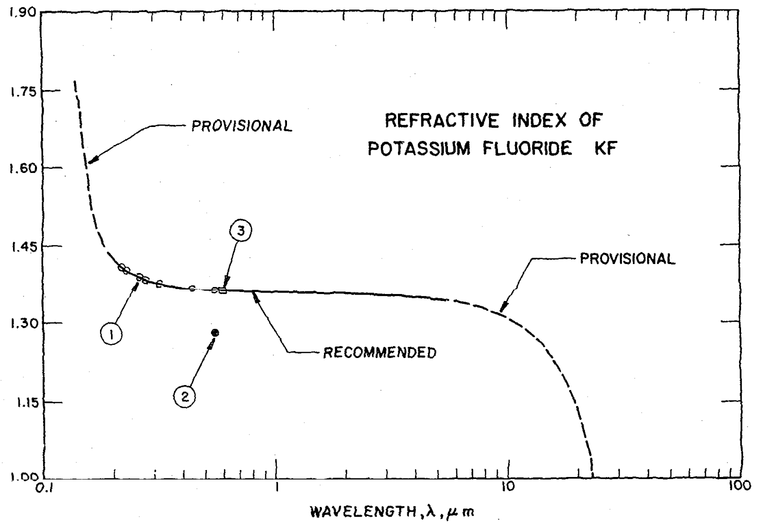

FIGURE 30. Refractive Index of KF

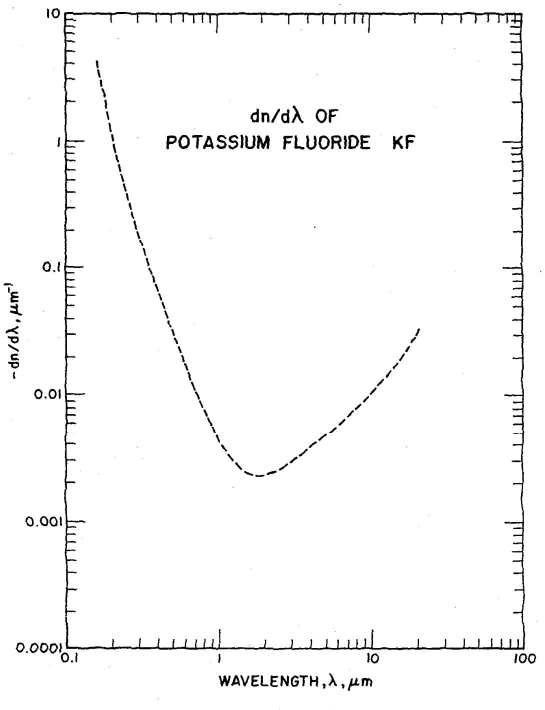

FIGURE 31. $dn/d\lambda$ of KF

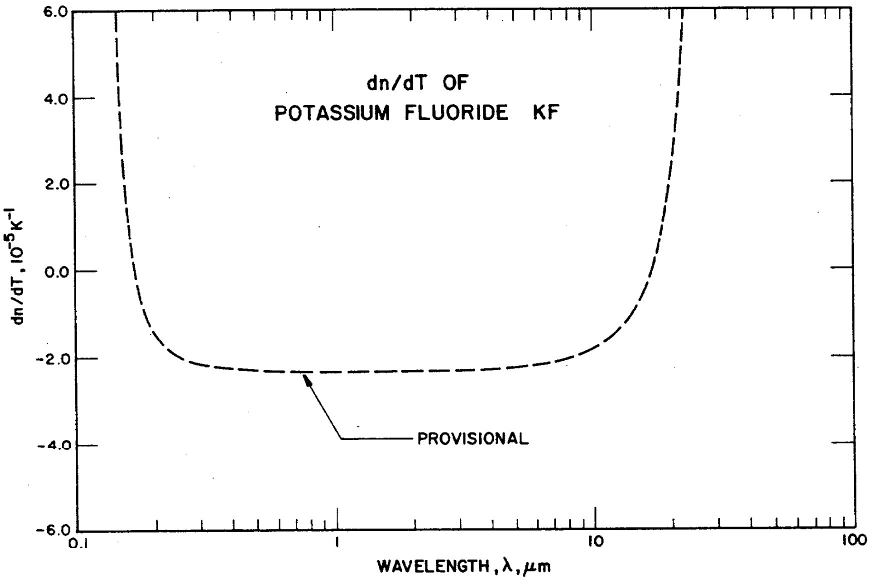

FIGURE 32. dn/dT of KF

TABLE 37. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KF

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	50	Kublitzky, A.	1934	D	0.214-0.578	330	Crystal, grown by Kyropoulos method; prismatic specimen with height of 15 mm, side length 20 mm and prism angle 54°18'35"; digitized data were presented with accuracy of one unit of the third decimal place.
2	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	1173	Molten KF; liquid prism formed by the top surface of the melt and an immersed, inclined platinum mirror; estimated uncertainty of 0.01 in measured n; digitized data were presented.
3	45	Spangenberg, K.	1923	M	0.5893	295	Crystal produced by heating KF-Glycerin solution at 80 C; it was found that when specimen was embedded in either of the two mixtures, C_2H_3N + C_7H_{10} and HCOC CH_3 + $(CH_3)_2$ CO_2, and illuminated by sodium light the contour of KF grain disappeared; the refractive indices of the mixtures were then measured by a Pulfrich refractometer for sodium D line; it was found that 1.360 < n_{KF} < 1.362; n_{KF} was therefore derived as 1.361 ±0.001.
4	87, 88	Wulff, P. and Heigl, A. Wulff, P.	1931, 1928	M	0.589	298	Crystal; grown by slowly cooling melt from 900 C in HF atmosphere; clear, transparent specimen was suspended in an alcohol-xylol mixture; digitized datum was presented with uncertainty 0.00004.
5	87, 88	Wulff, P. and Heigl, A. Wulff, P.	1931, 1928	M	0.589	298	Similar to above but crystal grown from a saturated KF-alcohol solution; estimated uncertainty of 0.00008 in refractive index.

TABLE 38. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KF

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 330.2 K	
0.21444	1.4111
0.21946	1.4081*
0.227	1.4040
0.231	1.4017
0.2573	1.3911
0.27488	1.3855
0.313	1.3780
0.435	1.3661
0.5461	1.3617
0.578	1.3610
CURVE 2 T = 1173.2 K	
0.5461	1.28
CURVE 3 T = 295.2 K	
0.5893	1.361
CURVE 4 T = 298.0 K	
0.589	1.36290
CURVE 5 T = 298.0 K	
0.589	1.36280

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* Not shown in figure.

TABLE 39. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR KF

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Radhakrishnan, T. [46] 1934	0.21-0.58 μm 330 K	$n^2 = 1.84782 + \frac{0.00435}{\lambda^2 - (0.126)^2} - 0.03017\,\lambda^2$
Present work 1975	0.15-22.0 μm 293 K	$n^2 = 1.55083 + \frac{0.29162\,\lambda^2}{\lambda^2 - (0.126)^2} + \frac{3.60001\,\lambda^2}{\lambda^2 - (51.55)^2}$

3.10. Potassium Chloride, KCl

Potassium chloride is widely used in spectroscopy, since its optical properties make it a convenient window and prism material from the ultraviolet to the infrared regions. The transmission range is about 0.21 to 30 μm. A plate 1 cm in thickness transmits radiation up to 24 μm. Since strong absorption occurs near the transmission limits, the useful transmission range of KCl is about 0.38 to 21 μm. Of all the substances which are otherwise suitable for optical parts, KCl is transparent over a wide range of the infrared spectrum.

KCl is grown in the same way as NaCl, but sometimes multiple crystals instead of single-crystal ingots result. Therefore, large prisms are somewhat rare and expensive. Crystals 30 cm in diameter are available.

Measurement of the refractive index of potassium chloride dates back to 1871, when Stefan [53] determined the refractive index of a sylvite prism for the B, D, and F of Fraunhofer lines. Later work, represented by Rubens [72], Martens [54], Paschen [55], and Gyulai [27], provided a large amount of data in the transparent region. Measurements beyond the transparent region were not made until 1934 when Cartwright, et al. [61] analyzed the reflection and transmission spectra of KCl thin films in the infrared region, 126 to 232 μm. In the low ultraviolet region, Tomiki [89] published values obtained by analyzing the reflection spectra. Refractive index data are now available for a wide wavelength range from 0.106 to 232 μm.

By a careful examination of the available data and information, five data sets provided by Martens [54], Paschen [55], Hohls [29], Harting [30], and Rubens and Nichols [58], were selected as the basis for reference data generation. The values of Hohls were obtained for a very thin plate specimen, and are slightly lower than those for bulk material. Data sets which are not selected were either reported with unreliable values or were measured under inadequate conditions. Data in the absorption regions were not analyzed, but are included here for completeness of presentation. Since the selected data were obtained at various temperatures, the temperature derivative, dn/dT, was needed to reduce the data to 293 K.

Measurements of the temperature coefficient of the refractive index, dn/dT, made available in the wavelength region from 0.21 to 21.0 μm by a number of investigators, were sufficient to carry out a least-squares fitting calculation. Potassium chloride is among the five materials which provided the empirical results that led to the parameters in table 5. With the aid of these parameters we constructed a formula for estimating dn/dT over a broader range of λ:

$$2n\frac{dn}{dT}=-11.13(n^2-1)+0.19+\frac{3.393\lambda^4}{(\lambda^2-0.02624)^2}+\frac{142.56\lambda^4}{(\lambda^2-4958.98)^2}, \qquad (41)$$

where dn/dT is in units of $10^{-5}\mathrm{K}^{-1}$ and λ is in μm.

In figure 36, the results calculated by eq (41) are compared with the experimental data. It appears that for wavelengths longer than five microns the calculated values are in general lower than the observed values, and that in the short wavelength region, 0.25–0.50 μm, the curve is higher than experiment. By a review of the sources, one can find that data sets 32, 34, and 36 (32 and 36 not shown in fig. 36) were obtained at about 330 K, some 40 degrees higher than 293 K, while data set 35 was obtained at a mean temperature about 15 degrees lower than 293 K. The trend of these data indicates that the absolute value of dn/dT increases with increasing temperature. Although dn/dT data of curve 9 were obtained at a mean temperature of 293, they appeared to be randomly scattered and not consistent with the trend demonstrated by curves 34 and 35.

It can be safely said that eq (41) predicts correct dn/dT values for wavelengths smaller than five microns. For wavelengths larger than five microns, experimental evidence is not sufficient to substantiate the predictions made by eq (41). However, the fact that the empirically constructed dn/dT formula for CsI predicts correct values for CsI in the long wavelength region, as discussed in subsection 3.20, gives strong evidence that eq (41) can be used to calculate the dn/dT data for KCl in the long wavelength region.

Equation (41) was used to make temperature corrections on the selected data sets which were obtained at temperatures other than the reference temperature, 293 K.

Dispersion formulas of KCl have been proposed from time to time by a number of authors, and have appeared in different forms. Table 44 contains a number of typical formulas. They have all been reduced, wherever possible, to standard forms so that a visual comparison can be easily made. From tables 3 and 44, preliminary parameters for a least-squares fitting were obtained. The calculation yielded the following dispersion equation for KCl at 293 K in the transparent region, 0.18–35.0 μm.

$$n^2=1.26486+\frac{0.30523\lambda^2}{\lambda^2-(0.100)^2}+\frac{0.41620\lambda^2}{\lambda^2-(0.131)^2}+\frac{0.18870\lambda^2}{\lambda^2-(0.162)^2}+\frac{2.6200\lambda^2}{\lambda^2-(70.42)^2}, \qquad (42)$$

where λ is in units of μm.

Equations (41) and (42) were used to generate the recommended values. The values appearing in the table of recommended values do not reflect the degree of accuracy; extra decimal places are given simply for tabular smoothness. In order to use the table properly, the reader should follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.18– 0.20	2	0.01
0.20– 0.24	3	0.005
0.24– 0.35	4	0.0005
0.35–10.00	4	0.0001
10.00–15.00	4	0.0002
15.00–21.00	4	0.0005
21.00–30.00	3	0.006
30.00–35.00	3	0.008

For dn/dT:

0.18– 0.20	1	0.9
0.20– 4.0	1	0.3
4.00–15.00	1	0.5
15.00–35.00	1	0.9

TABLE 40. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KCl AT 293 K *

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.180	1.89324	15.92658	17.24	0.300	1.54558	0.59045	-2.75	1.000	1.47983	0.01099	-3.20
0.182	1.86392	13.50987	13.74	0.305	1.54273	0.55253	-2.78	1.050	1.47932	0.00953	-3.20
0.184	1.83883	11.65298	11.08	0.310	1.54005	0.51798	-2.81	1.100	1.47887	0.00833	-3.20
0.186	1.81705	10.18879	9.01	0.315	1.53754	0.48642	-2.84	1.150	1.47848	0.00734	-3.21
0.188	1.79789	9.00918	7.36	0.320	1.53518	0.45752	-2.86	1.200	1.47813	0.00652	-3.21
0.190	1.78087	8.04152	6.04	0.325	1.53296	0.43099	-2.88	1.250	1.47783	0.00582	-3.21
0.192	1.76562	7.23545	4.95	0.330	1.53087	0.40658	-2.90	1.300	1.47755	0.00524	-3.21
0.194	1.75184	6.55505	4.04	0.335	1.52889	0.38407	-2.92	1.350	1.47730	0.00474	-3.21
0.196	1.73933	5.97413	3.28	0.340	1.52703	0.36327	-2.93	1.400	1.47708	0.00431	-3.21
0.198	1.72789	5.47316	2.64	0.345	1.52526	0.34402	-2.95	1.450	1.47687	0.00394	-3.21
0.200	1.71739	5.03730	2.09	0.350	1.52358	0.32617	-2.96	1.500	1.47668	0.00363	-3.21
0.202	1.70771	4.65513	1.61	0.355	1.52199	0.30959	-2.97	1.550	1.47651	0.00335	-3.21
0.204	1.69874	4.31771	1.19	0.360	1.52049	0.29417	-2.98	1.600	1.47634	0.00312	-3.21
0.206	1.69041	4.01792	0.83	0.365	1.51905	0.27980	-3.00	1.650	1.47619	0.00291	-3.21
0.208	1.68265	3.75007	0.51	0.370	1.51769	0.26638	-3.01	1.700	1.47605	0.00273	-3.21
0.210	1.67539	3.50955	0.23	0.375	1.51639	0.25385	-3.02	1.750	1.47592	0.00257	-3.21
0.212	1.66860	3.29256	-0.02	0.380	1.51515	0.24212	-3.02	1.800	1.47580	0.00243	-3.21
0.214	1.66221	3.09598	-0.25	0.385	1.51396	0.23113	-3.03	1.850	1.47568	0.00230	-3.21
0.216	1.65620	2.91720	-0.45	0.390	1.51283	0.22082	-3.04	1.900	1.47557	0.00219	-3.21
0.218	1.65053	2.75404	-0.63	0.395	1.51175	0.21114	-3.05	1.950	1.47546	0.00210	-3.21
0.220	1.64517	2.60464	-0.80	0.400	1.51072	0.20204	-3.05	2.000	1.47536	0.00201	-3.21
0.222	1.64010	2.46743	-0.94	0.410	1.50879	0.18539	-3.07	2.050	1.47526	0.00194	-3.21
0.224	1.63530	2.34105	-1.08	0.420	1.50701	0.17058	-3.08	2.100	1.47516	0.00187	-3.21
0.226	1.63073	2.22436	-1.20	0.430	1.50537	0.15736	-3.09	2.150	1.47507	0.00181	-3.21
0.228	1.62639	2.11635	-1.32	0.440	1.50386	0.14551	-3.10	2.200	1.47498	0.00176	-3.21
0.230	1.62226	2.01614	-1.42	0.450	1.50245	0.13485	-3.10	2.250	1.47489	0.00172	-3.21
0.232	1.61833	1.92298	-1.52	0.460	1.50115	0.12523	-3.11	2.300	1.47481	0.00168	-3.21
0.234	1.61457	1.83619	-1.61	0.470	1.49995	0.11654	-3.12	2.350	1.47473	0.00164	-3.21
0.236	1.61098	1.75519	-1.69	0.480	1.49882	0.10865	-3.12	2.400	1.47464	0.00161	-3.21
0.238	1.60754	1.67946	-1.76	0.490	1.49777	0.10147	-3.13	2.450	1.47457	0.00158	-3.21
0.240	1.60426	1.60853	-1.83	0.500	1.49679	0.09493	-3.13	2.500	1.47449	0.00156	-3.21
0.242	1.60111	1.54201	-1.90	0.510	1.49587	0.08895	-3.14	2.550	1.47441	0.00154	-3.21
0.244	1.59808	1.47951	-1.96	0.520	1.49501	0.08347	-3.14	2.600	1.47433	0.00152	-3.21
0.246	1.59519	1.42072	-2.01	0.530	1.49420	0.07845	-3.15	2.650	1.47426	0.00151	-3.21
0.248	1.59240	1.36534	-2.07	0.540	1.49344	0.07383	-3.15	2.700	1.47418	0.00150	-3.21
0.250	1.58972	1.31310	-2.12	0.550	1.49272	0.06957	-3.15	2.750	1.47411	0.00149	-3.20
0.252	1.58715	1.26377	-2.16	0.560	1.49205	0.06564	-3.16	2.800	1.47403	0.00148	-3.20
0.254	1.58466	1.21713	-2.21	0.570	1.49141	0.06201	-3.16	2.850	1.47396	0.00147	-3.20
0.256	1.58228	1.17299	-2.25	0.580	1.49081	0.05865	-3.16	2.900	1.47389	0.00147	-3.20
0.258	1.57997	1.13116	-2.28	0.590	1.49023	0.05553	-3.16	2.950	1.47381	0.00146	-3.20
0.260	1.57775	1.09149	-2.32	0.600	1.48969	0.05263	-3.17	3.000	1.47374	0.00146	-3.20
0.262	1.57560	1.05382	-2.35	0.620	1.48869	0.04742	-3.17	3.050	1.47367	0.00146	-3.20
0.264	1.57353	1.01803	-2.39	0.640	1.48779	0.04290	-3.17	3.100	1.47359	0.00146	-3.20
0.266	1.57153	0.98399	-2.42	0.660	1.48697	0.03894	-3.18	3.150	1.47352	0.00146	-3.20
0.268	1.56960	0.95158	-2.45	0.680	1.48623	0.03546	-3.18	3.200	1.47345	0.00147	-3.20
0.270	1.56772	0.92070	-2.47	0.700	1.48555	0.03239	-3.18	3.250	1.47337	0.00147	-3.20
0.272	1.56591	0.89126	-2.50	0.720	1.48493	0.02968	-3.18	3.300	1.47330	0.00148	-3.20
0.274	1.56416	0.86317	-2.52	0.740	1.48436	0.02727	-3.19	3.350	1.47323	0.00148	-3.20
0.276	1.56246	0.83634	-2.55	0.760	1.48384	0.02511	-3.19	3.400	1.47315	0.00149	-3.20
0.278	1.56081	0.81070	-2.57	0.780	1.48336	0.02319	-3.19	3.450	1.47308	0.00149	-3.20
0.280	1.55921	0.78618	-2.59	0.800	1.48291	0.02146	-3.19	3.500	1.47300	0.00150	-3.20
0.282	1.55767	0.76272	-2.61	0.820	1.48250	0.01990	-3.19	3.550	1.47293	0.00151	-3.20
0.284	1.55616	0.74026	-2.63	0.840	1.48212	0.01850	-3.19	3.600	1.47285	0.00152	-3.20
0.286	1.55470	0.71873	-2.65	0.860	1.48176	0.01723	-3.20	3.650	1.47278	0.00153	-3.20
0.288	1.55329	0.69809	-2.66	0.880	1.48143	0.01607	-3.20	3.700	1.47270	0.00154	-3.20
0.290	1.55191	0.67830	-2.68	0.900	1.48111	0.01502	-3.20	3.750	1.47262	0.00155	-3.19
0.292	1.55057	0.65930	-2.70	0.920	1.48082	0.01407	-3.20	3.800	1.47254	0.00156	-3.19
0.294	1.54927	0.64105	-2.71	0.940	1.48055	0.01319	-3.20	3.850	1.47247	0.00157	-3.19
0.296	1.54801	0.62352	-2.73	0.960	1.48030	0.01239	-3.20	3.900	1.47239	0.00158	-3.19
0.298	1.54678	0.60666	-2.74	0.980	1.48006	0.01166	-3.20	3.950	1.47231	0.00159	-3.19

TABLE 40. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KCl AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
4.000	1.47223	0.00161	-3.19	8.100	1.46290	0.00302	-3.10	16.400	1.42295	0.00681	-2.58
4.050	1.47215	0.00162	-3.19	8.200	1.46260	0.00306	-3.10	16.600	1.42158	0.00692	-2.56
4.100	1.47207	0.00163	-3.19	8.300	1.46229	0.00310	-3.10	16.800	1.42018	0.00703	-2.54
4.150	1.47198	0.00164	-3.19	8.400	1.46198	0.00314	-3.09	17.000	1.41877	0.00714	-2.52
4.200	1.47190	0.00166	-3.19	8.500	1.46166	0.00318	-3.09	17.200	1.41733	0.00725	-2.49
4.250	1.47182	0.00167	-3.19	8.600	1.46134	0.00322	-3.09	17.400	1.41587	0.00737	-2.47
4.300	1.47173	0.00168	-3.19	8.700	1.46102	0.00326	-3.08	17.600	1.41438	0.00748	-2.45
4.350	1.47165	0.00170	-3.19	8.800	1.46069	0.00330	-3.08	17.800	1.41287	0.00760	-2.42
4.400	1.47156	0.00171	-3.19	8.900	1.46036	0.00334	-3.08	18.000	1.41134	0.00772	-2.39
4.450	1.47148	0.00173	-3.19	9.000	1.46002	0.00338	-3.07	18.200	1.40979	0.00783	-2.37
4.500	1.47139	0.00174	-3.18	9.100	1.45968	0.00342	-3.07	18.400	1.40821	0.00795	-2.34
4.550	1.47130	0.00176	-3.18	9.200	1.45934	0.00346	-3.06	18.600	1.40661	0.00808	-2.31
4.600	1.47122	0.00177	-3.18	9.300	1.45899	0.00350	-3.06	18.800	1.40498	0.00820	-2.28
4.650	1.47113	0.00179	-3.18	9.400	1.45864	0.00354	-3.06	19.000	1.40333	0.00832	-2.25
4.700	1.47104	0.00180	-3.18	9.500	1.45828	0.00358	-3.05	19.200	1.40165	0.00845	-2.22
4.750	1.47095	0.00182	-3.18	9.600	1.45792	0.00362	-3.05	19.400	1.39995	0.00857	-2.19
4.800	1.47085	0.00183	-3.18	9.700	1.45756	0.00366	-3.05	19.600	1.39822	0.00870	-2.16
4.850	1.47076	0.00185	-3.18	9.800	1.45719	0.00371	-3.04	19.800	1.39647	0.00883	-2.13
4.900	1.47067	0.00187	-3.18	9.900	1.45682	0.00375	-3.04	20.000	1.39469	0.00897	-2.09
4.950	1.47058	0.00188	-3.18	10.000	1.45644	0.00379	-3.03	20.500	1.39012	0.00930	-2.00
5.000	1.47048	0.00190	-3.18	10.200	1.45567	0.00387	-3.02	21.000	1.38538	0.00965	-1.91
5.100	1.47029	0.00193	-3.18	10.400	1.45489	0.00396	-3.02	21.500	1.38047	0.01001	-1.81
5.200	1.47010	0.00196	-3.17	10.600	1.45409	0.00404	-3.01	22.000	1.37537	0.01038	-1.70
5.300	1.46990	0.00200	-3.17	10.800	1.45327	0.00413	-3.00	22.500	1.37009	0.01076	-1.58
5.400	1.46970	0.00203	-3.17	11.000	1.45244	0.00421	-2.99	23.000	1.36461	0.01116	-1.46
5.500	1.46949	0.00206	-3.17	11.200	1.45159	0.00430	-2.98	23.500	1.35892	0.01157	-1.33
5.600	1.46928	0.00210	-3.17	11.400	1.45072	0.00439	-2.97	24.000	1.35303	0.01200	-1.18
5.700	1.46907	0.00213	-3.16	11.600	1.44984	0.00447	-2.96	24.500	1.34692	0.01244	-1.03
5.800	1.46886	0.00217	-3.16	11.800	1.44893	0.00456	-2.94	25.000	1.34059	0.01290	-0.87
5.900	1.46864	0.00220	-3.16	12.000	1.44801	0.00465	-2.93	25.500	1.33402	0.01338	-0.69
6.000	1.46842	0.00224	-3.16	12.200	1.44707	0.00474	-2.92	26.000	1.32721	0.01388	-0.51
6.100	1.46819	0.00227	-3.16	12.400	1.44611	0.00483	-2.91	26.500	1.32014	0.01439	-0.30
6.200	1.46796	0.00231	-3.15	12.600	1.44514	0.00492	-2.90	27.000	1.31281	0.01493	-0.09
6.300	1.46773	0.00235	-3.15	12.800	1.44415	0.00501	-2.88	27.500	1.30520	0.01550	0.14
6.400	1.46749	0.00238	-3.15	13.000	1.44313	0.00511	-2.87	28.000	1.29731	0.01609	0.39
6.500	1.46725	0.00242	-3.15	13.200	1.44210	0.00520	-2.86	28.500	1.28911	0.01671	0.65
6.600	1.46701	0.00246	-3.14	13.400	1.44105	0.00529	-2.84	29.000	1.28060	0.01735	0.94
6.700	1.46676	0.00249	-3.14	13.600	1.43999	0.00539	-2.83	29.500	1.27175	0.01803	1.25
6.800	1.46651	0.00253	-3.14	13.800	1.43890	0.00548	-2.82	30.000	1.26256	0.01874	1.58
6.900	1.46626	0.00257	-3.14	14.000	1.43779	0.00558	-2.80	30.500	1.25301	0.01949	1.93
7.000	1.46600	0.00260	-3.13	14.200	1.43667	0.00568	-2.79	31.000	1.24307	0.02027	2.31
7.100	1.46574	0.00264	-3.13	14.400	1.43552	0.00578	-2.77	31.500	1.23273	0.02110	2.73
7.200	1.46547	0.00268	-3.13	14.600	1.43436	0.00588	-2.75	32.000	1.22196	0.02197	3.17
7.300	1.46520	0.00272	-3.13	14.800	1.43317	0.00598	-2.74	32.500	1.21075	0.02290	3.65
7.400	1.46493	0.00275	-3.12	15.000	1.43197	0.00608	-2.72	33.000	1.19906	0.02388	4.17
7.500	1.46465	0.00279	-3.12	15.200	1.43074	0.00618	-2.70	33.500	1.18686	0.02491	4.73
7.600	1.46437	0.00283	-3.12	15.400	1.42950	0.00628	-2.68	34.000	1.17413	0.02601	5.34
7.700	1.46408	0.00287	-3.11	15.600	1.42823	0.00638	-2.66	34.500	1.16084	0.02719	6.00
7.800	1.46379	0.00291	-3.11	15.800	1.42694	0.00649	-2.64	35.000	1.14693	0.02844	6.72
7.900	1.46350	0.00295	-3.11	16.000	1.42563	0.00660	-2.63				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.10. The number of digits with an overstrike are not relevant to accuracy of the data.

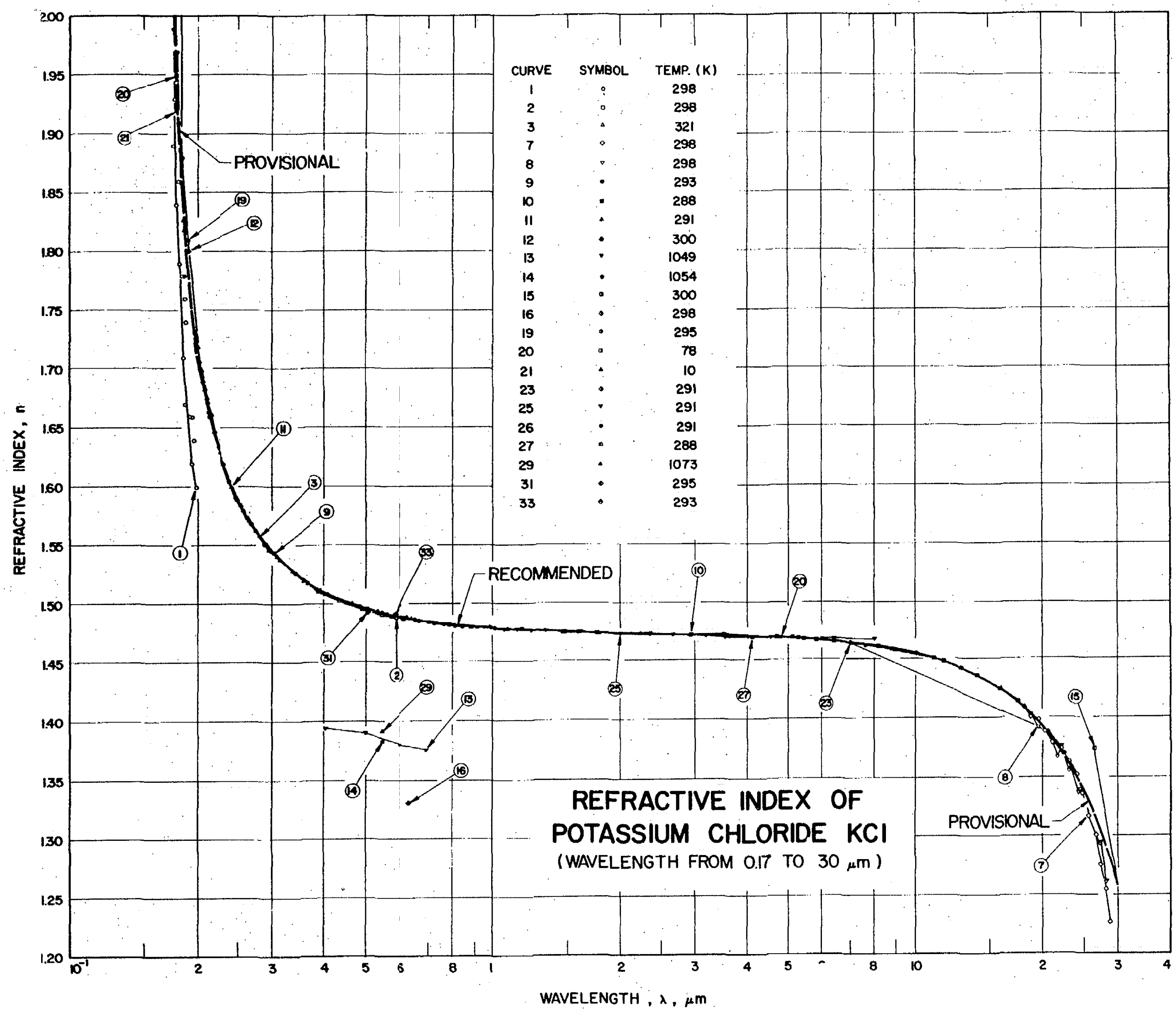

FIGURE 33. Refractive Index of KCl (transparent region)

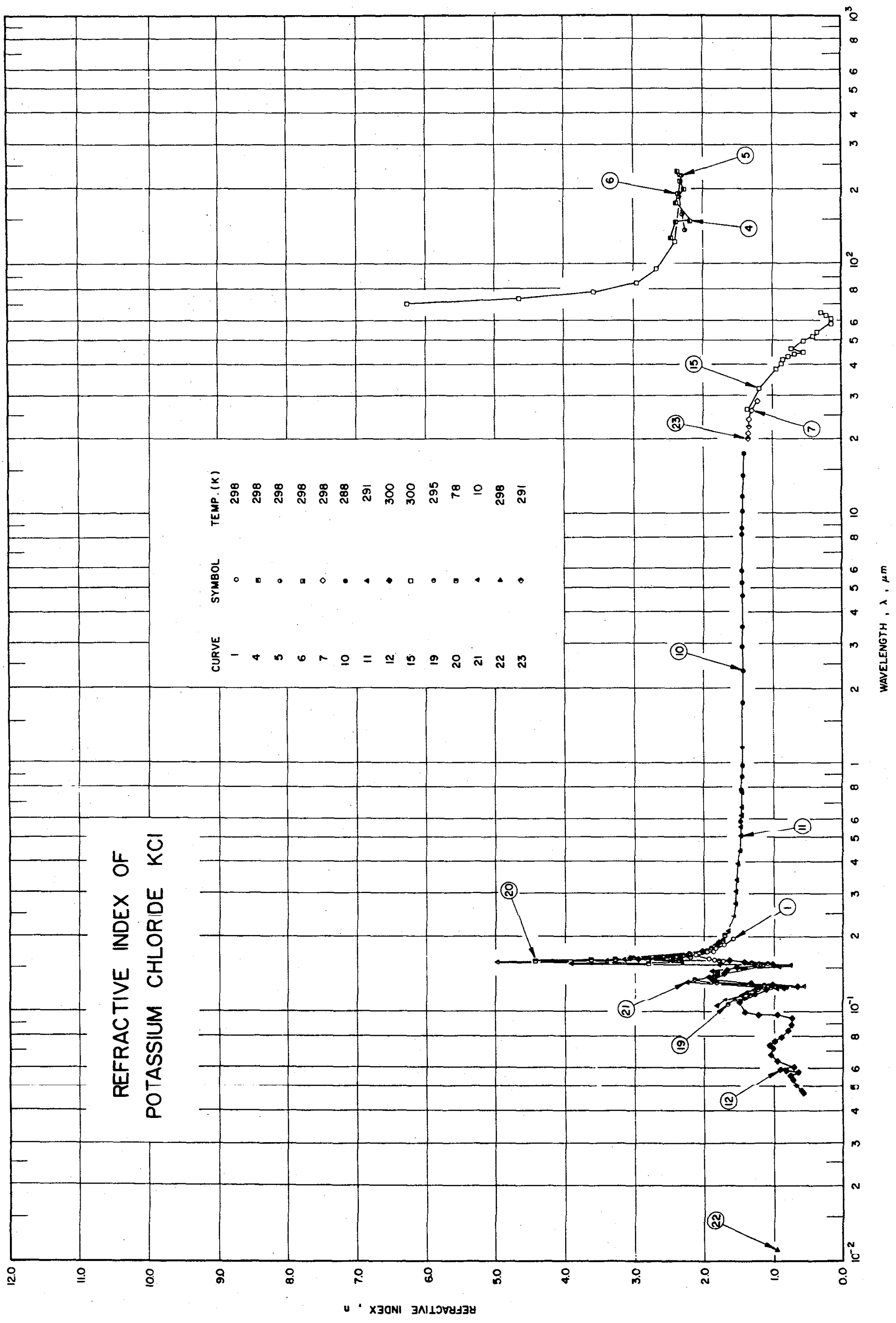

FIGURE 34. Refractive Index of KCl

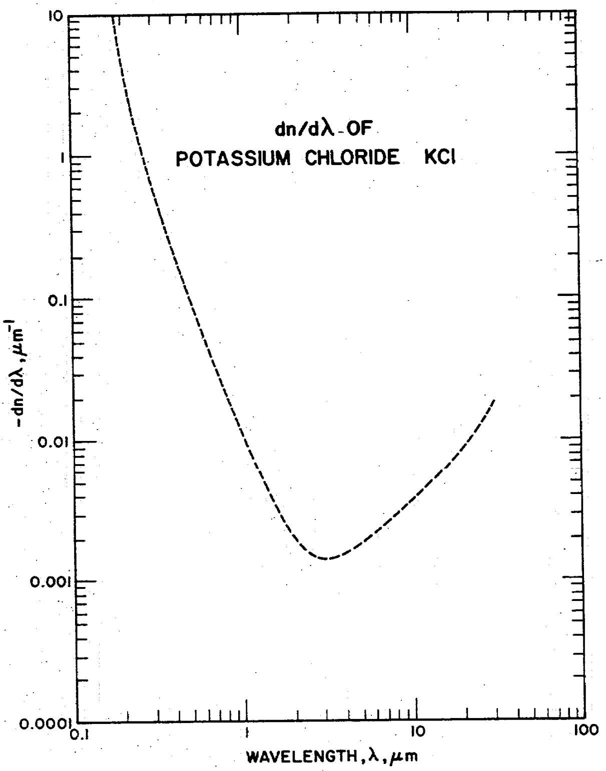

FIGURE 35. *dn/dλ* of KCl

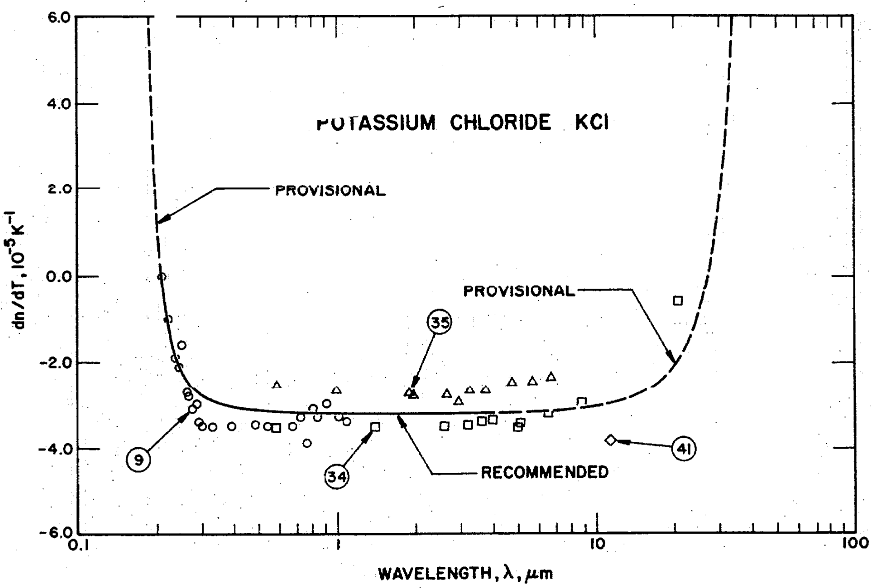

FIGURE 36. *dn/dT* of KCl

TABLE 41. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KCl

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	90	Vishnevskii, V.N., Kulik, L.N., and Romanyuk, N.A.	1967	R	0.16-0.20	298	Single crystal; grown in an open furnace by the Kyropolous method; specimens freshly cleaved in vacuum; reflection spectra recorded photographically for incident angles of 20°, 45°, 70°, and 75° at room temperature, refractive indices were obtained from graphical solutions to the Fresnel equations; data extracted from a figure.
2	87, 88	Wulff, P. and Heigl, A.	1931, 1928	M	0.589	298	Crystal; grown from melt in the Haën Co.; cleaved specimen of 1.5 mm thick was suspended in a mixture of m-Xylol-amyl acetate; digitized datum was presented with uncertainty 0.00003; dn/dT of sodium D line in the temperature range from 18° C to 25° was found to be -0.0001/°C.
3	27	Gyulai, Z.	1927	D	0.202-0.615	321	Synthetic crystal; prismatic specimen of height 18 mm, side of 23 mm, and apex angle of 62°9'; digitized data were presented.
4	61	Cartwright, C.H. and Czerny, M.	1934	R	126-232	298	Thin plate specimen; refractive indices were obtained from analysis of the reflection spectrum; data extracted from a figure in which the experimental data were plotted.
5	61	Cartwright, C.H. and Czerny, M.	1934	T	137-227	298	Thin plate specimen of 123 μm in thickness; refractive indices were obtained from analysis of the transmission spectrum; data extracted from a figure in which the experimental data plotted.
6	61	Cartwright, C.H. and Czerny, M.	1934	T	190-215	298	Similar to above but specimen of 163 μm in thickness.
7	29	Hohls, H.W.	1937	I	18.2-28.8	298	Crystal; thin plate specimen of 445 μm in thickness; digitized data were presented.
8	29	Hohls, H.W.	1937	I	18.7-28.2	298	Similar to above but plate thickness 325 μm.
9	30	Harting, H.	1943	D	0.213-1.0831	293	Crystal; the author stated that the refractive indices were measured by F. Wolf on the specimen supplied by A. Smakula but no references were cited; digitized data were presented; dn/dT at 293 K for each wavelength was also given.
10	55	Paschen, F.	1908	D	0.58932-17.680	288	Natural crystal; prismatic specimen of height 5 cm, width 4 cm and apex angle 53.3°; digitized data were presented; dn/dT at temperature around 15 C was found to be -0.000034 K^{-1} for wavelength 0.58932 μm.
11	54, 74	Martens, F.F. Martens, F.F.	1901, 1902	D	0.185-0.768	291	Crystal; prismatic specimen of height 13 mm, surface 13 x 19 mm and apex angle 38.9°; digitized data were presented.
12	66	Roessler, D.M. and Walker, W.C.	1968	R	0.0476-0.2480	300	Crystals suppliedby Harshaw Chemical Co. or by Westinghouse; reflection spectra were analyzed by Kramers-Kronig method; digitized data were presented.
13	67	Marcoux, J.	1971	F	0.40-0.70	1049	Molten KCl; Vycor tube filled with the melt formed a cylindrical lens; refractive indices were determined by finding the focal lengths of the lens at given wavelengths; uncertainty in n was estimated to ±0.005; digitized data were presented.
14	67	Marcoux, J.	1971	F	0.5460	1054	Similar to above.
15	91	Johnson, K.W. and Bell, E.E.	1969	R	26.0-223.0	300	Crystal; reflection spectrum was measured by the technique of asymmetric Fourier-transform spectroscopy and refractive indices were then determined; data extracted from a figure.

TABLE 41. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KCl (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
16	92	Durou, C., Girandou, J.C., and Moutou, C.	1973	P	0.6328	298	Aqueous solution of KCl was prepared by dissolving anhydrous Merck p.a. salt in double-distilled water; refractive indices of solutions of molarity 0.01, was measured by a Pulfrich refractometer.
17	92	Durou, C., et al.	1973	P	0.6328	298	Similar to above but solution of molarity 0.05.
18	92	Durou, C., et al.	1973	P	0.6328	298	Similar to above but solution of molarity 0.1.
19	89	Tomiki, T.	1967	R	0.107-0.214	295	Single crystal; grown by Kyropoulos method in a Pt-crucible; reflection spectrum was analyzed by Kramers-Kronig relation; data extracted from a figure.
20	89	Tomiki, T.	1967	R	0.159-0.214	78	Similar to above.
21	89	Tomiki, T.	1967	R	0.106-0.207	10	Similar to above.
22	42	Lukirskii, A.P., Savinov, E.P., Ershov, O.A., and Shepelev, Yu.F.	1964	R	0.0067, 0.0113	298	Film specimens; evaporated on Au or Al substrates; reflection spectra were analyzed by using Fresnel's formulae; digitized data were presented.
23	58	Rubens, H. and Nichols, E.F.	1897	D	0.434-22.5	291	Crystal; thin, sharp prismatic specimen with apex angle of 12°39'10"; digitized data were presented by the authors.
24	59	Rubens, H. and Trowbridge, A.	1897	D	10.01-18.10	291	Crystal; thin, sharp prismatic specimen with apex angle of 12°39'10"; digitized data were presented.
25	71	Rubens, H. and Snow, B.W.	1892	D	0.434-8.022	291	Crystal; prismatic specimen with height of 1.4 cm, edge of 2.0 cm and apex angle of 59°54'; digitized data were presented.
26	72, 73	Rubens, H.	1895, 1894	D	0.434-7.08	291	Crystal; prismatic specimen with apex angle of 59°54'; digitized data were presented by the author; this paper contained the same set of data in the author's 1894 paper but with revised wavelengths.
27	93	Trowbridge, A.	1898	D	0.982-11.197	~288	Crystal; prismatic specimen with height about 2.0 cm, edge about 3 1/2 cm and apex angle of 39°46'47"; the temperature of the specimen was maintained at about 15 C; digitized data were presented by the author.
28	43	Ramaseshan, S.	1947	P	0.4358-0.5893	~298	Crystal; grown by the method of slow evaporation of a saturated solution; plate specimen with polished faces; specimen was cemented to the prism of a Pulfrich refractometer by a suitable liquid in the determination of refractive index; digitized data were presented.
29	44	Zarzycki, J. and Naudin, F.	1963, 1971	D	0.5461	1073	Molten KCl, filled into a 60° prismatic Pt container with silica glass window of 4 mm diameter; estimated uncertainty of 0.001 in n; digitized data were presented.
30	74	Martens, F.F.	1902	D	0.441-0.643	291	Crystal; prismatic specimen with apex angle of 37°45'12.8"; digitized data were presented.
31	94	Wulff, P. and Anderson, T.F.	1935	D	0.2313-0.5086	295	Single crystal; prismatic specimen with apex angle of 53°36'30" ±10"; results obtained agreed very well with those obtained by other prism with apex angle of 53°42'10" but at a temperature of 296.2 K; digitized data were presented.
32	76	Pulfrich, C.	1892	D	0.589	290	Natural crystal; prismatic specimen of apex angle 30°1'49"; refractive index of sodium D line was determined by an Abbe autocollimating spectrometer; digitized value was presented; dn/dT of lines C, D, F, and G' in the temperature range from 19.6 C to 99.4 C were also given.

TABLE 41. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KCl (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
33	80	Dufet, M.H.	1891	D	0.589	293	Natural crystal; prismatic specimen with apex angle of 60°; measurements were made at 22.5 and 23 C and then reduced to 20 C by using the then known dn/dT = -0.0000346; the averaged value was presented.
34	82	Liebreich, E.	1911	D	0.589-8.85	291-373	Prismatic specimen with apex angle of 39°36'30", height of 3.5 cm and edge of 2.8 cm; specimen was placed inside a heating chamber regulated to ±0.5 C; measurements were made at various temperatures ranging from 18 to 100 C and dn/dT's were deduced; results of dn/dT were presented in digitized values; refractive indices at 18 C and 100 C were plotted, however, they were not extracted because it was impossible to read accurately to be consistent with given dn/dT's.
35	83	Liebreich, E.	1911	D	0.589-6.75	223-293	Prismatic specimen placed in a temperature regulated chamber; measurements were made at various temperatures ranging from -50 C to 20 C; digitized data were presented; this paper contains dn/dT only.
36	53	Stefan, J.M.	1871	D	0.397-0.760	293	Prismatic specimen with apex angle of 65°43'13"; refractive indices were measured by the minimum deviation method; temperature coefficients of refractive index for three lines, B, D, and F, were also determined in the temperature range from 15 to 94 C by heating the prism; digitized data were presented.
37	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; six prismatic specimens with apex angles about 39.6°; averaged values of refractive indices were presented with uncertainties of less than 2 units in the fourth decimal place; temperature was not given, room temperature assumed.
38	13	Lawndes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	290	Single crystal; prismatic sample; digitized data were given with uncertainty of ±0.0004.
39	13	Lawndes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	4	Similar to above.
40	112	Fedyukina, G.N. and Zlenko, V.Ya.	1972	M	0.589	281-308	Single crystal; disc specimens of 1-18 mm in thickness; refractive index for sodium D line was determined by immersion method; digitized value was reported with uncertainty of ±0.0005; temperature was not specified but a range was given.
41	113	Kolosovskii, O.A. and Ustimenko, L.N.	1972	I	10.6	293-308	Plate specimen placed in a CO_2 laser resonator; the temperature coefficient of refractive index was determined by measuring the drift of resonator optical length, casused by a definite change of sample temperature (cooled from about 308 K to 293 K); digitized value presented with less than 1% error.

TABLE 42. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KCl

[Wavelength, λ, μm; Refractive Index, n]

λ	n	λ	n	λ	n	λ	n	λ	n	λ	n
CURVE 1		CURVE 3 (cont.)		CURVE 7 (cont.)		CURVE 9 (cont.)		CURVE 11 (cont.)		CURVE 12 (cont.)	
T = 298. 0 K		T = 321.2 K		T = 298.0 K		T = 293.2 K		T = 291.2 K		T = 300.0 K	
0.160	1.75	0.2312	1.6203	18.8	1.401	0.36631	1.51889*	0.197	1.73114	0.0512	0.68*
0.160	1.80	0.2537	1.5851	19.7	1.398	0.39064	1.51286	0.198	1.72432	0.0514	0.68*
0.161	1.89	0.257	1.5809	20.4	1.389	0.40466	1.50993*	0.200	1.71864	0.0517	0.68*
0.162	1.96	0.265	1.5721	21.1	1.379	0.43583	1.50454*	0.204	1.69811	0.0519	0.68*
0.163	1.86	0.275	1.5634	22.2	1.374	0.48613	1.49818	0.208	1.68302	0.0530	0.68*
0.165	1.96	0.280	1.5587	23.1	1.363	0.54607	1.49293*	0.211	1.67275	0.0534	0.68*
0.165	2.14*	0.296	1.5471	24.1	1.352	0.58756	1.49028*	0.214	1.66182*	0.0537	0.68*
0.167	2.07*	0.313	1.5380	24.9	1.336	0.58930	1.49020*	0.219	1.64739*	0.0538	0.69*
0.167	2.13*	0.334	1.5286	25.7	1.317	0.65628	1.48700	0.224	1.63606	0.0539	0.69*
0.169	2.03*	0.365	1.5181	26.7	1.300	0.70652	1.48519	0.231	1.62037*	0.0541	0.71*
0.170	2.14*	0.405	1.5089	27.2	1.275	0.72814	1.48454	0.242	1.60041	0.0556	0.77*
0.170	2.07*	0.436	1.5036	28.2	1.254	0.76820	1.48349	0.250	1.58973	0.0561	0.77*
0.171	1.95	0.492	1.4967	28.8	1.226	0.81095	1.48257	0.257	1.58119*	0.0564	0.77*
0.173	2.05*	0.546	1.4919			0.84247	1.48196	0.263	1.57477	0.0566	0.76*
0.175	1.99	0.577	1.4899	CURVE 8		0.91230	1.48085	0.267	1.57038*	0.0569	0.74*
0.175	1.89	0.615	1.4875	T = 298.0 K		1.01398	1.47950	0.274	1.56380*	0.0571	0.72*
0.176	1.93					1.08303	1.47878	0.281	1.55830	0.0577	0.66*
0.178	1.84	CURVE 4		18.7	1.403			0.291	1.55134	0.0579	0.64*
0.180	1.86	T = 298.0 K		19.6	1.392	CURVE 10		0.308	1.54130	0.0582	0.65*
0.181	1.79			20.8	1.385	T = 288.2 K		0.312	1.53920*	0.0583	0.67*
0.181	1.86	126.0	2.38	21.7	1.367			0.340	1.52720	0.0585	0.69*
0.183	1.78	126.1	2.46	22.2	1.376	0.58932	1.490443*	0.358	1.52109	0.0586	0.72*
0.185	1.78	146.9	2.37	23.1	1.355	0.78576	1.483282	0.394	1.51213	0.0588	0.76*
0.185	1.71	147.3	2.19	23.2	1.357	0.88398	1.481422	0.410	1.50901	0.0590	0.83*
0.186	1.76	174.2	2.39	24.3	1.337	0.98220	1.480084	0.434	1.50497*	0.0593	0.89*
0.187	1.74	174.2	2.28	24.5	1.339	1.1786	1.478311	0.441	1.50384	0.0599	0.93*
0.187	1.67	200.4	2.28	27.2	1.293	1.7680	1.475890	0.467	1.50038	0.0602	0.92*
0.191	1.66	231.3	2.34	27.3	1.294	2.3573	1.474751	0.486	1.49835*	0.0604	0.90*
0.194	1.66			28.2	1.260	2.9466	1.473834	0.508	1.49614	0.0605	0.87*
0.194	1.62	CURVE 5		28.3	1.261	3.5359	1.473049	0.533	1.49404	0.0606	0.85*
0.196	1.64	T = 298.0 K				4.7146	1.471122	0.546	1.49313	0.0608	0.82*
0.198	1.60			CURVE 9		5.3039	1.470013	0.560	1.49212	0.0611	0.76*
		137.0	2.26	T = 293.2 K		5.8932	1.468804	0.589	1.49038*	0.0614	0.72*
CURVE 2		158.1	2.28			8.2505	1.462726	0.627	1.48841	0.0615	0.67*
T = 298.0 K		186.3	2.31	0.21360	1.6645	8.8398	1.460858	0.643	1.48771	0.0617	0.67*
		226.2	2.30	0.22470	1.6345	10.0184	1.45672	0.656	1.48721*	0.0619	0.69*
0.589	1.48974			0.23998	1.60500	11.786	1.44919	0.670	1.48663	0.0620	0.72*
		CURVE 6		0.24828	1.59265	12.965	1.44346	0.768	1.48374	0.0621	0.74*
CURVE 3		T = 298.0 K		0.25365	1.58569*	14.144	1.43722			0.0623	0.76*
T = 321.2 K				0.26537	1.57270*	15.912	1.42617	CURVE 12		0.0626	0.81*
		190.3	2.33	0.26993	1.56833	17.680	1.41403	T = 300.0 K		0.0633	0.87*
0.2026	1.7077	214.8	2.31	0.28035	1.55939*					0.0639	0.92*
0.2063	1.6909			0.28936	1.55272	CURVE 11		0.0477	0.57	0.0646	0.98*
0.2100	1.6767	CURVE 7		0.29676	1.54796*	T = 291.2 K		0.0479	0.57	0.0670	1.07*
0.2144	1.6620	T = 298.0 K		0.30215	1.54468			0.0481	0.58	0.0685	1.05*
0.2194	1.6474			0.31317	1.53875*	0.185	1.82704	0.0486	0.60	0.0689	1.03*
0.2265	1.6303	18.2	1.409	0.33415	1.52949*	0.186	1.81847	0.0496	0.64	0.0693	1.02*

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* Not shown in figure.

TABLE 42. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KCl (continued)

[Wavelength, λ, μm; Refractive Index, n]

CURVE 12 (cont.)
T = 300.0 K

λ	n
0.0709	1.01*
0.0717	1.02*
0.0721	1.03*
0.0725	1.00*
0.0729	1.06*
0.0742	1.08*
0.0761	1.04*
0.0765	1.02*
0.0770	1.00*
0.0805	0.90*
0.0821	0.86*
0.0838	0.82*
0.0855	0.80*
0.0879	0.76*
0.0892	0.75*
0.0905	0.76*
0.0925	0.75*
0.0939	0.75*
0.0946	0.75*
0.0954	0.74*
0.0957	0.75*
0.0961	0.75*
0.0965	0.73*
0.0969	0.81*
0.0973	0.86*
0.0976	0.91*
0.0980	0.97*
0.0984	1.05*
0.0988	1.21*
0.1000	1.35
0.1008	1.41
0.1033	1.50
0.1069	1.50
0.1088	1.51
0.1097	1.50
0.1107	1.48
0.1117	1.48*
0.1123	1.48*
0.1127	1.48
0.1137	1.43
0.1148	1.39
0.1170	1.32
0.1181	1.29
0.1192	1.28
0.1198	1.29*
0.1204	1.28*
0.1216	1.23
0.1228	1.18
0.1240	1.11
0.1246	1.05
0.1250	1.01
0.1255	0.96*
0.1260	0.89*
0.1265	0.81*
0.1272	0.72*
0.1278	0.67*
0.1286	0.67*
0.1292	0.71*
0.1294	0.75*
0.1297	0.79*
0.1300	0.84*
0.1301	0.86*
0.1302	0.89*
0.1304	0.92*
0.1305	0.95*
0.1306	0.99*
0.1308	1.03
0.1313	1.18
0.1319	1.34
0.1326	1.53
0.1333	1.68
0.1348	1.87
0.1378	1.90
0.1393	1.85
0.1425	1.76
0.1442	1.71
0.1450	1.69
0.1459	1.67
0.1467	1.68
0.1472	1.69
0.1476	1.70
0.1480	1.71
0.1485	1.71*
0.1494	1.68
0.1512	1.54
0.1521	1.45
0.1531	1.34
0.1534	1.29
0.1536	1.27
0.1538	1.24
0.1542	1.19
0.1546	1.14
0.1550	1.11
0.1554	1.08
0.1560	1.04
0.1569	1.02
0.1579	1.06
0.1590	1.14
0.1594	1.19
0.1598	1.26
0.1600	1.31
0.1602	1.36
0.1604	1.42
0.1606	1.48
0.1608	1.55
0.1610	1.55*
0.1612	1.65
0.1614	1.71
0.1616	1.80*
0.1619	2.00
0.1621	2.10*
0.1623	2.20*
0.1625	2.30*
0.1627	2.40*
0.1629	2.49*
0.1631	2.58*
0.1636	2.76*
0.1642	2.97*
0.1653	3.15*
0.1664	3.08*
0.1675	2.83*
0.1698	2.42*
0.1722	2.23*
0.1771	2.03*
0.1837	1.88
0.1907	1.80
0.2066	1.69*
0.2254	1.63*
0.2480	1.59*

CURVE 13
T = 1049.2 K

λ	n
0.4047	1.395
0.5000	1.390
0.6000	1.380
0.6943	1.376

CURVE 14
T = 1054.2 K

λ	n
0.5460	1.383

CURVE 15
T = 300.0 K

λ	n
26.455	1.3740
32.468	1.2078*
38.610	0.9863*
40.650	0.8872*
42.194	0.8872*
43.2900	0.7834*
44.444	0.6730*
45.249	0.5470*
45.872	0.5470*
46.512	0.7145*
47.847	0.7145*
50.000	0.5546*
52.083	0.4266*
54.054	0.3750*
59.172	0.1570*
60.606	0.1570*
63.694	0.2249*
64.935	0.3006*
70.922	6.2806*
74.074	4.6774*
78.740	3.5975*
85.470	2.9648*
97.087	2.6915*
121.951	2.4099*
222.22	2.3014

CURVE 16
T = 298.0 K

λ	n
0.6328	1.33134

CURVE 17
T = 298.0 K

λ	n
0.6328	1.33174*

CURVE 18
T = 298.0 K

λ	n
0.6328	1.33227*

CURVE 19
T = 295.0 K

λ	n
0.1070	1.66
0.1111	1.57
0.1176	1.33
0.1196	1.38
0.1230	1.23
0.1254	1.06
0.1272	0.82*
0.1286	0.82*
0.1298	1.15
0.1320	1.84
0.1332	2.04*
0.1355	2.17*
0.1399	1.89
0.1494	1.69
0.1550	1.15
0.1560	1.13
0.1561	1.10
0.1571	1.13*
0.1585	1.24
0.1592	1.31*
0.1596	1.44
0.1608	1.80*
0.1621	2.39*
0.1625	2.45*
0.1642	2.93*
0.1644	3.02*
0.1647	3.05*
0.1650	3.04*
0.1655	2.98*
0.1673	2.63*
0.1680	2.56*
0.1691	2.41*
0.1715	2.22*
0.1717	2.21*
0.1744	2.10*
0.1781	1.97
0.1807	1.91
0.1900	1.81
0.2033	1.70
0.2046	1.70*
0.2138	1.66

CURVE 20
T = 78. K

λ	n
0.1598	2.80*
0.1604	4.45*
0.1612	3.63*
0.1619	3.30*
0.1627	3.03*
0.1638	2.78*
0.1651	2.55*
0.1671	2.35*
0.1691	2.20*
0.1722	2.06*
0.1774	1.95
0.2033	1.70*
0.2138	1.66*

CURVE 21
T = 10.0 K

λ	n
0.1060	1.82
0.1080	1.82
0.1116	1.70
0.1127	1.73
0.1163	1.49
0.1182	1.40
0.1206	1.40
0.1229	1.28
0.1252	0.98*
0.1266	0.63*
0.1274	0.58*
0.1286	0.57*
0.1297	0.84*
0.1311	1.88
0.1322	2.27*
0.1337	2.27*
0.1372	1.94
0.1442	1.74
0.1447	1.81
0.1459	1.76
0.1467	1.90
0.1476	1.82
0.1519	0.94*
0.1534	0.76*
0.1553	0.88*
0.1562	1.18
0.1565	1.00
0.1565	1.21
0.1571	2.34*

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* Not shown in figure.

TABLE 42. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KCl (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 21 (cont.) T = 10.0 K	
0.1575	3.88*
0.1577	3.92*
0.1588	2.37*
0.1588	2.39*
0.1590	2.34*
0.1591	2.43*
0.1596	5.02*
0.1598	5.00*
0.1604	4.00*
0.1608	3.43*
0.1608	3.60*
0.1614	3.17*
0.1625	2.86*
0.1627	2.80*
0.1638	2.61*
0.1655	2.40*
0.1660	2.36*
0.1678	2.21*
0.1701	2.11*
0.1720	2.05*
0.1774	1.95*
0.1784	1.92
0.2033	1.70*
0.2066	1.69*
0.2138	1.66
CURVE 22 T = 298.0 K	
0.0067	0.99874
0.0113	0.99578
CURVE 23 T = 291.2 K	
0.434	1.5048*
0.589	1.4900*
7.08	1.4653
20.60	1.3882
22.5	1.369
CURVE 24 T = 291.2 K	
10.01	1.4561
14.14	1.4362
18.10	1.4108
CURVE 25 T = 291.2 K	
0.434	1.5048*
0.486	1.4981*
0.589	1.4900*
0.656	1.4868*
0.802	1.4829*
0.845	1.4819*
0.893	1.4809*
0.944	1.4802
1.003	1.4795*
1.070	1.4789
1.145	1.4782
1.234	1.4776
1.337	1.4771
1.458	1.4766
1.603	1.4761
1.781	1.4755
2.005	1.4749
2.291	1.4742
2.673	1.4732
3.209	1.4722
3.561	1.4717
4.011	1.4712
4.577	1.4708
5.345	1.4701*
6.412	1.4693
8.022	1.4681
CURVE 26 T = 291.2 K	
0.434	1.5048*
0.486	1.4981*
0.589	1.4900*
0.656	1.4868*
0.940	1.4805*
1.584	1.4761
2.23	1.4745
3.20	1.4727*
4.05	1.4716*
4.81	1.4705
5.31	1.4695*
5.95	1.4682*
7.08	1.4653*
CURVE 27 T = 288.2 K	
0.982	1.47967*
1.179	1.47747*
1.473	1.47644*
1.571	1.47563*
1.768	1.47542*
2.357	1.47422*
2.947	1.47365*
3.200	1.47268*
4.125	1.47156
4.714	1.47054*
5.137	1.47008
5.304	1.46938*
5.471	1.46937
5.893	1.46824*
6.482	1.46729
7.080	1.46547*
7.661	1.46393
8.840	1.46005*
9.006	1.45975
10.193	1.45437*
11.197	1.45166
CURVE 28 T = 298.0 K	
0.4358	1.5046
0.5461	1.4932
0.5893	1.4904
CURVE 29 T = 1073.2 K	
0.5461	1.392
CURVE 30 T = 291.2 K	
0.441	1.50377
0.508	1.49606
0.533	1.49397
0.643	1.48764
CURVE 31 T = 295.2 K	
0.2313	1.62022*
0.2573	1.58106*
CURVE 31 (cont.) T = 295.2 K	
0.2749	1.56364*
0.3404	1.52705*
0.4416	1.50378*
0.4678	1.50018*
0.5086	1.49384
CURVE 32 T = 290.7 K	
0.589	1.4904
CURVE 33 T = 293.2 K	
0.589	1.490294
CURVE 36 T = 293. K	
0.397	1.51061
0.431	1.50542
0.486	1.49830
0.527	1.49455
0.589	1.49031
0.656	1.48713
0.687	1.48597
0.760	1.48377
CURVE 37 T = 298. K	
0.486	1.4976
0.589	1.48965
0.656	1.4865
CURVE 38* T = 290.0 K	
0.4358	1.5053
0.5086	1.4961
0.5461	1.4934
0.5780	1.4911
0.5893	1.4907
0.6438	1.4980
CURVE 39* T = 4.0 K	
0.4358	1.5122
0.5086	1.5036
0.5461	1.5008
0.5780	1.4986
0.5893	1.4981
0.6438	1.4954
CURVE 40* T = 281.0–308.0 K	
0.589	1.4913

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*Not shown in figure.

TABLE 43. EXPERIMENTAL DATA ON dn/dT OF KCl

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 2	
T_m = 295.0 K	
0.589	-0.0001*
CURVE 9	
T_m = 293.2 K	
0.21360	0.0
0.22470	-1.0
0.23998	-1.9
0.24828	-2.1
0.25365	-1.6
0.26537	-2.7
0.26993	-2.8
0.28035	-3.1
0.28936	-3.0
0.29676	-3.4
0.30215	-3.5
0.31317	-3.5
CURVE 9 (cont.)	
T_m = 293.2 K	
0.33415	-3.5
0.36631	-3.5*
0.39064	-3.5
0.40466	-3.5
0.43583	-3.5*
0.48613	-3.5
0.54607	-3.5
0.58756	-3.5*
0.58930	-3.5*
0.65628	-3.5
0.70652	-3.5
0.72814	-3.3
0.76820	-3.9
0.81095	-3.1
0.84247	-3.3
0.91230	-3.0
1.01398	-3.3
1.08303	-3.4
CURVE 10	
T_m = 289.0 K	
0.58932	-3.4*
CURVE 32*	
T_m = 333.0 K	
0.434	-3.449
0.486	-3.498
0.589	-3.575
0.656	-3.575
CURVE 34	
T_m = 332.0 K	
0.589	-3.664
1.4	-3.646
2.6	-3.625
3.2	-3.608
CURVE 34 (cont.)	
T_m = 332.0 K	
3.65	-3.528
4.0	-3.475
5.0	-3.572
5.1	-3.540
6.55	-3.330
8.85	-3.114
21.0	-0.63
CURVE 35	
T_m = 258.0 K	
0.589	-2.52
0.589	-2.64*
0.589	-2.75*
0.589	-2.81*
0.589	-3.14*
1.0	-2.78
CURVE 35 (cont.)	
T_m = 258.0 K	
1.9	-2.86
2.0	-2.91
2.65	-2.90
2.95	-3.07
3.25	-2.82
3.25	-3.00
3.75	-2.79
4.75	-2.60
4.75	-2.78*
5.75	-2.57
6.75	-2.47
CURVE 36*	
T_m = 328.0 K	
0.486	-3.46
0.589	-3.46
0.687	-3.49
CURVE 41	
T_m = 300.0 K	
10.6	-3.9

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* Not shown in figure.

TABLE 44. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR KCl

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Rubens, H. and Nichols, E.F. [58] 1897	0.434-22.5 μm 291 K	$n^2 = 1.5329 + \frac{0.6410\,\lambda^2}{\lambda^2 - (0.1530)^2} + \frac{2.3792\,\lambda^2}{\lambda^2 - (67.21)^2}$
Martens, F.F. [54] 1901	0.185-0.768 μm 291 K	$n^2 = 1.25841 + \frac{0.672011\,\lambda^2}{\lambda^2 - (0.115265)^2} + \frac{0.244603\,\lambda^2}{\lambda^2 - (0.160730)^2} + \frac{1.93343\,\lambda^2}{\lambda^2 - (61.1)^2}$
Paschen, F. [55] 1908	0.58-17.70 μm 288 K	$n^2 = 1.200970 + \frac{0.700711\,\lambda^2}{\lambda^2 - (0.109125)^2} + \frac{0.273286\,\lambda^2}{\lambda^2 - (0.159859)^2} + \frac{1.691652\,\lambda^2}{\lambda^2 - (57.380)^2}$
Harting, H. [30] 1943	0.213-1.083 μm 293 K	$n = 1.47298 + \frac{0.00545}{(\lambda - 0.1045)^{1.59}}$
Radhakrishnan, T. [48] 1948	0.185-22.5 μm 291 K	$n^2 = 1.243412 + \frac{0.357362\,\lambda^2}{\lambda^2 - 0.01000} + \frac{0.037616\,\lambda^2}{\lambda^2 - 0.017161} + \frac{0.198086\,\lambda^2}{\lambda^2 - 0.026244} + \frac{2.514254\,\lambda^2}{\lambda^2 - 4998.5}$
Present work 1975	0.18-35.0 μm 293 K	$n^2 = 1.26486 + \frac{0.30523\,\lambda^2}{\lambda^2 - (0.100)^2} + \frac{0.41620\,\lambda^2}{\lambda^2 - (0.131)^2} + \frac{0.18870\,\lambda^2}{\lambda^2 - (0.162)^2} + \frac{2.620\,\lambda^2}{\lambda^2 - (70.42)^2}$

3.11. Potassium Bromide, KBr

Potassium bromide has optical characteristics similar to those of rock salt, but, having a higher molecular weight, it transmits further into the infrared. Crystals up to 11 kg are available from Harshaw Chemical Company. Very pure samples have been obtained and they can be cleaved easily. KBr is of interest to designers of optical instruments because of its transparency in the infrared region. Although KBr is transparent from 0.20 to 42 μm, the useful region is from 0.3 to 30 μm because strong absorption occurs near the transparency limits.

Measurements of the refractive index of KBr date back to 1874. For the transparent region experimental values were obtained mainly by the deviation method. For low ultraviolet and far infrared wavelengths there were no measurements until 1967, when Vishnevskii, et al. [90] reported their results for the region from 0.170 to 0.197 μm and Handi, et al. [16] reported results for the region 35 to 770 μm.

After carefully reviewing this work, we have selected the data sets reported by Spindler and Rodney [96], Stephens, et al. [97], Forrest [98], Harting [30], and Gundelach [99] as the basis of the generation of reference data. Data sets which were not selected either reported poor values or were determined by inadequate methods. Data for thin films are not consistent with those for the bulk material. The properties of the thin film vary widely with the surface conditions, the treatment of the sample and the thickness and aging of the film. As a consequence, the thin film data are useless unless a protecting coating was deposited to preserve its characteristics. Data for the absorption regions were not included in the analysis, but are presented here for completeness. Note that the selected data were obtained at different temperatures; the effect of temperature variations should be corrected before they were used for data analysis.

Data on the temperature coefficient of refractive index, dn/dT, of KBr are very scanty and limited. Only five sets were found, covering the wavelength range from 0.26 to 1.1 μm. Among the available data, those of Spindler and Rodney [96] are reasonably good, and those of Harting [11] show a wide scatter and are not internally consistent. The single value of Stephen, et al. [97] is a rough averaged value of dn/dT in a wavelength range of 0.404 to 25.14 μm at 295 K, and is consistent with the results of Spindler and Rodney. The single value reported by Forrest [98] is the average value of dn/dT in a wavelength range of 0.40 to 0.77 μm at a mean temperature of 301 K and is consistent with the other data sets. The single measurement of Korth [100] is not accurate. The available data on dn/dT are not suitable for a curve-fitting calculation, because the wavelength coverage of the acceptable data is not wide enough to make evident the effects due to the thermal shifts of absorption peaks. However, by use of our novel findings, reasonable estimation of dn/dT for a wide wavelength range is not a problem. The empirical parameter values in table 5 were used to construct the dn/dT for a wide wavelength range is not a problem. The empirical parameter values in table 5 were used to construct the dn/dT formula of KBr for the whole transparent region:

$$2n\frac{dn}{dT}=-11.61(n^2-1)+0.39+\frac{3.944\lambda^4}{(\lambda^2-0.03497)^2}+\frac{182.88\lambda^4}{(\lambda^2-7694.80)^2}, \qquad (43)$$

where dn/dT is in units of $10^{-5}\mathrm{K}^{-1}$ and λ in μm.

A comparison of the values calculated by eq (43) and the existing data is shown in figure 40. It appears that the calculated values are in general higher than the experimental values, but we have reason to believe that eq (43) predicts correct dn/dT values for the whole transparent region.

1. It has been observed in halide crystals that the absolute value of dn/dT increases with increasing temperature. Spindler and Rodney obtained dn/dT at 295 K; our dn/dT, for 293 K, should be located above their values. This is clearly shown in figure 40, where the calculated curve is above and roughly parallel to curve 5. Although the separation of these two curves seems too large to account for only two degrees in temperature difference, it is within the uncertainties in our calculation and the experiment.

2. In the case of CsI, the empirically constructed formula predicts correct dn/dT values in the long wavelength region, as discussed in subsection 3.20. One can expect this is to be the case here.

Spindler and Rodney derived an empirical relation (given in table 49) between dn/dT and wavelength, based on their experimental results. This expression indicated that dn/dT increases with increasing wavelength in the visible region 0.4 to 0.71 μm, but no attempt was made to derive dn/dT beyond the visible region.

Equation (43) was used to make temperature corrections to the selected data sets which were obtained at temperatures other than 293 K.

Quite a few dispersion equations have been proposed from time to time by a number of authors, and in various forms. Table 49 displays a few of typical formulas. They have all been reduced, wherever possible, to standard forms so as to facilitate a visual comparison. From the information in tables 3 and 49, preliminary parameters for least-squares fitting were obtained. The calculation yielded the following dispersion equation for KBr at 293 K in the transparent region, 0.20 to 42.0 μm.

$$n^2=1.39408+\frac{0.79221\lambda^4}{\lambda^2-(0.146)^2}+\frac{0.01981\lambda^2}{\lambda^2-(0.173)^2}$$

$$+\frac{0.15587\lambda^2}{\lambda^2-(0.187)^2}+\frac{0.17673\lambda^2}{\lambda^2-(60.61)^2}+\frac{2.06217\lambda^2}{\lambda^2-(87.72)^2}, \quad (44)$$

where λ is in units of μm.

Equations (43) and (44) were used to generate the recommended values. The property values are given to more decimal places than needed simply for the purpose of tabular smoothness. In order to use the table of recommended values properly, the readers should follow the following criteria:

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.20– 0.25	3	0.006
0.25– 0.35	4	0.0005
0.35– 0.40	4	0.0002
0.40–20.00	4	0.0001
20.00–26.00	4	0.0005
26.00–35.00	3	0.006
35.00–42.00	3	0.008

For *dn*/*dT*:

0.20– 0.25	1	0.9
0.25– 4.0	1	0.3
4.00–30.00	1	0.5
30.00–42.00	1	0.9

TABLE 45. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KBr AT 293 K*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.200	2.09953	25.67845	50.07	0.350	1.61167	0.52777	-3.24	1.500	1.53999	0.00482	-3.72
0.202	2.05356	20.61414	37.98	0.355	1.60911	0.49906	-3.26	1.550	1.53976	0.00440	-3.72
0.204	2.01607	17.06858	29.63	0.360	1.60668	0.47251	-3.29	1.600	1.53955	0.00404	-3.72
0.206	1.98456	14.46978	23.60	0.365	1.60438	0.44792	-3.31	1.650	1.53935	0.00372	-3.72
0.208	1.95778	12.49468	19.11	0.370	1.60220	0.42509	-3.34	1.700	1.53917	0.00343	-3.72
0.210	1.93440	10.94910	15.66	0.375	1.60013	0.40386	-3.36	1.750	1.53901	0.00319	-3.72
0.212	1.91378	9.71023	12.95	0.380	1.59816	0.38409	-3.37	1.800	1.53886	0.00296	-3.72
0.214	1.89540	8.69715	10.78	0.385	1.59628	0.36566	-3.39	1.850	1.53871	0.00277	-3.72
0.216	1.87888	7.85462	9.02	0.390	1.59450	0.34844	-3.41	1.900	1.53858	0.00259	-3.72
0.218	1.86390	7.14379	7.56	0.395	1.59280	0.33234	-3.42	1.950	1.53845	0.00244	-3.72
0.220	1.85023	6.53661	6.34	0.400	1.59117	0.31725	-3.44	2.000	1.53833	0.00230	-3.73
0.222	1.83770	6.01238	5.32	0.410	1.58814	0.28983	-3.46	2.050	1.53822	0.00217	-3.73
0.224	1.82614	5.55551	4.44	0.420	1.58537	0.26560	-3.48	2.100	1.53812	0.00206	-3.73
0.226	1.81544	5.15407	3.69	0.430	1.58282	0.24410	-3.50	2.150	1.53802	0.00196	-3.73
0.228	1.80549	4.79875	3.04	0.440	1.58048	0.22494	-3.52	2.200	1.53792	0.00187	-3.73
0.230	1.79622	4.48221	2.47	0.450	1.57831	0.20780	-3.54	2.250	1.53783	0.00179	-3.73
0.232	1.78754	4.19859	1.97	0.460	1.57632	0.19242	-3.55	2.300	1.53774	0.00171	-3.73
0.234	1.77940	3.94313	1.53	0.470	1.57446	0.17856	-3.56	2.350	1.53766	0.00164	-3.73
0.236	1.77175	3.71196	1.14	0.480	1.57274	0.16605	-3.57	2.400	1.53758	0.00158	-3.73
0.238	1.76454	3.50187	0.79	0.490	1.57114	0.15471	-3.58	2.450	1.53750	0.00153	-3.73
0.240	1.75773	3.31020	0.48	0.500	1.56964	0.14441	-3.59	2.500	1.53742	0.00148	-3.72
0.242	1.75129	3.13471	0.20	0.510	1.56825	0.13503	-3.60	2.550	1.53735	0.00143	-3.72
0.244	1.74518	2.97352	-0.06	0.520	1.56694	0.12647	-3.61	2.600	1.53728	0.00139	-3.72
0.246	1.73939	2.82502	-0.29	0.530	1.56571	0.11863	-3.61	2.650	1.53721	0.00135	-3.72
0.248	1.73388	2.68782	-0.49	0.540	1.56456	0.11144	-3.62	2.700	1.53715	0.00132	-3.72
0.250	1.72863	2.56075	-0.68	0.550	1.56348	0.10484	-3.63	2.750	1.53708	0.00129	-3.72
0.252	1.72363	2.44277	-0.86	0.560	1.56247	0.09876	-3.63	2.800	1.53702	0.00126	-3.72
0.254	1.71885	2.33300	-1.02	0.570	1.56151	0.09316	-3.64	2.850	1.53695	0.00124	-3.72
0.256	1.71429	2.23064	-1.16	0.580	1.56060	0.08797	-3.64	2.900	1.53689	0.00121	-3.72
0.258	1.70993	2.13502	-1.30	0.590	1.55975	0.08318	-3.65	2.950	1.53683	0.00119	-3.72
0.260	1.70575	2.04554	-1.42	0.600	1.55894	0.07873	-3.65	3.000	1.53677	0.00117	-3.72
0.262	1.70174	1.96164	-1.54	0.620	1.55744	0.07077	-3.66	3.050	1.53672	0.00116	-3.72
0.264	1.69790	1.88286	-1.64	0.640	1.55610	0.06386	-3.66	3.100	1.53666	0.00114	-3.72
0.266	1.69421	1.80878	-1.74	0.660	1.55488	0.05784	-3.67	3.150	1.53660	0.00113	-3.72
0.268	1.69066	1.73900	-1.84	0.680	1.55378	0.05257	-3.67	3.200	1.53655	0.00112	-3.72
0.270	1.68725	1.67321	-1.92	0.700	1.55278	0.04793	-3.68	3.250	1.53649	0.00111	-3.72
0.272	1.68396	1.61107	-2.00	0.720	1.55186	0.04383	-3.68	3.300	1.53643	0.00110	-3.72
0.274	1.68080	1.55233	-2.08	0.740	1.55102	0.04019	-3.68	3.350	1.53638	0.00109	-3.72
0.276	1.67775	1.49673	-2.15	0.760	1.55025	0.03695	-3.69	3.400	1.53633	0.00108	-3.72
0.278	1.67481	1.44405	-2.21	0.780	1.54954	0.03406	-3.69	3.450	1.53627	0.00108	-3.72
0.280	1.67197	1.39408	-2.27	0.800	1.54888	0.03146	-3.69	3.500	1.53622	0.00107	-3.72
0.282	1.66923	1.34662	-2.33	0.820	1.54828	0.02913	-3.70	3.550	1.53616	0.00107	-3.72
0.284	1.66659	1.30152	-2.39	0.840	1.54772	0.02703	-3.70	3.600	1.53611	0.00106	-3.72
0.286	1.66403	1.25862	-2.44	0.860	1.54720	0.02513	-3.70	3.650	1.53606	0.00106	-3.72
0.288	1.66155	1.21776	-2.49	0.880	1.54671	0.02340	-3.70	3.700	1.53600	0.00106	-3.72
0.290	1.65915	1.17883	-2.53	0.900	1.54626	0.02183	-3.70	3.750	1.53595	0.00106	-3.72
0.292	1.65683	1.14170	-2.58	0.920	1.54584	0.02041	-3.70	3.800	1.53590	0.00106	-3.72
0.294	1.65459	1.10625	-2.62	0.940	1.54544	0.01910	-3.71	3.850	1.53585	0.00106	-3.72
0.296	1.65241	1.07240	-2.66	0.960	1.54507	0.01791	-3.71	3.900	1.53579	0.00106	-3.72
0.298	1.65030	1.04003	-2.69	0.980	1.54472	0.01682	-3.71	3.950	1.53574	0.00106	-3.72
0.300	1.64825	1.00907	-2.73	1.000	1.54440	0.01582	-3.71	4.000	1.53569	0.00106	-3.72
0.305	1.64338	0.93730	-2.81	1.050	1.54366	0.01364	-3.71	4.050	1.53563	0.00106	-3.72
0.310	1.63886	0.87271	-2.88	1.100	1.54303	0.01186	-3.71	4.100	1.53558	0.00107	-3.72
0.315	1.63465	0.81436	-2.94	1.150	1.54247	0.01039	-3.72	4.150	1.53553	0.00107	-3.72
0.320	1.63071	0.76146	-3.00	1.200	1.54198	0.00916	-3.72	4.200	1.53547	0.00107	-3.72
0.325	1.62702	0.71337	-3.05	1.250	1.54155	0.00812	-3.72	4.250	1.53542	0.00107	-3.72
0.330	1.62357	0.66952	-3.09	1.300	1.54117	0.00724	-3.72	4.300	1.53537	0.00108	-3.72
0.335	1.62032	0.62942	-3.13	1.350	1.54083	0.00649	-3.72	4.350	1.53531	0.00108	-3.71
0.340	1.61727	0.59266	-3.17	1.400	1.54052	0.00585	-3.72	4.400	1.53526	0.00109	-3.71
0.345	1.61439	0.55888	-3.21	1.450	1.54024	0.00530	-3.72	4.450	1.53520	0.00109	-3.71

TABLE 45. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KBr AT 293 K (continued)*

λ µm	n	-dn/dλ µm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ µm	n	-dn/dλ µm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ µm	n	-dn/dλ µm⁻¹	dn/dT 10⁻⁵ K⁻¹
4.500	1.53515	0.00110	-3.71	9.200	1.52812	0.00197	-3.65	18.800	1.49798	0.00444	-3.23
4.550	1.53509	0.00110	-3.71	9.300	1.52792	0.00199	-3.64	19.000	1.49709	0.00450	-3.22
4.600	1.53504	0.00111	-3.71	9.400	1.52772	0.00202	-3.64	19.200	1.49618	0.00456	-3.20
4.650	1.53498	0.00111	-3.71	9.500	1.52751	0.00204	-3.64	19.400	1.49526	0.00462	-3.19
4.700	1.53493	0.00112	-3.71	9.600	1.52731	0.00206	-3.64	19.600	1.49433	0.00468	-3.17
4.750	1.53487	0.00112	-3.71	9.700	1.52710	0.00208	-3.63	19.800	1.49339	0.00475	-3.15
4.800	1.53482	0.00113	-3.71	9.800	1.52689	0.00211	-3.63	20.000	1.49243	0.00481	-3.14
4.850	1.53476	0.00114	-3.71	9.900	1.52668	0.00213	-3.63	20.500	1.48999	0.00497	-3.09
4.900	1.53470	0.00114	-3.71	10.000	1.52647	0.00215	-3.63	21.000	1.48746	0.00514	-3.05
4.950	1.53464	0.00115	-3.71	10.200	1.52603	0.00220	-3.62	21.500	1.48485	0.00531	-3.00
5.000	1.53459	0.00116	-3.71	10.400	1.52559	0.00224	-3.62	22.000	1.48215	0.00548	-2.95
5.100	1.53447	0.00117	-3.71	10.600	1.52514	0.00229	-3.61	22.500	1.47937	0.00566	-2.89
5.200	1.53435	0.00119	-3.71	10.800	1.52467	0.00233	-3.61	23.000	1.47650	0.00584	-2.83
5.300	1.53423	0.00120	-3.71	11.000	1.52420	0.00238	-3.60	23.500	1.47353	0.00602	-2.77
5.400	1.53411	0.00122	-3.71	11.200	1.52372	0.00243	-3.60	24.000	1.47047	0.00622	-2.71
5.500	1.53399	0.00123	-3.70	11.400	1.52323	0.00247	-3.59	24.500	1.46732	0.00641	-2.64
5.600	1.53386	0.00125	-3.70	11.600	1.52273	0.00252	-3.58	25.000	1.46406	0.00662	-2.57
5.700	1.53374	0.00127	-3.70	11.800	1.52222	0.00257	-3.58	25.500	1.46070	0.00682	-2.49
5.800	1.53361	0.00128	-3.70	12.000	1.52171	0.00261	-3.57	26.000	1.45723	0.00704	-2.41
5.900	1.53348	0.00130	-3.70	12.200	1.52118	0.00266	-3.57	26.500	1.45366	0.00726	-2.32
6.000	1.53335	0.00132	-3.70	12.400	1.52064	0.00271	-3.56	27.000	1.44998	0.00748	-2.23
6.100	1.53322	0.00134	-3.70	12.600	1.52009	0.00276	-3.55	27.500	1.44618	0.00772	-2.13
6.200	1.53308	0.00136	-3.70	12.800	1.51954	0.00281	-3.55	28.000	1.44226	0.00796	-2.03
6.300	1.53295	0.00137	-3.69	13.000	1.51897	0.00286	-3.54	28.500	1.43821	0.00821	-1.92
6.400	1.53281	0.00139	-3.69	13.200	1.51840	0.00291	-3.53	29.000	1.43404	0.00847	-1.81
6.500	1.53267	0.00141	-3.69	13.400	1.51781	0.00296	-3.52	29.500	1.42974	0.00873	-1.68
6.600	1.53253	0.00143	-3.69	13.600	1.51721	0.00301	-3.52	30.000	1.42531	0.00901	-1.56
6.700	1.53238	0.00145	-3.69	13.800	1.51661	0.00306	-3.51	30.500	1.42073	0.00930	-1.42
6.800	1.53224	0.00147	-3.69	14.000	1.51599	0.00311	-3.50	31.000	1.41601	0.00959	-1.27
6.900	1.53209	0.00149	-3.69	14.200	1.51536	0.00316	-3.49	31.500	1.41114	0.00990	-1.12
7.000	1.53194	0.00151	-3.68	14.400	1.51473	0.00321	-3.48	32.000	1.40611	0.01022	-0.96
7.100	1.53179	0.00153	-3.68	14.600	1.51408	0.00326	-3.47	32.500	1.40091	0.01055	-0.79
7.200	1.53163	0.00155	-3.68	14.800	1.51342	0.00331	-3.47	33.000	1.39555	0.01090	-0.61
7.300	1.53148	0.00157	-3.68	15.000	1.51275	0.00337	-3.46	33.500	1.39001	0.01126	-0.42
7.400	1.53132	0.00159	-3.68	15.200	1.51208	0.00342	-3.45	34.000	1.38429	0.01163	-0.21
7.500	1.53116	0.00161	-3.68	15.400	1.51139	0.00347	-3.44	34.500	1.37838	0.01202	0.0
7.600	1.53100	0.00163	-3.68	15.600	1.51069	0.00352	-3.43	35.000	1.37227	0.01243	0.2
7.700	1.53083	0.00165	-3.67	15.800	1.50998	0.00358	-3.42	35.500	1.36595	0.01286	0.4
7.800	1.53067	0.00167	-3.67	16.000	1.50926	0.00363	-3.41	36.000	1.35941	0.01331	0.73
7.900	1.53050	0.00169	-3.67	16.200	1.50852	0.00369	-3.40	36.500	1.35264	0.01377	1.01
8.000	1.53033	0.00171	-3.67	16.400	1.50778	0.00374	-3.39	37.000	1.34563	0.01427	1.30
8.100	1.53015	0.00174	-3.67	16.600	1.50703	0.00380	-3.37	37.500	1.33837	0.01478	1.60
8.200	1.52998	0.00176	-3.67	16.800	1.50626	0.00385	-3.36	38.000	1.33084	0.01533	1.93
8.300	1.52980	0.00178	-3.66	17.000	1.50548	0.00391	-3.35	38.500	1.32304	0.01590	2.28
8.400	1.52962	0.00180	-3.66	17.200	1.50470	0.00397	-3.34	39.000	1.31494	0.01650	2.65
8.500	1.52944	0.00182	-3.66	17.400	1.50390	0.00402	-3.33	39.500	1.30653	0.01714	3.04
8.600	1.52926	0.00184	-3.66	17.600	1.50309	0.00408	-3.31	40.000	1.29779	0.01782	3.46
8.700	1.52907	0.00186	-3.66	17.800	1.50227	0.00414	-3.30	40.500	1.28870	0.01854	3.91
8.800	1.52889	0.00189	-3.65	18.000	1.50143	0.00420	-3.29	41.000	1.27924	0.01930	4.39
8.900	1.52870	0.00191	-3.65	18.200	1.50059	0.00426	-3.27	41.500	1.26939	0.02012	4.90
9.000	1.52851	0.00193	-3.65	18.400	1.49973	0.00432	-3.26	42.000	1.25911	0.02099	5.45
9.100	1.52831	0.00195	-3.65	18.600	1.49886	0.00438	-3.25				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.11. The number of digits with an overstrike are not relevant to accuracy of the data.

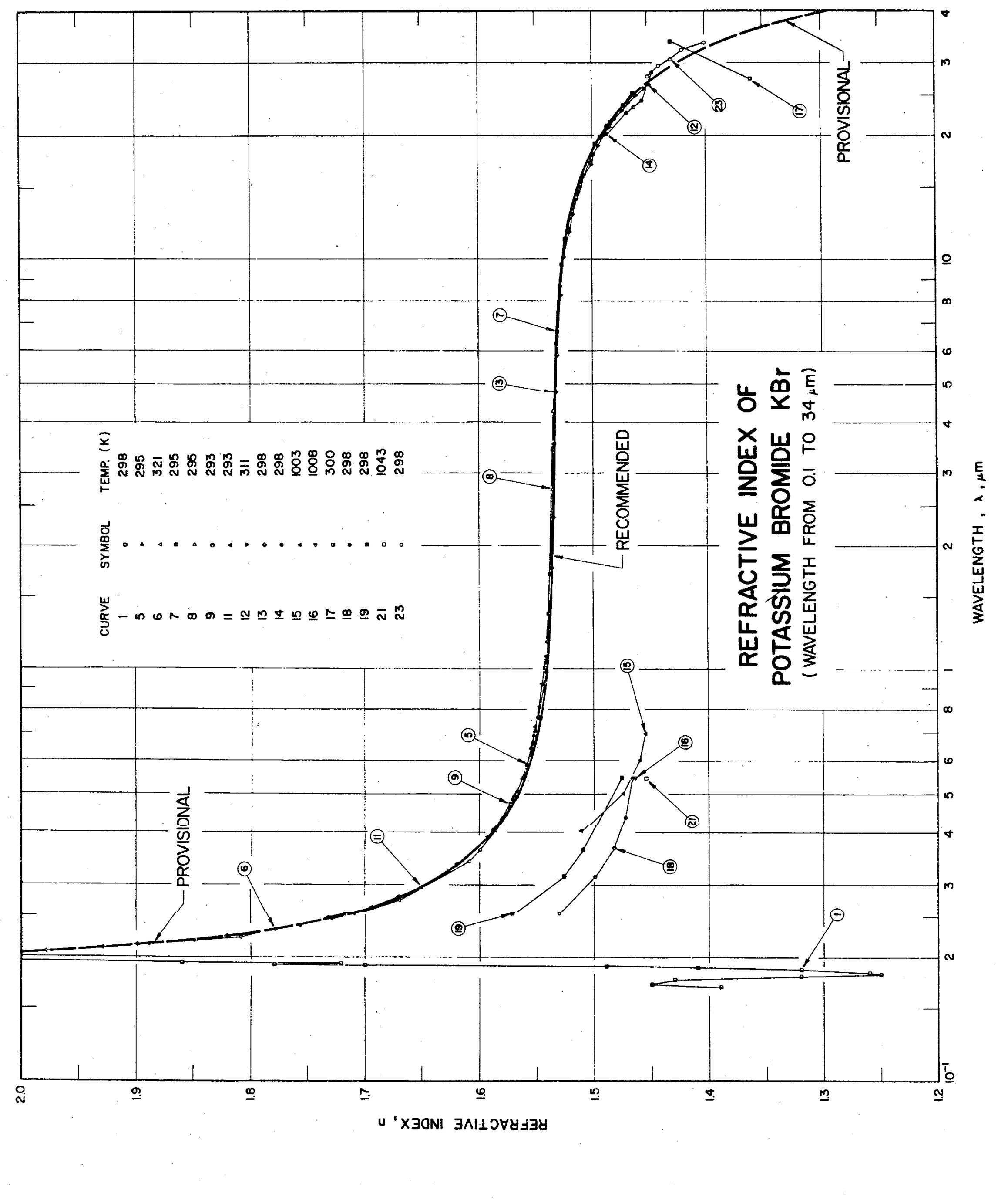

FIGURE 37. Refractive Index of KBr (transparent region)

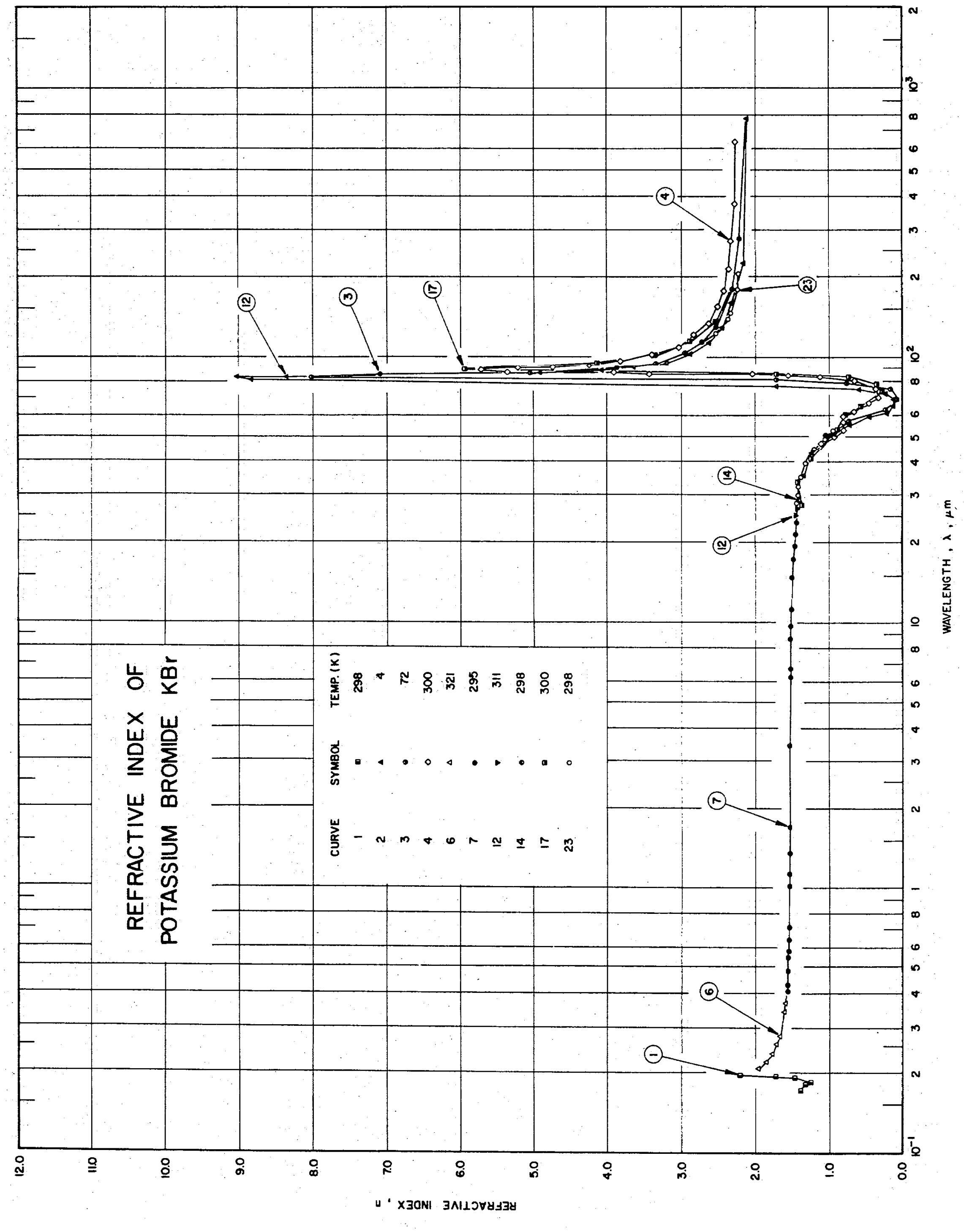

FIGURE 38. Refractive Index of KBr

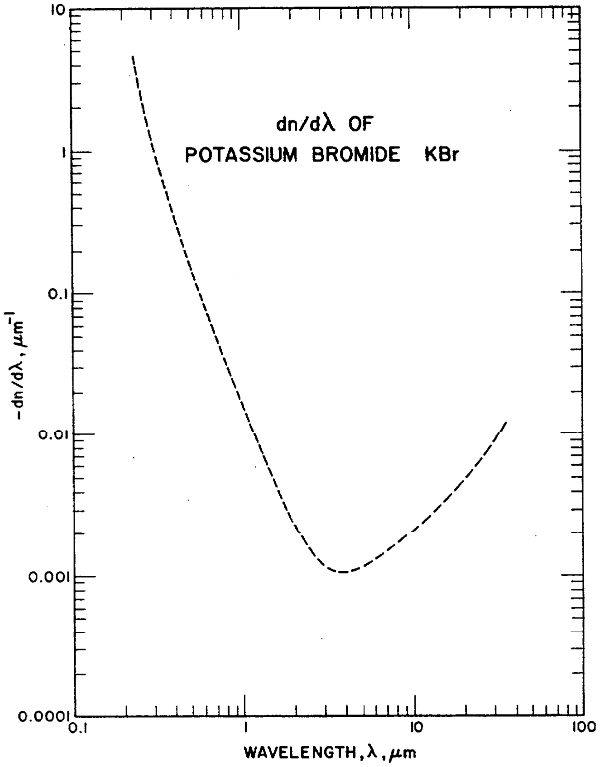

FIGURE 39. dn/dλ of KBr

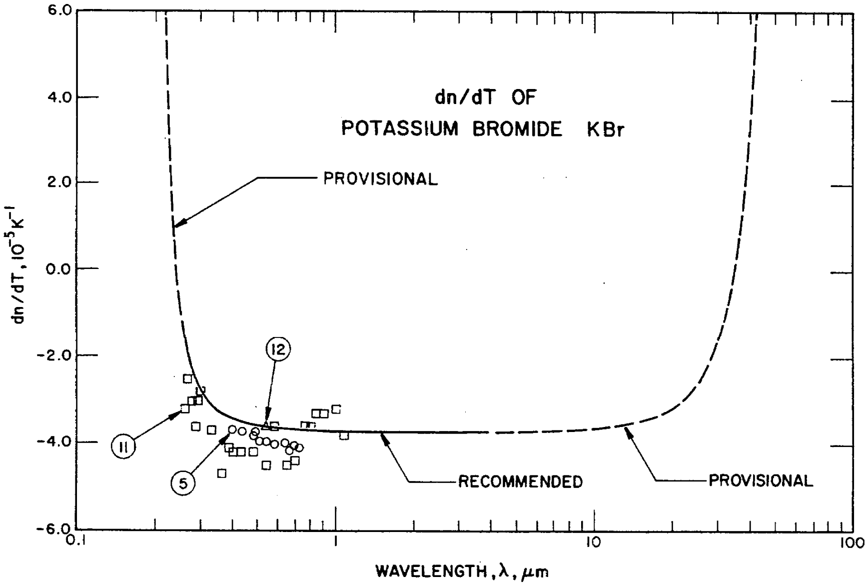

FIGURE 40. dn/dT of KBr

TABLE 46. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KBr

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	90	Vishnevskii, V.N., Kulik, L.N., and Romanyuk, N.A.	1967	R	0.170-0.197	298	Single crystal; grown in an open furnace by the Kyropolous method; specimens freshly cleaved in vacuum; reflection spectra recorded photographically for incident angles of 20°, 45°, 70° and 75° at room temperature; refractive indices were obtained from graphical solutions to the Fresnel equations; data extracted from a figure.
2	16	Handi, A., Claudel, J., Chanal, D., Strimer, P., and Vergnet, P.	1967	R	35-770	4	Crystal; sample was cut into a prism shape to avoid interference on reflectivity measurements; reflection spectrum was recorded at an incident angle of 15° and analyzed with Lorentz two linear damped oscillars model; data extracted from a smooth curve.
3	16	Handi, A., et al.	1967	R	35-770	72	Similar to above.
4	16	Handi, A., et al.	1967	R	47-625	300	Similar to above.
5	96	Spindler, R.J. and Rodney, W.S.	1952	D	0.40-0.71	295	Crystal; grown by the Harshaw Chemical Corporation; prismatic specimens of apex angle 60°, 60°, and 30° respectively; refractive index determinations were made at temperatures near 17°, 22°, and 27 C for 11 spectral lines and the values of dn/dT were then derived; all observed data were then adjusted to 22 C; digitized data were presented.
6	27	Gyulai, Z.	1927	D	0.21-0.62	321	Crystal; prismatic specimens with faces of 16 x 16 mm^2; apex angles of 59° and 30° respectively; digitized data were presented; accuracy of this set of data is 0.001.
7	97 116	Stephens, R.E., Plyler, E.K., Rodney, W.S., and Spindler, F.J., June, K.R.	1953 1972	D	0.40-25.14	295	Crystal; prismatic specimen obtained from Perkin-Elmer Corporation; indices determined by minimum deviation; uncertainty about 1.0 x 10^{-5}; digitized data presented; measurements were also made at 13.5° and 31.0 C a rough averaged value of -4.0 x 10^{-5}/°C for dn/dT obtained; typographical error in dispersion equation of 1953 paper, corrected in 1972 publication.
8	97	Stephens, R.E., et al.	1953	D	1.01-25.14	295	Similar to above but refractive indices were determined with known incident angles.
9	98	Forrest, J.W.	1942	D	0.405-0.770	293	Crystal; prismatic specimen with 60° apex angle; refractive indices were determined at various temperatures ranging from 21.4 C to 34.0 C and then reduced to 20.0 C by the experimentally determined temperature coefficient, dn/dT; dn/dT was found to be practically a constant over the wavelength region and the temperature range studied; the average value of dn/dT was -4.4 x 10^{-5} K^{-1}; estimated uncertainty of 0.0001 in n; digitized data were presented.
10	98	Forrest, J.W.	1942	D	0.4861-0.6563	293	The above author used a second sample measured at three wavelengths; obtained higher results, about 0.0001 greater in absolute value, but dispersions remained practically the same.
11	30	Harting, H.	1943	D	0.20-1.10	293	Crystal; the author stated that the refractive indices were measured by F. Wolf on the specimen supplied by Smakula, A. but no references were cited; digitized data were presented; dn/dT at 293 K for each wavelength was also given.
12	100	Korth, K.	1933	I	14.0-26.7	311	Single crystal; grown by the Kyropoulos method; plate specimens with thicknesses ranging from 151.0 to 396.7 μm; refractive indices were measured by interferometry; averaged results were reported in digitized values; dn/dT for wavelength 0.546 μm was found to be -3.6 x 10^{-5} K^{-1} in the temperature range from 38 to 90 C.

TABLE 46. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KBr (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
13	99	Gundelach, E.	1930	D	0.768-18.10	298	Crystal; prismatic specimen with height 4 cm, side 6 cm and apex angle 59°25'30"; digitized data were presented.
14	99	Gundelach, E.	1930	I	20.10-28.50	298	Crystal; plate specimens with thicknesses of 70 and 170 μm respectively; refractive indices were determined from interference information; digitized data were presented.
15	67	Marcoux, J.	1971	F	0.40-0.70	1003	Molten KBr; Vycor tube filled with the melt formed a cylindrical lens; refractive indices were determined by finding the focal lengths of the lens at given wavelengths; uncertainty in n was estimated to ±0.005; digitized data were presented.
16	67	Marcoux, J.	1971	F	0.5460	1008	Similar to above.
17	91	Johnson, D.W. and Bell, E.E.	1969	R	27.0-278.0	300	Crystal; reflection spectrum was measured by the technique of asymmetric Fourier-transform spectroscopy and refractive indices were then determined; data extracted from a figure.
18	86	Bauer, G.	1934	R	0.254-0.546	298	Crystal; thin film specimen with slight wedge shape by vacuum evaporation onto a quartz substrate and then sintered; reflectance was determined from reflected interference patterns; refractive indices were calculated from the equation, $R = (n_q - n^2/n_q + n^2)^2$, where n the refractive index of the film and n_q of quartz; digitized data were presented.
19	86	Bauer, G.	1934	R	0.254-0.546	298	Similar to above but for other film.
20	43	Ramaseshan, S.	1947	P	0.4358-0.5893	298	Crystal; grown by the method of slow evaporation of a saturated solution; plate specimen with polished faces; specimen was cemented to the prism of a Pulfrich refractometer by a suitable liquid in determining the refractive index; digitized data were presented with uncertainty one unit in the fourth place of decimal.
21	44	Zarzycki, J. and Naudin, F.	1963	D	0.5461	1043	Molten KBr, filled into a 60° prismatic Pt container with silica widows of 4 mm diameter; estimated uncertainty of 0.001 in n; digitized data were presented.
22	101	Topsëe, H. and Christiansen, C.	1874	D	0.439-0.656	298	Crystal; prismatic specimens of apex angles 40°36', 43°45' and 45°33' respectively; mean values of the results from three prisms were presented in digitized values; temperature was not specified, room temperature assumed.
23	102	Bell, E.E.	1967	T	27-204	298	KBr plate of 0.0182 cm thick was placed in one arm of a far infrared Michelson interferometer to obtain the asymmetric interferogram; spectrogram was analyzed by Fourier transformation; data extracted from a figure with one percent uncertainty in n-1.
24	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; four prismatic specimens with apex angle about 42.1°; averaged values of refractive indices were presented with uncertainties of less than 2 units in the fourth decimal places; temperature was not given. room temperature assumed.
25	13	Lawndes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	290	Single crystal; prismatic sample; digitized data were given with uncertainty of ±0.0004.
26	13	Lawndes, R.P. and Martin, D.H.	1968	D	0.4358-0.6438	4	Similar to above.
27	112	Fedyukina, G.N. and Zlenko, V.Ya.	1972	M	0.589	281-308	Single crystal; disc specimens of 1-18 mm in thickness; refractive index for sodium D line was determined by immersion method; digitized value was reported with uncertainty of ±0.0007; temperature was not specified but a range was given.

TABLE 47. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KBr

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1	
T = 298.0 K	
0.170	1.39
0.174	1.45
0.176	1.43
0.180	1.32
0.181	1.32*
0.183	1.25
0.185	1.26
0.187	1.32
0.190	1.41
0.190	1.49
0.191	1.70
0.192	1.78
0.193	1.72
0.194	1.86
0.195	2.06*
0.198	2.21*
CURVE 2	
T = 4.0 K	
35.587	1.35
43.290	1.24
51.020	0.95
55.866	0.71
59.524	0.47
61.350	0.22
64.516	0.11
69.930	0.11
72.464	0.22
74.074	0.6
76.336	1.72
80.645	8.86
83.645	9.05
83.333	8.38
86.207	4.94
88.496	4.10
90.909	3.65
95.238	3.21
102.04	2.89
112.36	2.65
129.87	2.46
158.73	2.33
222.222	2.18
769.23	2.14
CURVE 3	
T = 72. K	
35.587	1.35*
43.290	1.24*
50.505	1.07
57.471	0.74
63.291	0.23
68.027	0.09
75.188	0.18
78.740	0.77
81.301	1.71
83.333	8.04
85.470	7.10
86.207	5.08
90.909	3.89
95.238	3.36
104.17	2.97
113.64	2.72
129.87	2.55
178.57	2.31
277.78	2.22
769.23	2.14
CURVE 4	
T = 300.0 K	
47.847	1.11
50.251	0.95
52.910	0.82
56.180	0.82
59.172	0.82
62.500	0.68
66.225	0.49
70.423	0.33
74.627	0.39
80.000	0.67
83.333	1.13
84.034	1.58
84.746	2.06
84.746	2.53*
84.746	3.01*
84.746	3.48
86.207	3.94
86.207	4.42*
86.207	5.37
88.496	5.73
90.090	5.22
90.909	4.76
CURVE 4 (cont.)	
T = 300.0 K	
93.458	4.28
97.087	3.85
102.04	3.41
108.70	3.05
120.48	2.83
133.33	2.63
151.52	2.51
175.44	2.45
212.77	2.37
270.27	2.34
370.37	2.29
625.00	2.29
CURVE 5	
T = 295.2 K	
0.4046563	1.589754
0.4358342	1.581474
0.4861327	1.571786
0.4916036	1.570945
0.5085824	1.568476
0.5460740	1.563928
0.5875618	1.559967
0.6438170	1.555853
0.6678149	1.554433
0.6907496	1.553207
0.7065188	1.552449
CURVE 6	
T = 321.2 K	
0.2063	1.9860
0.2100	1.9374
0.2144	1.8934
0.2194	1.8541
0.2265	1.8122
0.2312	1.7897
0.248	1.7317
0.254	1.7181
0.257	1.7102*
0.275	1.6775
0.340	1.6160
0.347	1.6124*
0.361	1.6052
0.405	1.5885
0.436	1.5802*
CURVE 6 (cont.)	
T = 321.2 K	
0.492	1.5696
0.546	1.5625*
0.576	1.5593
0.579	1.5591
0.615	1.5559
CURVE 7	
T = 295.2 K	
0.404656	1.589753*
0.435835	1.581475*
0.486133	1.571789*
0.508582	1.568479*
0.546074	1.563930*
0.587562	1.559966*
0.643847	1.555853*
0.706520	1.552447*
1.01398	1.54410
1.12866	1.54265*
1.36728	1.54063
1.7012	1.53904
3.419	1.53614
6.238	1.53286
6.692	1.53220
8.662	1.52903
9.724	1.52689
11.035	1.52401
14.98	1.51282
17.40	1.50378
18.16	1.50066*
19.01	1.49701
19.91	1.49280
21.83	1.48305
23.86	1.47123
25.14	1.46303
CURVE 8	
T = 295.2 K	
1.01398	1.54408*
1.12866	1.54264*
1.36728	1.54060*
1.7012	1.53905*
2.44	1.53738
2.73	1.53695
3.419	1.53616*
CURVE 8 (cont.)	
T = 295.2 K	
4.258	1.53523
6.238	1.53284*
6.692	1.53219*
8.662	1.52901*
9.724	1.52689*
11.035	1.52403*
11.862	1.52199
14.29	1.51495
14.98	1.51286*
17.40	1.50400
18.16	1.50070
19.01	1.49704
19.91	1.49293
21.18	1.48664
21.83	1.48307
13.86	1.47138
15.14	1.46322
CURVE 9	
T = 293.2 K	
0.4047	1.58976*
0.4358	1.58149*
0.4471	1.57896
0.4713	1.57429
0.4861	1.57181*
0.4922	1.57085*
0.5016	1.56948*
0.5461	1.56395*
0.5877	1.55998*
0.5893	1.55986*
0.6563	1.55503
0.6678	1.55444*
0.7065	1.55245*
0.7699	1.54780
CURVE 10	
T = 293.2 K	
0.4861	1.57194
0.5893	1.55997
0.6563	1.55524
CURVE 11	
T = 293.2 K	
0.21360	1.9003
CURVE 11 (cont.)	
T = 293.2 K	
0.22470	1.8223
0.23998	1.7576
0.24828	1.7330
0.25365	1.7198
0.26537	1.6950
0.26993	1.6871*
0.28035	1.67125
0.28936	1.65976*
0.29676	1.65149
0.30215	1.64603*
0.33415	1.62093
0.36631	1.60391*
0.39064	1.59444
0.40466	1.58989*
0.43583	1.58159*
0.48613	1.57191*
0.54607	1.56405*
0.58756	1.56010*
0.58930	1.55995*
0.65628	1.55519*
0.70652	1.55256*
0.72814	1.55160
0.76820	1.55007*
0.81095	1.54860
0.84247	1.54775*
0.91230	1.54604
1.01398	1.54425*
1.08303	1.54335
CURVE 12	
T = 311.2 K	
14.	1.5141
15.	1.5107
16.	1.5071
17.	1.5030
18.	1.4989
19.	1.4944
20.	1.4896
21.	1.4847
22.	1.4793
23.	1.4733
24.	1.4672
25.	1.4606
26.	1.4536
26.7	1.4481

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* Not shown in figure.

TABLE 47. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KBr (continued)

[Wavelength, λ, μm; Refractive Index, n]

CURVE 13
T = 298.2 K

λ	n
0.768	1.5492
0.982	1.5437
1.179	1.5414
1.768	1.5385
2.357	1.5367
3.536	1.5350
4.714	1.5339
5.893	1.5325
8.250	1.5290
10.018	1.5255
11.768	1.5209
12.965	1.5177
14.143	1.5146*
15.910	1.5080
18.100	1.4983*

CURVE 14
T = 298.2 K

λ	n
20.10	1.4867
21.37	1.4786*
22.80	1.4682
23.45	1.4636
24.43	1.4555
26.30	1.4382*
28.50	1.4163

CURVE 15
T = 1003.2K

λ	n
0.4047	1.512
0.5000	1.475
0.6000	1.460
0.6943	1.455

CURVE 16
T = 1008.2 K

λ	n
0.5460	1.465

CURVE 17
T = 300.0 K

λ	n
27.3	1.36
33.9	1.43
41.5	1.26*
46.5	1.15*

CURVE 17 (cont.)
T = 300.0 K

λ	n
52.4	0.90*
54.1	0.90*
56.8	0.76*
60.2	0.79*
64.5	0.58*
69.9	0.34*
72.5	0.29*
75.8	0.29*
78.7	0.35*
83.3	0.73*
85.5	1.72*
89.3	5.97*
94.3	4.15*
101.0	3.39*
113.6	2.88*
135.1	2.55*
277.8	2.32*

CURVE 18
T = 298.0K

λ	n
0.254	1.531
0.313	1.500
0.366	1.484
0.435	1.474
0.546	1.467

CURVE 19
T = 298.0K

λ	n
0.254	1.572
0.313	1.526
0.366	1.510
0.546	1.476

CURVE 20
T = 298.0K

λ	n
0.4358	1.5813
0.5461	1.5631
0.5893	1.5585

CURVE 21
T = 1043.2 K

λ	n
0.5461	1.455

CURVE 22
T = 298.0 K

λ	n
0.439	1.5814
0.486	1.5715
0.589	1.5593
0.656	1.5546

CURVE 23
T = 298.0 K

λ	n
27.93	1.45
29.50	1.44
30.86	1.43
32.15	1.42
33.67	1.40
35.46	1.38*
37.31	1.36*
39.06	1.33*
40.49	1.31*
41.49	1.29*
42.19	1.28*
43.29	1.25*
44.44	1.23*
45.45	1.20*
46.73	1.17*
47.62	1.14*
48.54	1.12*
49.26	1.08*
50.25	1.05*
51.18	1.00*
52.08	0.96*
113.64	2.73*
121.95	2.54*
128.21	2.46*
136.99	2.39*
140.85	2.37*
144.93	2.35*
151.52	2.32*
161.29	2.30*
178.57	2.27*
204.08	2.25*

CURVE 24
T = 298. K

λ	n
0.486	1.57165
0.589	1.5596
0.656	1.55485

CURVE 25*
T = 290.0 K

λ	n
0.4358	1.5814
0.4678	1.5748
0.4800	1.5725
0.5086	1.5684
0.5461	1.5639
0.5780	1.5605
0.5893	1.5596
0.6438	1.5558

CURVE 26*
T = 4.0 K

λ	n
0.4358	1.5904
0.4678	1.5738
0.4800	1.5813
0.5086	1.5776
0.5461	1.5729
0.5780	1.5697
0.5893	1.5689
0.6438	1.5649

CURVE 27*
T = 281.0-308.0 K

λ	n
0.589	1.5592

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* Not shown in figure.

TABLE 48. EXPERIMENTAL DATA ON dn/dT OF KBr

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT	λ	dn/dT	λ	dn/dT	λ	dn/dT
CURVE 5		CURVE 9		CURVE 11 (cont.)		CURVE 12	
T_m = 295.0 K		T_m = 301.0 K		T_m = 293.0 K		T_m = 337.0 K	
0.4047	-3.675	0.40-0.77	-4.4*	0.48613	-4.2	0.546	-3.6
0.4358	-3.710			0.54607	-4.5		
0.4861	-3.837	CURVE 11		0.58756	-3.6		
0.4916	-3.729	T_m = 293.0 K		0.58930	-3.6		
0.5086	-3.943			0.65628	-4.5		
0.5461	-3.920	0.26537	-3.2	0.70652	-4.4		
0.5876	-4.003	0.26993	-2.5	0.72814	-4.1		
0.6438	-3.967	0.28035	-3.0	0.76820	-3.6		
0.6678	-4.158	0.28936	-3.6	0.81095	-3.6		
0.6907	-4.041	0.29676	-3.0	0.84247	-3.3		
0.7065	-4.083	0.30215	-2.8	0.91230	-3.3		
		0.33415	-3.7	1.01398	-3.2		
CURVE 7		0.36631	-4.7	1.08303	-3.8		
T_m = 295.0 K		0.39064	-4.1				
		0.40466	-4.2				
0.404-25.14	-4.0*	0.43583	-4.2				

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* Not shown in figure.

TABLE 49. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR KBr

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Harting, H. [30] 1943	0.213-1.083 μm 293 K	$n = 1.53472 + \frac{0.00771}{(\lambda - 0.1229)^{1.554}}$
Radhakrishnan, T. [48] 1948	0.214-10.02 μm 298 K and 321 K	$n^2 = 1.4725 + \frac{0.6204\,\lambda^2}{\lambda^2 - (0.146)^2} + \frac{0.2674\,\lambda^2}{\lambda^2 - (0.182)^2} + \frac{2.2847\,\lambda^2}{\lambda^2 - (85.824)^2}$
Stephens, R.E., Plyler, E.K., Rodney, W.S., and Spindler, R.J. [97] 1953 June, K.R. [116] 1972	0.40-25.14 μm 295 K	$n^2 = 2.361323 - 0.000311497\,\lambda^2 - 0.000000058613\,\lambda^4 + \frac{0.007676}{\lambda^2} + \frac{0.0156569}{\lambda^2 - 0.0324}$
Spindler, R.J. and Rodney, W.S. [96] 1952	0.40-0.71 μm 295 K	$n^2 = 2.3618102 - 0.00058072\,\lambda^2 + \frac{0.02305269}{\lambda^2 - 0.0245381}$ $dn/dT = -(31.742 + 13.21\,\lambda) \times 10^{-6}$
Handi, A., Claudel, J., Chanal, D., Strimer, P., and Vergnet, P. [10] 1967	47-625 μm 300 K	$n^2 - k^2 = \epsilon_{uv} + \sum_i 4\pi\rho_i \frac{1 - \Omega_i^2}{(1 - \Omega_i^2)^2 + (\delta_i\,\Omega_i)^2}$, $2nk = \sum_i 4\pi\rho_i \frac{\delta_i\,\Omega_i}{(1 - \Omega_i^2)^2 + (\delta_i\,\Omega_i)^2}$ *
Present work 1975	0.20-42.0 μm 293 K	$n^2 = 1.39408 + \frac{0.79221\,\lambda^2}{\lambda^2 - (0.146)^2} + \frac{0.01981\,\lambda^2}{\lambda^2 - (0.173)^2} + \frac{0.15587\,\lambda^2}{\lambda^2 - (0.187)^2} + \frac{0.17673\,\lambda^2}{\lambda^2 - (60.61)^2} + \frac{2.06217\,\lambda^2}{\lambda^2 - (87.72)^2}$

* $i = 1, 2$, $\Omega_i = \nu/\nu_i$; $\nu_1 = 113.9$ cm^{-1}, $\nu_2 = 165$ cm^{-1}; $\delta_1 = 0.052$, $\delta_2 = 0.23$; $\rho_1 = 0.198$, $\rho_2 = 0.015$; $\epsilon_{uv} = 2.40$, $\epsilon_s = 4.85$.

3.12. Potassium Iodide, KI

Potassium iodide is valuable as prism material, but it is too hygroscopic (being about twice as soluble in water as potassium bromide) and too soft for field use. It is also soluble in alcohol and in ammonia. Ingots 19 cm in diameter are available. Although KI is one of the softest rocksalt-structure alkali halides, not a suitable optical material, its wide transparency, 0.25 to 50 μm, draws attention in crystal structure research. Fundamental absorptions in the ultraviolet and infrared regions, static and high-frequency dielectric constants have been measured by a number of investigators, and the results are listed in table 3.

Reasonable amounts of data on the refractive index of KI are available in the open literature. By careful examination of the available data we find that for the transparent wavelength region the results of Gyulai [27] and Harting [30] are consistent (with temperature effects considered) to the fourth decimal place in spite of the fact that Gyulai quoted an accuracy of one unit at the third decimal place. Korth's values [100], although being reported to the fourth decimal place, are good only to the third place. Bauer's values appear too low to be considered as useful data because of his use of thin films, and the unfavorable surface conditions of the samples. Data reported by Sprockhoff [95] and Topsöe and Christiansen [101] appear slightly too high at the assumed temperature; they either observed at a considerably lower temperature or used inadequate samples.

In the infrared region, 40 μm and up, data were leduced by analyzing the information on reflection and transmission spectra. Data are available from the figures of Hadni, et al. [16], Edlridge, et al. [103], and Berg, et al. [104]. They are not included in the data analysis but are presented here for completeness.

Data measured by Gyulai, Harting, and Korth were adopted for our analysis. The selected data sets were obtained at different temperatures: Gyulai's measured at 339 K, Harting's at 293 K, and Korth's at 311 K. Information on dn/dT is needed to carry out temperature corrections on the selected data sets, but little is available.

Data on dn/dT were given by Harting [30] and Korth [100]. The values reported by Harting are for a waveength region from 0.248 to 1.083 μm and a temperature of 293 K. Although this data set covers a sufficient wavelength range for a curve fitting calculation, its unfavorable scatter led to unreasonable values of the adjustable parameters in eq (19). A single but reliable value was given by Korth for the Hg green line at a mean temperature of 337 K. As a consequence of the lack of reasonable data, temperature effect corrections to the available data on refractive index were never considered in early survey works or in handbooks. In the present work, however, this problem was solved by our empirical discoveries by which the unknown parameters of eq (19) for each of the alkali halides were predicted. This enabled us to construct a dn/dT formula for KI at 293 K in the transparent region:

$$2n\frac{dn}{dT}=-12.24(n^2-1)+0.80+\frac{4.785\lambda^4}{(\lambda^2-0.04796)^2}+\frac{165.92\lambda^4}{(\lambda^2-9611.84)^2}, \tag{45}$$

where dn/dT is in units of $10^{-5}\mathrm{K}^{-1}$ and λ in μm.

In figure 43, the values calculated by eq (45) are compared with the experimental data. It appears that our calculated values do not agree with those reported by Harting. However, we have reasons to believe that eq (45) predicts satisfactory dn/dT values for KI.

1. The figure shows that the curve of eq (45) is the lower envelope of Harting's data. If the uncertainties of Harting's measurements are the deviations of the points from the averaged position, our predictions are considered to be in acceptable agreement with the Harting's values.
2. Although it has been observed in halide crystals that the absolute value of dn/dT increases with increasing temperature, the variation is small in a fairly wide range of temperatures. This is the basis of the second expression of eq (4). It is clearly shown in figure 43 that our predictions are located at a reasonable distance from Korth's data point, in view of the difference in temperatures.
3. The predictions of the dn/dT formula for CsI based on the empirical parameters of table 5 agree closely with the data in the long wavelength region as discussed in subsection 3.20. We assume that this is also the case for KI.

Based on the above discussions, eq (45) was confidently used to reduce the selected refractive index data to 293 K.

Ramachandran [17] attempted to construct dispersion equations to fit the data provided by Gyulai and Korth, respectively, and found two equations, one for wavelengths from 0.206 to 0.615 μm at 339 K, and the other for wavelengths from 4 to 29 μm at 311 K, as shown in table 54. Note that these equations do not include the contributions of absorption bands located at the other end of the transparent region. This will lead to improper extrapolations. It is our goal to work out a formula which includes the effects due to the absorption bands at both ends of the transparent region, and yields the refractive indices for the whole transparent region at a chosen reference temperature, 293 K. Based on the information in tables 3 and 54, input parameters for least-squares fitting were obtained. The result of the fitting is a dispersion equation for KI at 293 K in the transparent region, 0.25–50 μm.

$$n^2 = 1.47285 + \frac{0.16512\lambda^2}{\lambda^2 - (0.129)^2} + \frac{0.41222\lambda^2}{\lambda^2 - (0.175)^2} + \frac{0.44163\lambda^2}{\lambda^2 - (0.187)^2} + \frac{0.16076\lambda^2}{\lambda^2 - (0.219)^2} + \frac{0.33571\lambda^2}{\lambda^2 - (69.44)^2} + \frac{1.92474\lambda^2}{\lambda^2 - (98.04)^2}, \tag{46}$$

where λ is in units of μm.

Equations (45) and (46) were used to generate the recommended values for n, $dn/d\lambda$, and dn/dT. More decimal places are given than are needed, for tabular smoothness. Readers are advised to use the criteria given below in order to insure the proper usage of the table of recommended values.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.25– 0.35	3	0.008
0.35–10.00	3	0.002
10.00–25.00	3	0.003
25.00–40.00	3	0.006
40.00–50.00	3	0.009

For dn/dT:

0.25– 0.27	1	0.9
0.27– 2.00	1	0.3
2.00–30.00	1	0.4
30.00–40.00	1	0.5
40.00–50.00	1	0.9

TABLE 50. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KI AT 293 K*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.250	2.04933	8.61024	12.21	0.550	1.67229	0.17742	-4.31	2.750	1.62962	0.00160	-4.49
0.252	2.03283	7.91020	10.41	0.560	1.67057	0.16669	-4.33	2.800	1.62954	0.00155	-4.49
0.254	2.01763	7.30303	8.89	0.570	1.66895	0.15684	-4.33	2.850	1.62946	0.00150	-4.49
0.256	2.00357	6.77157	7.59	0.580	1.66743	0.14776	-4.34	2.900	1.62939	0.00146	-4.49
0.258	1.99050	6.30265	6.48	0.590	1.66599	0.13940	-4.35	2.950	1.62931	0.00142	-4.48
0.260	1.97832	5.88599	5.52	0.600	1.66464	0.13167	-4.36	3.000	1.62924	0.00138	-4.48
0.262	1.96693	5.51344	4.67	0.620	1.66215	0.11789	-4.37	3.050	1.62918	0.00135	-4.48
0.264	1.95624	5.17847	3.94	0.640	1.65991	0.10601	-4.38	3.100	1.62911	0.00131	-4.48
0.266	1.94619	4.87576	3.28	0.660	1.65790	0.09571	-4.39	3.150	1.62904	0.00129	-4.48
.268	1.93672	4.60098	2.70	0.680	1.65607	0.08673	-4.40	3.200	1.62898	0.00126	-4.48
.270	1.92777	4.35052	2.19	0.700	1.65442	0.07887	-4.41	3.250	1.62892	0.00123	-4.48
.272	1.91930	4.12139	1.73	0.720	1.65291	0.07194	-4.41	3.300	1.62886	0.00121	-4.48
.274	1.91127	3.91104	1.31	0.740	1.65154	0.06582	-4.42	3.350	1.62880	0.00119	-4.48
0.276	1.90365	3.71734	0.93	0.760	1.65028	0.06039	-4.42	3.400	1.62874	0.00117	-4.48
0.278	1.89640	3.53845	0.60	0.780	1.64912	0.05555	-4.43	3.450	1.62868	0.00115	-4.48
0.280	1.88949	3.37281	0.29	0.800	1.64805	0.05122	-4.43	3.500	1.62862	0.00114	-4.48
0.282	1.88290	3.21905	0.01	0.820	1.64707	0.04734	-4.44	3.550	1.62857	0.00112	-4.48
0.284	1.87660	3.07600	-0.25	0.840	1.64615	0.04385	-4.44	3.600	1.62851	0.00111	-4.48
0.286	1.87059	2.94263	-0.49	0.860	1.64531	0.04070	-4.44	3.650	1.62846	0.00110	-4.48
0.288	1.86483	2.81804	-0.70	0.880	1.64452	0.03785	-4.45	3.700	1.62840	0.00108	-4.48
0.290	1.85931	2.70142	-0.90	0.900	1.64379	0.03526	-4.45	3.750	1.62835	0.00107	-4.48
0.292	1.85402	2.59209	-1.09	0.920	1.64311	0.03291	-4.45	3.800	1.62829	0.00107	-4.48
0.294	1.84894	2.48942	-1.26	0.940	1.64248	0.03077	-4.45	3.850	1.62824	0.00106	-4.48
0.296	1.84405	2.39285	-1.42	0.960	1.64188	0.02881	-4.46	3.900	1.62819	0.00105	-4.48
0.298	1.83936	2.30188	-1.56	0.980	1.64132	0.02702	-4.46	3.950	1.62814	0.00104	-4.48
0.300	1.83484	2.21608	-1.70	1.000	1.64080	0.02537	-4.46	4.000	1.62808	0.00104	-4.48
0.305	1.82426	2.02165	-2.00	1.050	1.63962	0.02182	-4.46	4.050	1.62803	0.00103	-4.48
0.310	1.81459	1.85185	-2.26	1.100	1.63861	0.01891	-4.47	4.100	1.62798	0.00103	-4.48
0.315	1.80571	1.70258	-2.48	1.150	1.63772	0.01651	-4.47	4.150	1.62793	0.00102	-4.48
0.320	1.79753	1.57057	-2.66	1.200	1.63695	0.01450	-4.47	4.200	1.62788	0.00102	-4.48
0.325	1.78998	1.45321	-2.83	1.250	1.63627	0.01282	-4.47	4.250	1.62783	0.00102	-4.48
0.330	1.78298	1.34836	-2.97	1.300	1.63566	0.01139	-4.47	4.300	1.62778	0.00102	-4.48
0.335	1.77648	1.25427	-3.09	1.350	1.63512	0.01018	-4.48	4.350	1.62773	0.00101	-4.48
0.340	1.77042	1.16951	-3.21	1.400	1.63464	0.00913	-4.48	4.400	1.62768	0.00101	-4.48
0.345	1.76477	1.09287	-3.30	1.450	1.63421	0.00824	-4.48	4.450	1.62762	0.00101	-4.48
0.350	1.75948	1.02333	-3.39	1.500	1.63382	0.00746	-4.48	4.500	1.62757	0.00101	-4.48
0.355	1.75452	0.96004	-3.47	1.550	1.63346	0.00678	-4.48	4.550	1.62752	0.00101	-4.48
0.360	1.74987	0.90226	-3.54	1.600	1.63314	0.00618	-4.48	4.600	1.62747	0.00101	-4.48
0.365	1.74549	0.84937	-3.60	1.650	1.63284	0.00566	-4.48	4.650	1.62742	0.00101	-4.48
0.370	1.74137	0.80084	-3.66	1.700	1.63257	0.00520	-4.48	4.700	1.62737	0.00101	-4.48
0.375	1.73748	0.75620	-3.71	1.750	1.63232	0.00480	-4.48	4.750	1.62732	0.00101	-4.48
0.380	1.73380	0.71504	-3.76	1.800	1.63209	0.00443	-4.48	4.800	1.62727	0.00102	-4.48
0.385	1.73032	0.67701	-3.80	1.850	1.63188	0.00411	-4.48	4.850	1.62722	0.00102	-4.48
0.390	1.72703	0.64181	-3.84	1.900	1.63168	0.00382	-4.48	4.900	1.62717	0.00102	-4.47
0.395	1.72390	0.60916	-3.88	1.950	1.63149	0.00357	-4.48	4.950	1.62712	0.00102	-4.47
0.400	1.72093	0.57882	-3.91	2.000	1.63132	0.00334	-4.48	5.000	1.62707	0.00102	-4.47
0.410	1.71542	0.52427	-3.97	2.050	1.63116	0.00313	-4.48	5.100	1.62696	0.00103	-4.47
0.420	1.71042	0.47672	-4.02	2.100	1.63101	0.00294	-4.48	5.200	1.62686	0.00104	-4.47
0.430	1.70587	0.43505	-4.06	2.150	1.63086	0.00277	-4.49	5.300	1.62676	0.00105	-4.47
0.440	1.70171	0.39832	-4.10	2.200	1.63073	0.00262	-4.49	5.400	1.62665	0.00105	-4.47
0.450	1.69789	0.36581	-4.13	2.250	1.63060	0.00248	-4.49	5.500	1.62655	0.00106	-4.47
0.460	1.69438	0.33690	-4.16	2.300	1.63048	0.00235	-4.49	5.600	1.62644	0.00107	-4.47
0.470	1.69114	0.31108	-4.19	2.350	1.63037	0.00223	-4.49	5.700	1.62633	0.00108	-4.47
0.480	1.68815	0.28795	-4.21	2.400	1.63026	0.00213	-4.49	5.800	1.62622	0.00109	-4.47
0.490	1.68537	0.26714	-4.23	2.450	1.63016	0.00203	-4.49	5.900	1.62611	0.00110	-4.47
0.500	1.68280	0.24837	-4.25	2.500	1.63006	0.00194	-4.49	6.000	1.62600	0.00112	-4.47
0.510	1.68040	0.23138	-4.26	2.550	1.62996	0.00186	-4.49	6.100	1.62589	0.00113	-4.46
0.520	1.67816	0.21596	-4.28	2.600	1.62987	0.00179	-4.49	6.200	1.62578	0.00114	-4.46
0.530	1.67608	0.20193	-4.29	2.650	1.62978	0.00172	-4.49	6.300	1.62566	0.00115	-4.46
0.540	1.67412	0.18913	-4.30	2.700	1.62970	0.00166	-4.49	6.400	1.62555	0.00116	-4.46

TABLE 50. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR KI AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
6.500	1.62543	0.00118	-4.46	12.800	1.61481	0.00225	-4.35	26.500	1.56323	0.00557	-3.54
6.600	1.62531	0.00119	-4.46	13.000	1.61436	0.00228	-4.34	27.000	1.56041	0.00573	-3.48
6.700	1.62519	0.00120	-4.46	13.200	1.61390	0.00232	-4.34	27.500	1.55750	0.00590	-3.42
6.800	1.62507	0.00122	-4.46	13.400	1.61343	0.00236	-4.33	28.000	1.55451	0.00607	-3.36
6.900	1.62495	0.00123	-4.46	13.600	1.61296	0.00240	-4.33	28.500	1.55143	0.00624	-3.29
7.000	1.62482	0.00125	-4.45	13.800	1.61247	0.00244	-4.32	29.000	1.54827	0.00642	-3.23
7.100	1.62470	0.00126	-4.45	14.000	1.61198	0.00248	-4.31	29.500	1.54502	0.00660	-3.15
7.200	1.62457	0.00128	-4.45	14.200	1.61148	0.00252	-4.31	30.000	1.54167	0.00679	-3.08
7.300	1.62444	0.00129	-4.45	14.400	1.61097	0.00256	-4.30	30.500	1.53822	0.00699	-3.00
7.400	1.62431	0.00131	-4.45	14.600	1.61046	0.00260	-4.29	31.000	1.53468	0.00719	-2.92
7.500	1.62418	0.00132	-4.45	14.800	1.60993	0.00264	-4.29	31.500	1.53103	0.00739	-2.83
7.600	1.62405	0.00134	-4.45	15.000	1.60940	0.00268	-4.28	32.000	1.52728	0.00761	-2.74
7.700	1.62391	0.00135	-4.45	15.200	1.60886	0.00272	-4.27	32.500	1.52342	0.00783	-2.64
7.800	1.62378	0.00137	-4.44	15.400	1.60831	0.00276	-4.27	33.000	1.51945	0.00806	-2.54
7.900	1.62364	0.00138	-4.44	15.600	1.60776	0.00280	-4.26	33.500	1.51537	0.00829	-2.44
8.000	1.62350	0.00140	-4.44	15.800	1.60719	0.00284	-4.25	34.000	1.51116	0.00853	-2.32
8.100	1.62336	0.00141	-4.44	16.000	1.60662	0.00288	-4.25	34.500	1.50683	0.00878	-2.21
8.200	1.62322	0.00143	-4.44	16.200	1.60604	0.00293	-4.24	35.000	1.50238	0.00904	-2.08
8.300	1.62307	0.00145	-4.44	16.400	1.60545	0.00297	-4.23	35.500	1.49779	0.00931	-1.95
8.400	1.62293	0.00146	-4.44	16.600	1.60485	0.00301	-4.22	36.000	1.49306	0.00959	-1.82
8.500	1.62278	0.00148	-4.43	16.800	1.60425	0.00305	-4.21	36.500	1.48820	0.00988	-1.68
8.600	1.62263	0.00150	-4.43	17.000	1.60363	0.00310	-4.21	37.000	1.48318	0.01018	-1.53
8.700	1.62248	0.00151	-4.43	17.200	1.60301	0.00314	-4.20	37.500	1.47802	0.01049	-1.37
8.800	1.62233	0.00153	-4.43	17.400	1.60238	0.00318	-4.19	38.000	1.47269	0.01082	-1.20
8.900	1.62218	0.00155	-4.43	17.600	1.60174	0.00323	-4.18	38.500	1.46720	0.01115	-1.02
9.000	1.62202	0.00156	-4.43	17.800	1.60109	0.00327	-4.17	39.000	1.46153	0.01151	-0.84
9.100	1.62186	0.00158	-4.43	18.000	1.60043	0.00332	-4.16	39.500	1.45569	0.01187	-0.65
9.200	1.62171	0.00160	-4.42	18.200	1.59976	0.00336	-4.15	40.000	1.44966	0.01226	-0.44
9.300	1.62155	0.00161	-4.42	18.400	1.59908	0.00341	-4.14	40.500	1.44343	0.01266	-0.23
9.400	1.62138	0.00163	-4.42	18.600	1.59840	0.00345	-4.13	41.000	1.43700	0.01307	0.00
9.500	1.62122	0.00165	-4.42	18.800	1.59770	0.00350	-4.12	41.500	1.43035	0.01351	0.24
9.600	1.62105	0.00166	-4.42	19.000	1.59700	0.00354	-4.11	42.000	1.42348	0.01397	0.49
9.700	1.62089	0.00168	-4.41	19.200	1.59628	0.00359	-4.10	42.500	1.41638	0.01445	0.76
9.800	1.62072	0.00170	-4.41	19.400	1.59556	0.00364	-4.09	43.000	1.40903	0.01496	1.04
9.900	1.62055	0.00172	-4.41	19.600	1.59483	0.00368	-4.08	43.500	1.40141	0.01549	1.34
10.000	1.62037	0.00173	-4.41	19.800	1.59409	0.00373	-4.07	44.000	1.39353	0.01605	1.65
10.200	1.62002	0.00177	-4.41	20.000	1.59334	0.00378	-4.06	44.500	1.38536	0.01664	1.99
10.400	1.61967	0.00180	-4.40	20.500	1.59142	0.00390	-4.03	45.000	1.37688	0.01727	2.34
10.600	1.61930	0.00184	-4.40	21.000	1.58944	0.00402	-4.00	45.500	1.36808	0.01793	2.71
10.800	1.61893	0.00188	-4.39	21.500	1.58739	0.00415	-3.97	46.000	1.35895	0.01863	3.11
11.000	1.61855	0.00191	-4.39	22.000	1.58529	0.00428	-3.93	46.500	1.34945	0.01937	3.53
11.200	1.61817	0.00195	-4.39	22.500	1.58312	0.00441	-3.90	47.000	1.33957	0.02016	3.97
11.400	1.61777	0.00198	-4.38	23.000	1.58088	0.00454	-3.86	47.500	1.32928	0.02101	4.44
11.600	1.61737	0.00202	-4.38	23.500	1.57857	0.00468	-3.82	48.000	1.31855	0.02191	4.94
11.800	1.61696	0.00206	-4.37	24.000	1.57620	0.00482	-3.78	48.500	1.30736	0.02287	5.48
12.000	1.61655	0.00209	-4.37	24.500	1.57375	0.00496	-3.73	49.000	1.29567	0.02390	6.05
12.200	1.61613	0.00213	-4.36	25.000	1.57124	0.00511	-3.69	49.500	1.28344	0.02501	6.66
12.400	1.61570	0.00217	-4.36	25.500	1.56864	0.00526	-3.64	50.000	1.27064	0.02621	7.31
12.600	1.61526	0.00221	-4.35	26.000	1.56598	0.00541	-3.59				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.12. The number of digits with an overstrike are not relevant to accuracy of the data.

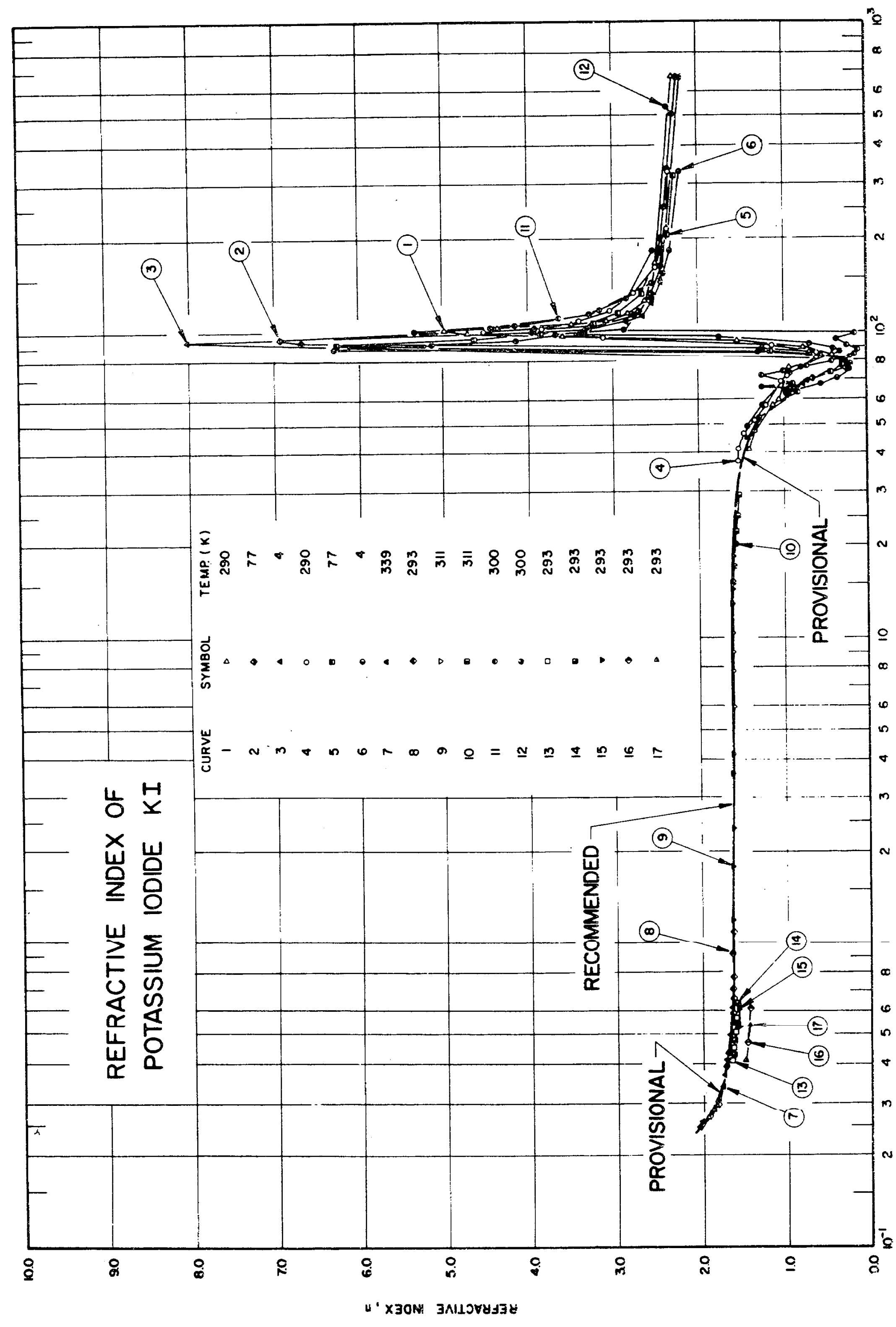

FIGURE 41. Refractive Index of KI

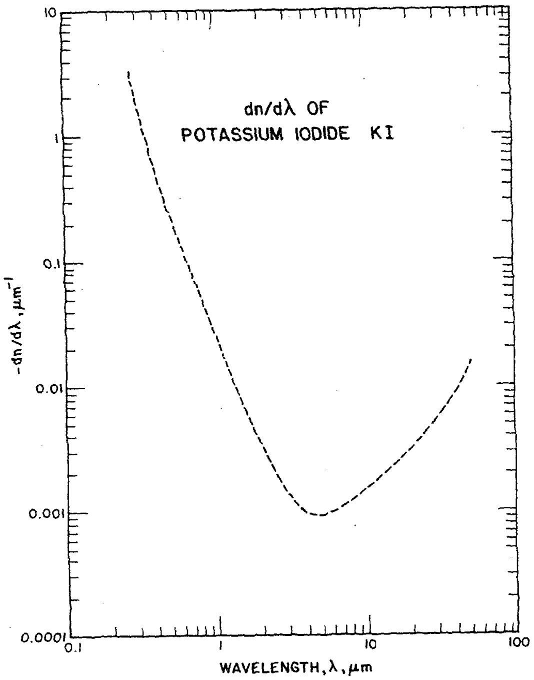

FIGURE 42. $dn/d\lambda$ of KI

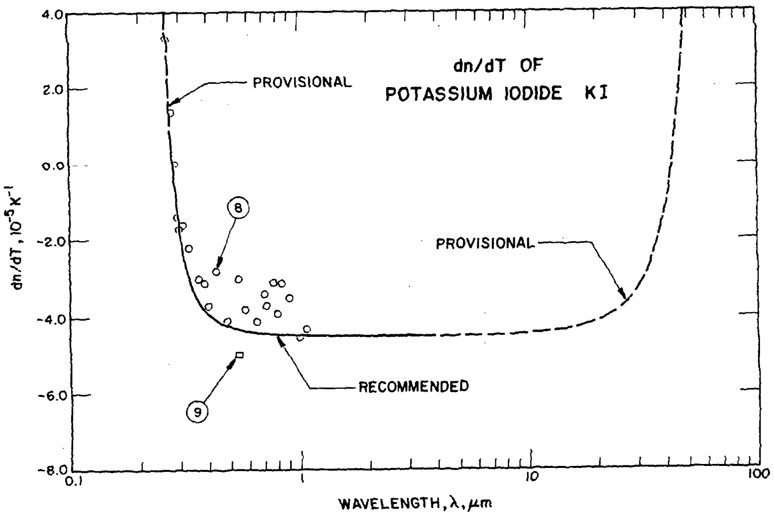

FIGURE 43. dn/dT of KI

TABLE 51. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KI

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	25	Hadni, A., Claudel, J., Morlot, G., and Strimer, P.	1968	R	40-667	290	Single crystal; 15°-incident reflection spectrum was analyzed by Kramers-Kronig method; data extracted from a curve.
2	25	Hadni, A., et al.	1968	R	40-667	77	Similar to above.
3	25	Hadni, A., et al.	1968	R	40-667	4	Similar to above.
4	25	Hadni, A., et al.	1968	R	37-323	290	Similar to above but analyzed by a two-oscillator Lorentz theory.
5	25	Hadni, A., et al.	1968	R	37-313	77	Similar to above.
6	25	Hadni, A., et al.	1968	R	37-323	4	Similar to above.
7	27	Gyulai, Z.	1927	D	0.206-0.615	339	Single crystal; grown by Kyropoulos method; prismatic specimen of height 12 mm, edge length 15 mm, and apex angle 35°48'37"; digitized data were presented with accuracy of one unit of the third decimal place.
8	30	Harting, H.	1943	D	0.248-1.083	293	Crystal; the author did not give specifications but mentioned that the specimen was supplied by A. Smakula and measured by F. Wolf; digitized data were presented; dn/dT at each wavelength was also presented.
9	100	Korth, K.	1933	D	0.546-18.10	311	Single crystal; grown by Kyropoulos method; prismatic specimen with side surface 5.8 x 8.5 cm^2 and apex angle 49°13'0" ±90"; digitized data were presented; dn/dT for wavelength 0.546 μm was found to be -5.0 x 10^{-5} K^{-1} in the temperature range from 38 to 90 C.
10	100	Korth, K.	1933	I	14-29	311	Single crystal; grown by Kyropoulos method; plate specimens of thicknesses ranging from 162.9 to 250 μm; averaged results were presented in digitized values.
11	103	Eldridge, J.E. and Kembry, K.A.	1973	T,R	45-181	300	Single crystal of natural KI; obtained from the Harshaw Chemical Co.; specimens of thickness ranging from 0.01 to 1.0 cm with slight wedge shape in order to eliminate interference fringes; transmission and reflectivity were measured by a Fourier spectrometer and refractive indices were derived; data extracted from a figure.
12	104	Berg, J.I. and Bell, E.E.	1971	T,R	40-526	300	Crystal; obtained from Harshaw Chemical Co.; transmission specimen with optically usable circular area as large as 1.91 cm in diameter; reflection specimen with thickness of about 1 cm and one polished surface; refractive indices were determined from transmission and reflection measurements employing a Michelson interferometer operated in the asymmetric mode; data extracted from a figure.
13	86	Bauer, G.	1934	I	0.406-0.570	293	Crystal; thin film of 1230 μm in thickness by vacuum evaporation; digitized data were presented.
14	86	Bauer, G.	1934	I	0.427-0.631	293	Similar to above but film thickness of 1178 μm.
15	86	Bauer, G.	1934	I	0.458-0.604	293	Similar to above but film thickness of 1138 μm.
16	86	Bauer, G.	1934	I	0.461, 0.609	293	Similar to above but film thickness of 623 μm.
17	86	Bauer, G.	1934	I	0.412, 0.535	293	Similar to above but film thickness of 548 μm.

TABLE 51. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF KI (continued)

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
18	101	Topsöe, H. and Christiansen, C.	1874	D	0.486-0.656	298	Crystal; prismatic specimens of apex angles 35°5′, 41°12′ and 43°12′ respectively; mean values of measurements from the three prisms were presented in digitized values; temperature was not specified, room temperature assumed.
19	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; four prismatic specimens with apex angles of about 45.5°; averaged values of refractive indices were presented with uncertainties of less than 2 units in the fourth decimal place; temperature was not given, room temperature assumed.
20	13	Lawndes, R. P. and Martin, D. H.	1968	D	0.4358-0.6438	290	Single crystal; prismatic sample; digitized data were presented with uncertainty of ±0.0004.
21	13	Lawndes, R. P. and Martin, D. H.	1968	D	0.4358-0.6438	4	Similar to above.

TABLE 52. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KI

[Wavelength, λ, μm; Refractive Index, r]

λ	n
CURVE 1 T = 290.0 K	
40.161	1.40
47.847	1.33
56.818	1.12
59.880	1.06
74.627	0.93
83.333	0.41
88.496	0.77
93.458	1.57
97.087	3.60
98.039	4.72
100.000	5.00
104.167	4.38
106.383	3.50
108.696	3.09
114.942	2.81
126.582	2.63
166.667	2.50
666.667	2.29
CURVE 2 T = 77. K	
40.161	1.40*
47.847	1.33*
56.818	1.12*
61.728	0.97
65.789	0.86
70.423	0.64
75.188	0.27
80.645	0.24
86.207	0.68
88.496	1.24
93.458	6.69
95.238	6.92
101.010	3.93
104.167	3.29
112.360	2.76
116.279	2.70
131.579	2.55
163.934	2.46
666.667	2.25
CURVE 3 T = 4. K	
40.161	1.40*
47.847	1.33*
CURVE 3 (cont.) T = 4. K	
56.818	1.12*
61.728	0.97*
66.225	0.77
68.966	0.60
74.074	0.24*
80.645	0.24
86.207	0.68*
88.496	1.24
93.458	8.02
100.000	3.96
102.041	3.34
108.696	2.83
113.636	2.68
123.457	2.54
144.928	2.43
666.667	2.20
CURVE 4 T = 290.0 K	
37.175	1.55
41.495	1.55
46.296	1.49
51.546	1.33
57.471	1.20
68.493	1.02
71.429	0.97
81.301	0.60
85.470	0.60
90.909	1.13
96.154	3.12
100.000	4.52
104.167	3.86
109.890	3.41
117.648	3.02
133.333	2.76
161.290	2.50
212.766	2.37
322.581	2.33
CURVE 5 T = 77.0 K	
37.175	1.55*
41.494	1.55*
46.296	1.49*
51.546	1.33*
CURVE 5 (cont.) T = 77.0 K	
57.471	1.20*
62.500	0.98
67.568	0.71*
72.993	0.42
76.923	0.29
80.000	0.29
83.333	0.58
86.957	1.16
91.743	6.28
95.238	4.61
99.010	3.88
105.263	3.24
114.942	2.91
131.579	2.67
163.934	2.43*
204.082	2.33
312.500	2.28
CURVE 6 T = 4. K	
37.175	1.55*
41.494	1.55*
46.296	1.49*
51.546	1.33*
57.471	1.20*
62.500	0.98*
67.568	0.55
70.922	0.35
74.627	0.20
77.519	0.20
81.301	0.33
84.746	0.68
86.207	1.28
89.286	6.29
91.743	5.14
94.340	4.16
98.039	3.69
102.041	3.18
109.890	2.87
119.048	2.70*
129.870	2.55
151.515	2.40
181.818	2.31
322.581	2.20
CURVE 7 T = 339. K	
0.254	2.0169
0.265	1.9452*
0.280	1.8847
0.289	1.8575*
0.296	1.8393*
0.302	1.8269
0.313	1.8070*
0.334	1.7754
0.365	1.7434
0.405	1.7169
0.436	1.7018*
0.492	1.6832
0.546	1.6711
0.576	1.6659*
0.579	1.6656
0.615	1.6595
CURVE 8 T = 293.2 K	
0.24828	2.0548
0.25365	2.0105*
0.26537	1.9424
0.26993	1.9221*
0.28035	1.8837*
0.28936	1.85746*
0.29676	1.83967
0.30215	1.82769*
0.31317	1.80707*
0.33415	1.77664*
0.36631	1.74416*
0.39064	1.72671
0.40466	1.71843*
0.43583	1.70350
0.48613	1.68664*
0.54607	1.67310*
0.58756	1.66654
0.58930	1.66643*
0.65628	1.65809
0.70652	1.6537
0.72814	1.6520*
0.76820	1.6494
0.81095	1.6471*
0.84247	1.6456*
0.91230	1.6427
1.01398	1.6396
1.08303	1.6381
CURVE 9 T = 311.2 K	
0.546	1.6733*
0.577	1.6682*
0.579	1.6678*
0.623	1.6619*
0.691	1.6552*
1.18	1.6366
1.77	1.6313
2.36	1.6295
3.54	1.6275
4.13	1.6269
5.89	1.6252
7.66	1.6235
8.84	1.6219
10.02	1.6201
11.79	1.6172*
12.97	1.6150
14.14	1.6127
15.91	1.6085*
18.10	1.6030
CURVE 10 T = 311.2 K	
14	1.6128*
15	1.6107
16	1.6082*
17	1.6056
18	1.6027*
19	1.5997*
20	1.5964
21	1.5930*
22	1.5895
23	1.5858*
24	1.5819*
25	1.5775
26	1.5729*
27	1.5681*
28	1.5629*
29	1.5571
CURVE 11 T = 300.0 K	
45.5	1.41
52.7	1.29
57.5	1.15*
62.2	0.96*
CURVE 11 (cont.) T = 300.0 K	
63.5	0.83
64.5	0.96
65.2	1.23
65.9	1.24*
67.2	0.89
68.0	0.89*
69.8	1.25*
70.8	1.25
73.2	1.00
76.1	0.70
79.1	0.41
82.2	0.20
84.0	0.14
85.3	0.15*
87.7	0.10
90.3	0.22
94.1	0.36
99.6	0.13
104.4	4.47
110.13	3.63
116.6	3.16
128.9	2.81
181.4	2.51
CURVE 12 T = 300.0 K	
40.6	1.53*
49.5	1.41
57.5	1.23
65.4	0.92*
72.5	0.92
75.2	0.79
84.7	0.31
88.5	0.40
91.7	0.69
96.2	1.76
100.0	5.34
106.4	4.16
114.9	3.29
128.2	2.83*
142.8	2.53
149.3	2.53*
166.7	2.46*
200.0	2.42
250.0	2.38
333.3	2.33

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* Not shown in figure.

TABLE 52. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF KI (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 12 (cont.) T = 300.0 K	
500.0	2.28
526.3	2.33
CURVE 13 T = 293.2 K	
0.4066	1.653
0.4459	1.632
0.5005	1.627
0.5694	1.620
CURVE 14 T = 293.2 K	
0.4273	1.633
0.4771	1.621
CURVE 14 (cont.) T = 293.2 K	
0.5424	1.612
0.6306	1.607
CURVE 15 T = 293.2 K	
0.4581	1.610*
0.5200	1.599
0.6039	1.592
CURVE 16 T = 293.2 K	
0.4614	1.482
0.6092	1.466
CURVE 17 T = 293.2 K	
0.4126	1.507
0.5351	1.466
CURVE 18 T = 298.0 K	
0.486	1.6871
0.589	1.6666
0.656	1.6584
CURVE 19 T = 298.0 K	
0.486	1.6880
0.589	1.6674
0.656	1.65935
CURVE 20* T = 290.0 K	
0.4358	1.7042
0.4678	1.6917
0.4800	1.6888
0.5086	1.6809
0.5461	1.6734
0.5780	1.6686
0.5893	1.6668
0.6438	1.6586
CURVE 21* T = 4.0 K	
0.4358	1.7161
0.4678	1.7042
0.4800	1.7006
0.5086	1.6937
CURVE 21 (cont.)* T = 4.0 K	
0.5461	1.6852
0.5780	1.6804
0.5893	1.6786
0.6438	1.6722

TABLE 53. EXPERIMENTAL DATA ON dn/dT OF KI

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	n
CURVE 8 T_m = 293.0 K	
0.24828	13.1
0.25365	10.2
0.26537	4.2
0.26993	3.3
0.28035	1.4
0.28936	0.0
0.29676	-1.4
0.30215	-1.7
0.31317	-1.6
0.33415	-2.2
0.36631	-3.0
0.39064	-3.1
0.40466	-3.7
0.43583	-2.8
0.48613	-4.1
0.54607	-3.0
0.58756	-3.8
CURVE 8 (cont.) T_m = 293.0 K	
0.58930	-3.8
0.65628	-4.1
0.70652	-3.4
0.72814	-3.7
0.76820	-3.1
0.81095	-3.9
0.84247	-3.1
0.91230	-3.5
1.01398	-4.5
1.08303	-4.3
CURVE 9 T_m = 337.0 K	
0.546	-5.0

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* Not shown in figure.

TABLE 54. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR KI

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Harting, H. [30] 1943	0.248-1.083 μm 293 K	$n = 1.61974 + \dfrac{0.01509}{(\lambda - 0.1737)^{1.28}}$
Ramachandran, G.N. [17] 1947	4.0-29.0 μm 311 K	$n^2 = 2.6499 + \dfrac{2.530\,\lambda^2}{\lambda^2 - (102.0)^2}$
Ramachandran, G.N. [17] 1947	0.253-0.615 μm 339 K	$n^2 = 1.4532 + \dfrac{0.2150\,\lambda^2}{\lambda^2 - (0.1290)^2} + \dfrac{0.8027\,\lambda^2}{\lambda^2 - (0.1805)^2}$ $+ \dfrac{0.1780\,\lambda^2}{\lambda^2 - (0.2190)^2}$
Hadni, A., Caludel, J., Morlot, G., and Strimer, P. [25] 1968	40-667 μm 290 K	$n^2 - k^2 = \epsilon_{uv} + \sum_i 4\pi\rho_i \dfrac{1 - \Omega_i^2}{(1 - \Omega_i^2)^2 + (\delta_i \Omega_i)^2}$, $2nk = \sum_i 4\pi\rho_i \dfrac{\delta_i \Omega_i}{(1 - \Omega_i^2)^2 + (\delta_i \Omega_i)^2}$ *
Present work 1975	0.25-50.0 μm 293 K	$n^2 = 1.47285 + \dfrac{0.16512\,\lambda^2}{\lambda^2 - (0.129)^2} + \dfrac{0.41222\,\lambda^2}{\lambda^2 - (0.175)^2}$ $+ \dfrac{0.44163\,\lambda^2}{\lambda^2 - (0.187)^2} + \dfrac{0.16076\,\lambda^2}{\lambda^2 - (0.219)^2}$ $+ \dfrac{0.33571\,\lambda^2}{\lambda^2 - (69.44)^2} + \dfrac{1.92474\,\lambda^2}{\lambda^2 - (98.04)}$

*; − 1.2, $\Omega_i = \nu/\nu_i$; $\nu_1 = 102$ cm^{-1}, $v_2 = 144$ cm^{-1}; $\delta_1 = 0.084$, $\delta_2 = 0.3$; $\rho_1 = 0.17$, $\rho_2 = 0.022$;
$_{uv} = 2.7$, $\epsilon_s = 5.12$.

3.13. Rubidium Fluoride, RbF

The refractive index of RbF is available only for a single spectral line, the sodium D line, measured by Spangenberg [45] in 1923 using the immersion method. One of the reasons for the scantiness of the data is difficulty in crystal growing. Though little attention was paid to the refractive index measurement, a number of other physical properties of RbF were investigated. Values of a few of them are given in tables 2 and 3. Although there is only a single value of n available, a dispersion equation can be formed by correlating the dielectric constants and the wavelengths of absorption peaks to the refractive index by the two-oscillator model. Using the values of known parameters from table 3 and the available value of n:

$\epsilon_s = 6.48$,
$\epsilon_{uv} = 1.93$,
$\lambda_u = 0.124$ μm (average of two peaks),
$\lambda_l = 63.29$ μm,
$n = 1.398$ for $\lambda = 0.5893$ μm

the value of the adjustable parameter A of eq (13) is found to be 1.395. This leads to a dispersion equation for RbF at 293 K in the transparent region from 0.15–25.0 μm.

$$n^2 = 1.395 + \frac{0.535\lambda^2}{\lambda^2-(0.124)^2} + \frac{4.55\lambda^2}{\lambda^2-(63.29)^2}, \qquad (47)$$

where λ is in units of μm.

No experimental data on dn/dT are available. Our empirical parameter values in table 5 were used to construct a dn/dT formula for the transparent region:

$$2n\frac{dn}{dT} = -8.25(n^2-1) - 0.89 + \frac{1.581\lambda^4}{(\lambda^2-0.01742)^2} + \frac{227.50\lambda^4}{(\lambda^2-4005.62)^2}, \qquad (48)$$

where dn/dT is in units of 10^{-5} K^{-1} and λ in μm.

Equations (47) and (48) were used to generate the recommended values of refractive index and its wavelength and temperature derivatives. In the table of recommended values, more decimal places than needed are given, for tabular smoothness and internal comparison. The readers are advised to follow the criteria given below in order to find meaningful values from the table.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.15– 0.21	2	0.02
0.21– 0.30	3	0.008
0.30– 0.40	3	0.006
0.40– 1.50	3	0.005
1.50– 8.00	3	0.006
8.00–11.00	3	0.008
11.00–15.00	3	0.02
15.00–25.00	2	0.03

For dn/dT:

0.15– 1.00	1	0.8
1.00–10.00	1	0.6
10.00–20.00	1	0.8
20.00–25.00	0	≥1

TABLE 55. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbF AT 293 K*

λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	$-dn/d\lambda$ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.150	1.75633	13.84325	3.68	0.270	1.43976	0.46641	-2.44	0.700	1.39527	0.01889	-2.51
0.152	1.73044	12.09909	2.54	0.272	1.43885	0.45294	-2.44	0.720	1.39491	0.01737	-2.51
0.154	1.70772	10.66528	1.68	0.274	1.43795	0.44002	-2.44	0.740	1.39457	0.01601	-2.51
0.156	1.68762	9.47186	1.02	0.276	1.43708	0.42760	-2.44	0.760	1.39427	0.01480	-2.51
0.158	1.66971	8.46764	0.50	0.278	1.43624	0.41567	-2.44	0.780	1.39398	0.01372	-2.51
0.160	1.65365	7.61443	0.09	0.280	1.43542	0.40421	-2.45	0.800	1.39372	0.01275	-2.51
0.162	1.63917	6.88328	-0.25	0.282	1.43462	0.39318	-2.45	0.820	1.39347	0.01188	-2.51
0.164	1.62605	6.25186	-0.53	0.284	1.43385	0.38257	-2.45	0.840	1.39324	0.01110	-2.51
0.166	1.61411	5.70278	-0.76	0.286	1.43309	0.37235	-2.45	0.860	1.39302	0.01038	-2.51
0.168	1.60320	5.22226	-0.95	0.288	1.43236	0.36252	-2.45	0.880	1.39282	0.00974	-2.51
0.170	1.59318	4.79934	-1.12	0.290	1.43164	0.35304	-2.46	0.900	1.39263	0.00915	-2.51
0.172	1.58397	4.42513	-1.26	0.292	1.43095	0.34391	-2.46	0.920	1.39246	0.00862	-2.51
0.174	1.57545	4.09243	-1.38	0.294	1.43027	0.33510	-2.46	0.940	1.39229	0.00813	-2.51
0.176	1.56757	3.79531	-1.49	0.296	1.42961	0.32661	-2.46	0.960	1.39213	0.00769	-2.51
0.178	1.56025	3.52888	-1.58	0.298	1.42896	0.31841	-2.46	0.980	1.39198	0.00729	-2.51
0.180	1.55344	3.28904	-1.66	0.300	1.42833	0.31050	-2.46	1.000	1.39184	0.00691	-2.51
0.182	1.54708	3.07238	-1.73	0.305	1.42683	0.29189	-2.47	1.050	1.39152	0.00611	-2.51
0.184	1.54114	2.87601	-1.79	0.310	1.42541	0.27479	-2.47	1.100	1.39123	0.00546	-2.51
0.186	1.53557	2.69747	-1.85	0.315	1.42408	0.25906	-2.47	1.150	1.39097	0.00492	-2.51
0.188	1.53034	2.53468	-1.90	0.320	1.42282	0.24455	-2.48	1.200	1.39073	0.00448	-2.51
0.190	1.52542	2.38584	-1.94	0.325	1.42163	0.23115	-2.48	1.250	1.39052	0.00411	-2.51
0.192	1.52078	2.24940	-1.99	0.330	1.42050	0.21875	-2.48	1.300	1.39032	0.00381	-2.51
0.194	1.51641	2.12403	-2.02	0.335	1.41944	0.20725	-2.48	1.350	1.39014	0.00355	-2.51
0.196	1.51228	2.00857	-2.05	0.340	1.41843	0.19657	-2.48	1.400	1.38997	0.00334	-2.51
0.198	1.50837	1.90201	-2.08	0.345	1.41747	0.18664	-2.49	1.450	1.38980	0.00316	-2.51
0.200	1.50467	1.80346	-2.11	0.350	1.41656	0.17740	-2.49	1.500	1.38965	0.00301	-2.51
0.202	1.50115	1.71213	-2.14	0.355	1.41570	0.16877	-2.49	1.550	1.38950	0.00288	-2.51
0.204	1.49781	1.62736	-2.16	0.360	1.41487	0.16071	-2.49	1.600	1.38936	0.00277	-2.51
0.206	1.49464	1.54852	-2.18	0.365	1.41409	0.15318	-2.49	1.650	1.38922	0.00268	-2.51
0.208	1.49162	1.47508	-2.20	0.370	1.41334	0.14612	-2.49	1.700	1.38909	0.00261	-2.50
0.210	1.48874	1.40656	-2.22	0.375	1.41263	0.13951	-2.49	1.750	1.38896	0.00255	-2.50
0.212	1.48599	1.34254	-2.23	0.380	1.41195	0.13330	-2.49	1.800	1.38884	0.00250	-2.50
0.214	1.48336	1.28263	-2.25	0.385	1.41129	0.12746	-2.49	1.850	1.38871	0.00246	-2.50
0.216	1.48086	1.22649	-2.26	0.390	1.41067	0.12197	-2.50	1.900	1.38859	0.00243	-2.50
0.218	1.47846	1.17381	-2.28	0.395	1.41007	0.11681	-2.50	1.950	1.38847	0.00240	-2.50
0.220	1.47616	1.12433	-2.29	0.400	1.40950	0.11193	-2.50	2.000	1.38835	0.00239	-2.50
0.222	1.47396	1.07778	-2.30	0.410	1.40843	0.10300	-2.50	2.050	1.38823	0.00237	-2.50
0.224	1.47184	1.03394	-2.31	0.420	1.40744	0.09501	-2.50	2.100	1.38811	0.00237	-2.50
0.226	1.46982	0.99262	-2.32	0.430	1.40653	0.08786	-2.50	2.150	1.38799	0.00236	-2.50
0.228	1.46787	0.95361	-2.33	0.440	1.40568	0.08142	-2.50	2.200	1.38788	0.00237	-2.50
0.230	1.46600	0.91676	-2.34	0.450	1.40490	0.07561	-2.50	2.250	1.38776	0.00237	-2.50
0.232	1.46420	0.88191	-2.35	0.460	1.40417	0.07036	-2.50	2.300	1.38764	0.00238	-2.50
0.234	1.46247	0.84892	-2.35	0.470	1.40349	0.06560	-2.50	2.350	1.38752	0.00239	-2.50
0.236	1.46081	0.81766	-2.36	0.480	1.40285	0.06127	-2.50	2.400	1.38740	0.00240	-2.50
0.238	1.45920	0.78801	-2.37	0.490	1.40226	0.05732	-2.50	2.450	1.38728	0.00242	-2.50
0.240	1.45765	0.75987	-2.37	0.500	1.40171	0.05371	-2.51	2.500	1.38716	0.00243	-2.50
0.242	1.45616	0.73314	-2.38	0.510	1.40118	0.05041	-2.51	2.550	1.38704	0.00245	-2.50
0.244	1.45472	0.70773	-2.39	0.520	1.40070	0.04738	-2.51	2.600	1.38691	0.00248	-2.49
0.246	1.45333	0.68355	-2.39	0.530	1.40024	0.04459	-2.51	2.650	1.38679	0.00250	-2.49
0.248	1.45199	0.66052	-2.40	0.540	1.39980	0.04203	-2.51	2.700	1.38666	0.00252	-2.49
0.250	1.45069	0.63858	-2.40	0.550	1.39940	0.03966	-2.51	2.750	1.38654	0.00255	-2.49
0.252	1.44943	0.61765	-2.40	0.560	1.39901	0.03748	-2.51	2.800	1.38641	0.00257	-2.49
0.254	1.44822	0.59768	-2.41	0.570	1.39864	0.03546	-2.51	2.850	1.38628	0.00260	-2.49
0.256	1.44704	0.57862	-2.41	0.580	1.39830	0.03358	-2.51	2.900	1.38615	0.00263	-2.49
0.258	1.44590	0.56040	-2.42	0.590	1.39797	0.03184	-2.51	2.950	1.38602	0.00266	-2.49
0.260	1.44480	0.54298	-2.42	0.600	1.39766	0.03022	-2.51	3.000	1.38588	0.00269	-2.49
0.262	1.44373	0.52632	-2.42	0.620	1.39709	0.02731	-2.51	3.050	1.38575	0.00272	-2.49
0.264	1.44269	0.51037	-2.43	0.640	1.39657	0.02478	-2.51	3.100	1.38561	0.00275	-2.49
0.266	1.44169	0.49509	-2.43	0.660	1.39609	0.02256	-2.51	3.150	1.38547	0.00279	-2.49
0.268	1.44071	0.48045	-2.43	0.680	1.39566	0.02061	-2.51	3.200	1.38533	0.00282	-2.48

TABLE 55. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbF (continued)*

λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}	λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}	λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}
3.250	1.38519	0.00285	-2.48	6.400	1.37230	0.00543	-2.39	12.600	1.31995	0.01176	-1.91
3.300	1.38505	0.00289	-2.48	6.500	1.37175	0.00552	-2.39	12.800	1.31758	0.01200	-1.88
3.350	1.38490	0.00292	-2.48	6.600	1.37119	0.00561	-2.39	13.000	1.31515	0.01224	-1.86
3.400	1.38475	0.00296	-2.48	6.700	1.37063	0.00570	-2.38	13.200	1.31268	0.01249	-1.83
3.450	1.38461	0.00299	-2.48	6.800	1.37005	0.00579	-2.38	13.400	1.31016	0.01274	-1.80
3.500	1.38445	0.00303	-2.48	6.900	1.36947	0.00588	-2.37	13.600	1.30758	0.01299	-1.77
3.550	1.38430	0.00306	-2.48	7.000	1.36888	0.00597	-2.37	13.800	1.30496	0.01324	-1.74
3.600	1.38415	0.00310	-2.48	7.100	1.36827	0.00606	-2.36	14.000	1.30229	0.01350	-1.71
3.650	1.38399	0.00314	-2.48	7.200	1.36766	0.00615	-2.36	14.200	1.29956	0.01376	-1.67
3.700	1.38383	0.00318	-2.48	7.300	1.36704	0.00625	-2.35	14.400	1.29678	0.01403	-1.64
3.750	1.38367	0.00321	-2.47	7.400	1.36641	0.00634	-2.35	14.600	1.29395	0.01430	-1.60
3.800	1.38351	0.00325	-2.47	7.500	1.36578	0.00643	-2.34	14.800	1.29106	0.01457	-1.57
3.850	1.38335	0.00329	-2.47	7.600	1.36513	0.00652	-2.34	15.000	1.28812	0.01485	-1.53
3.900	1.38318	0.00333	-2.47	7.700	1.36447	0.00662	-2.33	15.200	1.28512	0.01513	-1.49
3.950	1.38302	0.00337	-2.47	7.800	1.36380	0.00671	-2.33	15.400	1.28206	0.01542	-1.45
4.000	1.38285	0.00341	-2.47	7.900	1.36313	0.00681	-2.32	15.600	1.27895	0.01571	-1.41
4.050	1.38268	0.00344	-2.47	8.000	1.36244	0.00690	-2.32	15.800	1.27578	0.01600	-1.36
4.100	1.38250	0.00348	-2.47	8.100	1.36175	0.00699	-2.31	16.000	1.27255	0.01630	-1.32
4.150	1.38233	0.00352	-2.47	8.200	1.36104	0.00709	-2.31	16.200	1.26926	0.01660	-1.27
4.200	1.38215	0.00356	-2.46	8.300	1.36033	0.00719	-2.30	16.400	1.26591	0.01691	-1.22
4.250	1.38197	0.00360	-2.46	8.400	1.35961	0.00728	-2.29	16.600	1.26250	0.01723	-1.17
4.300	1.38179	0.00364	-2.46	8.500	1.35887	0.00738	-2.29	16.800	1.25902	0.01754	-1.12
4.350	1.38161	0.00368	-2.46	8.600	1.35813	0.00748	-2.28	17.000	1.25548	0.01787	-1.07
4.400	1.38142	0.00372	-2.46	8.700	1.35738	0.00757	-2.27	17.200	1.25187	0.01820	-1.02
4.450	1.38124	0.00376	-2.46	8.800	1.35662	0.00767	-2.27	17.400	1.24820	0.01853	-0.96
4.500	1.38105	0.00380	-2.46	8.900	1.35584	0.00777	-2.26	17.600	1.24446	0.01887	-0.90
4.550	1.38085	0.00385	-2.46	9.000	1.35506	0.00787	-2.25	17.800	1.24065	0.01922	-0.84
4.600	1.38066	0.00389	-2.45	9.100	1.35427	0.00797	-2.25	18.000	1.23677	0.01957	-0.77
4.650	1.38047	0.00393	-2.45	9.200	1.35347	0.00807	-2.24	18.200	1.23282	0.01993	-0.71
4.700	1.38027	0.00397	-2.45	9.300	1.35266	0.00817	-2.23	18.400	1.22880	0.02030	-0.64
4.750	1.38007	0.00401	-2.45	9.400	1.35184	0.00827	-2.23	18.600	1.22470	0.02067	-0.57
4.800	1.37987	0.00405	-2.45	9.500	1.35100	0.00837	-2.22	18.800	1.22053	0.02105	-0.50
4.850	1.37966	0.00409	-2.45	9.600	1.35016	0.00847	-2.21	19.000	1.21628	0.02143	-0.42
4.900	1.37946	0.00413	-2.45	9.700	1.34931	0.00857	-2.20	19.200	1.21196	0.02183	-0.35
4.950	1.37925	0.00418	-2.44	9.800	1.34845	0.00867	-2.20	19.400	1.20755	0.02223	-0.27
5.000	1.37904	0.00422	-2.44	9.900	1.34758	0.00878	-2.19	19.600	1.20306	0.02264	-0.18
5.100	1.37861	0.00430	-2.44	10.000	1.34669	0.00888	-2.18	19.800	1.19849	0.02306	-0.10
5.200	1.37818	0.00439	-2.44	10.200	1.34490	0.00909	-2.16	20.000	1.19384	0.02349	-0.01
5.300	1.37774	0.00447	-2.43	10.400	1.34306	0.00930	-2.15	20.500	1.18182	0.02459	0.23
5.400	1.37729	0.00456	-2.43	10.600	1.34118	0.00951	-2.13	21.000	1.16924	0.02576	0.49
5.500	1.37683	0.00464	-2.43	10.800	1.33926	0.00972	-2.11	21.500	1.15605	0.02700	0.77
5.600	1.37636	0.00473	-2.42	11.000	1.33729	0.00994	-2.09	22.000	1.14223	0.02831	1.08
5.700	1.37588	0.00482	-2.42	11.200	1.33528	0.01016	-2.07	22.500	1.12773	0.02970	1.42
5.800	1.37539	0.00490	-2.42	11.400	1.33323	0.01038	-2.05	23.000	1.11252	0.03117	1.80
5.900	1.37490	0.00499	-2.41	11.600	1.33113	0.01060	-2.03	23.500	1.09654	0.03275	2.21
6.000	1.37440	0.00508	-2.41	11.800	1.32898	0.01083	-2.01	24.000	1.07974	0.03444	2.66
6.100	1.37388	0.00516	-2.41	12.000	1.32680	0.01106	-1.98	24.500	1.06208	0.03626	3.16
6.200	1.37336	0.00525	-2.40	12.200	1.32456	0.01129	-1.96	25.000	1.04347	0.03821	3.71
6.300	1.37283	0.00534	-2.40	12.400	1.32228	0.01152	-1.94				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.13. The number of digits with an overstrike are not relevant to accuracy of the data.

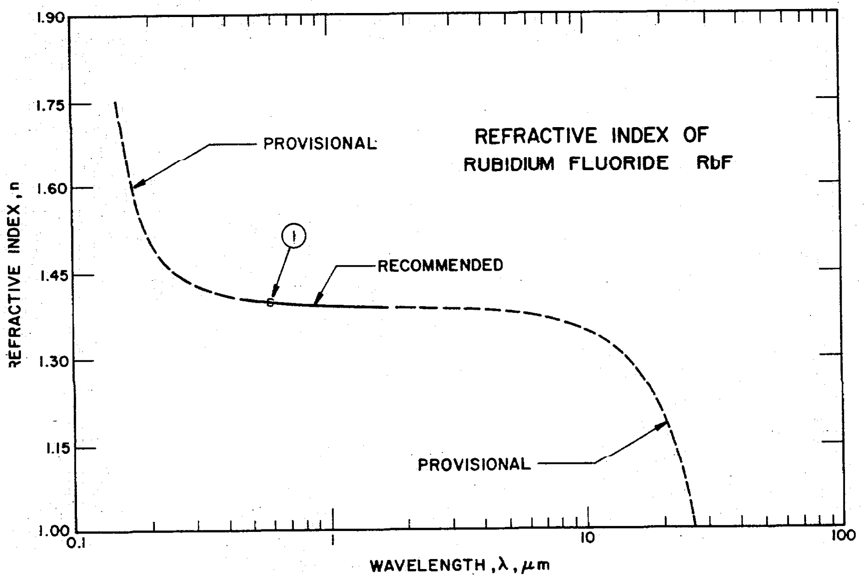

FIGURE 44. Refractive Index of RbF

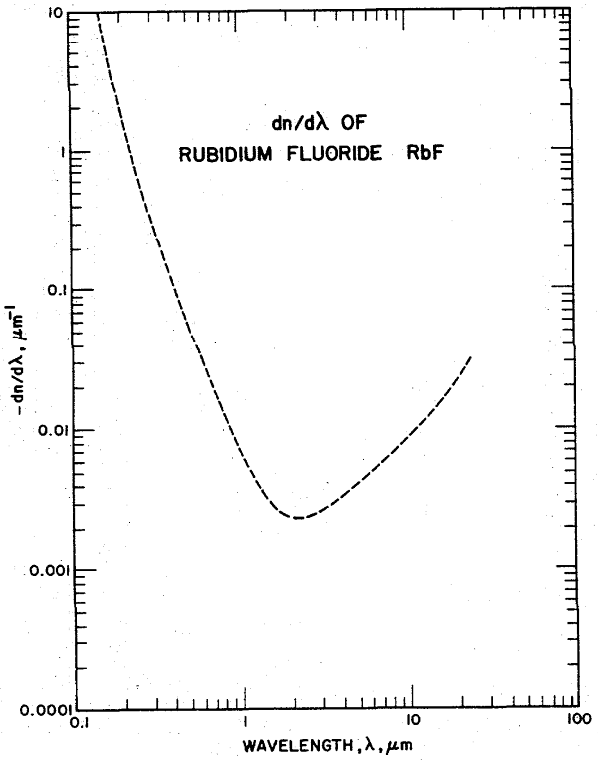

FIGURE 45. $dn/d\lambda$ of RbF

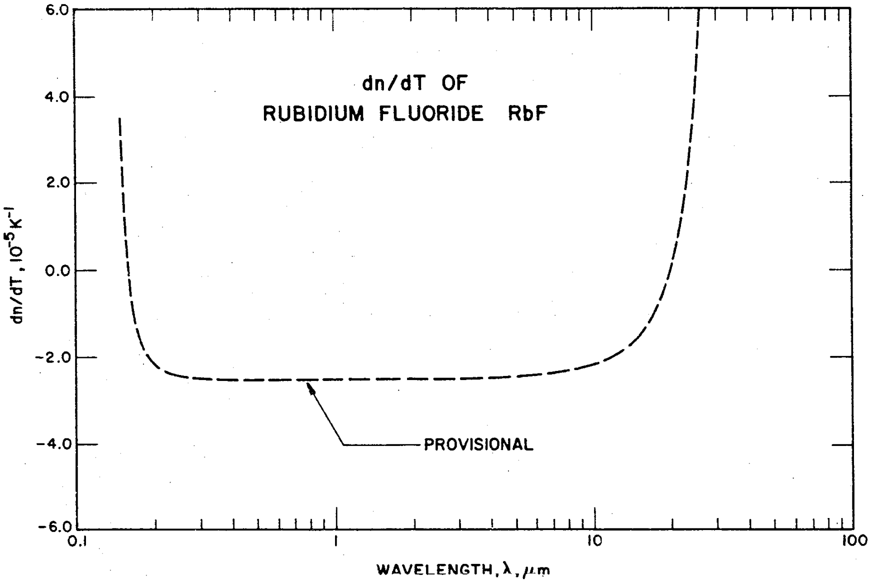

FIGURE 46. *dn/dT* of RbF

TABLE 56. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF RbF

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	45	Spangenberg, K.	1923	M	0.5893	295	RbF was produced by the reaction $2RbCo_3 + 2HF \rightarrow 2RbF + H_2CO_3$ in a Pt crucible; refractive index for mean of sodium D lines was determined by the immersion method.

TABLE 57. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF RbF

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 295.2 K	
0.5893	1.398

3.14. Rubidium Chloride, RbCl

Rubidium chloride is hygroscopic and must be carefully handled to preserve the surface polish. The transmission region of RbCl is approximately from 0.18 to 40 μm. The gradual decrease in transmittance at shorter wavelengths is due to surface scattering that is caused by the roughness of the surface, and not to absorption or scattering within the material itself [105].

The available data on the refractive index of RbCl are very limited; only three reports were found. Sprockhoff [95], in 1904, was probably the first to measure the refractive index of RbCl for three spectral lines (the C, D, and F lines), by the minimum deviation method. These three values remained unchecked until Gyulai [27], in 1927, performed experiments for an extended wavelength region from 0.19 to 0.58 μm by the deviation method at an elevated temperature, 321 K. The accuracy of his measurements is one unit of the third decimal place, but the reported values are given to the fourth place for tabular smoothness. The refractive index for sodium D line was remeasured using the immersion method at room temperature by Wulff and Heigl [87] in 1928, and the result deviated from that of Sprockhoff only in the fourth decimal place. In addition, the temperature derivative, dn/dT, for sodium D line in the temperature range from 296 to 298 K was determined, and a value of $-1.0\times10^{-4}\mathrm{K}^{-1}$ was reported. This value is obviously inaccurate.

The values reported by Gyulai [27] were adopted in the present work to generate reference data on the refractive index of RbCl. Since the data was obtained at a temperaure of 321 K, dn/dT is needed to reduce this set of data to 293 K. No experimental data on dn/dT are available to carry out the corrections, but our empirical findings permit reasonable estimation of dn/dT for a wide wavelength range. Using the predicted parameters in table 5, the following dn/dT formula was constructed for RbCl:

$$2n\frac{dn}{dT}=-10.80(n^2-1)-0.84+\frac{2.006\lambda^4}{(\lambda^2-0.02756)^2}+\frac{186.32\lambda^4}{(\lambda^2-7368.51)^2}, \tag{49}$$

where dn/dT is in units of 10^{-5} K^{-1} and λ in μm. This equation was used to reduce Gyulai's data to 293 K.

Radharkrishnan [48] worked out a dispersion formula (shown in table 62) expressing the refractive indices of RbCl in terms of its characteristic absorption peaks, using Gyulai's data. The wavelengths of ultraviolet absorption peaks, indicated by his equation, agree with the measured values listed in table 3. However, no information concerning the infrared absorption peak and dielectric constants was given. This leads to large uncertainties in the long wavelength region. Since the wavelength of the fundamental infrared absorption peak and the dielectric constants for high and low frequencies are now available (see table 3), a better formula of the Sellmeier type can be constructed, and the extrapolation into the infrared can be carried out with less uncertainty. By using the known parameters with eq (10), the least-squares fitting of Gyulai's data (reduced to 293 K) yielded a dispersion equation for RbCl at 293 K in the transparent region, 0.18–40.0 μm.

$$n^2=1.47558+\frac{0.56600\lambda^2}{\lambda^2-(0.138)^2}+\frac{0.14493\lambda^2}{\lambda^2-(0.166)^2}+\frac{2.74000\lambda^2}{\lambda^2-(85.84)^2}, \tag{50}$$

where λ is in units of μm.

Equations (49) and (50) are used to generate the reference data given in the table of recommended values on refractive index, $dn/d\lambda$ and dn/dT. In this table, more decimal places than needed are given for the purpose of tabular smoothness. In order to use this table properly, the readers should follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.18– 0.20	2	0.02
0.20– 0.25	3	0.005
0.25– 0.35	3	0.004
0.35– 1.50	3	0.002
1.50–10.00	3	0.004
10.00–21.00	3	0.008
21.00–40.00	2	0.02

For dn/dT:

0.18– 0.20	0	⩾1
0.20–30.00	1	0.5
30.00–40.00	0	⩾1

TABLE 58. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbCl AT 293 K*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.180	1.95396	21.24517	15.06	0.300	1.54994	0.61269	-3.81	1.000	1.48365	0.01065	-3.94
0.182	1.91553	17.40495	10.81	0.305	1.54698	0.57205	-3.83	1.050	1.48316	0.00921	-3.94
0.184	1.88364	14.62800	7.87	0.310	1.54422	0.53514	-3.84	1.100	1.48273	0.00803	-3.94
0.186	1.85657	12.53754	5.72	0.315	1.54163	0.50152	-3.85	1.150	1.48235	0.00706	-3.94
0.188	1.83318	10.91305	4.10	0.320	1.53920	0.47081	-3.86	1.200	1.48202	0.00624	-3.94
0.190	1.81269	9.61788	2.85	0.325	1.53691	0.44270	-3.86	1.250	1.48172	0.00556	-3.94
0.192	1.79455	8.56336	1.86	0.330	1.53477	0.41690	-3.87	1.300	1.48146	0.00498	-3.94
0.194	1.77832	7.68963	1.07	0.335	1.53274	0.39316	-3.88	1.350	1.48122	0.00449	-3.94
0.196	1.76370	6.95498	0.42	0.340	1.53083	0.37129	-3.88	1.400	1.48101	0.00407	-3.94
0.198	1.75043	6.32948	-0.11	0.345	1.52903	0.35108	-3.89	1.450	1.48082	0.00370	-3.94
0.200	1.73832	5.79114	-0.56	0.350	1.52732	0.33239	-3.89	1.500	1.48064	0.00339	-3.94
0.202	1.72722	5.32348	-0.93	0.355	1.52570	0.31506	-3.90	1.550	1.48048	0.00312	-3.94
0.204	1.71699	4.91387	-1.25	0.360	1.52417	0.29897	-3.90	1.600	1.48033	0.00288	-3.94
0.206	1.70753	4.55251	-1.52	0.365	1.52271	0.28400	-3.91	1.650	1.48019	0.00267	-3.94
0.208	1.69875	4.23168	-1.76	0.370	1.52132	0.27006	-3.91	1.700	1.48006	0.00249	-3.94
0.210	1.69058	3.94520	-1.97	0.375	1.52001	0.25785	-3.91	1.750	1.47994	0.00233	-3.94
0.212	1.68295	3.68806	-2.15	0.380	1.51875	0.24491	-3.91	1.800	1.47982	0.00219	-3.94
0.214	1.67581	3.45620	-2.30	0.385	1.51756	0.23354	-3.92	1.850	1.47972	0.00206	-3.94
0.216	1.66911	3.24625	-2.44	0.390	1.51642	0.22290	-3.92	1.900	1.47962	0.00195	-3.94
0.218	1.66281	3.05540	-2.57	0.395	1.51533	0.21291	-3.92	1.950	1.47952	0.00185	-3.94
0.220	1.65688	2.88130	-2.68	0.400	1.51429	0.20354	-3.92	2.000	1.47943	0.00176	-3.94
0.222	1.65128	2.72197	-2.77	0.410	1.51234	0.18644	-3.92	2.050	1.47935	0.00169	-3.94
0.224	1.64598	2.57573	-2.86	0.420	1.51055	0.17126	-3.93	2.100	1.47926	0.00162	-3.93
0.226	1.64097	2.44111	-2.94	0.430	1.50891	0.15774	-3.93	2.150	1.47918	0.00156	-3.93
0.228	1.63621	2.31689	-3.01	0.440	1.50739	0.14565	-3.93	2.200	1.47911	0.00150	-3.93
0.230	1.63169	2.20198	-3.08	0.450	1.50599	0.13480	-3.93	2.250	1.47903	0.00145	-3.93
0.232	1.62740	2.09544	-3.14	0.460	1.50469	0.12503	-3.93	2.300	1.47896	0.00141	-3.93
0.234	1.62331	1.99647	-3.19	0.470	1.50349	0.11621	-3.94	2.350	1.47889	0.00137	-3.93
0.236	1.61941	1.90434	-3.24	0.480	1.50236	0.10822	-3.94	2.400	1.47883	0.00133	-3.93
0.238	1.61569	1.81842	-3.29	0.490	1.50132	0.10097	-3.94	2.450	1.47876	0.00130	-3.93
0.240	1.61213	1,73815	-3.33	0.500	1.50034	0.09436	-3.94	2.500	1.47870	0.00127	-3.93
0.242	1.60873	1.66304	-3.37	0.510	1.49943	0.08834	-3.94	2.550	1.47863	0.00125	-3.93
0.244	1.60547	1.59264	-3.40	0.520	1.49857	0.08283	-3.94	2.600	1.47857	0.00123	-3.93
0.246	1.60236	1.52656	-3.43	0.530	1.49777	0.07778	-3.94	2.650	1.47851	0.00121	-3.93
0.248	1.59937	1.46446	-3.46	0.540	1.49702	0.07314	-3.94	2.700	1.47845	0.00119	-3.93
0.250	1.59650	1.40601	-3.49	0.550	1.49631	0.06887	-3.94	2.750	1.47839	0.00118	-3.93
0.252	1.59374	1.35092	-3.52	0.560	1.49564	0.06493	-3.94	2.800	1.47833	0.00116	-3.93
0.254	1.59109	1.29895	-3.54	0.570	1.49501	0.06129	-3.94	2.850	1.47827	0.00115	-3.93
0.256	1.58854	1.24985	-3.56	0.580	1.49441	0.05793	-3.94	2.900	1.47822	0.00114	-3.93
0.258	1.58609	1.20343	-3.58	0.590	1.49385	0.05481	-3.94	2.950	1.47816	0.00114	-3.93
0.260	1.58373	1.15947	-3.60	0.600	1.49331	0.05192	-3.94	3.000	1.47810	0.00113	-3.93
0.262	1.58145	1.11783	-3.62	0.620	1.49233	0.04673	-3.94	3.050	1.47805	0.00112	-3.93
0.264	1.57925	1.07832	-3.64	0.640	1.49144	0.04222	-3.94	3.100	1.47799	0.00112	-3.93
0.266	1.57713	1.04081	-3.65	0.660	1.49064	0.03829	-3.94	3.150	1.47794	0.00112	-3.93
0.268	1.57509	1.00517	-3.67	0.680	1.48991	0.03484	-3.94	3.200	1.47788	0.00111	-3.93
0.270	1.57311	0.97127	-3.68	0.700	1.48924	0.03179	-3.94	3.250	1.47782	0.00111	-3.93
0.272	1.57120	0.93900	-3.69	0.720	1.48863	0.02910	-3.94	3.300	1.47777	0.00111	-3.93
0.274	1.56936	0.90825	-3.71	0.740	1.48807	0.02671	-3.94	3.350	1.47771	0.00111	-3.93
0.276	1.56757	0.87894	-3.72	0.760	1.48756	0.02459	-3.94	3.400	1.47766	0.00111	-3.93
0.278	1.56584	0.85098	-3.73	0.780	1.48709	0.02268	-3.94	3.450	1.47760	0.00112	-3.93
0.280	1.56416	0.82427	-3.74	0.800	1.48665	0.02097	-3.94	3.500	1.47755	0.00112	-3.93
0.282	1.56254	0.79876	-3.75	0.820	1.48625	0.01944	-3.94	3.550	1.47749	0.00112	-3.93
0.284	1.56097	0.77437	-3.76	0.840	1.48587	0.01805	-3.94	3.600	1.47743	0.00112	-3.93
0.286	1.55944	0.75103	-3.76	0.860	1.48553	0.01679	-3.94	3.650	1.47738	0.00113	-3.93
0.288	1.55796	0.72869	-3.77	0.880	1.48520	0.01566	-3.94	3.700	1.47732	0.00113	-3.92
0.290	1.55653	0.70729	-3.78	0.900	1.48490	0.01462	-3.94	3.750	1.47726	0.00114	-3.92
0.292	1.55513	0.68678	-3.79	0.920	1.48462	0.01368	-3.94	3.800	1.47721	0.00114	-3.92
0.294	1.55378	0.66710	-3.79	0.940	1.48435	0.01282	-3.94	3.850	1.47715	0.00115	-3.92
0.296	1.55246	0.64822	-3.80	0.960	1.48410	0.01203	-3.94	3.900	1.47709	0.00115	-3.92
0.298	1.55119	0.63010	-3.81	0.980	1.48387	0.01131	-3.94	3.950	1.47703	0.00116	-3.92

TABLE 58. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbCl AT 293 K (continued)*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
4.000	1.47698	0.00117	-3.92	8.400	1.46977	0.00218	-3.86	17.600	1.43746	0.00496	-3.48
4.050	1.47692	0.00118	-3.92	8.500	1.46955	0.00221	-3.86	17.800	1.43647	0.00503	-3.46
4.100	1.47686	0.00118	-3.92	8.600	1.46932	0.00224	-3.86	18.000	1.43545	0.00510	-3.45
4.150	1.47680	0.00119	-3.92	8.700	1.46910	0.00226	-3.85	18.200	1.43442	0.00517	-3.43
4.200	1.47674	0.00120	-3.92	8.800	1.46887	0.00229	-3.85	18.400	1.43338	0.00525	-3.42
4.250	1.47668	0.00121	-3.92	8.900	1.46864	0.00232	-3.85	18.600	1.43233	0.00532	-3.40
4.300	1.47662	0.00121	-3.92	9.000	1.46841	0.00234	-3.85	18.800	1.43125	0.00539	-3.38
4.350	1.47656	0.00122	-3.92	9.100	1.46817	0.00237	-3.84	19.000	1.43017	0.00546	-3.37
4.400	1.47650	0.00123	-3.92	9.200	1.46793	0.00240	-3.84	19.200	1.42907	0.00554	-3.35
4.450	1.47644	0.00124	-3.92	9.300	1.46769	0.00243	-3.84	19.400	1.42795	0.00561	-3.33
4.500	1.47637	0.00125	-3.92	9.400	1.46745	0.00245	-3.84	19.600	1.42682	0.00569	-3.31
4.550	1.47631	0.00126	-3.92	9.500	1.46720	0.00248	-3.83	19.800	1.42568	0.00576	-3.30
4.600	1.47625	0.00127	-3.92	9.600	1.46695	0.00251	-3.83	20.000	1.42452	0.00584	-3.28
4.650	1.47618	0.00128	-3.92	9.700	1.46670	0.00253	-3.83	20.500	1.42155	0.00603	-3.23
4.700	1.47612	0.00129	-3.92	9.800	1.46645	0.00256	-3.83	21.000	1.41849	0.00623	-3.18
4.750	1.47605	0.00130	-3.92	9.900	1.46619	0.00259	-3.82	21.500	1.41532	0.00643	-3.12
4.800	1.47599	0.00131	-3.91	10.000	1.46593	0.00262	-3.82	22.000	1.41205	0.00664	-3.06
4.850	1.47592	0.00132	-3.91	10.200	1.46540	0.00267	-3.82	22.500	1.40868	0.00685	-3.00
4.900	1.47586	0.00133	-3.91	10.400	1.46486	0.00273	-3.81	23.000	1.40520	0.00707	-2.93
4.950	1.47579	0.00134	-3.91	10.600	1.46431	0.00278	-3.81	23.500	1.40162	0.00729	-2.86
5.000	1.47572	0.00135	-3.91	10.800	1.46375	0.00284	-3.80	24.000	1.39792	0.00751	-2.79
5.100	1.47559	0.00137	-3.91	11.000	1.46317	0.00290	-3.79	24.500	1.39410	0.00775	-2.71
5.200	1.47545	0.00139	-3.91	11.200	1.46259	0.00295	-3.79	25.000	1.39017	0.00798	-2.63
5.300	1.47531	0.00141	-3.91	11.400	1.46199	0.00301	-3.78	25.500	1.38612	0.00823	-2.54
5.400	1.47517	0.00144	-3.91	11.600	1.46138	0.00307	-3.78	26.000	1.38194	0.00848	-2.45
5.500	1.47502	0.00146	-3.91	11.800	1.46076	0.00313	-3.77	26.500	1.37763	0.00874	-2.35
5.600	1.47488	0.00148	-3.91	12.000	1.46013	0.00318	-3.76	27.000	1.37320	0.00901	-2.24
5.700	1.47473	0.00150	-3.90	12.200	1.45949	0.00324	-3.75	27.500	1.36863	0.00928	-2.13
5.800	1.47457	0.00153	-3.90	12.400	1.45883	0.00330	-3.75	28.000	1.36392	0.00956	-2.01
5.900	1.47442	0.00155	-3.90	12.600	1.45817	0.00336	-3.74	28.500	1.35907	0.00985	-1.88
6.000	1.47426	0.00157	-3.90	12.800	1.45749	0.00342	-3.73	29.000	1.35407	0.01015	-1.75
6.100	1.47411	0.00160	-3.90	13.000	1.45680	0.00348	-3.72	29.500	1.34891	0.01046	-1.61
6.200	1.47394	0.00162	-3.90	13.200	1.45610	0.00354	-3.72	30.000	1.34361	0.01077	-1.46
6.300	1.47378	0.00165	-3.90	13.400	1.45538	0.00360	-3.71	30.500	1.33814	0.01110	-1.30
6.400	1.47362	0.00167	-3.89	13.600	1.45466	0.00366	-3.70	31.000	1.33250	0.01144	-1.13
6.500	1.47345	0.00170	-3.89	13.800	1.45392	0.00372	-3.69	31.500	1.32670	0.01179	-0.95
6.600	1.47328	0.00172	-3.89	14.000	1.45317	0.00378	-3.68	32.000	1.32071	0.01215	-0.76
6.700	1.47310	0.00175	-3.89	14.200	1.45240	0.00385	-3.67	32.500	1.31454	0.01253	-0.56
6.800	1.47293	0.00177	-3.89	14.400	1.45163	0.00391	-3.66	33.000	1.30818	0.01292	-0.35
6.900	1.47275	0.00180	-3.89	14.600	1.45084	0.00397	-3.65	33.500	1.30162	0.01332	-0.12
7.000	1.47257	0.00182	-3.89	14.800	1.45004	0.00403	-3.64	34.000	1.29486	0.01374	0.12
7.100	1.47238	0.00185	-3.88	15.000	1.44923	0.00410	-3.63	34.500	1.28788	0.01417	0.38
7.200	1.47220	0.00187	-3.88	15.200	1.44840	0.00416	-3.62	35.000	1.28069	0.01462	0.65
7.300	1.47201	0.00190	-3.88	15.400	1.44756	0.00423	-3.61	35.500	1.27326	0.01509	0.94
7.400	1.47182	0.00192	-3.88	15.600	1.44671	0.00429	-3.60	36.000	1.26560	0.01557	1.25
7.500	1.47163	0.00195	-3.88	15.800	1.44585	0.00436	-3.59	36.500	1.25768	0.01608	1.57
7.600	1.47143	0.00197	-3.88	16.000	1.44497	0.00442	-3.58	37.000	1.24951	0.01661	1.92
7.700	1.47123	0.00200	-3.87	16.200	1.44408	0.00449	-3.57	37.500	1.24107	0.01716	2.29
7.800	1.47103	0.00203	-3.87	16.400	1.44317	0.00455	-3.55	38.000	1.23235	0.01774	2.69
7.900	1.47083	0.00205	-3.87	16.600	1.44226	0.00462	-3.54	38.500	1.22333	0.01834	3.11
8.000	1.47062	0.00208	-3.87	16.800	1.44132	0.00469	-3.53	39.000	1.21400	0.01897	3.56
8.100	1.47041	0.00210	-3.87	17.000	1.44038	0.00476	-3.52	39.500	1.20435	0.01963	4.05
8.200	1.47020	0.00213	-3.86	17.200	1.43942	0.00482	-3.50	40.000	1.19437	0.02032	4.56
8.300	1.46998	0.00216	-3.86	17.400	1.43845	0.00489	-3.49				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.14. The number of digits with an overstrike are not relevant to accuracy of the data.

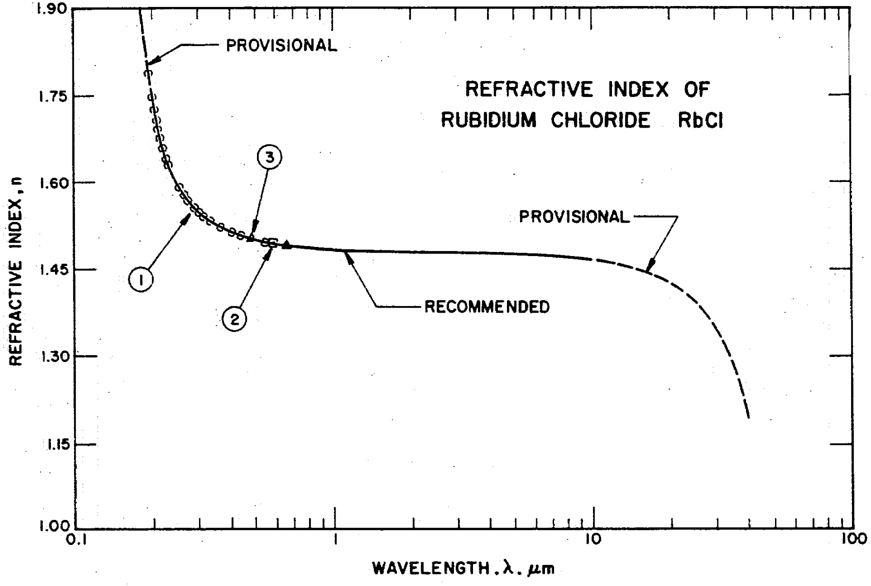

FIGURE 47. Refractive Index of RbCl

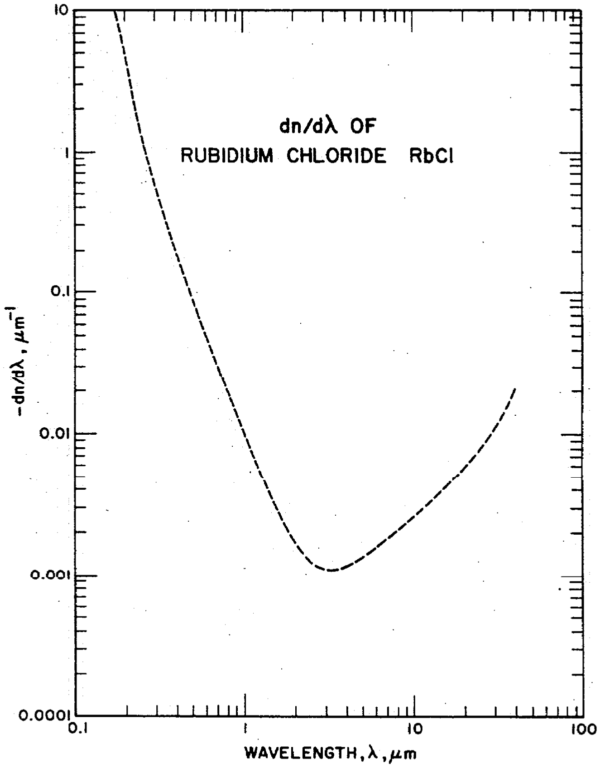

FIGURE 48. $dn/d\lambda$ of RbCl

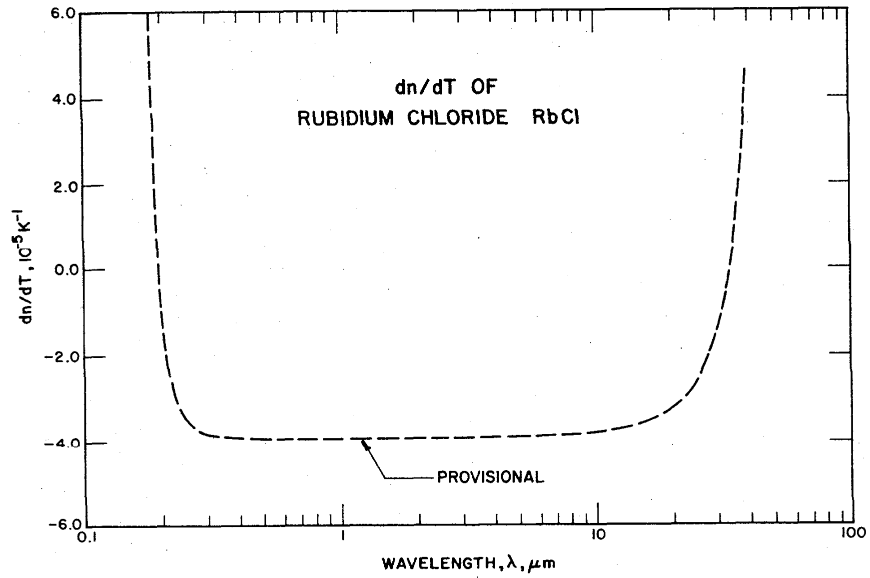

FIGURE 49. *dn/dT* of RbCl

TABLE 59. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF RbCl

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	27	Gyulai, Z.	1927	D	0.193-0.577	321	Crystal; prismatic specimen with face of 11 x 10 mm^2 and apex angle of 59° 41'40"; digitized data were presented with accuracy of one unit in the third decimal place.
2	87	Wulff, P. and Heigl, A.	1931 1928	M	0.589	298	Crystal; prepared by first slowly evaporating a saturated solution of RbCl and then melting in a dry atmosphere of HCl and N_2 mixture, crystallized by slowly cooling; refractive index for sodium D line was determined by the immersion method; digitized datum was presented with uncertainty of 0.00003; dn/dT of sodium D line in the temperature range from 23 C to 25 C was found as -0.0001/°C.
3	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; six prismatic specimens with apex angle of about 39.7°; averaged values of refractive indices were presented with uncertainties of less than 2 units in the fourth decimal place; temperature was not given, room temperature assumed.

TABLE 60. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF RbCl

[Wavelength, λ, μm; Refractive Index, n]

λ	n	λ	n	λ	n
CURVE 1		CURVE 1 (cont.)		CURVE 3	
T = 321.2 K		T = 321.2 K		T = 298.0 K	
0.1935	1.7859	0.313	1.5419	0.486	1.5016
0.1990	1.7452	0.334	1.5322	0.589	1.4936
0.2026	1.7244	0.365	1.5216	0.656	1.4903
0.2063	1.7058	0.405	1.5123		
0.2100	1.6898	0.436	1.5069		
0.2144	1.6734	0.492	1.4999		
0.2194	1.6574	0.546	1.4951		
0.2265	1.6387	0.577	1.4929		
0.2312	1.6278*				
0.254	1.5905	CURVE 2			
0.265	1.5771*	T = 298.0 K			
0.275	1.5677				
0.289	1.5562*	0.589	1.49374		
0.296	1.5512				
0.302	1.5478*				

TABLE 61. EXPERIMENTAL DATA ON dn/dT OF RbCl

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 3	
T_m = 297.0 K	
0.589	-0.0001*

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* Not shown in figure.

TABLE 62. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR RbCl

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Radhakrishnan, T. [48] 1948	0.193-0.546 μm 321 K	$n^2 = 1.4752 + \frac{0.55511\,\lambda^2}{\lambda^2 - (0.138)^2} + \frac{0.15241\,\lambda^2}{\lambda^2 - (0.166)^2} - 0.0004\,\lambda^2$
Present work 1975	0.18-40.0 μm 293 K	$n^2 = 1.47558 + \frac{0.56600\,\lambda^2}{\lambda^2 - (0.138)^2} + \frac{0.14493\,\lambda^2}{\lambda^2 - (0.166)^2} + \frac{2.740\,\lambda^2}{\lambda^2 - (85.84)^2}$

3.15. Rubidium Bromide, RbBr

Rubidium bromide is hygroscopic and must be handled with great care to protect the surface polish. A plate of moderate thickness with properly polished surfaces is transparent from 0.25 to 40 μm. Roughness of the surfaces causes a considerable decrease in transmittance. It is found that the gradual decrease in transmittance at shorter wavelengths is caused by imperfection of the surface and not by absorption or scattering within the material itself [105].

Only two sets of measurements were found in the open literature. In 1904, Sprackhoff [95] measured refractive indices of RbBr for three spectral lines, namely the C, D, and F lines, by the minimum deviation method. Thirty years later, Kublitzky [50] used the same technique in measurements for more lines in a region from 0.219 to 0.58 μm at a temperature of 308 K. The accuracy of his measurements is one unit in the third decimal place, but his reported values are given to the fourth place for the purpose of tabular smoothness. Scantiness of available data leaves us no choice but to use Kublitzky's measurements as the basis for generating reference data. Information on dn/dT is needed to reduce Kublitzky's values from 308 to 293 K, but it is not available. This is not a problem, because we have found empirical parameters which are used to construct dn/dT formulas, and have proved to give correct predictions, as is discussed in subsections 3.11 and 3.12. Using the parameter values in table 5, we are led to the following equation for dn/dT for RbBr at 293 K in the transparent region:

$$2n\frac{dn}{dT}=-11.25(n^2-1)-0.89+\frac{2.278\lambda^4}{(\lambda^2-0.03648)^2}+\frac{191.52\lambda^4}{(\lambda^2-13062.20)^2}, \qquad (51)$$

where dn/dT is in units of $10^{-5}\mathrm{K}^{-1}$ and λ in μm. This equation was used to make temperature corrections to the selected data.

Radhakrishnan [48] attempted to correlate the dispersion and absorption bands by means of a dispersion formula and obtained an equation valid at 308 K, as shown in table 66. His equation yields wavelengths of ultraviolet absorption peaks which agree closely with those obtained by direct measurements (see table 3) but gives no information concerning the infrared absorption peak. As a consequence, extrapolation using this equation will be uncertain. We have constructed a better formula of the Sellmeier type, which gives the refractive index at wavelengths beyond Kublitzky's work with less uncertainty. Using the information in tables 3 and 66, the input parameters for the least-squares fitting were obtained, the result is a dispersion equation for RbBr at 293 K in the transparent region:

$$n^2=1.45931+\frac{0.16301\lambda^2}{\lambda^2-(0.123)^2}+\frac{0.29841\lambda^2}{\lambda^2-(0.146)^2}+\frac{0.17198\lambda^2}{\lambda^2-(0.155)^2}+\frac{0.12186\lambda^2}{\lambda^2-(0.178)^2}+\frac{0.13039\lambda^2}{\lambda^2-(0.191)^2}+\frac{2.520\lambda^2}{\lambda^2-(114.29)^2}, \qquad (52)$$

where λ is in units of μm.

Equations (51) and (52) are used to generate the recommended values of refractive index, $dn/d\lambda$ and dn/dT. In this table, more decimal places than needed are given for the purpose of tabular smoothness. In order to obtain meaningful values from the table, readers are advised to follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.21– 0.22	2	0.02
0.22– 0.30	3	0.005
0.30– 0.40	3	0.003
0.40– 1.50	3	0.002
1.50–15.00	3	0.004
15.00–30.00	3	0.006
30.00–40.00	3	0.008
40.00–50.00	2	0.02

For dn/dT:

0.21– 0.22	0	≥1
0.22–40.00	1	0.5
40.00–50.00	0	≥1

TABLE 63. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbBr AT 293 K*

λ µm	n	-dn/dλ µm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ µm	n	-dn/dλ µm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ µm	n	-dn/dλ µm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.210	1.96224	14.17331	11.04	0.375	1.59199	0.39372	-4.40	1.750	1.53345	0.00289	-4.49
0.212	1.93588	12.26353	8.38	0.380	1.59007	0.37404	-4.40	1.800	1.53331	0.00268	-4.49
0.214	1.91292	10.75791	6.34	0.385	1.58825	0.35571	-4.41	1.850	1.53318	0.00249	-4.49
0.216	1.89266	9.54377	4.74	0.390	1.58652	0.33863	-4.42	1.900	1.53306	0.00232	-4.49
0.218	1.87460	8.54614	3.47	0.395	1.58486	0.32268	-4.42	1.950	1.53295	0.00217	-4.49
0.220	1.85836	7.71337	2.44	0.400	1.58329	0.30776	-4.43	2.000	1.53284	0.00203	-4.49
0.222	1.84366	7.00881	1.59	0.410	1.58035	0.28069	-4.44	2.050	1.53275	0.00191	-4.49
0.224	1.83026	6.40579	0.89	0.420	1.57766	0.25684	-4.44	2.100	1.53265	0.00180	-4.49
0.226	1.81798	5.88447	0.30	0.430	1.57520	0.23573	-4.45	2.150	1.53256	0.00170	-4.49
0.228	1.80668	5.42979	-0.21	0.440	1.57294	0.21695	-4.46	2.200	1.53248	0.00161	-4.49
0.230	1.79622	5.03015	-0.64	0.450	1.57086	0.20019	-4.46	2.250	1.53240	0.00153	-4.49
0.232	1.78652	4.67645	-1.01	0.460	1.56893	0.18518	-4.46	2.300	1.53233	0.00146	-4.49
0.234	1.77749	4.36148	-1.33	0.470	1.56715	0.17168	-4.47	2.350	1.53226	0.00139	-4.49
0.236	1.76906	4.07945	-1.61	0.480	1.56549	0.15950	-4.47	2.400	1.53219	0.00133	-4.48
0.238	1.76116	3.82563	-1.86	0.490	1.56395	0.14848	-4.47	2.450	1.53212	0.00127	-4.48
0.240	1.75374	3.59617	-2.08	0.500	1.56252	0.13849	-4.47	2.500	1.53206	0.00122	-4.48
0.242	1.74676	3.38788	-2.27	0.510	1.56118	0.12940	-4.48	2.550	1.53200	0.00118	-4.48
0.244	1.74017	3.19808	-2.45	0.520	1.55993	0.12111	-4.48	2.600	1.53194	0.00114	-4.48
0.246	1.73395	3.02453	-2.60	0.530	1.55876	0.11354	-4.48	2.650	1.53189	0.00110	-4.48
0.248	1.72807	2.86534	-2.74	0.540	1.55766	0.10659	-4.48	2.700	1.53183	0.00106	-4.48
0.250	1.72248	2.71887	-2.87	0.550	1.55662	0.10022	-4.48	2.750	1.53178	0.00103	-4.48
0.252	1.71718	2.58375	-2.98	0.560	1.55565	0.09436	-4.48	2.800	1.53173	0.00100	-4.48
0.254	1.71214	2.45877	-3.08	0.570	1.55473	0.08896	-4.48	2.850	1.53168	0.00097	-4.48
0.256	1.70734	2.34291	-3.18	0.580	1.55387	0.08397	-4.48	2.900	1.53163	0.00095	-4.48
0.258	1.70277	2.23525	-3.26	0.590	1.55305	0.07936	-4.49	2.950	1.53159	0.00092	-4.48
0.260	1.69840	2.13500	-3.34	0.600	1.55228	0.07508	-4.49	3.000	1.53154	0.00090	-4.48
0.262	1.69422	2.04149	-3.41	0.620	1.55086	0.06743	-4.49	3.050	1.53150	0.00088	-4.48
0.264	1.69023	1.95408	-3.48	0.640	1.54958	0.06081	-4.49	3.100	1.53145	0.00087	-4.48
0.266	1.68640	1.87225	-3.54	0.660	1.54842	0.05504	-4.49	3.150	1.53141	0.00085	-4.48
0.268	1.68273	1.79551	-3.59	0.680	1.54737	0.04999	-4.49	3.200	1.53137	0.00084	-4.48
0.270	1.67922	1.72343	-3.64	0.700	1.54642	0.04555	-4.49	3.250	1.53133	0.00082	-4.48
0.272	1.67584	1.65563	-3.69	0.720	1.54555	0.04163	-4.49	3.300	1.53129	0.00081	-4.48
0.274	1.67259	1.59177	-3.73	0.740	1.54475	0.03815	-4.49	3.350	1.53125	0.00080	-4.48
0.276	1.66947	1.53154	-3.78	0.760	1.54402	0.03506	-4.49	3.400	1.53121	0.00079	-4.48
0.278	1.66646	1.47467	-3.81	0.780	1.54334	0.03230	-4.49	3.450	1.53117	0.00078	-4.48
0.280	1.66357	1.42089	-3.85	0.800	1.54272	0.02982	-4.49	3.500	1.53113	0.00077	-4.48
0.282	1.66078	1.36999	-3.88	0.820	1.54215	0.02760	-4.49	3.550	1.53109	0.00076	-4.48
0.284	1.65809	1.32176	-3.91	0.840	1.54162	0.02559	-4.49	3.600	1.53105	0.00076	-4.48
0.286	1.65549	1.27601	-3.94	0.860	1.54112	0.02378	-4.49	3.650	1.53101	0.00075	-4.48
0.288	1.65298	1.23256	-3.97	0.880	1.54066	0.02214	-4.49	3.700	1.53098	0.00075	-4.48
0.290	1.65056	1.19128	-3.99	0.900	1.54024	0.02065	-4.49	3.750	1.53094	0.00074	-4.48
0.292	1.64821	1.15200	-4.02	0.920	1.53984	0.01929	-4.49	3.800	1.53090	0.00074	-4.48
0.294	1.64595	1.11460	-4.04	0.940	1.53946	0.01805	-4.49	3.850	1.53086	0.00073	-4.48
0.296	1.64375	1.07897	-4.06	0.960	1.53912	0.01691	-4.49	3.900	1.53083	0.00073	-4.48
0.298	1.64163	1.04498	-4.08	0.980	1.53879	0.01588	-4.49	3.950	1.53079	0.00073	-4.48
0.300	1.63957	1.01255	-4.10	1.000	1.53848	0.01492	-4.49	4.000	1.53076	0.00073	-4.48
0.305	1.63470	0.93763	-4.14	1.050	1.53779	0.01285	-4.49	4.050	1.53072	0.00072	-4.48
0.310	1.63018	0.87054	-4.18	1.100	1.53719	0.01116	-4.49	4.100	1.53068	0.00072	-4.48
0.315	1.62598	0.81021	-4.21	1.150	1.53667	0.00976	-4.49	4.150	1.53065	0.00072	-4.48
0.320	1.62207	0.75576	-4.24	1.200	1.53621	0.00859	-4.49	4.200	1.53061	0.00072	-4.48
0.325	1.61842	0.70644	-4.26	1.250	1.53580	0.00760	-4.49	4.250	1.53057	0.00072	-4.48
0.330	1.61500	0.66164	-4.28	1.300	1.53545	0.00676	-4.49	4.300	1.53054	0.00072	-4.48
0.335	1.61180	0.62081	-4.30	1.350	1.53513	0.00605	-4.49	4.350	1.53050	0.00072	-4.48
0.340	1.60879	0.58350	-4.32	1.400	1.53484	0.00544	-4.49	4.400	1.53047	0.00072	-4.48
0.345	1.60596	0.54931	-4.33	1.450	1.53458	0.00491	-4.49	4.450	1.53043	0.00072	-4.48
0.350	1.60329	0.51792	-4.35	1.500	1.53435	0.00445	-4.49	4.500	1.53039	0.00072	-4.48
0.355	1.60077	0.48902	-4.36	1.550	1.53413	0.00406	-4.49	4.550	1.53036	0.00073	-4.48
0.360	1.59839	0.46236	-4.37	1.600	1.53394	0.00371	-4.49	4.600	1.53032	0.00073	-4.48
0.365	1.59614	0.43772	-4.38	1.650	1.53376	0.00340	-4.49	4.650	1.53029	0.00073	-4.48
0.370	1.59401	0.41489	-4.39	1.700	1.53360	0.00313	-4.49	4.700	1.53025	0.00073	-4.48

TABLE 63. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbBr AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
4.750	1.53021	0.00073	-4.48	10.200	1.52477	0.00132	-4.43	23.500	1.49457	0.00331	-4.05
4.800	1.53018	0.00074	-4.48	10.400	1.52450	0.00135	-4.43	24.000	1.49290	0.00340	-4.03
4.850	1.53014	0.00074	-4.47	10.600	1.52423	0.00138	-4.42	24.500	1.49118	0.00348	-4.00
4.900	1.53010	0.00074	-4.47	10.800	1.52395	0.00140	-4.42	25.000	1.48941	0.00357	-3.97
4.950	1.53006	0.00074	-4.47	11.000	1.52367	0.00143	-4.42	25.500	1.48760	0.00366	-3.94
5.000	1.53003	0.00075	-4.47	11.200	1.52338	0.00146	-4.41	26.000	1.48575	0.00376	-3.91
5.100	1.52995	0.00075	-4.47	11.400	1.52309	0.00148	-4.41	26.500	1.48385	0.00385	-3.88
5.200	1.52988	0.00076	-4.47	11.600	1.52279	0.00151	-4.41	27.000	1.48190	0.00394	-3.85
5.300	1.52980	0.00077	-4.47	11.800	1.52248	0.00154	-4.41	27.500	1.47990	0.00404	-3.81
5.400	1.52972	0.00077	-4.47	12.000	1.52217	0.00156	-4.40	28.000	1.47786	0.00414	-3.77
5.500	1.52965	0.00078	-4.47	12.200	1.52186	0.00159	-4.40	28.500	1.47577	0.00424	-3.73
5.600	1.52957	0.00079	-4.47	12.400	1.52154	0.00162	-4.40	29.000	1.47362	0.00434	-3.69
5.700	1.52949	0.00080	-4.47	12.600	1.52121	0.00164	-4.39	29.500	1.47143	0.00444	-3.65
5.800	1.52941	0.00081	-4.47	12.800	1.52088	0.00167	-4.39	30.000	1.46918	0.00454	-3.61
5.900	1.52933	0.00082	-4.47	13.000	1.52054	0.00170	-4.39	30.500	1.46688	0.00465	-3.56
6.000	1.52924	0.00083	-4.47	13.200	1.52020	0.00173	-4.38	31.000	1.46453	0.00476	-3.51
6.100	1.52916	0.00084	-4.47	13.400	1.51985	0.00175	-4.38	31.500	1.46212	0.00487	-3.46
6.200	1.52908	0.00085	-4.47	13.600	1.51950	0.00178	-4.38	32.000	1.45966	0.00498	-3.41
6.300	1.52899	0.00086	-4.47	13.800	1.51914	0.00181	-4.37	32.500	1.45714	0.00509	-3.35
6.400	1.52891	0.00087	-4.47	14.000	1.51877	0.00184	-4.37	33.000	1.45457	0.00521	-3.29
6.500	1.52882	0.00088	-4.46	14.200	1.51840	0.00187	-4.36	33.500	1.45193	0.00533	-3.23
6.600	1.52873	0.00089	-4.46	14.400	1.51803	0.00189	-4.36	34.000	1.44924	0.00545	-3.17
6.700	1.52864	0.00090	-4.46	14.600	1.51765	0.00192	-4.36	34.500	1.44649	0.00557	-3.10
6.800	1.52855	0.00091	-4.46	14.800	1.51726	0.00195	-4.35	35.000	1.44367	0.00570	-3.03
6.900	1.52846	0.00092	-4.46	15.000	1.51686	0.00198	-4.35	35.500	1.44079	0.00582	-2.96
7.000	1.52837	0.00093	-4.46	15.200	1.51647	0.00201	-4.34	36.000	1.43785	0.00595	-2.89
7.100	1.52827	0.00094	-4.46	15.400	1.51606	0.00204	-4.34	36.500	1.43484	0.00609	-2.81
7.200	1.52818	0.00095	-4.46	15.600	1.51565	0.00207	-4.33	37.000	1.43176	0.00622	-2.72
7.300	1.52808	0.00097	-4.46	15.800	1.51524	0.00209	-4.33	37.500	1.42861	0.00636	-2.64
7.400	1.52798	0.00098	-4.46	16.000	1.51481	0.00212	-4.32	38.000	1.42540	0.00650	-2.55
7.500	1.52789	0.00099	-4.46	16.200	1.51439	0.00215	-4.32	38.500	1.42211	0.00665	-2.45
7.600	1.52779	0.00100	-4.46	16.400	1.51395	0.00218	-4.31	39.000	1.41875	0.00679	-2.35
7.700	1.52769	0.00101	-4.45	16.600	1.51351	0.00221	-4.31	39.500	1.41532	0.00694	-2.25
7.800	1.52758	0.00102	-4.45	16.800	1.51307	0.00224	-4.30	40.000	1.41181	0.00710	-2.14
7.900	1.52748	0.00104	-4.45	17.000	1.51262	0.00227	-4.30	40.500	1.40822	0.00726	-2.03
8.000	1.52738	0.00105	-4.45	17.200	1.51216	0.00230	-4.29	41.000	1.40455	0.00742	-1.91
8.100	1.52727	0.00106	-4.45	17.400	1.51170	0.00233	-4.29	41.500	1.40080	0.00758	-1.79
8.200	1.52717	0.00107	-4.45	17.600	1.51123	0.00236	-4.28	42.000	1.39697	0.00775	-1.66
8.300	1.52706	0.00108	-4.45	17.800	1.51075	0.00239	-4.28	42.500	1.39305	0.00793	-1.53
8.400	1.52695	0.00110	-4.45	18.000	1.51027	0.00242	-4.27	43.000	1.38904	0.00810	-1.39
8.500	1.52684	0.00111	-4.45	18.200	1.50978	0.00245	-4.26	43.500	1.38494	0.00829	-1.24
8.600	1.52673	0.00112	-4.45	18.400	1.50929	0.00248	-4.26	44.000	1.38075	0.00847	-1.09
8.700	1.52661	0.00113	-4.45	18.600	1.50879	0.00251	-4.25	44.500	1.37647	0.00867	-0.93
8.800	1.52650	0.00115	-4.44	18.800	1.50829	0.00254	-4.25	45.000	1.37209	0.00886	-0.76
8.900	1.52638	0.00116	-4.44	19.000	1.50778	0.00257	-4.24	45.500	1.36760	0.00906	-0.59
9.000	1.52627	0.00117	-4.44	19.200	1.50726	0.00260	-4.23	46.000	1.36302	0.00927	-0.41
9.100	1.52615	0.00118	-4.44	19.400	1.50673	0.00264	-4.23	46.500	1.35833	0.00948	-0.21
9.200	1.52603	0.00120	-4.44	19.600	1.50620	0.00267	-4.22	47.000	1.35353	0.00970	-0.01
9.300	1.52591	0.00121	-4.44	19.800	1.50567	0.00270	-4.21	47.500	1.34863	0.00993	0.20
9.400	1.52579	0.00122	-4.44	20.000	1.50512	0.00273	-4.20	48.000	1.34360	0.01016	0.41
9.500	1.52567	0.00123	-4.44	20.500	1.50374	0.00281	-4.19	48.500	1.33846	0.01040	0.64
9.600	1.52554	0.00125	-4.44	21.000	1.50231	0.00289	-4.17	49.000	1.33320	0.01064	0.88
9.700	1.52542	0.00126	-4.43	21.500	1.50085	0.00297	-4.15	49.500	1.32782	0.01090	1.13
9.800	1.52529	0.00127	-4.43	22.000	1.49934	0.00305	-4.12	50.000	1.32231	0.01116	1.40
9.900	1.52516	0.00129	-4.43	22.500	1.49779	0.00314	-4.10				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.15. The number of digits with an overstrike are not relevant to accuracy of the data.

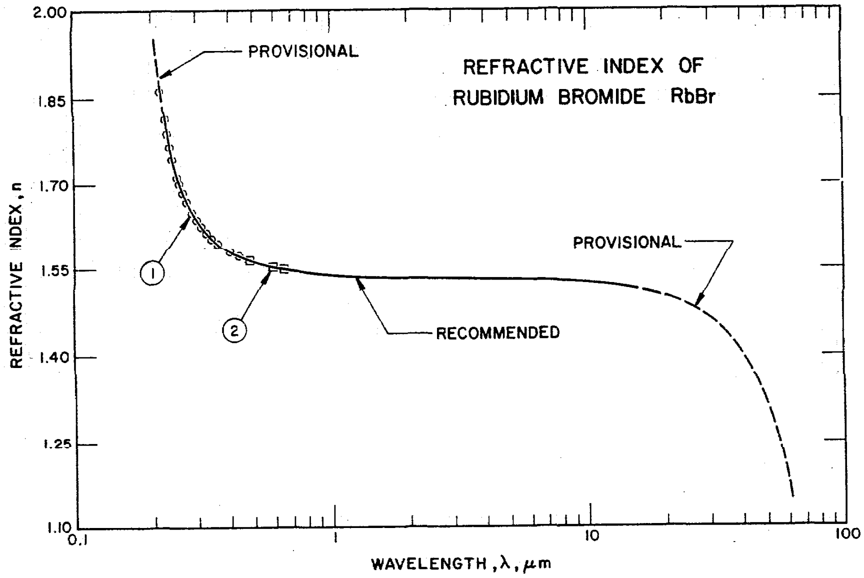

FIGURE 50. Refractive Index of RbBr

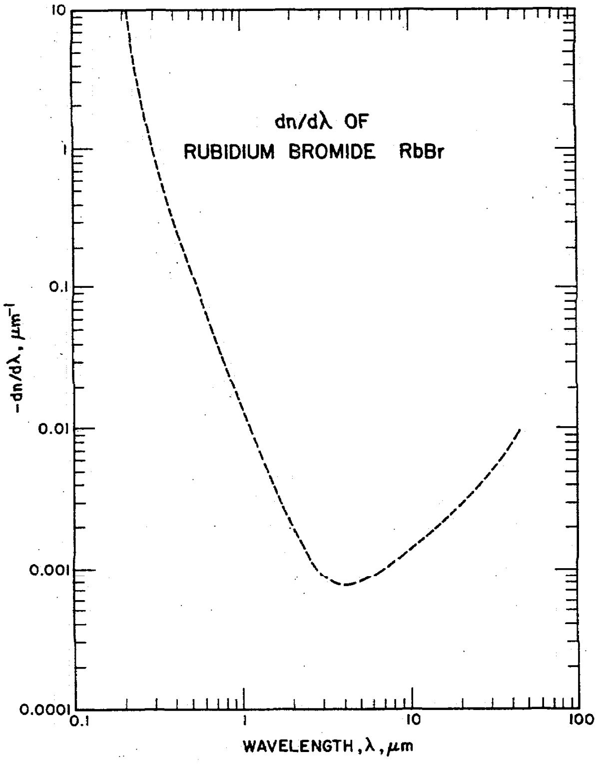

FIGURE 51. $dn/d\lambda$ of RbBr

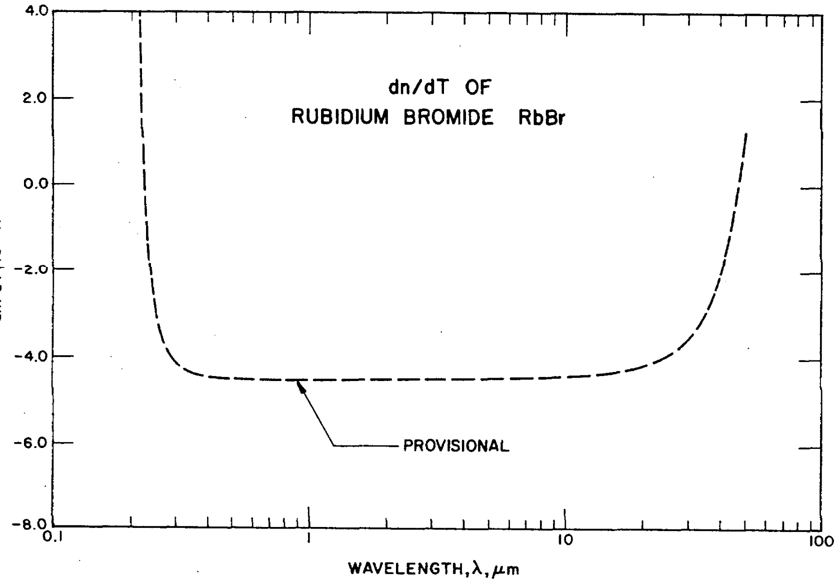

FIGURE 52. dn/dT of RbBr

TABLE 64. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF RbBr

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	50	Kublitzky, A.	1934	D	0.219-0.578	308	Crystal; grown by the Kyropoulos method; prismatic specimen with height of 20 mm, side of 20 mm, and apex angle 25°43'43"; digitized data were presented with accuracy of one unit of the third decimal place.
2	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; eight prismatic specimens with apex angle of about 36.3°; averaged probable values of refractive indices were presented; temperature was not given, room temperature assumed.

TABLE 65. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF RbBr

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 308.2 K	
0.21946	1.8610
0.227	1.8137
0.231	1.7888
0.237	1.7644
0.2428	1.7433
0.2537	1.7120
0.2573	1.7036
0.265	1.6868
0.27488	1.6711
0.28035	1.6625
0.288	1.6520
0.28936	1.6505
0.29673	1.6427
0.29806	1.6413
0.30215	1.6367
0.313	1.6266
0.326	1.6170
CURVE 1 (cont.) T = 308.2 K	
0.33415	1.6113
0.340	1.6074
0.347	1.6037
0.361	1.5960
0.366	1.5945
0.405	1.5807
0.435	1.5725
0.5461	1.5550
0.578	1.5523
CURVE 2 T = 298.0 K	
0.486	1.5646
0.589	1.5528
0.656	1.5483

TABLE 66. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR RbBr

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Radhakrishnan, T. [48] 1948	0.219-0.546 μm 308 K	$n^2 = 1.4500 + \frac{0.2000\ \lambda^2}{\lambda^2 - 0.015129} + \frac{0.3651\ \lambda^2}{\lambda^2 - 0.022650} + \frac{0.3224\ \lambda^2}{\lambda^2 - 0.033124}$
Present work 1975	0.21-50.0 μm 293 K	$n^2 = 1.45931 + \frac{0.16301\ \lambda^2}{\lambda^2 - (0.123)^2} + \frac{0.29841\ \lambda^2}{\lambda^2 - (0.146)^2} + \frac{0.17198\ \lambda^2}{\lambda^2 - (0.155)^2} + \frac{0.12186\ \lambda^2}{\lambda^2 - (0.178)^2} + \frac{0.13039\ \lambda^2}{\lambda^2 - (0.191)^2} + \frac{2.520\ \lambda^2}{\lambda^2 - (114.29)^2}$

3.16. Rubidium Iodide, RbI

Rubidium iodide is the most hygroscopic of the rubidium halides and care must be exercised in handling it to preserve the surface condition, which plays an important rôle in its transparency. A plate of RbI a few mm thick with well-polished surface is transparent from 0.25 to more than 50 μm. The gradual decrease in transmittance at shorter wavelengths is due to surface scattering that is caused by the roughness of the surface and not by absorption or scattering within the material itself [105].

As with the other rubidium halides there are few data available; only two sets of data were found for the transparent region, those of Sprockhoff [95] (for C, D, and F lines) and Kublitzky [50] (for the region 0.25–0.58 μm). In the ultraviolet, Baldini and Rigaldi [106] investigated a narrow spectral region, 0.18 to 0.25 μm, deriving the optical constants of thin films of RbI from the reflection spectra. The wavelengths of the ultraviolet absorption peaks derived from this work are inconsistent with those observed for the bulk material.

Because of the lack of data, we had to rely on Kublitzky's data as the basis for generating the reference data. The accuracy of this set of data is one unit in the third decimal place, but the reported values are given to the fourth place. However, we used the reported values in the data analysis. Since this data set was obtained at a temperature of 309 K, the temperature coefficient of the refractive index is needed to reduce the data to 293 K. Experimental values are not available. In the present work, values of dn/dT can be estimated for a wide wavelength range, using our empirical findings discussed in subsection 2.2. Using the parameters values from table 5, a dn/dT formula was constructed for RbI in the transparent region:

$$2n\frac{dn}{dT}=-12.45\ (n^2-1)-0.85+\frac{2.686\lambda^4}{(\lambda^2-0.04973)^2}+\frac{169.92\lambda^4}{(\lambda^2-17543.00)^2}, \qquad (53)$$

where dn/dT is in units of $10^{-5}\mathrm{K}^{-1}$ and λ in μm. This equation was used to reduce Kublitzky's data to 293 K.

Radhakrishnan [48] obtained a dispersion formula (shown in table 70) based on Kublitzky's data. This formula gives the wavelengths of three ultraviolet absorption peaks, which agree with those studied by Hilsch and Pohl [23] and Schneider and O'Bryan [24] (see table 3), but it gives no information concerning the infrared absorption peak and the dielectric constants. Naturally, extrapolated values for the long wavelengths as given by this equation have large uncertainties. It is therefore not an adequate formula for a wide wavelength range. Using the information in tables 3 and 70, the input parameters for the least-square fitting of the data to eq (10) were obtained. The calculation yielded a dispersion equation for RbI at 293 K in the transparent region, 0.24 to 64.0 μm.

$$n^2=1.60563+\frac{0.00947\lambda^2}{\lambda^2-(0.120)^2}+\frac{0.01073\lambda^2}{\lambda^2-(0.134)^2}+\frac{0.00136\lambda^2}{\lambda^2-(0.156)^2}+\frac{0.41864\lambda^2}{\lambda^2-(0.179)^2}+\frac{0.41771\lambda^2}{\lambda^2-(0.187)^2}+\frac{0.13707\lambda^2}{\lambda^2-(0.223)^2}+\frac{2.36091\lambda^2}{\lambda^2-(132.45)^2}, \qquad (54)$$

where λ is in units of μm.

Equations (53) and (54) were used to generate the recommended values of refractive index, $dn/d\lambda$ and dn/dT for RbI. Since more decimal places than needed are given for the purpose of tabular smoothness, readers are advised to follow the criteria given below in order to use the recommended values correctly.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.24– 0.25	2	0.02
0.25– 0.30	3	0.004
0.30– 0.40	3	0.003
0.40– 1.50	3	0.002
1.50–20.00	3	0.003
20.00–30.00	3	0.006
30.00–50.00	3	0.009
50.00–64.00	2	0.02

For dn/dT:

0.24– 0.27	0	≥1
0.27–45.00	1	0.5
45.00–64.00	0	≥1

TABLE 67. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbI AT 293 K *

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.240	2.15543	17.73825	22.65	0.500	1.66302	0.23302	-5.61	2.500	1.61414	0.00162	-5.61
0.242	2.12267	15.14553	17.32	0.510	1.66077	0.21692	-5.61	2.550	1.61406	0.00154	-5.61
0.244	2.09444	13.16729	13.37	0.520	1.65868	0.20233	-5.61	2.600	1.61398	0.00147	-5.61
0.246	2.06972	11.61245	10.34	0.530	1.65672	0.18907	-5.62	2.650	1.61391	0.00141	-5.61
0.248	2.04779	10.36036	7.98	0.540	1.65489	0.17697	-5.62	2.700	1.61384	0.00134	-5.61
0.250	2.02813	9.33153	6.10	0.550	1.65318	0.16592	-5.62	2.750	1.61378	0.00129	-5.61
0.252	2.01035	8.47172	4.57	0.560	1.65157	0.15581	-5.62	2.800	1.61371	0.00124	-5.61
0.254	1.99416	7.74277	3.32	0.570	1.65006	0.14652	-5.62	2.850	1.61365	0.00119	-5.61
0.256	1.97931	7.11712	2.27	0.580	1.64864	0.13798	-5.62	2.900	1.61359	0.00114	-5.61
0.258	1.96564	6.57440	1.40	0.590	1.64730	0.13011	-5.62	2.950	1.61354	0.00110	-5.61
0.260	1.95297	6.09925	0.65	0.600	1.64603	0.12284	-5.62	3.000	1.61348	0.00107	-5.61
0.262	1.94120	5.67950	0.02	0.620	1.64371	0.10989	-5.63	3.050	1.61343	0.00103	-5.61
0.264	1.93022	5.30714	-0.53	0.640	1.64163	0.09875	-5.63	3.100	1.61338	0.00100	-5.61
0.266	1.91995	4.97370	-1.01	0.660	1.63975	0.08909	-5.63	3.150	1.61333	0.00097	-5.61
0.268	1.91030	4.67375	-1.43	0.680	1.63805	0.08069	-5.63	3.200	1.61328	0.00094	-5.61
0.270	1.90123	4.40257	-1.79	0.700	1.63652	0.07333	-5.63	3.250	1.61324	0.00091	-5.61
0.272	1.89268	4.15627	-2.11	0.720	1.63512	0.06685	-5.63	3.300	1.61319	0.00089	-5.61
0.274	1.88459	3.93167	-2.40	0.740	1.63384	0.06113	-5.63	3.350	1.61315	0.00086	-5.61
0.276	1.87694	3.72607	-2.66	0.760	1.63267	0.05606	-5.63	3.400	1.61311	0.00084	-5.61
0.278	1.86968	3.53724	-2.89	0.780	1.63159	0.05154	-5.63	3.450	1.61306	0.00082	-5.61
0.280	1.86278	3.36326	-3.09	0.800	1.63060	0.04750	-5.63	3.500	1.61302	0.00080	-5.61
0.282	1.85622	3.20250	-3.28	0.820	1.62969	0.04389	-5.62	3.550	1.61298	0.00079	-5.61
0.284	1.84996	3.05357	-3.44	0.840	1.62884	0.04063	-5.62	3.600	1.61294	0.00077	-5.61
0.286	1.84399	2.91526	-3.59	0.860	1.62806	0.03770	-5.62	3.650	1.61291	0.00076	-5.61
0.288	1.83829	2.78652	-3.73	0.880	1.62733	0.03504	-5.62	3.700	1.61287	0.00074	-5.61
0.290	1.83284	2.66643	-3.86	0.900	1.62666	0.03264	-5.62	3.750	1.61283	0.00073	-5.61
0.292	1.82762	2.55419	-3.97	0.920	1.62603	0.03045	-5.62	3.800	1.61280	0.00072	-5.60
0.294	1.82262	2.44910	-4.08	0.940	1.62544	0.02845	-5.62	3.850	1.61276	0.00071	-5.60
0.296	1.81782	2.35053	-4.17	0.960	1.62489	0.02663	-5.62	3.900	1.61273	0.00070	-5.60
0.298	1.81322	2.25792	-4.26	0.980	1.62437	0.02497	-5.62	3.950	1.61269	0.00069	-5.60
0.300	1.80879	2.17079	-4.34	1.000	1.62389	0.02344	-5.62	4.000	1.61266	0.00068	-5.60
0.305	1.79844	1.97409	-4.52	1.050	1.62280	0.02013	-5.62	4.050	1.61262	0.00067	-5.60
0.310	1.78900	1.80318	-4.67	1.100	1.62186	0.01743	-5.62	4.100	1.61259	0.00066	-5.60
0.315	1.78037	1.65360	-4.79	1.150	1.62105	0.01520	-5.62	4.150	1.61256	0.00065	-5.60
0.320	1.77244	1.52185	-4.90	1.200	1.62034	0.01333	-5.62	4.200	1.61252	0.00065	-5.60
0.325	1.76513	1.40514	-4.99	1.250	1.61971	0.01177	-5.62	4.250	1.61249	0.00064	-5.60
0.330	1.75837	1.30121	-5.06	1.300	1.61916	0.01045	-5.62	4.300	1.61246	0.00064	-5.60
0.335	1.75210	1.20823	-5.12	1.350	1.61866	0.00932	-5.62	4.350	1.61243	0.00063	-5.60
0.340	1.74627	1.12469	-5.18	1.400	1.61822	0.00835	-5.62	4.400	1.61240	0.00063	-5.60
0.345	1.74084	1.04935	-5.23	1.450	1.61783	0.00751	-5.62	4.450	1.61237	0.00062	-5.60
0.350	1.73576	0.98114	-5.27	1.500	1.61747	0.00679	-5.61	4.500	1.61234	0.00062	-5.60
0.355	1.73101	0.91920	-5.31	1.550	1.61715	0.00616	-5.61	4.550	1.61230	0.00061	-5.60
0.360	1.72656	0.86277	-5.34	1.600	1.61685	0.00560	-5.61	4.600	1.61227	0.00061	-5.60
0.365	1.72238	0.81122	-5.37	1.650	1.61659	0.00512	-5.61	4.650	1.61224	0.00061	-5.60
0.370	1.71844	0.76399	-5.39	1.700	1.61634	0.00469	-5.61	4.700	1.61221	0.00060	-5.60
0.375	1.71473	0.72062	-5.42	1.750	1.61612	0.00431	-5.61	4.750	1.61218	0.00060	-5.60
0.380	1.71123	0.68070	-5.44	1.800	1.61591	0.00397	-5.61	4.800	1.61215	0.00060	-5.60
0.385	1.70792	0.64388	-5.46	1.850	1.61572	0.00367	-5.61	4.850	1.61212	0.00060	-5.60
0.390	1.70479	0.60984	-5.47	1.900	1.61554	0.00340	-5.61	4.900	1.61209	0.00060	-5.60
0.395	1.70182	0.57831	-5.49	1.950	1.61538	0.00316	-5.61	4.950	1.61206	0.00059	-5.60
0.400	1.69900	0.54905	-5.50	2.000	1.61523	0.00294	-5.61	5.000	1.61203	0.00059	-5.60
0.410	1.69378	0.49654	-5.52	2.050	1.61508	0.00275	-5.61	5.100	1.61197	0.00059	-5.60
0.420	1.68905	0.45086	-5.54	2.100	1.61495	0.00257	-5.61	5.200	1.61192	0.00059	-5.60
0.430	1.68474	0.41091	-5.55	2.150	1.61483	0.00241	-5.61	5.300	1.61186	0.00059	-5.60
0.440	1.68081	0.37578	-5.57	2.200	1.61471	0.00226	-5.61	5.400	1.61180	0.00059	-5.60
0.450	1.67721	0.34472	-5.58	2.250	1.61460	0.00213	-5.61	5.500	1.61174	0.00059	-5.60
0.460	1.67391	0.31716	-5.58	2.300	1.61450	0.00201	-5.61	5.600	1.61168	0.00059	-5.60
0.470	1.67086	0.29258	-5.59	2.350	1.61440	0.00190	-5.61	5.700	1.61162	0.00060	-5.60
0.480	1.66804	0.27058	-5.60	2.400	1.61431	0.00180	-5.61	5.800	1.61156	0.00060	-5.60
0.490	1.66544	0.25082	-5.60	2.450	1.61422	0.00171	-5.61	5.900	1.61150	0.00060	-5.60

TABLE 67. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR RbI AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
6.000	1.61144	0.00060	-5.60	14.000	1.60441	0.00121	-5.53	35.000	1.55673	0.00350	-4.79
6.100	1.61138	0.00061	-5.60	14.200	1.60416	0.00123	-5.53	35.500	1.55496	0.00357	-4.76
6.200	1.61132	0.00061	-5.60	14.400	1.60391	0.00124	-5.52	36.000	1.55316	0.00364	-4.72
6.300	1.61126	0.00062	-5.59	14.600	1.60366	0.00126	-5.52	36.500	1.55133	0.00371	-4.68
6.400	1.61119	0.00062	-5.59	14.800	1.60341	0.00128	-5.52	37.000	1.54945	0.00378	-4.64
6.500	1.61113	0.00063	-5.59	15.000	1.60315	0.00130	-5.51	37.500	1.54754	0.00385	-4.60
6.600	1.61107	0.00063	-5.59	15.200	1.60289	0.00132	-5.51	38.000	1.54560	0.00393	-4.56
6.700	1.61101	0.00064	-5.59	15.400	1.60262	0.00133	-5.51	38.500	1.54361	0.00401	-4.51
6.800	1.61094	0.00064	-5.59	15.600	1.60236	0.00135	-5.51	39.000	1.54159	0.00408	-4.47
6.900	1.61088	0.00065	-5.59	15.800	1.60208	0.00137	-5.50	39.500	1.53953	0.00416	-4.42
7.000	1.61081	0.00065	-5.59	16.000	1.60181	0.00139	-5.50	40.000	1.53743	0.00424	-4.37
7.100	1.61075	0.00066	-5.59	16.200	1.60153	0.00141	-5.50	40.500	1.53529	0.00432	-4.32
7.200	1.61068	0.00066	-5.59	16.400	1.60124	0.00143	-5.49	41.000	1.53311	0.00440	-4.26
7.300	1.61061	0.00067	-5.59	16.600	1.60096	0.00145	-5.49	41.500	1.53089	0.00449	-4.21
7.400	1.61055	0.00068	-5.59	16.800	1.60067	0.00146	-5.49	42.000	1.52863	0.00457	-4.15
7.500	1.61048	0.00068	-5.59	17.000	1.60037	0.00148	-5.48	42.500	1.52632	0.00466	-4.09
7.600	1.61041	0.00069	-5.59	17.200	1.60007	0.00150	-5.48	43.000	1.52397	0.00474	-4.03
7.700	1.61034	0.00070	-5.59	17.400	1.59977	0.00152	-5.48	43.500	1.52157	0.00483	-3.96
7.800	1.61027	0.00070	-5.59	17.600	1.59947	0.00154	-5.47	44.000	1.51913	0.00493	-3.89
7.900	1.61020	0.00071	-5.59	17.800	1.59916	0.00156	-5.47	44.500	1.51665	0.00502	-3.82
8.000	1.61013	0.00072	-5.58	18.000	1.59884	0.00158	-5.47	45.000	1.51412	0.00511	-3.75
8.100	1.61006	0.00072	-5.58	18.200	1.59853	0.00160	-5.46	45.500	1.51154	0.00521	-3.68
8.200	1.60999	0.00073	-5.58	18.400	1.59820	0.00161	-5.46	46.000	1.50891	0.00531	-3.60
8.300	1.60991	0.00074	-5.58	18.600	1.59788	0.00163	-5.45	46.500	1.50623	0.00541	-3.52
8.400	1.60984	0.00074	-5.58	18.800	1.59755	0.00165	-5.45	47.000	1.50350	0.00551	-3.44
8.500	1.60976	0.00075	-5.58	19.000	1.59722	0.00167	-5.45	47.500	1.50072	0.00561	-3.35
8.600	1.60969	0.00076	-5.58	19.200	1.59688	0.00169	-5.44	48.000	1.49789	0.00572	-3.26
8.700	1.60961	0.00077	-5.58	19.400	1.59654	0.00171	-5.44	48.500	1.49501	0.00582	-3.17
8.800	1.60953	0.00077	-5.58	19.600	1.59620	0.00173	-5.43	49.000	1.49207	0.00593	-3.07
8.900	1.60946	0.00078	-5.58	19.800	1.59585	0.00175	-5.43	49.500	1.48907	0.00604	-2.97
9.000	1.60938	0.00079	-5.58	20.000	1.59550	0.00177	-5.43	50.000	1.48602	0.00616	-2.86
9.100	1.60930	0.00080	-5.58	20.500	1.59460	0.00182	-5.41	50.500	1.48292	0.00627	-2.76
9.200	1.60922	0.00080	-5.58	21.000	1.59368	0.00187	-5.40	51.000	1.47975	0.00639	-2.64
9.300	1.60914	0.00081	-5.58	21.500	1.59273	0.00192	-5.39	51.500	1.47652	0.00652	-2.53
9.400	1.60906	0.00082	-5.57	22.000	1.59176	0.00197	-5.38	52.000	1.47323	0.00664	-2.41
9.500	1.60897	0.00083	-5.57	22.500	1.59076	0.00202	-5.36	52.500	1.46988	0.00677	-2.28
9.600	1.60889	0.00084	-5.57	23.000	1.58974	0.00207	-5.35	53.000	1.46647	0.00690	-2.15
9.700	1.60881	0.00084	-5.57	23.500	1.58869	0.00212	-5.34	53.500	1.46299	0.00703	-2.02
9.800	1.60872	0.00085	-5.57	24.000	1.58762	0.00218	-5.32	54.000	1.45944	0.00716	-1.88
9.900	1.60864	0.00086	-5.57	24.500	1.58651	0.00223	-5.31	54.500	1.45582	0.00730	-1.73
10.000	1.60855	0.00087	-5.57	25.000	1.58539	0.00228	-5.29	55.000	1.45214	0.00744	-1.58
10.200	1.60837	0.00088	-5.57	25.500	1.58423	0.00234	-5.27	55.500	1.44838	0.00759	-1.42
10.400	1.60820	0.00090	-5.57	26.000	1.58305	0.00239	-5.26	56.000	1.44455	0.00774	-1.26
10.600	1.60801	0.00092	-5.56	26.500	1.58184	0.00245	-5.24	56.500	1.44064	0.00789	-1.09
10.800	1.60783	0.00093	-5.56	27.000	1.58060	0.00250	-5.22	57.000	1.43666	0.00804	-0.92
11.000	1.60764	0.00095	-5.56	27.500	1.57933	0.00256	-5.20	57.500	1.43260	0.00820	-0.73
11.200	1.60745	0.00097	-5.56	28.000	1.57804	0.00262	-5.18	58.000	1.42846	0.00836	-0.54
11.400	1.60725	0.00098	-5.56	28.500	1.57672	0.00268	-5.16	58.500	1.42423	0.00853	-0.35
11.600	1.60705	0.00100	-5.56	29.000	1.57536	0.00273	-5.14	59.000	1.41993	0.00870	-0.14
11.800	1.60685	0.00102	-5.55	29.500	1.57398	0.00279	-5.11	59.500	1.41553	0.00888	0.07
12.000	1.60665	0.00103	-5.55	30.000	1.57257	0.00285	-5.09	60.000	1.41105	0.00906	0.29
12.200	1.60644	0.00105	-5.55	30.500	1.57113	0.00291	-5.06	60.500	1.40647	0.00924	0.52
12.400	1.60623	0.00107	-5.55	31.000	1.56966	0.00298	-5.04	61.000	1.40180	0.00943	0.76
12.600	1.60601	0.00109	-5.54	31.500	1.56815	0.00304	-5.01	61.500	1.39704	0.00963	1.01
12.800	1.60579	0.00110	-5.54	32.000	1.56662	0.00310	-4.98	62.000	1.39217	0.00983	1.27
13.000	1.60557	0.00112	-5.54	32.500	1.56505	0.00316	-4.95	62.500	1.38721	0.01003	1.54
13.200	1.60534	0.00114	-5.54	33.000	1.56345	0.00323	-4.93	63.000	1.38214	0.01025	1.82
13.400	1.60511	0.00116	-5.54	33.500	1.56182	0.00330	-4.89	63.500	1.37696	0.01046	2.11
13.600	1.60488	0.00117	-5.53	34.000	1.56016	0.00336	-4.86	64.000	1.37167	0.01069	2.42
13.800	1.60465	0.00119	-5.53	34.500	1.55846	0.00343	-4.83				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.16. The number of digits with an overstrike are not relevant to accuracy of the data.

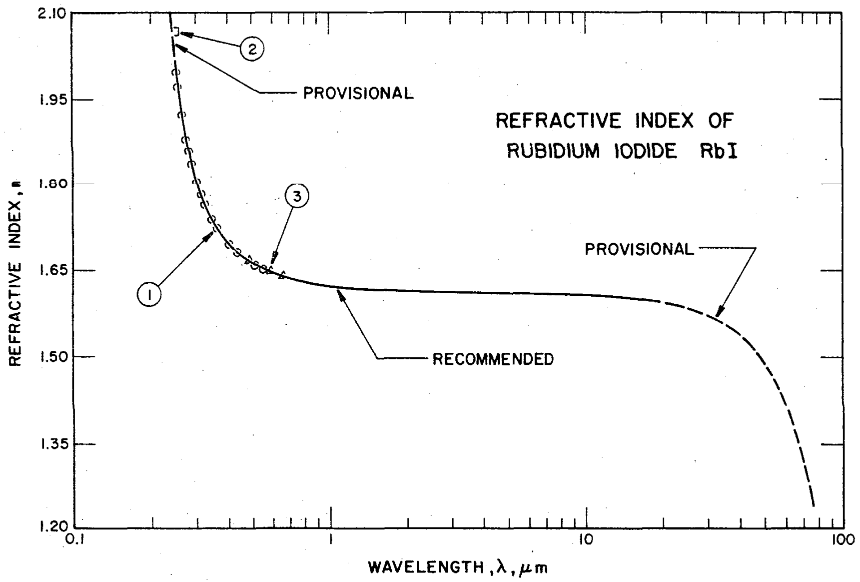

FIGURE 53. Refractive Index of RbI

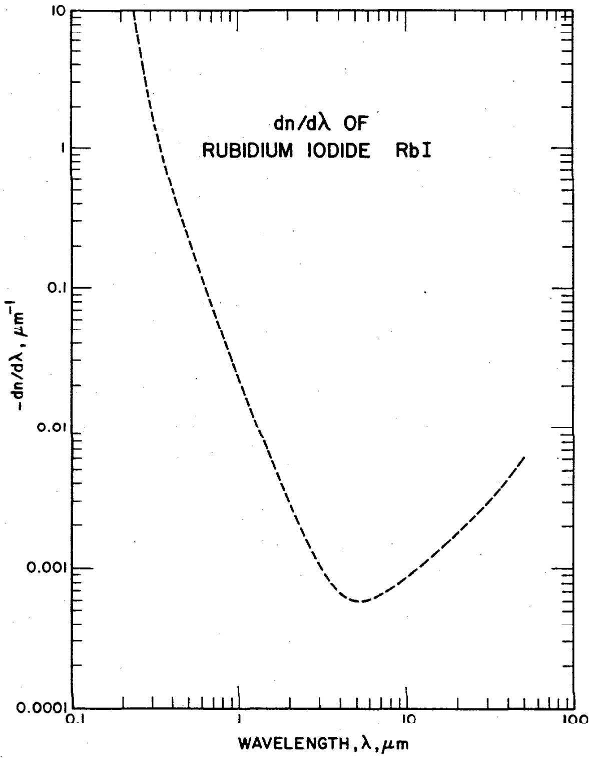

FIGURE 54. $dn/d\lambda$ of RbI

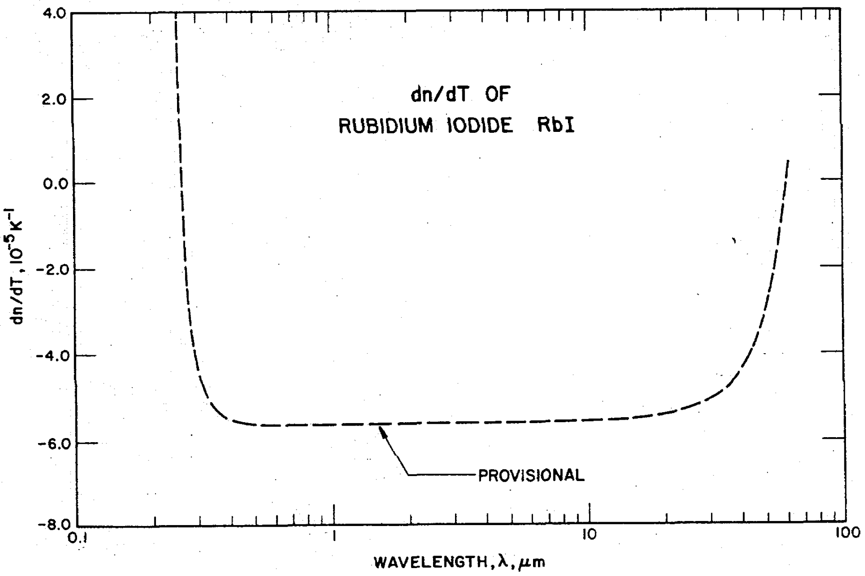

FIGURE 55. *dn/dT* of RbI

TABLE 68. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF RbI

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	50	Kublitzky, A.	1934	D	0.253-0.578	309	Crystal; grown by the Kyropoulos method; prismatic specimen with height of 25 mm, side of 30 mm and apex angle of 52°21'40"; digitized data were presented with accuracy of one unit of the third decimal place.
2	106	Baldini, G. and Rigaldi, L.	1970,	T, R	0.18-0.25	298	Thin film of RbI, by vacuum sublimation onto a fused silica plate; refractive indices were determined from information of normal-incident reflection and transmission; data extracted from a figure; reported uncertainty 1%.
3	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; seven prismatic specimens with apex angles of about 44.3°; averaged probable values of measurements were presented; temperature was not given, room temperature assumed.

TABLE 69. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF RbI

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 309.0 K	
0.2537	1.9950
0.2573	1.9693
0.265	1.9219
0.27488	1.8806
0.28035	1.8602
0.288	1.8368
0.29673	1.8158
0.29806	1.8125
0.30215	1.8019
0.313	1.7838
0.326	1.7645
0.340	1.7456
0.347	1.7389
0.361	1.7254
0.366	1.7218
0.405	1.6960
0.435	1.6815
CURVE 1 (cont.) T = 309.0 K	
0.47999	1.6667
0.5086	1.6589
0.5461	1.6515
0.578	1.6465
CURVE 2* T = 298.0 K	
0.1806	1.198
0.1825	1.203
0.1867	1.300
0.1881	1.302
0.1898	1.403
0.1912	1.496
0.1920	1.496
0.1933	1.413
0.1960	2.298
CURVE 2 (cont.)* T = 298.0 K	
0.2000	1.998
0.2051	1.805
0.2098	0.904
0.2150	0.904
0.2202	1.200
0.2240	1.702
0.2274	2.199
0.2299	2.497
0.2397	2.277
0.2499	2.067
CURVE 3 T = 298.0 K	
0.486	1.6672
0.589	1.6474
0.656	1.6397

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* Not shown in figure.

TABLE 70. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR RbI

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Radhakrishnan, T. [48] 1948	0.25-0.546 μm 309 K	$n^2 = 1.6017 + \frac{0.01749\,\lambda^2}{\lambda^2 - 0.015625} + \frac{0.83466\,\lambda^2}{\lambda^2 - 0.033489} + \frac{0.13917\,\lambda^2}{\lambda^2 - 0.049729}$
Present work 1975	0.24-64 μm 293 K	$n^2 = 1.60563 + \frac{0.00947\,\lambda^2}{\lambda^2 - (0.120)^2} + \frac{0.01073\,\lambda^2}{\lambda^2 - (0.134)^2} + \frac{0.00136\,\lambda^2}{\lambda^2 - (0.156)^2} + \frac{0.41864\,\lambda^2}{\lambda^2 - (0.179)^2} + \frac{0.41771\,\lambda^2}{\lambda^2 - (0.187)^2} + \frac{0.13707\,\lambda^2}{\lambda^2 - (0.223)^2} + \frac{2.36091\,\lambda^2}{\lambda^2 - (132.45)^2}$

3.17. Cesium Fluoride, CsF

The refractive index of CsF for a single spectral line, the sodium D line, was obtained by Spangenberg [45] using the immersion method. He gave two values for n, one for α-CsF, and the other for β-CsF. The fact that there is one measured value of n only for one wavelength does not prevent us from making a reasonable estimate of the refractive indices for a wide transparent region because there exist known property parameters intimately related to the refractive index, enabling us to make the necessary calculations. Using the values from table 3 and the available n:

$$\epsilon_s = 8.08,$$

$$\epsilon_{uv} = 2.16,$$

$$\lambda_u = 0.121\ \mu\text{m (averaged value of 3 peaks)},$$

$$\lambda_l = 78.74\ \mu\text{m},$$

$$n = 1.478\ (\text{of } \alpha\text{-CsF}),\ \text{for } \lambda = 0.5893\ \mu\text{m},$$

the adjustable constant A of eq (13) is found to be 1.60. This leads to a dispersion equation for α-CsF at 293 K in the transparent region, 0.15–30.0 μm.

$$n^2 = 1.60 + \frac{0.56\lambda^2}{\lambda^2 - (0.121)^2} + \frac{5.92\lambda^2}{\lambda^2 - (78.74)^2}, \quad (55)$$

where λ is in units of μm.

If we used the refractive index of β-CsF, the value of A would be negative, which is not an acceptable solution.

No experimental data on dn/dT are available, but our empirical parameter values in table 5 were used to construct a dn/dT formula for the transparent region:

$$2n\frac{dn}{dT} = -9.60\,(n^2-1) - 2.54 + \frac{1.42\lambda^4}{(\lambda^2 - 0.01850)^2} + \frac{296.00\lambda^4}{(\lambda^2 - 6199.99)^2}, \quad (56)$$

where dn/dT is in units of 10^{-5}K^{-1} and λ in μm.

Equations (55) and (56) were used to generate the recommended values of the refractive index, $dn/d\lambda$ and dn/dT for CsF. As noted, these equations are based totally on the available data on the thermal linear expansion, dielectric constants, the wavelengths of absorption peaks, and our empirical parameters. As a consequence, the accuracies of the estimated values are governed by the uncertainties in the above mentioned parameters. The following criteria are recommended.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.15– 0.19	2	0.02
0.19– 0.30	3	0.008
0.30– 1.50	3	0.003
1.50–10.00	3	0.006
10.00–16.00	3	0.008
16.00–30.00	2	0.03

For dn/dT:

0.15– 0.16	0	⩾1
0.16–22.00	1	0.5
22.00–30.00	0	⩾1

TABLE 71. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsF AT 293 K*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.150	1.78976	11.12562	5.89	0.270	1.51679	0.43017	-4.12	0.700	1.47539	0.01767	-4.17
0.152	1.76884	9.83716	3.56	0.272	1.51595	0.41791	-4.12	0.720	1.47505	0.01624	-4.17
0.154	1.75027	8.75962	1.97	0.274	1.51512	0.40613	-4.12	0.740	1.47474	0.01496	-4.17
0.156	1.73369	7.84914	0.81	0.276	1.51432	0.39482	-4.12	0.760	1.47445	0.01383	-4.17
0.158	1.71878	7.07275	-0.06	0.278	1.51354	0.38394	-4.12	0.780	1.47419	0.01281	-4.17
0.160	1.70532	6.40526	-0.72	0.280	1.51278	0.37348	-4.13	0.800	1.47394	0.01190	-4.17
0.162	1.69310	5.82715	-1.24	0.282	1.51205	0.36341	-4.13	0.820	1.47371	0.01108	-4.17
0.164	1.68196	5.32313	-1.66	0.284	1.51133	0.35371	-4.13	0.840	1.47350	0.01033	-4.17
0.166	1.67177	4.88101	-1.99	0.286	1.51063	0.34438	-4.13	0.860	1.47330	0.00966	-4.17
0.168	1.66241	4.49106	-2.27	0.288	1.50995	0.33539	-4.13	0.880	1.47311	0.00906	-4.17
0.170	1.65378	4.14537	-2.50	0.290	1.50929	0.32672	-4.14	0.900	1.47293	0.00850	-4.17
0.172	1.64580	3.83748	-2.69	0.292	1.50865	0.31836	-4.14	0.920	1.47277	0.00800	-4.17
0.174	1.63840	3.56208	-2.86	0.294	1.50802	0.31029	-4.14	0.940	1.47261	0.00754	-4.17
0.176	1.63153	3.31475	-2.99	0.296	1.50740	0.30251	-4.14	0.960	1.47247	0.00712	-4.17
0.178	1.62513	3.09161	-3.11	0.298	1.50681	0.29500	-4.14	0.980	1.47233	0.00674	-4.17
0.180	1.61915	2.89017	-3.22	0.300	1.50622	0.28774	-4.14	1.000	1.47220	0.00638	-4.17
0.182	1.61356	2.70719	-3.31	0.305	1.50483	0.27066	-4.14	1.050	1.47190	0.00562	-4.17
0.184	1.60831	2.54065	-3.39	0.310	1.50352	0.25496	-4.15	1.100	1.47163	0.00500	-4.17
0.186	1.60338	2.38864	-3.46	0.315	1.50228	0.24049	-4.15	1.150	1.47140	0.00449	-4.17
0.188	1.59875	2.24953	-3.52	0.320	1.50111	0.22714	-4.15	1.200	1.47118	0.00407	-4.17
0.190	1.59438	2.12190	-3.57	0.325	1.50000	0.21480	-4.15	1.250	1.47099	0.00372	-4.17
0.192	1.59025	2.00453	-3.62	0.330	1.49896	0.20337	-4.16	1.300	1.47081	0.00343	-4.17
0.194	1.58635	1.89636	-3.66	0.335	1.49797	0.19276	-4.16	1.350	1.47064	0.00318	-4.17
0.196	1.58266	1.79645	-3.70	0.340	1.49703	0.18291	-4.16	1.400	1.47049	0.00297	-4.17
0.198	1.57916	1.70396	-3.74	0.345	1.49614	0.17374	-4.16	1.450	1.47035	0.00280	-4.17
0.200	1.57584	1.61825	-3.77	0.350	1.49529	0.16519	-4.16	1.500	1.47021	0.00265	-4.17
0.202	1.57269	1.53861	-3.80	0.355	1.49449	0.15721	-4.16	1.550	1.47008	0.00252	-4.17
0.204	1.56968	1.46450	-3.82	0.360	1.49372	0.14975	-4.16	1.600	1.46996	0.00242	-4.17
0.206	1.56682	1.39544	-3.85	0.365	1.49299	0.14278	-4.16	1.650	1.46984	0.00233	-4.17
0.208	1.56410	1.33097	-3.87	0.370	1.49229	0.13624	-4.16	1.700	1.46972	0.00225	-4.17
0.210	1.56150	1.27070	-3.89	0.375	1.49162	0.13011	-4.16	1.750	1.46961	0.00219	-4.16
0.212	1.55901	1.21428	-3.91	0.380	1.49099	0.12435	-4.16	1.800	1.46951	0.00214	-4.16
0.214	1.55664	1.16139	-3.92	0.385	1.49038	0.11894	-4.17	1.850	1.46940	0.00209	-4.16
0.216	1.55437	1.11174	-3.94	0.390	1.48980	0.11384	-4.17	1.900	1.46930	0.00206	-4.16
0.218	1.55219	1.06508	-3.95	0.395	1.48924	0.10904	-4.17	1.950	1.46919	0.00203	-4.16
0.220	1.55010	1.02117	-3.97	0.400	1.48871	0.10452	-4.17	2.000	1.46909	0.00200	-4.16
0.222	1.54810	0.97981	-3.98	0.410	1.48771	0.09621	-4.17	2.050	1.46899	0.00199	-4.16
0.224	1.54618	0.94080	-3.99	0.420	1.48678	0.08879	-4.17	2.100	1.46889	0.00197	-4.16
0.226	1.54434	0.90397	-4.00	0.430	1.48593	0.08212	-4.17	2.150	1.46880	0.00197	-4.16
0.228	1.54257	0.86916	-4.01	0.440	1.48514	0.07613	-4.17	2.200	1.46870	0.00196	-4.16
0.230	1.54086	0.83624	-4.02	0.450	1.48440	0.07072	-4.17	2.250	1.46860	0.00196	-4.16
0.232	1.53922	0.80506	-4.03	0.460	1.48372	0.06582	-4.17	2.300	1.46850	0.00196	-4.16
0.234	1.53764	0.77551	-4.04	0.470	1.48308	0.06138	-4.17	2.350	1.46840	0.00196	-4.16
0.236	1.53612	0.74748	-4.04	0.480	1.48249	0.05733	-4.17	2.400	1.46831	0.00197	-4.16
0.238	1.53465	0.72087	-4.05	0.490	1.48194	0.05365	-4.17	2.450	1.46821	0.00198	-4.16
0.240	1.53323	0.69558	-4.06	0.500	1.48142	0.05028	-4.17	2.500	1.46811	0.00199	-4.16
0.242	1.53187	0.67153	-4.06	0.510	1.48093	0.04719	-4.17	2.550	1.46801	0.00200	-4.16
0.244	1.53055	0.64865	-4.07	0.520	1.48047	0.04436	-4.17	2.600	1.46791	0.00201	-4.16
0.246	1.52927	0.62685	-4.07	0.530	1.48004	0.04176	-4.17	2.650	1.46781	0.00203	-4.16
0.248	1.52804	0.60608	-4.08	0.540	1.47964	0.03936	-4.17	2.700	1.46770	0.00205	-4.16
0.250	1.52684	0.58626	-4.08	0.550	1.47925	0.03714	-4.17	2.750	1.46760	0.00206	-4.15
0.252	1.52569	0.56735	-4.09	0.560	1.47889	0.03510	-4.17	2.800	1.46750	0.00208	-4.15
0.254	1.52457	0.54929	-4.09	0.570	1.47855	0.03320	-4.17	2.850	1.46739	0.00210	-4.15
0.256	1.52349	0.53203	-4.09	0.580	1.47823	0.03145	-4.17	2.900	1.46729	0.00212	-4.15
0.258	1.52245	0.51553	-4.10	0.590	1.47792	0.02982	-4.17	2.950	1.46718	0.00214	-4.15
0.260	1.52143	0.49974	-4.10	0.600	1.47763	0.02830	-4.17	3.000	1.46707	0.00217	-4.15
0.262	1.52045	0.48462	-4.10	0.620	1.47709	0.02557	-4.17	3.050	1.46697	0.00219	-4.15
0.264	1.51949	0.47014	-4.11	0.640	1.47661	0.02319	-4.17	3.100	1.46686	0.00221	-4.15
0.266	1.51857	0.45626	-4.11	0.660	1.47616	0.02111	-4.17	3.150	1.46674	0.00224	-4.15
0.268	1.51767	0.44294	-4.11	0.680	1.47576	0.01928	-4.17	3.200	1.46663	0.00226	-4.15

TABLE 71. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsF AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
3.250	1.46652	0.00229	-4.15	6.700	1.45499	0.00448	-4.07	13.800	1.40444	0.00999	-3.62
3.300	1.46640	0.00231	-4.15	6.800	1.45454	0.00455	-4.06	14.000	1.40242	0.01017	-3.60
3.350	1.46629	0.00234	-4.15	6.900	1.45408	0.00462	-4.06	14.200	1.40037	0.01035	-3.58
3.400	1.46617	0.00237	-4.15	7.000	1.45362	0.00469	-4.06	14.400	1.39828	0.01053	-3.55
3.450	1.46605	0.00239	-4.14	7.100	1.45315	0.00476	-4.05	14.600	1.39616	0.01071	-3.53
3.500	1.46593	0.00242	-4.14	7.200	1.45267	0.00483	-4.05	14.800	1.39400	0.01090	-3.51
3.550	1.46581	0.00245	-4.14	7.300	1.45218	0.00490	-4.04	15.000	1.39180	0.01108	-3.49
3.600	1.46569	0.00248	-4.14	7.400	1.45169	0.00497	-4.04	15.200	1.38956	0.01127	-3.46
3.650	1.46556	0.00250	-4.14	7.500	1.45119	0.00504	-4.04	15.400	1.38729	0.01146	-3.44
3.700	1.46543	0.00253	-4.14	7.600	1.45068	0.00511	-4.03	15.600	1.38498	0.01165	-3.41
3.750	1.46531	0.00256	-4.14	7.700	1.45017	0.00518	-4.03	15.800	1.38263	0.01185	-3.38
3.800	1.46518	0.00259	-4.14	7.800	1.44964	0.00525	-4.02	16.000	1.38024	0.01204	-3.36
3.850	1.46505	0.00262	-4.14	7.900	1.44911	0.00532	-4.02	16.200	1.37781	0.01224	-3.33
3.900	1.46492	0.00265	-4.14	8.000	1.44858	0.00539	-4.02	16.400	1.37534	0.01244	-3.30
3.950	1.46478	0.00268	-4.14	8.100	1.44804	0.00547	-4.01	16.600	1.37283	0.01265	-3.27
4.000	1.46465	0.00271	-4.14	8.200	1.44749	0.00554	-4.01	16.800	1.37029	0.01285	-3.24
4.050	1.46451	0.00274	-4.13	8.300	1.44693	0.00561	-4.00	17.000	1.36769	0.01306	-3.21
4.100	1.46437	0.00277	-4.13	8.400	1.44636	0.00568	-4.00	17.200	1.36506	0.01327	-3.18
4.150	1.46424	0.00280	-4.13	8.500	1.44579	0.00576	-3.99	17.400	1.36239	0.01348	-3.14
4.200	1.46409	0.00283	-4.13	8.600	1.44521	0.00583	-3.99	17.600	1.35967	0.01370	-3.11
4.250	1.46395	0.00286	-4.13	8.700	1.44463	0.00590	-3.99	17.800	1.35691	0.01391	-3.07
4.300	1.46381	0.00289	-4.13	8.800	1.44403	0.00598	-3.98	18.000	1.35410	0.01413	-3.04
4.350	1.46366	0.00292	-4.13	8.900	1.44343	0.00605	-3.98	18.200	1.35126	0.01435	-3.00
4.400	1.46352	0.00295	-4.13	9.000	1.44282	0.00612	-3.97	18.400	1.34836	0.01458	-2.96
4.450	1.46337	0.00299	-4.13	9.100	1.44221	0.00620	-3.97	18.600	1.34542	0.01481	-2.92
4.500	1.46322	0.00302	-4.13	9.200	1.44158	0.00627	-3.96	18.800	1.34244	0.01504	-2.88
4.550	1.46307	0.00305	-4.12	9.300	1.44095	0.00635	-3.96	19.000	1.33941	0.01527	-2.84
4.600	1.46291	0.00308	-4.12	9.400	1.44031	0.00642	-3.95	19.200	1.33633	0.01551	-2.80
4.650	1.46276	0.00311	-4.12	9.500	1.43967	0.00649	-3.94	19.400	1.33320	0.01575	-2.76
4.700	1.46260	0.00314	-4.12	9.600	1.43901	0.00657	-3.94	19.600	1.33003	0.01599	-2.71
4.750	1.46244	0.00318	-4.12	9.700	1.43835	0.00665	-3.93	19.800	1.32681	0.01624	-2.67
4.800	1.46228	0.00321	-4.12	9.800	1.43769	0.00672	-3.93	20.000	1.32353	0.01649	-2.62
4.850	1.46212	0.00324	-4.12	9.900	1.43701	0.00680	-3.92	20.500	1.31513	0.01713	-2.50
4.900	1.46196	0.00327	-4.12	10.000	1.43633	0.00687	-3.92	21.000	1.30640	0.01779	-2.36
4.950	1.46180	0.00331	-4.12	10.200	1.43494	0.00703	-3.90	21.500	1.29734	0.01848	-2.22
5.000	1.46163	0.00334	-4.11	10.400	1.43352	0.00718	-3.89	22.000	1.28792	0.01919	-2.07
5.100	1.46129	0.00340	-4.11	10.600	1.43206	0.00734	-3.88	22.500	1.27814	0.01993	-1.90
5.200	1.46095	0.00347	-4.11	10.800	1.43058	0.00749	-3.87	23.000	1.26799	0.02070	-1.73
5.300	1.46060	0.00353	-4.11	11.000	1.42907	0.00765	-3.85	23.500	1.25743	0.02151	-1.54
5.400	1.46024	0.00360	-4.10	11.200	1.42752	0.00781	-3.84	24.000	1.24647	0.02234	-1.34
5.500	1.45988	0.00367	-4.10	11.400	1.42594	0.00797	-3.83	24.500	1.23508	0.02322	-1.12
5.600	1.45951	0.00373	-4.10	11.600	1.42433	0.00813	-3.81	25.000	1.22325	0.02414	-0.89
5.700	1.45913	0.00380	-4.10	11.800	1.42269	0.00829	-3.80	25.500	1.21094	0.02510	-0.64
5.800	1.45875	0.00387	-4.09	12.000	1.42102	0.00845	-3.78	26.000	1.19814	0.02610	-0.36
5.900	1.45836	0.00393	-4.09	12.200	1.41931	0.00862	-3.76	26.500	1.18483	0.02716	-0.07
6.000	1.45796	0.00400	-4.09	12.400	1.41757	0.00879	-3.75	27.000	1.17097	0.02828	0.24
6.100	1.45756	0.00407	-4.08	12.600	1.41580	0.00895	-3.73	27.500	1.15655	0.02945	0.58
6.200	1.45715	0.00414	-4.08	12.800	1.41399	0.00912	-3.71	28.000	1.14151	0.03069	0.95
6.300	1.45673	0.00421	-4.08	13.000	1.41215	0.00929	-3.70	28.500	1.12584	0.03201	1.35
6.400	1.45631	0.00427	-4.08	13.200	1.41027	0.00946	-3.68	29.000	1.10949	0.03341	1.78
6.500	1.45588	0.00434	-4.07	13.400	1.40836	0.00964	-3.66	29.500	1.09242	0.03489	2.25
6.600	1.45544	0.00441	-4.07	13.600	1.40642	0.00981	-3.64	30.000	1.07458	0.03648	2.76

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.17. The number of digits with an overstrike are not relevant to accuracy of the data.

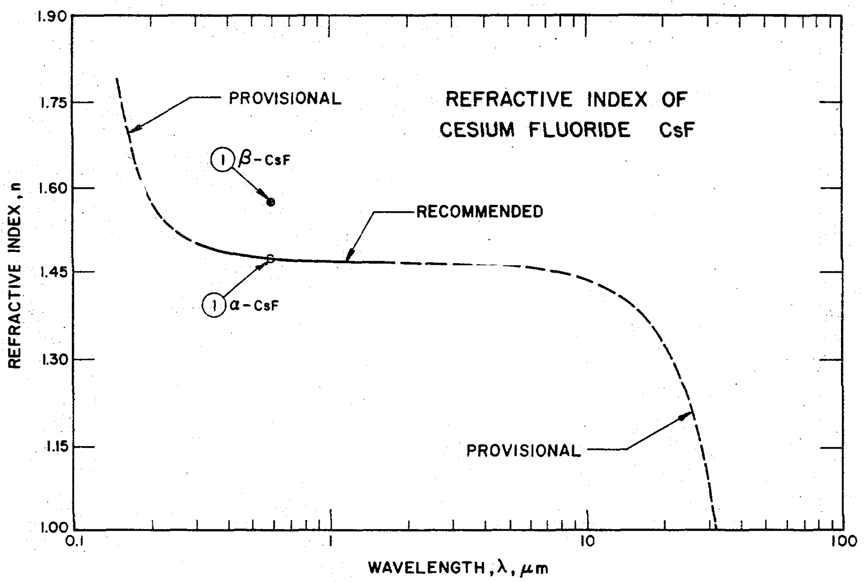

FIGURE 56. Refractive Index of CsF

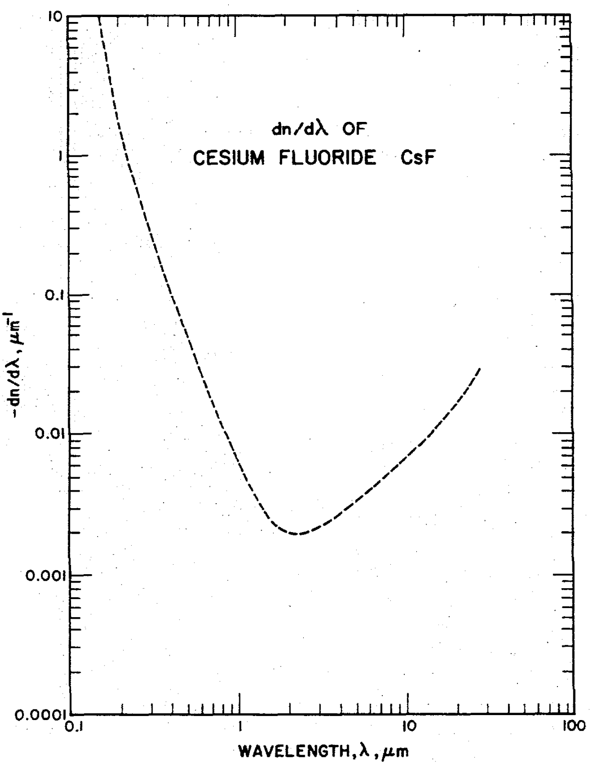

FIGURE 57. $dn/d\lambda$ of CsF

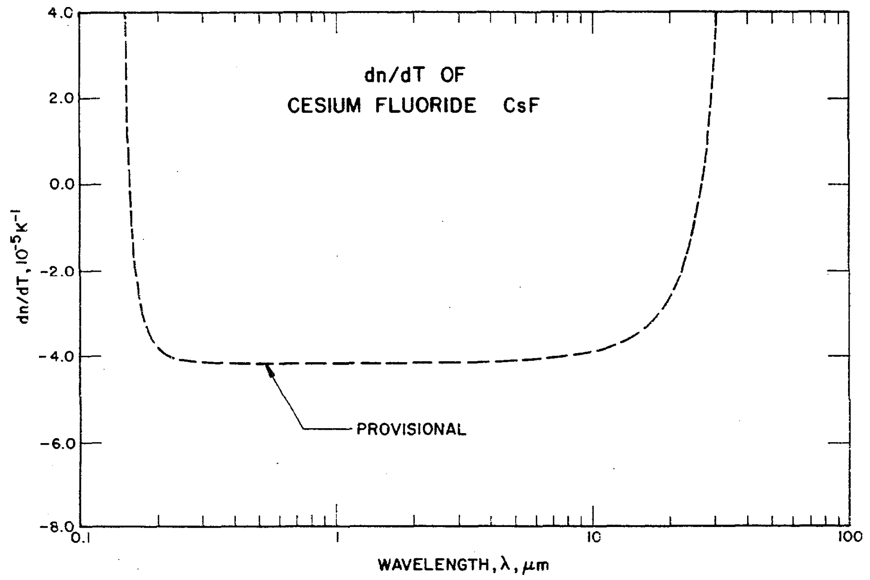

FIGURE 58. *dn/dT* of CsF

TABLE 72. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF CsF

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	45	Spangenberg, K.	1923	M	0.5893	295	Crystal formed by slowly cooling melt; immersion method was used; two values on the refractive index for mean of sodium D lines were obtained; 1.478 ± 0.005 was attributed to α-CsF and 1.578 ±0.0005 to β-CsF.

TABLE 73. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF CsF

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 295.2 K	
0.5893	1.578
0.5893	1.478

3.18. Cesium Chloride, CsCl

Cesium chloride is very hygroscopic and highly soluble in water. It is, therefore, an unsatisfactory material for making optical parts, despite its optical transparency over a fairly wide wavelength region. While CsCl is not suitable for ordinary applications, it is an interesting object for scientific studies. The wavelengths of absorption bands in the ultraviolet region have been measured by Hilsch and Pohl [23] and by Schneider and O'Bryan [24]. Lowndes and Martin [13] measured the infrared absorption band and the dielectric constant. In table 3, the results of the above work are listed.

Because it is an unfavorable material for optical use, there have been few measurements of the refractive index. For the transparent region, only four data sets covering a limited wavelength range were found in the literature. Upon careful examination, one finds that the works of Wulff, et al. (the first three listed in table 75) produced reliable results which can be used as the basis for the reference data generation. Results reported by Sprockhoff appear to be unreliable, as the given values seem too high for the assumed temperature. The large discrepancies may be attributed either to the measurements being made at a lower temperature than was reported, or to the measurements being made on impure specimens. In the infrared region, Vergnat, et al. [26] obtained refractive indices for powdered CsCl by analyzing the reflection spectrum. This set of data is presented here for completeness, but it was not used for data analysis.

Data reported by Wulff, et al. were obtained at a temperature of 298 K, five degrees higher than our chosen reference temperature. Since the value of dn/dT of CsCl is about $6.0\times10^{-5}\mathrm{K}^{-1}$ in the visible region [18], a temperature correction of about 3 units in the fourth decimal place needs to be made.

Although there is not a single experimental value of dn/dT available in the literature, we can make reasonable estimates of dn/dT over a wide wavelength range, using our empirical discoveries. Using the parameter values in table 5, the following dn/dT formula was constructed for CsCl:

$$2n\frac{dn}{dT}=-13.89\,(n^2-1)-4.27+\frac{1.989\lambda^4}{(\lambda^2-0.02624)^2}+\frac{276.48\lambda^4}{(\lambda^2-10100.25)^2}, \tag{57}$$

where dn/dT is in units of $10^{-5}\mathrm{K}^{-1}$ and λ in μm. Equation (57) was used to calculate dn/dT values for reducing Wulff's data to 293 K.

With the information available from table 3, a least-squares fitting of the reduced data to eq (10) was carried out. It resulted in a dispersion equation for CsCl at 293 K in the transparent region, 0.18–40.0 μm.

$$n^2=1.33013+\frac{0.98369\,\lambda^2}{\lambda^2-(0.119)^2}+\frac{0.00009\,\lambda^2}{\lambda^2-(0.137)^2}+\frac{0.00018\,\lambda^2}{\lambda^2-(0.145)^2}+\frac{0.30914\,\lambda^2}{\lambda^2-(0.162)^2}+\frac{4.320\,\lambda^2}{\lambda^2-(100.50)^2}, \tag{58}$$

where λ is in units of μm.

In practical use, the contributions of the third and fourth term are small and can be neglected; they are given here for completeness. Equations (57) and (58) were used to generate recommended values of refractive index $dn/d\lambda$ and dn/dT. In the tables, the property values are given to more decimal places than needed, for tabular smoothness. In order to use the recommended values correctly, readers should follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.18– 0.20	2	0.01
0.20– 0.30	3	0.005
0.30– 0.40	3	0.003
0.40– 1.50	3	0.001
1.50–20.00	3	0.003
20.00–30.00	3	0.006
30.00–40.00	3	0.008
For dn/dT:		
0.18– 0.19	0	⩾ 1
0.19–30.00	1	0.4
30.00–40.00	1	0.9

TABLE 74. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsCl AT 293 K*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
0.180	2.16918	21.24306	-0.16	0.300	1.71295	0.77401	-7.93	1.000	1.62643	0.01434	-7.69
0.182	2.13013	17.95727	-1.73	0.305	1.70920	0.72456	-7.93	1.050	1.62576	0.01240	-7.69
0.184	2.09684	15.44092	-2.90	0.310	1.70570	0.67949	-7.92	1.100	1.62518	0.01080	-7.69
0.186	2.06801	13.46361	-3.79	0.315	1.70240	0.63830	-7.92	1.150	1.62467	0.00948	-7.69
0.188	2.04273	11.87619	-4.49	0.320	1.69931	0.60056	-7.91	1.200	1.62423	0.00838	-7.68
0.190	2.02031	10.57845	-5.05	0.325	1.69639	0.56591	-7.91	1.250	1.62383	0.00745	-7.68
0.192	2.00027	9.50096	-5.50	0.330	1.69364	0.53400	-7.90	1.300	1.62348	0.00666	-7.68
0.194	1.98220	8.59429	-5.87	0.335	1.69105	0.50458	-7.90	1.350	1.62317	0.00599	-7.68
0.196	1.96580	7.82241	-6.17	0.340	1.68859	0.47738	-7.89	1.400	1.62288	0.00542	-7.68
0.198	1.95083	7.15853	-6.42	0.345	1.68627	0.45220	-7.89	1.450	1.62262	0.00492	-7.68
0.200	1.93711	6.58236	-6.63	0.350	1.68407	0.42864	-7.88	1.500	1.62239	0.00449	-7.68
0.202	1.92446	6.07829	-6.81	0.355	1.68198	0.40713	-7.88	1.550	1.62217	0.00412	-7.67
0.204	1.91275	5.63414	-6.96	0.360	1.68000	0.38693	-7.87	1.600	1.62198	0.00379	-7.67
0.206	1.90189	5.24024	-7.09	0.365	1.67811	0.36810	-7.87	1.650	1.62179	0.00350	-7.67
0.208	1.89176	4.88689	-7.20	0.370	1.67631	0.35052	-7.86	1.700	1.62162	0.00325	-7.67
0.210	1.88231	4.57384	-7.30	0.375	1.67460	0.33409	-7.86	1.750	1.62147	0.00303	-7.67
0.212	1.87345	4.29000	-7.38	0.380	1.67297	0.31871	-7.86	1.800	1.62132	0.00283	-7.67
0.214	1.86513	4.03314	-7.45	0.385	1.67141	0.30430	-7.85	1.850	1.62118	0.00266	-7.67
0.216	1.85730	3.79978	-7.51	0.390	1.66993	0.29077	-7.85	1.900	1.62105	0.00251	-7.67
0.218	1.84992	3.58699	-7.57	0.395	1.66850	0.27807	-7.84	1.950	1.62093	0.00237	-7.67
0.220	1.84294	3.39230	-7.62	0.400	1.66714	0.26612	-7.84	2.000	1.62082	0.00224	-7.67
0.222	1.83634	3.21362	-7.66	0.410	1.66459	0.24426	-7.83	2.050	1.62071	0.00213	-7.67
0.224	1.83008	3.04915	-7.69	0.420	1.66225	0.22480	-7.83	2.100	1.62060	0.00204	-7.67
0.226	1.82413	2.89736	-7.73	0.430	1.66009	0.20742	-7.82	2.150	1.62050	0.00195	-7.67
0.228	1.81848	2.75691	-7.75	0.440	1.65810	0.19184	-7.81	2.200	1.62041	0.00187	-7.66
0.230	1.81310	2.62666	-7.78	0.450	1.65625	0.17781	-7.81	2.250	1.62032	0.00180	-7.66
0.232	1.80797	2.50561	-7.80	0.460	1.65453	0.16516	-7.80	2.300	1.62023	0.00173	-7.66
0.234	1.80307	2.39286	-7.82	0.470	1.65294	0.15371	-7.79	2.350	1.62014	0.00168	-7.66
0.236	1.79839	2.28765	-7.84	0.480	1.65146	0.14332	-7.79	2.400	1.62006	0.00163	-7.66
0.238	1.79391	2.18930	-7.85	0.490	1.65007	0.13387	-7.79	2.450	1.61998	0.00158	-7.66
0.240	1.78963	2.09721	-7.87	0.500	1.64878	0.12525	-7.78	2.500	1.61990	0.00154	-7.66
0.242	1.78552	2.01083	-7.88	0.510	1.64756	0.11737	-7.78	2.550	1.61983	0.00150	-7.66
0.244	1.78158	1.92968	-7.89	0.520	1.64643	0.11015	-7.77	2.600	1.61975	0.00147	-7.66
0.246	1.77780	1.85335	-7.90	0.530	1.64536	0.10353	-7.77	2.650	1.61968	0.00144	-7.66
0.248	1.77416	1.78145	-7.91	0.540	1.64435	0.09743	-7.76	2.700	1.61961	0.00141	-7.66
0.250	1.77067	1.71362	-7.91	0.550	1.64341	0.09182	-7.76	2.750	1.61954	0.00139	-7.66
0.252	1.76731	1.64957	-7.92	0.560	1.64252	0.08663	-7.76	2.800	1.61947	0.00136	-7.66
0.254	1.76407	1.58900	-7.92	0.570	1.64168	0.08184	-7.75	2.850	1.61940	0.00134	-7.66
0.256	1.76095	1.53167	-7.93	0.580	1.64088	0.07740	-7.75	2.900	1.61934	0.00133	-7.66
0.258	1.75794	1.47734	-7.93	0.590	1.64013	0.07328	-7.75	2.950	1.61927	0.00131	-7.66
0.260	1.75504	1.42581	-7.93	0.600	1.63941	0.06945	-7.75	3.000	1.61921	0.00130	-7.66
0.262	1.75224	1.37688	-7.94	0.620	1.63809	0.06258	-7.74	3.050	1.61914	0.00129	-7.66
0.264	1.74953	1.33037	-7.94	0.640	1.63690	0.05660	-7.74	3.100	1.61908	0.00128	-7.66
0.266	1.74691	1.28613	-7.94	0.660	1.63583	0.05136	-7.73	3.150	1.61901	0.00127	-7.66
0.268	1.74438	1.24401	-7.94	0.680	1.63484	0.04677	-7.73	3.200	1.61895	0.00126	-7.66
0.270	1.74194	1.20387	-7.94	0.700	1.63395	0.04271	-7.72	3.250	1.61889	0.00126	-7.65
0.272	1.73957	1.16559	-7.94	0.720	1.63313	0.03912	-7.72	3.300	1.61882	0.00125	-7.65
0.274	1.73727	1.12905	-7.94	0.740	1.63238	0.03593	-7.72	3.350	1.61876	0.00125	-7.65
0.276	1.73505	1.09416	-7.94	0.760	1.63169	0.03308	-7.72	3.400	1.61870	0.00125	-7.65
0.278	1.73289	1.06081	-7.94	0.780	1.63106	0.03053	-7.71	3.450	1.61864	0.00125	-7.65
0.280	1.73080	1.02891	-7.94	0.800	1.63047	0.02823	-7.71	3.500	1.61857	0.00125	-7.65
0.282	1.72878	0.99838	-7.94	0.820	1.62993	0.02617	-7.71	3.550	1.61851	0.00125	-7.65
0.284	1.72681	0.96914	-7.94	0.840	1.62942	0.02431	-7.71	3.600	1.61845	0.00125	-7.65
0.286	1.72490	0.94112	-7.94	0.860	1.62895	0.02262	-7.70	3.650	1.61839	0.00125	-7.65
0.288	1.72305	0.91425	-7.94	0.880	1.62852	0.02109	-7.70	3.700	1.61832	0.00125	-7.65
0.290	1.72124	0.88847	-7.94	0.900	1.62811	0.01970	-7.70	3.750	1.61826	0.00125	-7.65
0.292	1.71949	0.86372	-7.94	0.920	1.62773	0.01843	-7.70	3.800	1.61820	0.00126	-7.65
0.294	1.71779	0.83995	-7.94	0.940	1.62737	0.01727	-7.70	3.850	1.61814	0.00126	-7.65
0.296	1.71613	0.81710	-7.93	0.960	1.62704	0.01621	-7.70	3.900	1.61807	0.00126	-7.65
0.298	1.71452	0.79514	-7.93	0.980	1.62672	0.01524	-7.69	3.950	1.61801	0.00127	-7.65

TABLE 74. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsCl AT 293 K (continued)*

λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
4.000	1.617$\overline{95}$	0.001$\overline{27}$	-7.6$\overline{5}$	8.400	1.610$\overline{32}$	0.002$\overline{29}$	-7.5$\overline{7}$	17.600	1.576$\overline{90}$	0.005$\overline{08}$	-7.1$\overline{8}$
4.050	1.617$\overline{88}$	0.001$\overline{28}$	-7.6$\overline{5}$	8.500	1.610$\overline{09}$	0.002$\overline{31}$	-7.5$\overline{7}$	17.800	1.575$\overline{88}$	0.005$\overline{15}$	-7.1$\overline{7}$
4.100	1.617$\overline{82}$	0.001$\overline{29}$	-7.6$\overline{5}$	8.600	1.609$\overline{86}$	0.002$\overline{34}$	-7.5$\overline{7}$	18.000	1.574$\overline{84}$	0.005$\overline{22}$	-7.1$\overline{5}$
4.150	1.617$\overline{75}$	0.001$\overline{29}$	-7.6$\overline{5}$	8.700	1.609$\overline{63}$	0.002$\overline{37}$	-7.5$\overline{7}$	18.200	1.573$\overline{79}$	0.005$\overline{29}$	-7.1$\overline{4}$
4.200	1.617$\overline{69}$	0.001$\overline{30}$	-7.6$\overline{4}$	8.800	1.609$\overline{39}$	0.002$\overline{40}$	-7.5$\overline{7}$	18.400	1.572$\overline{72}$	0.005$\overline{36}$	-7.1$\overline{3}$
4.250	1.617$\overline{62}$	0.001$\overline{31}$	-7.6$\overline{4}$	8.900	1.609$\overline{15}$	0.002$\overline{42}$	-7.5$\overline{6}$	18.600	1.571$\overline{65}$	0.005$\overline{43}$	-7.1$\overline{1}$
4.300	1.617$\overline{56}$	0.001$\overline{31}$	-7.6$\overline{4}$	9.000	1.608$\overline{90}$	0.002$\overline{45}$	-7.5$\overline{6}$	18.800	1.570$\overline{55}$	0.005$\overline{50}$	-7.1$\overline{0}$
4.350	1.617$\overline{49}$	0.001$\overline{32}$	-7.6$\overline{4}$	9.100	1.608$\overline{66}$	0.002$\overline{48}$	-7.5$\overline{6}$	19.000	1.569$\overline{45}$	0.005$\overline{57}$	-7.0$\overline{8}$
4.400	1.617$\overline{43}$	0.001$\overline{33}$	-7.6$\overline{4}$	9.200	1.608$\overline{41}$	0.002$\overline{51}$	-7.5$\overline{6}$	19.200	1.568$\overline{32}$	0.005$\overline{64}$	-7.0$\overline{6}$
4.450	1.617$\overline{36}$	0.001$\overline{34}$	-7.6$\overline{4}$	9.300	1.608$\overline{16}$	0.002$\overline{53}$	-7.5$\overline{5}$	19.400	1.567$\overline{19}$	0.005$\overline{71}$	-7.0$\overline{5}$
4.500	1.617$\overline{29}$	0.001$\overline{34}$	-7.6$\overline{4}$	9.400	1.607$\overline{90}$	0.002$\overline{56}$	-7.5$\overline{5}$	19.600	1.566$\overline{04}$	0.005$\overline{79}$	-7.0$\overline{3}$
4.550	1.617$\overline{23}$	0.001$\overline{35}$	-7.6$\overline{4}$	9.500	1.607$\overline{64}$	0.002$\overline{59}$	-7.5$\overline{5}$	19.800	1.564$\overline{87}$	0.005$\overline{86}$	-7.0$\overline{1}$
4.600	1.617$\overline{16}$	0.001$\overline{36}$	-7.6$\overline{4}$	9.600	1.607$\overline{38}$	0.002$\overline{62}$	-7.5$\overline{4}$	20.000	1.563$\overline{69}$	0.005$\overline{93}$	-7.0$\overline{0}$
4.650	1.617$\overline{09}$	0.001$\overline{37}$	-7.6$\overline{4}$	9.700	1.607$\overline{12}$	0.002$\overline{65}$	-7.5$\overline{4}$	20.500	1.560$\overline{68}$	0.006$\overline{12}$	-6.9$\overline{5}$
4.700	1.617$\overline{02}$	0.001$\overline{38}$	-7.6$\overline{4}$	9.800	1.606$\overline{85}$	0.002$\overline{67}$	-7.5$\overline{4}$	21.000	1.557$\overline{58}$	0.006$\overline{31}$	-6.9$\overline{1}$
4.750	1.616$\overline{95}$	0.001$\overline{39}$	-7.6$\overline{4}$	9.900	1.606$\overline{59}$	0.002$\overline{70}$	-7.5$\overline{4}$	21.500	1.554$\overline{37}$	0.006$\overline{50}$	-6.8$\overline{6}$
4.800	1.616$\overline{88}$	0.001$\overline{40}$	-7.6$\overline{4}$	10.000	1.606$\overline{31}$	0.002$\overline{73}$	-7.5$\overline{3}$	22.000	1.551$\overline{08}$	0.006$\overline{69}$	-6.8$\overline{0}$
4.850	1.616$\overline{81}$	0.001$\overline{41}$	-7.6$\overline{4}$	10.200	1.605$\overline{76}$	0.002$\overline{79}$	-7.5$\overline{3}$	22.500	1.547$\overline{68}$	0.006$\overline{89}$	-6.7$\overline{5}$
4.900	1.616$\overline{74}$	0.001$\overline{42}$	-7.6$\overline{4}$	10.400	1.605$\overline{20}$	0.002$\overline{84}$	-7.5$\overline{2}$	23.000	1.544$\overline{18}$	0.007$\overline{10}$	-6.6$\overline{9}$
4.950	1.616$\overline{67}$	0.001$\overline{43}$	-7.6$\overline{4}$	10.600	1.604$\overline{63}$	0.002$\overline{90}$	-7.5$\overline{2}$	23.500	1.540$\overline{58}$	0.007$\overline{30}$	-6.6$\overline{3}$
5.000	1.616$\overline{60}$	0.001$\overline{44}$	-7.6$\overline{3}$	10.800	1.604$\overline{04}$	0.002$\overline{96}$	-7.5$\overline{1}$	24.000	1.536$\overline{88}$	0.007$\overline{51}$	-6.5$\overline{7}$
5.100	1.616$\overline{45}$	0.001$\overline{46}$	-7.6$\overline{3}$	11.000	1.603$\overline{44}$	0.003$\overline{02}$	-7.5$\overline{0}$	24.500	1.533$\overline{07}$	0.007$\overline{73}$	-6.5$\overline{0}$
5.200	1.616$\overline{31}$	0.001$\overline{48}$	-7.6$\overline{3}$	11.200	1.602$\overline{83}$	0.003$\overline{07}$	-7.5$\overline{0}$	25.000	1.529$\overline{15}$	0.007$\overline{95}$	-6.4$\overline{3}$
5.300	1.616$\overline{16}$	0.001$\overline{50}$	-7.6$\overline{3}$	11.400	1.602$\overline{21}$	0.003$\overline{13}$	-7.4$\overline{9}$	25.500	1.525$\overline{12}$	0.008$\overline{17}$	-6.3$\overline{6}$
5.400	1.616$\overline{01}$	0.001$\overline{52}$	-7.6$\overline{3}$	11.600	1.601$\overline{58}$	0.003$\overline{19}$	-7.4$\overline{8}$	26.000	1.520$\overline{98}$	0.008$\overline{40}$	-6.2$\overline{8}$
5.500	1.615$\overline{85}$	0.001$\overline{55}$	-7.6$\overline{3}$	11.800	1.600$\overline{94}$	0.003$\overline{25}$	-7.4$\overline{8}$	26.500	1.516$\overline{72}$	0.008$\overline{63}$	-6.2$\overline{0}$
5.600	1.615$\overline{70}$	0.001$\overline{57}$	-7.6$\overline{3}$	12.000	1.600$\overline{28}$	0.003$\overline{31}$	-7.4$\overline{7}$	27.000	1.512$\overline{35}$	0.008$\overline{87}$	-6.1$\overline{1}$
5.700	1.615$\overline{54}$	0.001$\overline{59}$	-7.6$\overline{3}$	12.200	1.599$\overline{61}$	0.003$\overline{37}$	-7.4$\overline{6}$	27.500	1.507$\overline{85}$	0.009$\overline{12}$	-6.0$\overline{2}$
5.800	1.615$\overline{38}$	0.001$\overline{62}$	-7.6$\overline{2}$	12.400	1.598$\overline{93}$	0.003$\overline{43}$	-7.4$\overline{5}$	28.000	1.503$\overline{23}$	0.009$\overline{36}$	-5.9$\overline{3}$
5.900	1.615$\overline{21}$	0.001$\overline{64}$	-7.6$\overline{2}$	12.600	1.598$\overline{24}$	0.003$\overline{49}$	-7.4$\overline{5}$	28.500	1.498$\overline{49}$	0.009$\overline{62}$	-5.8$\overline{3}$
6.000	1.615$\overline{05}$	0.001$\overline{66}$	-7.6$\overline{2}$	12.800	1.597$\overline{54}$	0.003$\overline{55}$	-7.4$\overline{4}$	29.000	1.493$\overline{61}$	0.009$\overline{88}$	-5.7$\overline{2}$
6.100	1.614$\overline{88}$	0.001$\overline{69}$	-7.6$\overline{2}$	13.000	1.596$\overline{82}$	0.003$\overline{61}$	-7.4$\overline{3}$	29.500	1.488$\overline{60}$	0.010$\overline{15}$	-5.6$\overline{1}$
6.200	1.614$\overline{71}$	0.001$\overline{71}$	-7.6$\overline{2}$	13.200	1.596$\overline{09}$	0.003$\overline{67}$	-7.4$\overline{2}$	30.000	1.483$\overline{46}$	0.010$\overline{43}$	-5.5$\overline{0}$
6.300	1.614$\overline{54}$	0.001$\overline{74}$	-7.6$\overline{2}$	13.400	1.595$\overline{35}$	0.003$\overline{73}$	-7.4$\overline{1}$	30.500	1.478$\overline{18}$	0.010$\overline{71}$	-5.3$\overline{8}$
6.400	1.614$\overline{36}$	0.001$\overline{76}$	-7.6$\overline{1}$	13.600	1.594$\overline{60}$	0.003$\overline{79}$	-7.4$\overline{0}$	31.000	1.472$\overline{75}$	0.011$\overline{00}$	-5.2$\overline{5}$
6.500	1.614$\overline{19}$	0.001$\overline{79}$	-7.6$\overline{1}$	13.800	1.593$\overline{84}$	0.003$\overline{85}$	-7.4$\overline{0}$	31.500	1.467$\overline{18}$	0.011$\overline{29}$	-5.1$\overline{2}$
6.600	1.614$\overline{01}$	0.001$\overline{81}$	-7.6$\overline{1}$	14.000	1.593$\overline{06}$	0.003$\overline{91}$	-7.3$\overline{9}$	32.000	1.461$\overline{46}$	0.011$\overline{60}$	-4.9$\overline{7}$
6.700	1.613$\overline{82}$	0.001$\overline{84}$	-7.6$\overline{1}$	14.200	1.592$\overline{27}$	0.003$\overline{98}$	-7.3$\overline{8}$	32.500	1.455$\overline{58}$	0.011$\overline{91}$	-4.8$\overline{3}$
6.800	1.613$\overline{64}$	0.001$\overline{86}$	-7.6$\overline{1}$	14.400	1.591$\overline{47}$	0.004$\overline{04}$	-7.3$\overline{7}$	33.000	1.449$\overline{54}$	0.012$\overline{23}$	-4.6$\overline{7}$
6.900	1.613$\overline{45}$	0.001$\overline{89}$	-7.6$\overline{1}$	14.600	1.590$\overline{66}$	0.004$\overline{10}$	-7.3$\overline{6}$	33.500	1.443$\overline{34}$	0.012$\overline{56}$	-4.5$\overline{1}$
7.000	1.613$\overline{26}$	0.001$\overline{91}$	-7.6$\overline{0}$	14.800	1.589$\overline{83}$	0.004$\overline{16}$	-7.3$\overline{5}$	34.000	1.436$\overline{98}$	0.012$\overline{91}$	-4.3$\overline{3}$
7.100	1.613$\overline{07}$	0.001$\overline{94}$	-7.6$\overline{0}$	15.000	1.588$\overline{99}$	0.004$\overline{23}$	-7.3$\overline{4}$	34.500	1.430$\overline{44}$	0.013$\overline{26}$	-4.1$\overline{5}$
7.200	1.612$\overline{87}$	0.001$\overline{97}$	-7.6$\overline{0}$	15.200	1.588$\overline{14}$	0.004$\overline{29}$	-7.3$\overline{3}$	35.000	1.423$\overline{72}$	0.013$\overline{62}$	-3.9$\overline{6}$
7.300	1.612$\overline{68}$	0.001$\overline{99}$	-7.6$\overline{0}$	15.400	1.587$\overline{27}$	0.004$\overline{36}$	-7.3$\overline{2}$	35.500	1.416$\overline{82}$	0.013$\overline{99}$	-3.7$\overline{6}$
7.400	1.612$\overline{48}$	0.002$\overline{02}$	-7.6$\overline{0}$	15.600	1.586$\overline{40}$	0.004$\overline{42}$	-7.3$\overline{1}$	36.000	1.409$\overline{73}$	0.014$\overline{38}$	-3.5$\overline{5}$
7.500	1.612$\overline{27}$	0.002$\overline{04}$	-7.5$\overline{9}$	15.800	1.585$\overline{51}$	0.004$\overline{48}$	-7.2$\overline{9}$	36.500	1.402$\overline{44}$	0.014$\overline{77}$	-3.3$\overline{3}$
7.600	1.612$\overline{07}$	0.002$\overline{07}$	-7.5$\overline{9}$	16.000	1.584$\overline{60}$	0.004$\overline{55}$	-7.2$\overline{8}$	37.000	1.394$\overline{95}$	0.015$\overline{18}$	-3.0$\overline{9}$
7.700	1.611$\overline{86}$	0.002$\overline{10}$	-7.5$\overline{9}$	16.200	1.583$\overline{69}$	0.004$\overline{62}$	-7.2$\overline{7}$	37.500	1.387$\overline{26}$	0.015$\overline{60}$	-2.8$\overline{4}$
7.800	1.611$\overline{65}$	0.002$\overline{12}$	-7.5$\overline{9}$	16.400	1.582$\overline{76}$	0.004$\overline{68}$	-7.2$\overline{6}$	38.000	1.379$\overline{35}$	0.016$\overline{04}$	-2.5$\overline{8}$
7.900	1.611$\overline{43}$	0.002$\overline{15}$	-7.5$\overline{9}$	16.600	1.581$\overline{81}$	0.004$\overline{75}$	-7.2$\overline{5}$	38.500	1.371$\overline{21}$	0.016$\overline{50}$	-2.3$\overline{1}$
8.000	1.611$\overline{22}$	0.002$\overline{18}$	-7.5$\overline{8}$	16.800	1.580$\overline{86}$	0.004$\overline{81}$	-7.2$\overline{3}$	39.000	1.362$\overline{85}$	0.016$\overline{96}$	-2.0$\overline{2}$
8.100	1.611$\overline{00}$	0.002$\overline{20}$	-7.5$\overline{8}$	17.000	1.579$\overline{89}$	0.004$\overline{88}$	-7.2$\overline{2}$	39.500	1.354$\overline{24}$	0.017$\overline{45}$	-1.7$\overline{1}$
8.200	1.610$\overline{78}$	0.002$\overline{23}$	-7.5$\overline{8}$	17.200	1.578$\overline{91}$	0.004$\overline{95}$	-7.2$\overline{1}$	40.000	1.345$\overline{39}$	0.017$\overline{95}$	-1.3$\overline{9}$
8.300	1.610$\overline{55}$	0.002$\overline{26}$	-7.5$\overline{8}$	17.400	1.577$\overline{91}$	0.005$\overline{02}$	-7.2$\overline{0}$				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.18. The number of digits with an overstrike are not relevant to accuracy of the data.

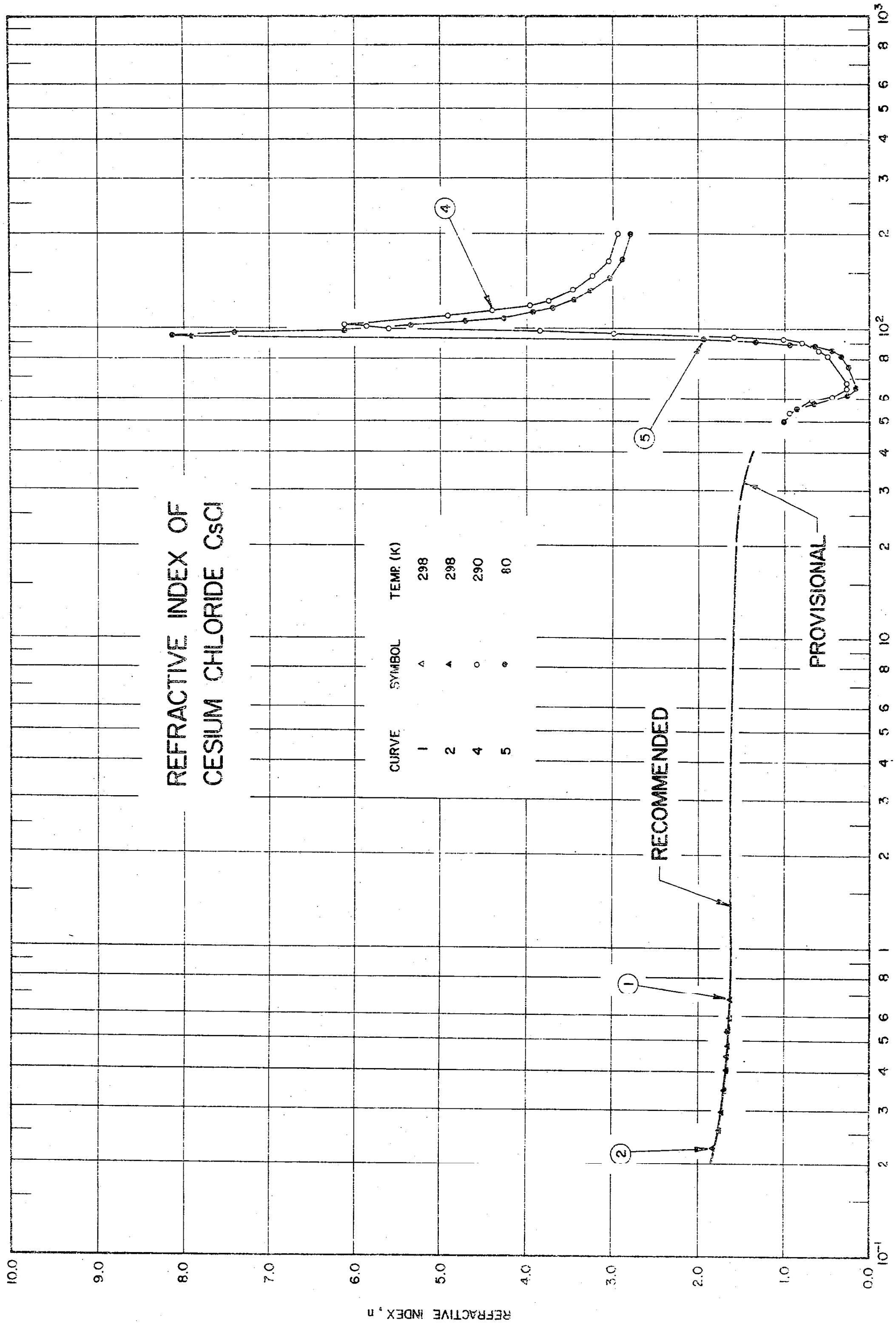

FIGURE 59. Refractive Index of CsCl

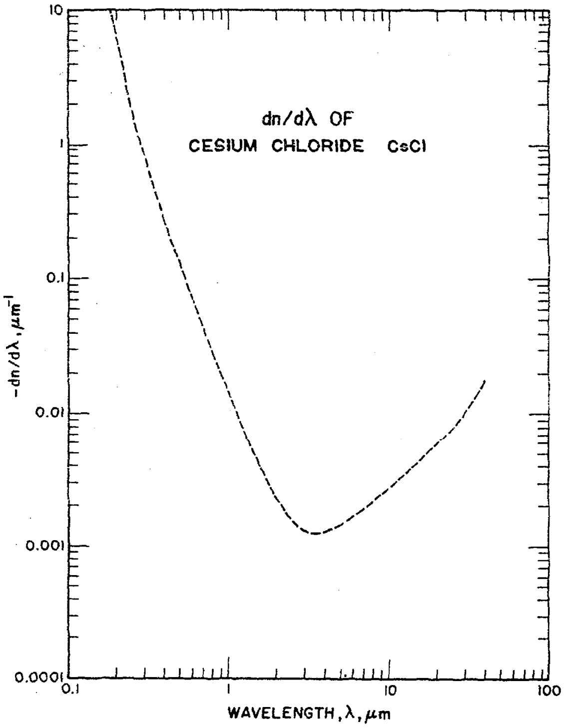

FIGURE 60. $dn/d\lambda$ of CsCl

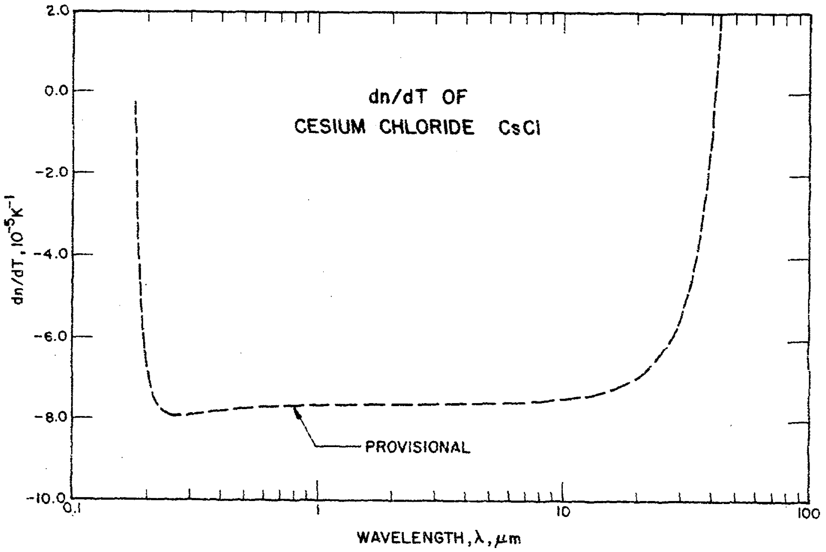

FIGURE 61. dn/dT of CsCl

TABLE 75. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF CsCl

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	85	Wulff, P. and Schaller, D.	1934	M	0.480-0.671	298	Crystal; specimen was suspended in a $C_{10}H_7Br$ and C_6H_5Cl mixture during refractive index determination; digitized data were presented with uncertainties of 0.0001.
2	94	Wulff, P. and Anderson, T. F.	1935	D	0.2265-0.5379	298	Crystal; prismatic specimens with apex angles of about 51°22'; averaged results were presented in digitized values.
3	87, 88	Wulff, P. and Heigl, A.	1931, 1928	M	0.589	298	Crystal; grown by slow cooling of the melt in a stream of N_2-HCl mixture; specimen 1.5 mm thick was immersed in a mono bromonaphthalene-cedar oil mixture; digitized datum was presented with uncertainty 0.00003.
4	26	Vergnat, P., Claudel, J., Hamdi, A., Strimer, P., and Vermillard, F.	1969	R	53-200	290	Powder; pure; pressed into a 15° wedge shape specimen to avoid interference effect during reflectance measurements; refractive indices were deduced by Lorentz analysis to the reflection spectrum; data extracted from a figure.
5	26	Vergnat, P., et al.	1969	R	50-200	80, 25	Similar to above; curves for 80 K and 25 K were plotted too close to be distinguished.
6	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; six prismatic specimens with apex angles of about 35.3°; averaged probable values of measurements were presented; temperature was not given, room temperature assumed.

TABLE 76. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF CsCl

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 298. K	
0.48001	1.6510
0.54610	1.6434
0.58962	1.6397
0.67078	1.6347
CURVE 2 T = 298. K	
0.2265	1.8226*
0.2288	1.8161
0.2312	1.8097
0.2573	1.7587
0.2749	1.7356*
0.2981	1.7139
0.3261	1.6957
0.3404	1.6880*
0.3467	1.6851*
0.3612	1.6791
0.4000	1.6668*
0.4416	1.6573
0.4678	1.6528*
0.4800	1.6510
0.5086	1.6472*
0.5339	1.6444*
0.5379	1.6440
CURVE 3 T = 298. K	
0.589	1.63966
CURVE 4 T = 290. K	
53.39	0.95
58.07	0.69
60.83	0.44
64.31	0.28
67.02	0.28
81.50	0.50
85.84	0.60
90.09	0.80
92.34	1.02
94.79	1.60
97.94	3.00
98.91	3.87
CURVE 4 (cont.) T = 290. K	
100.70	5.61
101.73	5.89
103.31	6.11
110.74	4.91
114.68	4.41
119.62	3.99
123.61	3.75
132.63	3.49
146.20	3.23
162.34	3.06
200.00	2.92
CURVE 5 T = 80., 25. K	
50.05	1.02
54.98	0.86
57.27	0.66
61.35	0.26
64.10	0.15
75.93	0.25
81.77	0.32
85.91	0.44
88.26	0.63
89.93	0.96
91.24	1.36
92.42	1.97
95.33	7.91
95.97	8.17
97.47	7.41
99.70	6.12
102.35	5.35
105.37	4.71
108.46	4.28
112.61	3.93
117.51	3.70
123.15	3.48
131.75	3.27
146.84	3.04
166.67	2.89
200.00	2.79
CURVE 6 T = 298. K	
0.486	1.6523
CURVE 6 (cont.) T = 298. K	
0.589	1.6418
0.656	1.6377

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* Not shown in figure.

TABLE 77. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR CsCl

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Vergnat, P., Claudel, J., Hadni, A., Strimer, P., and Vermillard, F. [26] 1969	53-200 μm 290 K	$n^2-k^2 = \epsilon_{uv} + \sum_i 4\pi\rho_i \frac{\nu_i^2(\nu_i^2-\nu^2)}{(\nu_i^2-\nu^2)^2+\delta_i^2\nu_i^2\nu^2}$, $2nk = \sum_i 4\pi\rho_i \frac{\nu_i^3\nu\delta_i}{(\nu_i^2-\nu^2)^2+\delta_i^2\nu_i^2\nu^2}$ *
Present work 1975	0.18-40.0 μm 293 K	$n^2 = 1.33013 + \frac{0.98369\lambda^2}{\lambda^2-(0.119)^2} + \frac{0.00009\lambda^2}{\lambda^2-(0.137)^2} + \frac{0.00018\lambda^2}{\lambda^2-(0.145)^2} + \frac{0.30914\lambda^2}{\lambda^2-(0.162)^2} + \frac{4.320\lambda^2}{\lambda^2-(100.50)^2}$

*$i = 1,2$; $\nu_1 = 99$ cm^{-1}; $\nu_2 = 125$ cm^{-1}; $\delta_1 = 0.075$, $\delta_2 = 0.25$; $\rho_1 = 0.32$, $\rho_2 = 0.020$; $\epsilon_{uv} = 2.7$, $\epsilon_s = 6.98$.

3.19. Cesium Bromide, CsBr

Early measurements of the refractive index of CsBr were made by Sprockhoff [95] in 1904. He used the minimum deviation method to determine the refractive indices for three visible spectral lines, 0.486, 0.589, and 0.656 μm. Although his values were presented to 4 decimal places, the temperatures at which the data were obtained were not specified; the significance of the data is thus uncertain.

In the following 50 years, no other measurement of the refractive index of CsBr was reported. The main reasons for this long blank period were the difficulties in crystal growing. Large crystals suitable for optical components were not available. It was not until 1953 that large crystals of CsBr of reasonably good optical quality were successfully grown, providing a new material for infrared studies in the range beyond the 25μm limit of KBr, out to about 40 μm. A mixed crystal of thallium bromide-iodide, known as KRS–5, was previously the only material available for use in this region.

The dispersion of CsBr compares favorably with that of KRS–5 beyond 20 microns, and when the effects of inhomogeneity and reflection losses are considered the resolving power of a CsBr prism is much better.

The refractive index in the transparent region of CsBr was extensively and precisely measured by Rodney and Spindler [107, 108] in 1952 and 1953. The minimum deviation method was used for a wide wavelength range from 0.365 to 39.22 μm. Rodney and Spindler [107] worked out a dispersion equation of CsBr as shown in table 82. They pointed out that five of the seven constants in that equation were determined by means of a simultaneous solution. The constants appearing in the denominators of two terms represent the infrared and ultraviolet absorption bands. The ultraviolet term was determined by taking a weighted mean of several measured bands. The infrared term is an estimate based on information on CsCl, and is probably too low.

Refractive indices of CsBr in the infrared absorption region, 30–275 μm, were derived by Geick [109] in 1961, based on the analysis of transmission and nearly-normal reflection spectra. He concluded that an absorption peak was located at 136.7 μm. The infrared region up to 200 μm was reinvestigated by Vergnat, et al. [26] in 1969. The Lorentz damped-oscillator model was used to analyze the normal reflection spectra. Two absorption peaks were found at 97.09 and 133.33 μm, with the one of longer wavelength predominating. These results indicated that the wavelength in the infrared term used by Rodney and Spindler was low.

In the millimeter-wavelength region, the refractive index at 2000 μm was determined by Dianov and Irisova [47] in 1967. The result, $n^2 = 6.55$ at room temperature, agrees closely with the value of static dielectric constant given by Vergnat, et al. [26]. This completes the record of activities in determining the refractive index of CsBr.

In view of the available information discussed above, we used the two data sets by Rodney and Spindler [107, 108] as the basis for generation of recommended values. Since the data sets were reported at temperatures of 300 and 297 K respectively, temperature corrections were needed to reduce the selected data to 293 K. However, there was little data on which to base such corrections. Rodney and Spindler [107] reported an averaged dn/dT value of -7.9×10^{-5} K^{-1} for the wavelength range 0.36–39 μm, but no detailed variation of dn/dT was given.

In the present research this obstacle was removed by our empirical methods, as discussed in subsection 2.2. With the aid of the predicted parameters in table 5, we constructed a formula for dn/dT values for CsBr over the entire transparent region:

$$2n\frac{dn}{dT} = -14.22\,(n^2-1) - 4.75 + \frac{2.172\,\lambda^4}{(\lambda^2-0.03497)^2} + \frac{310.40\,\lambda^4}{(\lambda^2-18509.60)^2}, \tag{59}$$

where dn/dT is in units of 10^{-5} K^{-1} and λ in μm.

The results of this process and encouraging. In figure 64, it is evident that our averaged value of dn/dT in the transparent region is about -8.2×10^{-5} K^{-1}, while the value of Rodney and Spindler is -7.9×10^{-5} K^{-1}. In the better set of the selected data, Rodney and Spindler [107] obtained refractive indices at temperatures ranging from 297 to 304 K, and then reduced to 300 K with accuracies within ± 1 or 2×10^{-5}. If the errors are totally due to the uncertainties of dn/dT, which is very likely, the uncertainty in dn/dT is about 0.3×10^{-5} K^{-1} or higher. The accuracy of the other set is perhaps less than 0.0001. Therefore, it can be safely said that the predictions of eq (59) are reasonable. The selected data were reduced to 293 K using this equation.

From the information in tables 3 and 82, input parameters for a least-squares fitting were obtained. The calculation resulted in a dispersion equation for CsBr at 293 K in the transparent region, 0.21–55.0 μm.

$$n^2 = 1.14600 + \frac{1.26628\,\lambda^2}{\lambda^2-(0.120)^2} + \frac{0.01137\,\lambda^2}{\lambda^2-(0.146)^2} + \frac{0.00975\,\lambda^2}{\lambda^2-(0.160)^2} + \frac{0.00672\,\lambda^2}{\lambda^2-(0.173)^2} + \frac{0.34557\lambda^2}{\lambda^2-(0.187)^2} + \frac{3.76339\lambda^2}{\lambda^2-(136.05)^2}, \tag{60}$$

where λ is in units of μm.

Equations (59) and (60) are used to generate the recommended values of refractive index, and its wavelength and temperature derivatives. The property values are given to more decimal places than needed to assure tabular smoothness. In using values from the table, readers should follow the criteria given below.

For refractive index:

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
0.21– 0.25	2	0.01
0.25– 0.35	4	0.0003
0.35–30.00	4	0.0001
30.00–40.00	4	0.0005
40.00–55.00	3	0.006
For *dn/dT*:		
0.21– 0.22	0	⩾ 1
0.22–40.00	1	0.4
40.00–55.00	1	0.9

TABLE 78. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsBr AT 293 K*

λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}	λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}	λ µm	n	-dn/dλ µm^{-1}	dn/dT 10^{-5} K^{-1}
0.210	2.18206	16.14981	-1.73	0.375	1.74657	0.48942	-8.61	1.750	1.67191	0.00373	-8.39
0.212	2.15191	14.08686	-2.85	0.380	1.74419	0.46565	-8.60	1.800	1.67173	0.00344	-8.39
0.214	2.12545	12.42466	-3.74	0.385	1.74192	0.44348	-8.60	1.850	1.67156	0.00319	-8.39
0.216	2.10201	11.06295	-4.46	0.390	1.73975	0.42277	-8.60	1.900	1.67141	0.00297	-8.39
0.218	2.08105	9.93127	-5.04	0.395	1.73769	0.40339	-8.59	1.950	1.67127	0.00277	-8.39
0.220	2.06216	8.97890	-5.53	0.400	1.73571	0.38524	-8.59	2.000	1.67113	0.00259	-8.39
0.222	2.04504	8.16854	-5.93	0.410	1.73203	0.35222	-8.58	2.050	1.67101	0.00243	-8.39
0.224	2.02941	7.47224	-6.27	0.420	1.72866	0.32304	-8.57	2.100	1.67089	0.00228	-8.39
0.226	2.01509	6.86870	-6.56	0.430	1.72556	0.29712	-8.57	2.150	1.67078	0.00215	-8.39
0.228	2.00189	6.34147	-6.80	0.440	1.72271	0.27400	-8.56	2.200	1.67067	0.00203	-8.38
0.230	1.98968	5.87763	-7.02	0.450	1.72007	0.25331	-8.55	2.250	1.67058	0.00192	-8.38
0.232	1.97834	5.46696	-7.20	0.460	1.71763	0.23472	-8.55	2.300	1.67048	0.00182	-8.38
0.234	1.96778	5.10124	-7.36	0.470	1.71537	0.21797	-8.54	2.350	1.67039	0.00173	-8.38
0.236	1.95791	4.77384	-7.50	0.480	1.71327	0.20282	-8.54	2.400	1.67031	0.00165	-8.38
0.238	1.94866	4.47932	-7.62	0.490	1.71131	0.18909	-8.53	2.450	1.67023	0.00157	-8.38
0.240	1.93997	4.21319	-7.73	0.500	1.70948	0.17660	-8.53	2.500	1.67015	0.00150	-8.38
0.242	1.93179	3.97173	-7.82	0.510	1.70777	0.16522	-8.52	2.550	1.67008	0.00144	-8.38
0.244	1.92407	3.75184	-7.90	0.520	1.70617	0.15483	-8.52	2.600	1.67001	0.00138	-8.38
0.246	1.91677	3.55088	-7.98	0.530	1.70467	0.14531	-8.51	2.650	1.66994	0.00133	-8.38
0.248	1.90986	3.36662	-8.04	0.540	1.70326	0.13657	-8.51	2.700	1.66987	0.00128	-8.38
0.250	1.90330	3.19717	-8.10	0.550	1.70194	0.12854	-8.50	2.750	1.66981	0.00123	-8.38
0.252	1.89706	3.04091	-8.16	0.560	1.70069	0.12114	-8.50	2.800	1.66975	0.00119	-8.38
0.254	1.89113	2.89642	-8.20	0.570	1.69952	0.11431	-8.50	2.850	1.66969	0.00115	-8.38
0.256	1.88547	2.76250	-8.25	0.580	1.69840	0.10799	-8.49	2.900	1.66964	0.00112	-8.38
0.258	1.88007	2.63808	-8.28	0.590	1.69735	0.10214	-8.49	2.950	1.66958	0.00109	-8.38
0.260	1.87491	2.52225	-8.32	0.600	1.69636	0.09672	-8.48	3.000	1.66953	0.00106	-8.38
0.262	1.86998	2.41418	-8.35	0.620	1.69453	0.08699	-8.48	3.050	1.66948	0.00103	-8.38
0.264	1.86525	2.31317	-8.38	0.640	1.69287	0.07854	-8.47	3.100	1.66942	0.00100	-8.38
0.266	1.86072	2.21859	-8.40	0.660	1.69138	0.07117	-8.47	3.150	1.66937	0.00098	-8.38
0.268	1.85637	2.12987	-8.43	0.680	1.69002	0.06471	-8.46	3.200	1.66933	0.00096	-8.38
0.270	1.85219	2.04652	-8.45	0.700	1.68878	0.05902	-8.46	3.250	1.66928	0.00094	-8.38
0.272	1.84818	1.96810	-8.47	0.720	1.68765	0.05399	-8.45	3.300	1.66923	0.00092	-8.38
0.274	1.84432	1.89420	-8.48	0.740	1.68662	0.04952	-8.45	3.350	1.66919	0.00090	-8.38
0.276	1.84060	1.82448	-8.50	0.760	1.68567	0.04554	-8.45	3.400	1.66914	0.00089	-8.38
0.278	1.83702	1.75860	-8.51	0.780	1.68480	0.04198	-8.44	3.450	1.66910	0.00088	-8.38
0.280	1.83356	1.69628	-8.52	0.800	1.68399	0.03878	-8.44	3.500	1.66905	0.00086	-8.38
0.282	1.83023	1.63726	-8.54	0.820	1.68324	0.03591	-8.44	3.550	1.66901	0.00085	-8.38
0.284	1.82701	1.58130	-8.55	0.840	1.68255	0.03332	-8.43	3.600	1.66897	0.00084	-8.38
0.286	1.82390	1.52819	-8.56	0.860	1.68191	0.03097	-8.43	3.650	1.66893	0.00083	-8.37
0.288	1.82090	1.47772	-8.56	0.880	1.68131	0.02884	-8.43	3.700	1.66889	0.00082	-8.37
0.290	1.81799	1.42972	-8.57	0.900	1.68075	0.02691	-8.43	3.750	1.66885	0.00081	-8.37
0.292	1.81518	1.38402	-8.58	0.920	1.68023	0.02515	-8.43	3.800	1.66881	0.00080	-8.37
0.294	1.81245	1.34048	-8.58	0.940	1.67975	0.02354	-8.42	3.850	1.66877	0.00080	-8.37
0.296	1.80982	1.29896	-8.59	0.960	1.67929	0.02206	-8.42	3.900	1.66873	0.00079	-8.37
0.298	1.80726	1.25933	-8.59	0.980	1.67886	0.02071	-8.42	3.950	1.66869	0.00078	-8.37
0.300	1.80478	1.22147	-8.60	1.000	1.67846	0.01947	-8.42	4.000	1.66865	0.00078	-8.37
0.305	1.79889	1.13390	-8.61	1.050	1.67756	0.01678	-8.41	4.050	1.66861	0.00077	-8.37
0.310	1.79342	1.05531	-8.61	1.100	1.67677	0.01457	-8.41	4.100	1.66857	0.00077	-8.37
0.315	1.78833	0.98448	-8.62	1.150	1.67609	0.01274	-8.41	4.150	1.66853	0.00077	-8.37
0.320	1.78357	0.92041	-8.62	1.200	1.67550	0.01120	-8.41	4.200	1.66849	0.00076	-8.37
0.325	1.77911	0.86225	-8.62	1.250	1.67497	0.00991	-8.40	4.250	1.66845	0.00076	-8.37
0.330	1.77494	0.80928	-8.62	1.300	1.67450	0.00882	-8.40	4.300	1.66842	0.00076	-8.37
0.335	1.77101	0.76091	-8.62	1.350	1.67408	0.00788	-8.40	4.350	1.66838	0.00076	-8.37
0.340	1.76732	0.71660	-8.62	1.400	1.67371	0.00708	-8.40	4.400	1.66834	0.00076	-8.37
0.345	1.76384	0.67591	-8.62	1.450	1.67337	0.00639	-8.40	4.450	1.66830	0.00075	-8.37
0.350	1.76056	0.63847	-8.62	1.500	1.67307	0.00579	-8.40	4.500	1.66827	0.00075	-8.37
0.355	1.75745	0.60392	-8.62	1.550	1.67279	0.00526	-8.39	4.550	1.66823	0.00075	-8.37
0.360	1.75451	0.57198	-8.61	1.600	1.67254	0.00480	-8.39	4.600	1.66819	0.00075	-8.37
0.365	1.75173	0.54240	-8.61	1.650	1.67231	0.00440	-8.39	4.650	1.66815	0.00075	-8.37
0.370	1.74908	0.51494	-8.61	1.700	1.67210	0.00404	-8.39	4.700	1.66811	0.00075	-8.37

TABLE 78. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsBr AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
4.750	1.66808	0.00075	-8.37	10.800	1.66196	0.00135	-8.31	26.500	1.62399	0.00359	-7.81
4.800	1.66804	0.00075	-8.37	11.000	1.66168	0.00138	-8.31	27.000	1.62217	0.00367	-7.78
4.850	1.66800	0.00076	-8.37	11.200	1.66141	0.00140	-8.30	27.500	1.62032	0.00375	-7.75
4.900	1.66796	0.00076	-8.37	11.400	1.66112	0.00143	-8.30	28.000	1.61842	0.00384	-7.72
4.950	1.66793	0.00076	-8.37	11.600	1.66083	0.00145	-8.30	28.500	1.61648	0.00392	-7.69
5.000	1.66789	0.00076	-8.37	11.800	1.66054	0.00148	-8.30	29.000	1.61450	0.00401	-7.66
5.100	1.66781	0.00076	-8.37	12.000	1.66024	0.00150	-8.29	29.500	1.61247	0.00410	-7.62
5.200	1.66773	0.00077	-8.37	12.200	1.65994	0.00153	-8.29	30.000	1.61040	0.00419	-7.58
5.300	1.66766	0.00077	-8.36	12.400	1.65963	0.00155	-8.29	30.500	1.60829	0.00428	-7.55
5.400	1.66758	0.00078	-8.36	12.600	1.65932	0.00158	-8.28	31.000	1.60613	0.00437	-7.51
5.500	1.66750	0.00078	-8.36	12.800	1.65900	0.00161	-8.28	31.500	1.60392	0.00446	-7.46
5.600	1.66742	0.00079	-8.36	13.000	1.65868	0.00163	-8.28	32.000	1.60167	0.00455	-7.42
5.700	1.66734	0.00080	-8.36	13.200	1.65835	0.00166	-8.27	32.500	1.59937	0.00465	-7.38
5.800	1.66726	0.00081	-8.36	13.400	1.65801	0.00168	-8.27	33.000	1.59702	0.00474	-7.33
5.900	1.66718	0.00081	-8.36	13.600	1.65767	0.00171	-8.26	33.500	1.59462	0.00484	-7.28
6.000	1.66710	0.00082	-8.36	13.800	1.65733	0.00174	-8.26	34.000	1.59218	0.00494	-7.23
6.100	1.66702	0.00083	-8.36	14.000	1.65698	0.00176	-8.26	34.500	1.58968	0.00504	-7.18
6.200	1.66694	0.00084	-8.36	14.200	1.65662	0.00179	-8.25	35.000	1.58714	0.00514	-7.13
6.300	1.66685	0.00085	-8.36	14.400	1.65626	0.00181	-8.25	35.500	1.58454	0.00525	-7.07
6.400	1.66677	0.00086	-8.36	14.600	1.65590	0.00184	-8.25	36.000	1.58189	0.00535	-7.01
6.500	1.66668	0.00086	-8.36	14.800	1.65553	0.00187	-8.24	36.500	1.57919	0.00546	-6.95
6.600	1.66659	0.00087	-8.36	15.000	1.65515	0.00189	-8.24	37.000	1.57643	0.00557	-6.89
6.700	1.66651	0.00088	-8.35	15.200	1.65477	0.00192	-8.23	37.500	1.57362	0.00568	-6.82
6.800	1.66642	0.00089	-8.35	15.400	1.65438	0.00195	-8.23	38.000	1.57076	0.00579	-6.75
6.900	1.66633	0.00090	-8.35	15.600	1.65399	0.00197	-8.22	38.500	1.56784	0.00590	-6.68
7.000	1.66624	0.00091	-8.35	15.800	1.65359	0.00200	-8.22	39.000	1.56486	0.00602	-6.61
7.100	1.66614	0.00092	-8.35	16.000	1.65319	0.00203	-8.21	39.500	1.56182	0.00613	-6.54
7.200	1.66605	0.00093	-8.35	16.200	1.65278	0.00206	-8.21	40.000	1.55872	0.00625	-6.46
7.300	1.66596	0.00094	-8.35	16.400	1.65237	0.00208	-8.20	40.500	1.55557	0.00637	-6.37
7.400	1.66586	0.00095	-8.35	16.600	1.65195	0.00211	-8.20	41.000	1.55235	0.00650	-6.29
7.500	1.66577	0.00097	-8.35	16.800	1.65152	0.00214	-8.20	41.500	1.54907	0.00662	-6.20
7.600	1.66567	0.00098	-8.35	17.000	1.65109	0.00216	-8.19	42.000	1.54573	0.00675	-6.11
7.700	1.66557	0.00099	-8.35	17.200	1.65066	0.00219	-8.18	42.500	1.54232	0.00688	-6.01
7.800	1.66547	0.00100	-8.34	17.400	1.65022	0.00222	-8.18	43.000	1.53885	0.00701	-5.92
7.900	1.66537	0.00101	-8.34	17.600	1.64977	0.00225	-8.17	43.500	1.53531	0.00715	-5.81
8.000	1.66527	0.00102	-8.34	17.800	1.64932	0.00227	-8.17	44.000	1.53170	0.00729	-5.71
8.100	1.66517	0.00103	-8.34	18.000	1.64886	0.00230	-8.16	44.500	1.52802	0.00743	-5.60
8.200	1.66506	0.00104	-8.34	18.200	1.64840	0.00233	-8.16	45.000	1.52427	0.00757	-5.48
8.300	1.66496	0.00105	-8.34	18.400	1.64793	0.00236	-8.15	45.500	1.52045	0.00771	-5.36
8.400	1.66485	0.00107	-8.34	18.600	1.64745	0.00239	-8.15	46.000	1.51656	0.00786	-5.24
8.500	1.66475	0.00108	-8.34	18.800	1.64697	0.00241	-8.14	46.500	1.51259	0.00801	-5.11
8.600	1.66464	0.00109	-8.34	19.000	1.64649	0.00244	-8.13	47.000	1.50855	0.00817	-4.98
8.700	1.66453	0.00110	-8.34	19.200	1.64600	0.00247	-8.13	47.500	1.50442	0.00833	-4.84
8.800	1.66442	0.00111	-8.33	19.400	1.64550	0.00250	-8.12	48.000	1.50022	0.00849	-4.70
8.900	1.66431	0.00112	-8.33	19.600	1.64500	0.00253	-8.11	48.500	1.49594	0.00865	-4.55
9.000	1.66419	0.00113	-8.33	19.800	1.64449	0.00256	-8.11	49.000	1.49157	0.00882	-4.39
9.100	1.66408	0.00115	-8.33	20.000	1.64397	0.00259	-8.10	49.500	1.48712	0.00899	-4.23
9.200	1.66396	0.00116	-8.33	20.500	1.64266	0.00266	-8.08	50.000	1.48258	0.00917	-4.06
9.300	1.66385	0.00117	-8.33	21.000	1.64132	0.00273	-8.07	50.500	1.47795	0.00935	-3.89
9.400	1.66373	0.00118	-8.33	21.500	1.63993	0.00281	-8.05	51.000	1.47323	0.00953	-3.71
9.500	1.66361	0.00119	-8.33	22.000	1.63851	0.00288	-8.03	51.500	1.46842	0.00972	-3.52
9.600	1.66349	0.00121	-8.33	22.500	1.63705	0.00296	-8.01	52.000	1.46351	0.00991	-3.32
9.700	1.66337	0.00122	-8.32	23.000	1.63555	0.00303	-7.99	52.500	1.45851	0.01010	-3.12
9.800	1.66325	0.00123	-8.32	23.500	1.63402	0.00311	-7.97	53.000	1.45341	0.01030	-2.91
9.900	1.66312	0.00124	-8.32	24.000	1.63245	0.00319	-7.94	53.500	1.44821	0.01051	-2.69
10.000	1.66300	0.00125	-8.32	24.500	1.63083	0.00326	-7.92	54.000	1.44290	0.01072	-2.46
10.200	1.66275	0.00128	-8.32	25.000	1.62918	0.00334	-7.89	54.500	1.43748	0.01094	-2.23
10.400	1.66249	0.00130	-8.32	25.500	1.62749	0.00342	-7.87	55.000	1.43193	0.01116	-1.98
10.600	1.66222	0.00133	-8.31	26.000	1.62576	0.00350	-7.84				

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.19. The number of digits with an overstrike are not relevant to accuracy of the data.

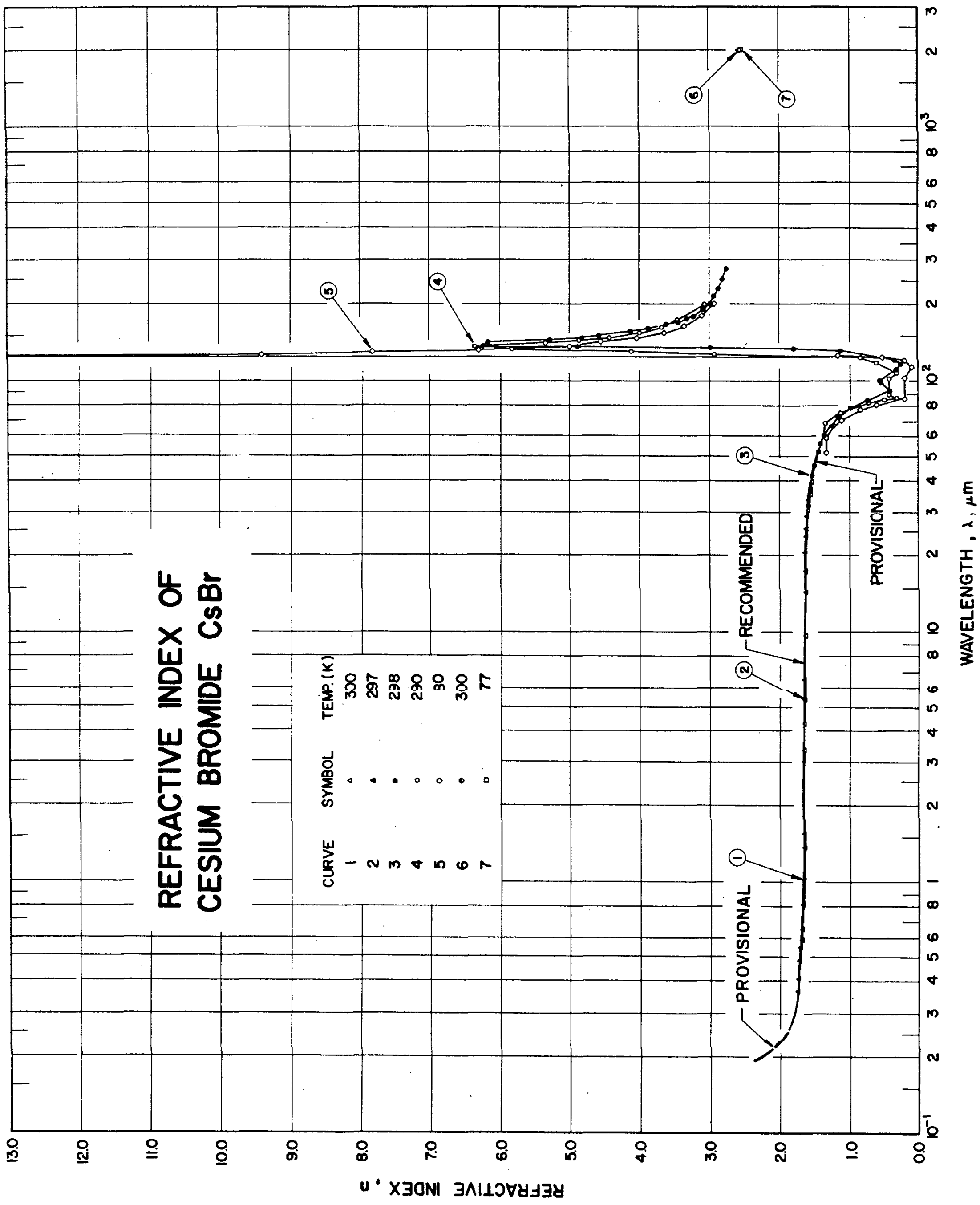

FIGURE 62. Refractive Index of CsBr

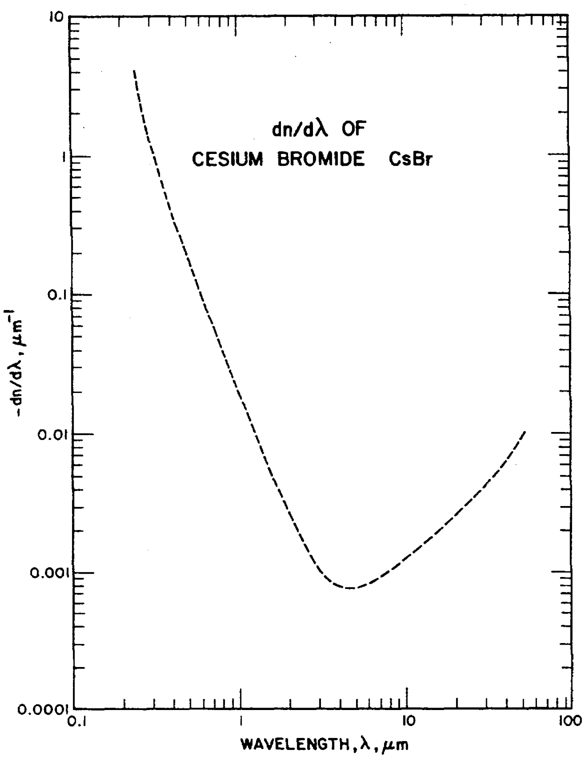

FIGURE 63. $dn/d\lambda$ of CsBr

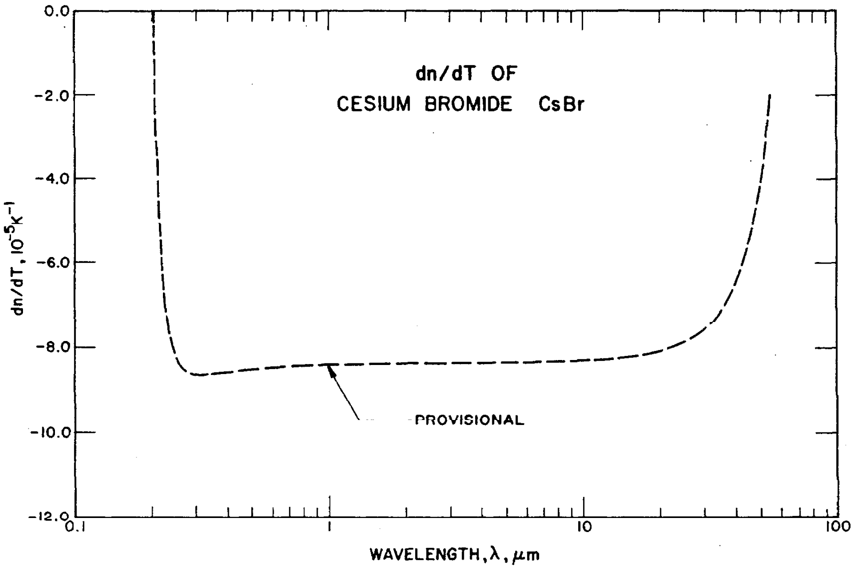

FIGURE 64. dn/dT of CsBr

TABLE 79. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF CsBr

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	107	Rodney, W.S. and Spindler, R.J.	1953	D	0.365-39.22	300	Crystal; two large samples one grown by the Harshaw Chemical Co. of Cleveland, Ohio and the other grown at the National Bureau of Standards; prismatic specimens with faces of about 4 square inches; refractive indices of the two crystals were measured at temperatures ranging from 24 to 31 C and the averaged dn/dT in the wavelength region and temperature range considered was -7.9×10^{-5} K^{-1} for both specimens; all of the data were then adjusted to that at 27 C and presented in digitized values accurate to within ±1 or 2×10^{-5} in refractive indices for wavelengths shorter than 30 μm.
2	108	Rodney, W.S. and Spindler, R.J.	1952	D	0.365-34.48	297	Crystal; grown by the Harshaw Chemical Co.; prismatic specimen with apex angle of 53°; digitized data were presented; the accuracy of these data, outside the visible region, might not be greater than $\pm 1 \times 10^{-4}$ in refractive index.
3	109	Geick, R.	1961	T,R	30-275	298	Crystal; thin-film and plate specimens prepared by vacuum evaporation onto a substrate of cellulose lacquer membrane for CsBr films with thickness from 0.2 to 25 μm, by scraping from a bulk for thickness from 25 μm to 1 mm; specimens with thickness from 1 mm to 1 cm obtained from commercial production and polished to plane parallel; transmission and nearly-normal-incident reflection spectra were measured and analyzed by the method discussed in this reference; digitized data were presented with error of 5%; refractive indices for wavelengths from 36 to 65 μm were extrapolated according to formulae, from 65 to 80 μm were extrapolated graphically.
4	26	Vergnat, P., Claudel, J., Haudi, A., Strimer, P., and Vermillard, F.	1969	R	60-200	290	Single crystal; specimen of 15° wedge in order to avoid the effect of interference during reflectance measurements; reflection spectrum was measured at incident angle less than 15°; refractive indices were determined by Lorentz analysis; data extracted from a figure.
5	26	Vergnat, P., et al.	1969	R	70-200	80, 25	Similar to above; the curves for 80 K and 25 K appeared to coincide, hard to distinguish.
6	47	Dianov, E.M. and Irisova, N.A.	1967	I	2000	300	Plate specimens with various thicknesses; refractive index was determined from information of transmitted interferograms; digitized value was presented with uncertainty of 0.01.
7	47	Dianov, E.M. and Irisova, N.A.	1967	I	2000	77	Similar to above but uncertainty of 0.015.
8	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; seven prismatic specimens with apex angles of about 37.2°; averaged probable values of measurements were presented; temperature was not given, room temperature assumed.

TABLE 80. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF CsBr

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1 T = 300.2 K	
0.365015	1.75118
0.366288	1.75050*
0.404656	1.73344
0.435835	1.72333*
0.546074	1.70189
0.643847	1.69202
1.01398	1.67766
1.12866	1.67584*
1.52952	1.67237
1.7011	1.67158*
3.3610	1.66866
4.258	1.66794
6.465	1.66587
9.724	1.66283
11.035	1.66118*
14.29	1.65594
14.98	1.65474*
15.48	1.65375*
17.40	1.64967*
18.16	1.64795*
20.57	1.64184
21.80	1.63846*
22.76	1.63565*
23.86	1.63234*
25.16	1.62817
25.97	1.62521*
26.63	1.62284*
29.81	1.61034*
30.54	1.60749
30.91	1.60591*
31.70	1.60198*
33.00	1.59584*
34.48	1.58835*
35.45	1.58284
35.90	1.58069*
37.52	1.57183*
39.22	1.55990
CURVE 2 T = 297.2 K	
0.3650	1.7514*
0.3663	1.7507*
0.4047	1.73360*
0.4358	1.72351*
0.4861	1.71169
0.5461	1.70208*
CURVE 2 (cont.) T = 297.2 K	
0.5876	1.69725*
0.5893	1.69707
0.6438	1.69221*
0.6562	1.69127*
0.6678	1.69048*
0.7065	1.68805*
0.8189	1.6832
1.0139	1.6778*
1.1287	1.6760*
1.3622	1.6736
1.5295	1.6725*
1.7011	1.6717*
3.3610	1.6688*
4.258	1.6681*
5.344	1.6665
6.415	1.6661*
9.724	1.6630*
11.035	1.6614*
14.29	1.6561*
14.98	1.6549*
15.48	1.6539*
17.40	1.6494
18.16	1.6481*
20.57	1.6420*
21.79	1.6386*
22.76	1.6360*
23.92	1.6324
25.16	1.6284*
25.97	1.6253*
26.60	1.6230*
28.33	1.6165
29.15	1.6131*
29.81	1.6106*
30.69	1.6077*
33.11	1.6020
34.48	1.5960*
CURVE 3 T = 298.0 K	
31	1.606*
32	1.601
33	1.597*
34	1.592*
35	1.587*
36	1.582*
37	1.577
CURVE 3 (cont.) T = 298.0 K	
38	1.571*
39	1.565*
40	1.558*
41	1.552*
42	1.546
43	1.539*
44	1.532*
45	1.524*
46	1.516
47	1.508*
48	1.500*
49	1.491*
50	1.482*
51	1.472*
52	1.462
53	1.451*
54	1.440*
55	1.429*
56	1.417
57	1.405*
58	1.39*
59	1.38*
60	1.365
61	1.35*
62	1.33*
63	1.315*
64	1.30*
65	1.285*
66	1.27
68	1.24*
70	1.20*
72	1.16
74	1.215*
76	1.06*
78	1.000
80	0.924*
82	0.842*
84	0.744
86	0.618*
88	0.497*
90	0.426*
92	0.416
94	0.449*
96	0.495*
98	0.551
100	0.579
102	0.541*
CURVE 3 (cont.) T = 298.0 K	
104	0.491*
106	0.449*
108	0.382*
110	0.321
112	0.287*
114	0.284
116	0.299*
118	0.323*
120	0.359
122	0.417*
124	0.490*
126	0.622*
128	0.801*
130	1.13
132	1.80
134	3.00
136	4.89
138	6.24
140	6.18
142	5.72*
144	5.29
146	5.07*
148	4.81
150	4.59
152	4.38*
154	4.23*
156	4.11
158	3.99*
160	3.88
162	3.78*
164	3.69*
166	3.61
168	3.54*
170	3.47
172	3.42*
174	3.36*
176	3.32
178	3.28*
180	3.24
185	3.16*
190	3.10
195	3.05*
200	3.00
205	2.97*
210	2.94*
215	2.92
220	2.90*
CURVE 3 (cont.) T = 298.0 K	
225	2.88*
230	2.86
235	2.85*
240	2.83*
245	2.82*
250	2.80
255	2.79*
260	2.78*
265	2.77*
270	2.77*
275	2.76
CURVE 4 T = 290.0 K	
60.79	1.34
68.82	1.34
74.24	1.12
77.76	0.99*
82.17	0.72
84.75	0.50
86.66	0.32
92.00	0.43
101.63	0.43
108.81	0.32
118.20	0.61
122.70	0.84
124.38	1.16*
128.04	2.92
130.55	4.12
132.80	5.83
135.14	6.38
138.31	5.94*
140.45	5.34
143.68	4.88
148.59	4.43
154.08	4.02
161.55	3.69
172.71	3.48
200.00	3.09
CURVE 5 T = 80., 25. K	
50.68	1.34
58.21	1.34
66.18	1.22
CURVE 5 (cont.) T = 80., 25. K	
70.92	1.11
77.04	0.85
81.57	0.61
86.28	0.20
102.25	0.20
114.55	0.10
120.34	0.20
123.00	0.52
124.69	1.17
127.23	15.70
128.87	9.46
130.04	7.83
132.80	6.30
137.74	5.00
141.24	4.55
147.06	4.05
154.08	3.66
164.47	3.38
180.83	3.11
200.00	2.92
CURVE 6 T = 300.0 K	
2000.	2.56
CURVE 7 T = 77.0 K	
2000.	2.53
CURVE 8 T = 298. K	
0.486	1.7126
0.589	1.6984
0.656	1.6924

---

* Not shown in figure.

TABLE 81. EXPERIMENTAL DATA ON dn/dT OF CsBr

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 1 T_m = 306.0 K	
0.365-39.20	-7.9*

---

* Not shown in figure.

TABLE 82. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR CsBr

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Rodney, W.S. and Spindler, R.J. [107] 1953	0.36-40 μm 300 K	$n^2 = 5.640752 - 0.000003338\,\lambda^2 + \frac{0.0018612}{\lambda^2} + \frac{41110.49}{\lambda^2 - (119.96)^2} + \frac{0.0290764}{\lambda^2 - (0.15800)^2}$
Vergnat, P., Claudel, J., Hadni, A., Strimer, P., and Vermillard, F. [26] 1969	53-200 μm 290 K	$n^2\text{-}k^2 = \epsilon_{uv} + \sum_i 4\pi\rho_i \frac{\nu_i^2(\nu_i^2 - \nu^2)}{(\nu_i^2 - \nu^2)^2 + \delta_i^2\nu_i^2\nu^2}$, $2nk = \sum_i 4\pi\rho_i \frac{\nu_i^3\,\nu\,\delta_i}{(\nu_i^2 - \nu^2)^2 + \delta_i^2\nu_i^2\nu^2}$ *
Present work 1975	0.21-55.0 μm 293 K	$n^2 = 1.14600 + \frac{1.26628\,\lambda^2}{\lambda^2 - (0.120)^2} + \frac{0.01137\,\lambda^2}{\lambda^2 - (0.146)^2} + \frac{0.00975\,\lambda^2}{\lambda^2 - (0.160)^2} + \frac{0.00672\,\lambda^2}{\lambda^2 - (0.173)^2} + \frac{0.34557\,\lambda^2}{\lambda^2 - (0.187)^2} + \frac{3.76339\,\lambda^2}{\lambda^2 - (136.05)^2}$

*$i = 1, 2$; $\nu_1 = 75$ cm^{-1}, $\nu_2 = 103$ cm^{-1}; $\delta_1 = 0.06$, $\delta_2 = 0.16$; $\rho_1 = 0.284$, $\rho_2 = 0.009$; $\epsilon_{uv} = 2.88$, $\epsilon_s = 6.57$.

3.20. Cesium Iodide, CsI

Early measurements on the refractive index of CsI were made by Sprockhoff [95] in 1904, using a minimum deviation method for three visible spectral lines, 0.486, 0.589, and 0.656 μm. Although his values were presented to four decimal places, the temperature at which the data were taken was not specified. These three values were the only available data for about 50 years. The main reason for such a long period of inactivity was the difficulty in growing adequate crystals. Large and good quality crystals suitable for optical components were not available; also, the need for infrared transparency was not generally felt.

It was not until 1955 that the refractive index for the wide range of transmission (0.29 to 53 μm) was measured by Rodney [110] on several cesium iodide samples grown by the Harshaw Chemical Company. The refractive indices were measured at temperatures near 15, 24, and 34 °C by the deviation method. The temperature derivatives of refractive index were determined for each wavelength and all data were reduced to 24 °C. He adopted a dispersion equation of the Sellmeier type, simplified to five terms, to fit the reduced data. Although his dispersion equation fitted his data quite well, more terms could have been included to advantage, since information on more than five absorption bands was then available.

In the ultraviolet region, 0.20–0.25 μm, Lamatsch, Rossel, and Sauer [111] derived the refractive indices from information on the transmission and reflection spectra. Since they used vacuum-evaporated thin film samples, the wavelengths of the two absorption bands obtained are higher than that of the bulk material. Large discrepancies between this set of data and that calculated from Rodney's work are to be expected.

Values of the refractive index beyond the transparent region in the infrared were obtained by Vergnat, et al. [26] in 1969, by analyzing the reflection spectrum. They found that the wavelengths of infrared absorption bands are 117.65 and 161.29 μm at room temperature. One of the two values is in close agreement with that of Rodney, as shown in table 87. As a matter of fact, the predominant contribution to the absorption is due to the one band that Rodney used.

In the millimeter wavelength region, the refractive index at 2000 μm was obtained by Dianov and Irisova [47] in 1966. Their result, $n^2 = 6.452$ at room temperature, agree to the first decimal place with the static dielectric constant given by Vergnat, et al. [26]. This completes the record of the published activities in determining the refractive index of CsI.

From the available information, the data of Rodney were adopted as the basis for the generation of recommended values. Since this set of data was measured at a temperature of 297 K, corrections had to be made to reduce the data to 293 K. Rodney [110] discussed the temperature derivative of the refractive index quite thoroughly in his paper; however, an equation for calculating dn/dT in general was not given.

The temperature coefficient of the refractive index of CsI unlike that of other alkali halides, has been measured over the whole transparent region. Using the existing data on dn/dT and the parameters in tables 2 and 3, a least-squares fitting of the data to eq (19) was carried out. The results, together with those obtained for LiF, NaF, NaCl, and KCl, provided the basis for the procedure discussed in subsection 2.2; see also figures 2 and 3. These results were used to predict the unknown parameters of eq (19) for all the twenty alkali halides, as given in table 5. With these parameters we can construct a formula for calculating dn/dT for CsI.

$$2n\frac{dn}{dT} = -14.70\,(n^2-1) - 5.53 + \frac{2.464\,\lambda^4}{(\lambda^2-0.04752)^2} + \frac{242.76\,\lambda^4}{(\lambda^2-26014.46)^2}, \tag{61}$$

where dn/dT is in units of $10^{-5}\,\mathrm{K}^{-1}$ and λ in μm.

Comparison of the predictions of eq (61) and the experimental data shown in figure 67 shows excellent agreement except at two points, at about 0.30 and 0.35 μm. From the fact that the constructed dn/dT formulas always agree with experimental data at low wavelengths, as shown in dn/dT figures of LiF, NaF, NaCl, and KCl, we believe that eq (61) gives reasonable estimates in the low wavelength region. Equation (61) is confidently used to reduce the selected data to 293 K.

As listed in table 3, the ultraviolet absorption spectrum of CsI between 0.10 and 0.24 μm consists of seven absorption peaks. The infrared spectrum comprises two fundamental absorption peaks, but the dominant effect on the refractive index is due to the peak at 161.29 μm. In the present work, the effects of all the absorption peaks on the refractive index in the transparent region are taken into consideration, and the best fit equation is used to calculate the refractive index of CsI at 293 K in the transparent region, 0.25–67.0 μm.

$$n^2 = 1.27587 + \frac{0.68689\,\lambda^2}{\lambda^2-(0.130)^2} + \frac{0.26090\,\lambda^2}{\lambda^2-(0.147)^2} + \frac{0.06256\,\lambda^2}{\lambda^2-(0.163)^2} + \frac{0.06527\,\lambda^2}{\lambda^2-(0.177)^2} + \frac{0.14991\,\lambda^2}{\lambda^2-(0.185)^2} + \frac{0.51818\,\lambda^2}{\lambda^2-(0.206)^2} + \frac{0.01918\,\lambda^2}{\lambda^2-(0.218)^2} + \frac{3.38229\,\lambda^2}{\lambda^2-(161.29)^2}, \tag{62}$$

where λ is in units of μm.

Equations (61) and (62) were used to generate the recommended values of refractive index and its wavelength and temperature derivatives. In the table of recommended values, more decimal places than needed are given, for tabular smoothness and internal comparison. In using values from the table, readers should follow the criteria given below.

Wavelength range (μm)	Meaningful decimal place	Estimated uncertainty, ±
For refractive index:		
0.25– 0.35	4	0.0002
0.35–20.00	4	0.0001
20.00–40.00	4	0.0002
40.00–50.00	4	0.0005
50.00–67.00	3	0.001
For dn/dT:		
0.25– 0.35	1	0.8
0.35– 1.00	1	0.5
1.00–50.00	1	0.3
50.00–67.00	0	1

TABLE 83. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsI AT 293 K *

λ μm	n	-dn/dT μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}	λ μm	n	-dn/dλ μm^{-1}	dn/dT 10^{-5} K^{-1}
0.250	2.20938	8.76398	-4.46	0.550	1.79451	0.20657	-9.67	2.750	1.74479	0.00157	-9.48
0.252	2.19248	8.14296	-5.15	0.560	1.79250	0.19420	-9.66	2.800	1.74471	0.00150	-9.48
0.254	2.17676	7.59006	-5.74	0.570	1.79062	0.18284	-9.66	2.850	1.74464	0.00144	-9.48
0.256	2.16208	7.09518	-6.23	0.580	1.78884	0.17236	-9.65	2.900	1.74457	0.00138	-9.48
0.258	2.14834	6.65010	-6.65	0.590	1.78717	0.16270	-9.65	2.950	1.74450	0.00132	-9.48
0.260	2.13545	6.24803	-7.01	0.600	1.78559	0.15376	-9.64	3.000	1.74443	0.00127	-9.48
0.262	2.12333	5.88336	-7.32	0.620	1.78268	0.13780	-9.63	3.050	1.74437	0.00122	-9.48
0.264	2.11190	5.55137	-7.59	0.640	1.78006	0.12402	-9.62	3.100	1.74431	0.00118	-9.48
0.266	2.10110	5.24810	-7.82	0.660	1.77770	0.11206	-9.61	3.150	1.74425	0.00114	-9.48
0.268	2.09089	4.97019	-8.03	0.680	1.77557	0.10162	-9.61	3.200	1.74420	0.00110	-9.48
0.270	2.08121	4.71476	-8.21	0.700	1.77363	0.09246	-9.60	3.250	1.74414	0.00107	-9.48
0.272	2.07202	4.47935	-8.37	0.720	1.77186	0.08439	-9.59	3.300	1.74409	0.00103	-9.48
0.274	2.06328	4.26183	-8.51	0.740	1.77025	0.07725	-9.59	3.350	1.74404	0.00100	-9.48
0.276	2.05496	4.06037	-8.64	0.760	1.76877	0.07090	-9.58	3.400	1.74399	0.00097	-9.48
0.278	2.04703	3.87335	-8.75	0.780	1.76741	0.06525	-9.58	3.450	1.74394	0.00095	-9.48
0.280	2.03946	3.69938	-8.85	0.800	1.76615	0.06018	-9.57	3.500	1.74390	0.00092	-9.48
0.282	2.03222	3.53722	-8.94	0.820	1.76500	0.05564	-9.57	3.550	1.74385	0.00090	-9.48
0.284	2.02530	3.38578	-9.02	0.840	1.76392	0.05155	-9.56	3.600	1.74381	0.00087	-9.48
0.286	2.01867	3.24411	-9.09	0.860	1.76293	0.04785	-9.56	3.650	1.74376	0.00085	-9.48
0.288	2.01232	3.11135	-9.16	0.880	1.76201	0.04451	-9.56	3.700	1.74372	0.00083	-9.48
0.290	2.00622	2.98675	-9.21	0.900	1.76115	0.04147	-9.55	3.750	1.74368	0.00082	-9.48
0.292	2.00037	2.86963	-9.27	0.920	1.76035	0.03871	-9.55	3.800	1.74364	0.00080	-9.47
0.294	1.99474	2.75938	-9.32	0.940	1.75960	0.03619	-9.55	3.850	1.74360	0.00078	-9.47
0.296	1.98932	2.65545	-9.36	0.960	1.75890	0.03389	-9.54	3.900	1.74356	0.00077	-9.47
0.298	1.98411	2.55736	-9.40	0.980	1.75824	0.03178	-9.54	3.950	1.74352	0.00075	-9.47
0.300	1.97909	2.46466	-9.44	1.000	1.75763	0.02984	-9.54	4.000	1.74349	0.00074	-9.47
0.305	1.96731	2.25399	-9.51	1.050	1.75624	0.02565	-9.53	4.050	1.74345	0.00073	-9.47
0.310	1.95651	2.06932	-9.57	1.100	1.75505	0.02222	-9.53	4.100	1.74341	0.00072	-9.47
0.315	1.94658	1.90644	-9.62	1.150	1.75401	0.01938	-9.52	4.150	1.74338	0.00070	-9.47
0.320	1.93741	1.76199	-9.66	1.200	1.75310	0.01701	-9.52	4.200	1.74334	0.00069	-9.47
0.325	1.92893	1.63323	-9.69	1.250	1.75230	0.01502	-9.51	4.250	1.74331	0.00068	-9.47
0.330	1.92106	1.51793	-9.71	1.300	1.75160	0.01333	-9.51	4.300	1.74327	0.00068	-9.47
0.335	1.91373	1.41425	-9.73	1.350	1.75097	0.01189	-9.51	4.350	1.74324	0.00067	-9.47
0.340	1.90690	1.32066	-9.75	1.400	1.75040	0.01065	-9.51	4.400	1.74321	0.00066	-9.47
0.345	1.90051	1.23587	-9.76	1.450	1.74990	0.00958	-9.50	4.450	1.74317	0.00065	-9.47
0.350	1.89453	1.15880	-9.77	1.500	1.74944	0.00865	-9.50	4.500	1.74314	0.00065	-9.47
0.355	1.88891	1.08854	-9.78	1.550	1.74903	0.00784	-9.50	4.550	1.74311	0.00064	-9.47
0.360	1.88363	1.02430	-9.78	1.600	1.74866	0.00713	-9.50	4.600	1.74308	0.00063	-9.47
0.365	1.87866	0.96541	-9.78	1.650	1.74832	0.00651	-9.50	4.650	1.74305	0.00063	-9.47
0.370	1.87397	0.91128	-9.78	1.700	1.74801	0.00596	-9.50	4.700	1.74302	0.00062	-9.47
0.375	1.86954	0.86143	-9.79	1.750	1.74772	0.00547	-9.50	4.750	1.74298	0.00062	-9.47
0.380	1.86535	0.81540	-9.79	1.800	1.74746	0.00504	-9.49	4.800	1.74295	0.00061	-9.47
0.385	1.86138	0.77282	-9.78	1.850	1.74721	0.00465	-9.49	4.850	1.74292	0.00061	-9.47
0.390	1.85762	0.73335	-9.78	1.900	1.74699	0.00430	-9.49	4.900	1.74289	0.00061	-9.47
0.395	1.85404	0.69670	-9.78	1.950	1.74678	0.00399	-9.49	4.950	1.74286	0.00060	-9.47
0.400	1.85064	0.66260	-9.78	2.000	1.74659	0.00371	-9.49	5.000	1.74283	0.00060	-9.47
0.410	1.84433	0.60119	-9.77	2.050	1.74641	0.00346	-9.49	5.100	1.74277	0.00059	-9.47
0.420	1.83859	0.54754	-9.76	2.100	1.74625	0.00323	-9.49	5.200	1.74271	0.00059	-9.47
0.430	1.83336	0.50042	-9.76	2.150	1.74609	0.00302	-9.49	5.300	1.74265	0.00059	-9.47
0.440	1.82857	0.45882	-9.75	2.200	1.74594	0.00283	-9.49	5.400	1.74260	0.00058	-9.47
0.450	1.82417	0.42192	-9.74	2.250	1.74581	0.00266	-9.49	5.500	1.74254	0.00058	-9.47
0.460	1.82012	0.38905	-9.73	2.300	1.74568	0.00251	-9.49	5.600	1.74248	0.00058	-9.47
0.470	1.81637	0.35965	-9.73	2.350	1.74555	0.00236	-9.49	5.700	1.74242	0.00058	-9.47
0.480	1.81291	0.33326	-9.72	2.400	1.74544	0.00223	-9.48	5.800	1.74236	0.00058	-9.47
0.490	1.80970	0.30950	-9.71	2.450	1.74533	0.00211	-9.48	5.900	1.74231	0.00058	-9.47
0.500	1.80672	0.28802	-9.70	2.500	1.74523	0.00200	-9.48	6.000	1.74225	0.00058	-9.46
0.510	1.80393	0.26856	-9.69	2.550	1.74513	0.00190	-9.48	6.100	1.74219	0.00058	-9.46
0.520	1.80134	0.25088	-9.69	2.600	1.74504	0.00181	-9.48	6.200	1.74213	0.00058	-9.46
0.530	1.79891	0.23476	-9.68	2.650	1.74495	0.00172	-9.48	6.300	1.74207	0.00058	-9.46
0.540	1.79664	0.22004	-9.67	2.700	1.74487	0.00164	-9.48	6.400	1.74202	0.00059	-9.46

TABLE 83. RECOMMENDED VALUES ON THE REFRACTIVE INDEX AND ITS WAVELENGTH AND TEMPERATURE DERIVATIVES FOR CsI AT 293 K (continued)*

λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹	λ μm	n	-dn/dλ μm⁻¹	dn/dT 10⁻⁵ K⁻¹
6.500	1.74196	0.00059	-9.46	15.000	1.73478	0.00115	-9.39	37.500	1.68686	0.00323	-8.72
6.600	1.74190	0.00059	-9.46	15.200	1.73455	0.00117	-9.39	38.000	1.68523	0.00329	-8.69
6.700	1.74184	0.00060	-9.46	15.400	1.73431	0.00118	-9.39	38.500	1.68358	0.00334	-8.66
6.800	1.74178	0.00060	-9.46	15.600	1.73408	0.00120	-9.38	39.000	1.68189	0.00340	-8.62
6.900	1.74172	0.00060	-9.46	15.800	1.73383	0.00122	-9.38	39.500	1.68017	0.00346	-8.59
7.000	1.74166	0.00061	-9.46	16.000	1.73359	0.00123	-9.38	40.000	1.67843	0.00352	-8.56
7.100	1.74160	0.00061	-9.46	16.200	1.73334	0.00125	-9.38	40.500	1.67666	0.00358	-8.53
7.200	1.74154	0.00062	-9.46	16.400	1.73309	0.00126	-9.37	41.000	1.67485	0.00364	-8.49
7.300	1.74147	0.00062	-9.46	16.600	1.73284	0.00128	-9.37	41.500	1.67302	0.00370	-8.46
7.400	1.74141	0.00062	-9.46	16.800	1.73258	0.00129	-9.37	42.000	1.67115	0.00376	-8.42
7.500	1.74135	0.00063	-9.46	17.000	1.73232	0.00131	-9.37	42.500	1.66926	0.00382	-8.38
7.600	1.74129	0.00063	-9.46	17.200	1.73206	0.00133	-9.36	43.000	1.66733	0.00389	-8.34
7.700	1.74122	0.00064	-9.46	17.400	1.73179	0.00134	-9.36	43.500	1.66537	0.00395	-8.30
7.800	1.74116	0.00064	-9.46	17.600	1.73152	0.00136	-9.36	44.000	1.66338	0.00401	-8.26
7.900	1.74109	0.00065	-9.45	17.800	1.73124	0.00137	-9.35	44.500	1.66136	0.00408	-8.21
8.000	1.74103	0.00066	-9.45	18.000	1.73097	0.00139	-9.35	45.000	1.65930	0.00415	-8.17
8.100	1.74096	0.00066	-9.45	18.200	1.73069	0.00141	-9.35	45.500	1.65721	0.00421	-8.12
8.200	1.74090	0.00067	-9.45	18.400	1.73041	0.00142	-9.34	46.000	1.65509	0.00428	-8.08
8.300	1.74083	0.00067	-9.45	18.600	1.73012	0.00144	-9.34	46.500	1.65293	0.00435	-8.03
8.400	1.74076	0.00068	-9.45	18.800	1.72983	0.00146	-9.34	47.000	1.65073	0.00442	-7.98
8.500	1.74069	0.00068	-9.45	19.000	1.72954	0.00147	-9.33	47.500	1.64851	0.00449	-7.92
8.600	1.74063	0.00069	-9.45	19.200	1.72924	0.00149	-9.33	48.000	1.64624	0.00456	-7.87
8.700	1.74056	0.00070	-9.45	19.400	1.72894	0.00151	-9.33	48.500	1.64394	0.00464	-7.81
8.800	1.74049	0.00070	-9.45	19.600	1.72864	0.00152	-9.32	49.000	1.64161	0.00471	-7.76
8.900	1.74042	0.00071	-9.45	19.800	1.72833	0.00154	-9.32	49.500	1.63923	0.00479	-7.70
9.000	1.74034	0.00072	-9.45	20.000	1.72802	0.00156	-9.32	50.000	1.63682	0.00486	-7.64
9.100	1.74027	0.00072	-9.45	20.500	1.72723	0.00160	-9.31	50.500	1.63437	0.00494	-7.58
9.200	1.74020	0.00073	-9.45	21.000	1.72642	0.00164	-9.30	51.000	1.63188	0.00502	-7.51
9.300	1.74013	0.00073	-9.45	21.500	1.72559	0.00168	-9.29	51.500	1.62935	0.00510	-7.45
9.400	1.74005	0.00074	-9.44	22.000	1.72474	0.00172	-9.28	52.000	1.62679	0.00518	-7.38
9.500	1.73998	0.00075	-9.44	22.500	1.72387	0.00177	-9.27	52.500	1.62418	0.00526	-7.31
9.600	1.73990	0.00075	-9.44	23.000	1.72298	0.00181	-9.26	53.000	1.62153	0.00534	-7.23
9.700	1.73983	0.00076	-9.44	23.500	1.72206	0.00185	-9.25	53.500	1.61884	0.00543	-7.16
9.800	1.73975	0.00077	-9.44	24.000	1.72112	0.00190	-9.23	54.000	1.61610	0.00551	-7.08
9.900	1.73967	0.00077	-9.44	24.500	1.72016	0.00194	-9.22	54.500	1.61332	0.00560	-7.00
10.000	1.73960	0.00078	-9.44	25.000	1.71918	0.00199	-9.21	55.000	1.61050	0.00569	-6.92
10.200	1.73944	0.00080	-9.44	25.500	1.71817	0.00203	-9.20	55.500	1.60764	0.00578	-6.84
10.400	1.73928	0.00081	-9.44	26.000	1.71715	0.00208	-9.18	56.000	1.60473	0.00587	-6.75
10.600	1.73911	0.00082	-9.44	26.500	1.71610	0.00212	-9.17	56.500	1.60177	0.00596	-6.66
10.800	1.73895	0.00084	-9.43	27.000	1.71502	0.00217	-9.15	57.000	1.59877	0.00605	-6.57
11.000	1.73878	0.00085	-9.43	27.500	1.71393	0.00221	-9.14	57.500	1.59572	0.00615	-6.47
11.200	1.73861	0.00087	-9.43	28.000	1.71281	0.00226	-9.12	58.000	1.59262	0.00625	-6.37
11.400	1.73843	0.00088	-9.43	28.500	1.71167	0.00231	-9.11	58.500	1.58947	0.00634	-6.27
11.600	1.73826	0.00089	-9.43	29.000	1.71050	0.00236	-9.09	59.000	1.58628	0.00645	-6.17
11.800	1.73808	0.00091	-9.43	29.500	1.70931	0.00240	-9.08	59.500	1.58303	0.00655	-6.06
12.000	1.73789	0.00092	-9.42	30.000	1.70810	0.00245	-9.06	60.000	1.57973	0.00665	-5.95
12.200	1.73771	0.00094	-9.42	30.500	1.70686	0.00250	-9.04	60.500	1.57637	0.00676	-5.83
12.400	1.73752	0.00095	-9.42	31.000	1.70560	0.00255	-9.02	61.000	1.57297	0.00687	-5.71
12.600	1.73732	0.00097	-9.42	31.500	1.70431	0.00260	-9.00	61.500	1.56951	0.00698	-5.59
12.800	1.73713	0.00098	-9.42	32.000	1.70300	0.00265	-8.98	62.000	1.56599	0.00709	-5.47
13.000	1.73693	0.00100	-9.41	32.500	1.70166	0.00270	-8.96	62.500	1.56242	0.00720	-5.34
13.200	1.73673	0.00101	-9.41	33.000	1.70030	0.00275	-8.94	63.000	1.55879	0.00732	-5.20
13.400	1.73653	0.00103	-9.41	33.500	1.69891	0.00280	-8.92	63.500	1.55510	0.00744	-5.06
13.600	1.73632	0.00104	-9.41	34.000	1.69750	0.00285	-8.90	64.000	1.55136	0.00756	-4.92
13.800	1.73611	0.00106	-9.41	34.500	1.69606	0.00291	-8.87	64.500	1.54755	0.00768	-4.77
14.000	1.73589	0.00107	-9.40	35.000	1.69460	0.00296	-8.85	65.000	1.54368	0.00780	-4.62
14.200	1.73568	0.00109	-9.40	35.500	1.69310	0.00301	-8.82	65.500	1.53974	0.00793	-4.46
14.400	1.73546	0.00111	-9.40	36.000	1.69158	0.00307	-8.80	66.000	1.53575	0.00806	-4.30
14.600	1.73524	0.00112	-9.40	36.500	1.69004	0.00312	-8.77	66.500	1.53168	0.00819	-4.14
14.800	1.73501	0.00114	-9.39	37.000	1.68846	0.00317	-8.74	67.000	1.52755	0.00833	-3.96

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* In this table more decimal places are reported than warranted merely for the purpose of tabular smoothness and internal comparison. For meaningful decimal places and uncertainties of tabulated values in various wavelength ranges, see the text of subsection 3.20. The number of digits with an overstrike are not relevant to accuracy of the data.

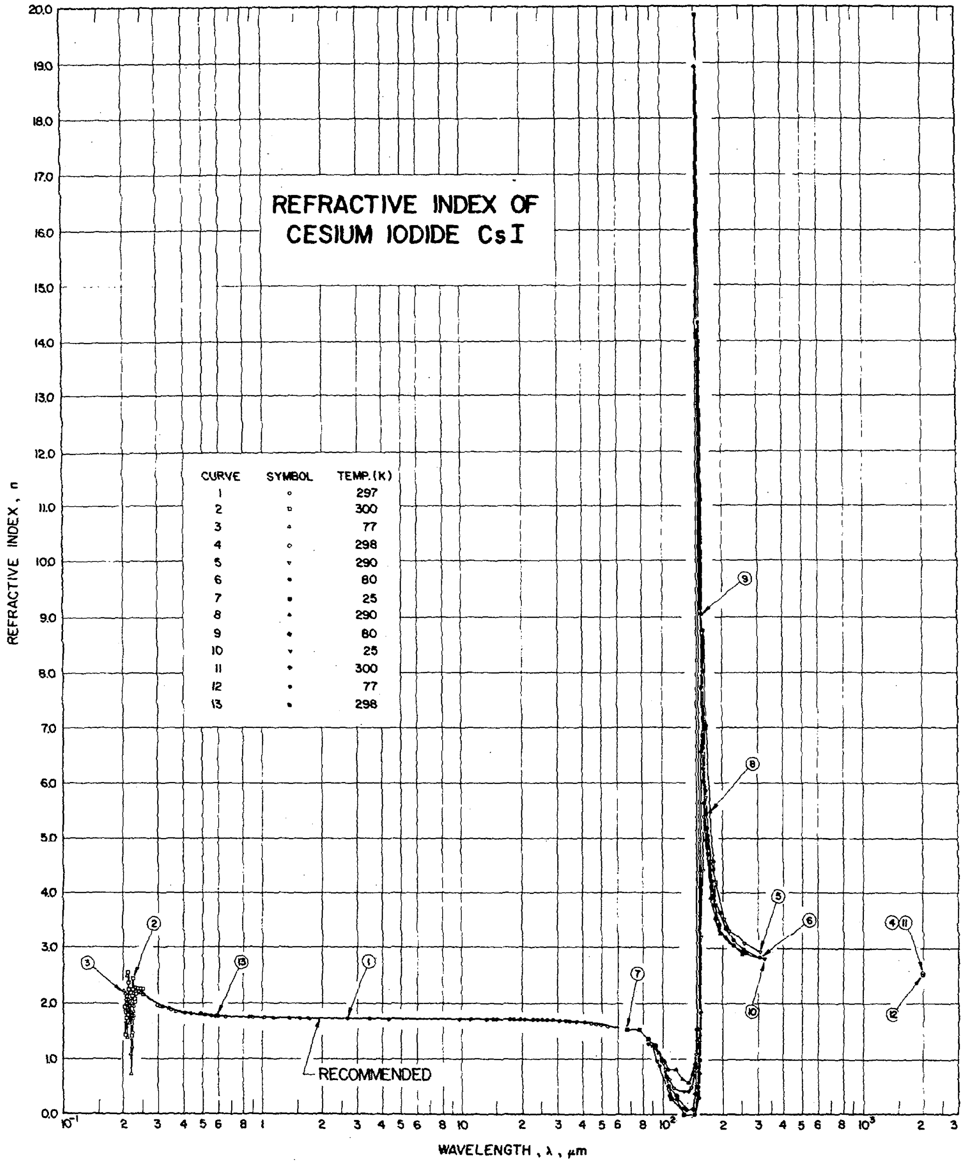

FIGURE 65. Refractive Index of CsI

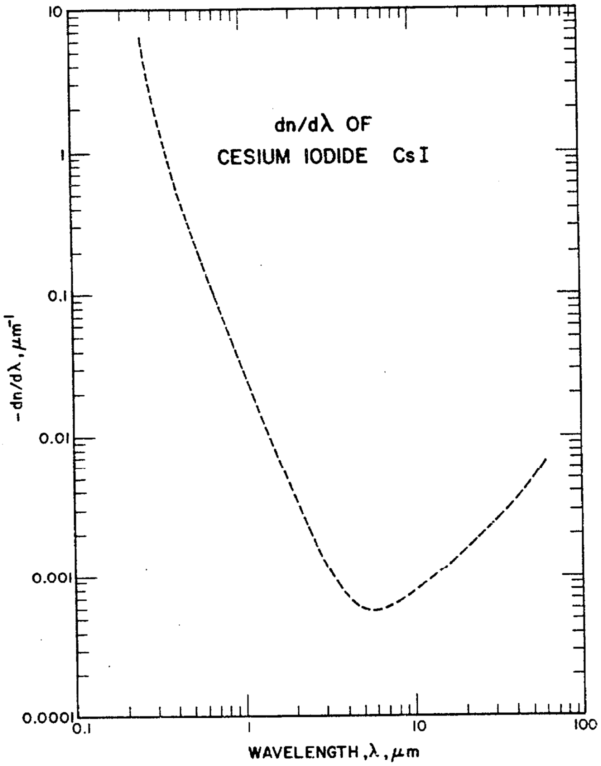

FIGURE 66. dn/dλ of CsI

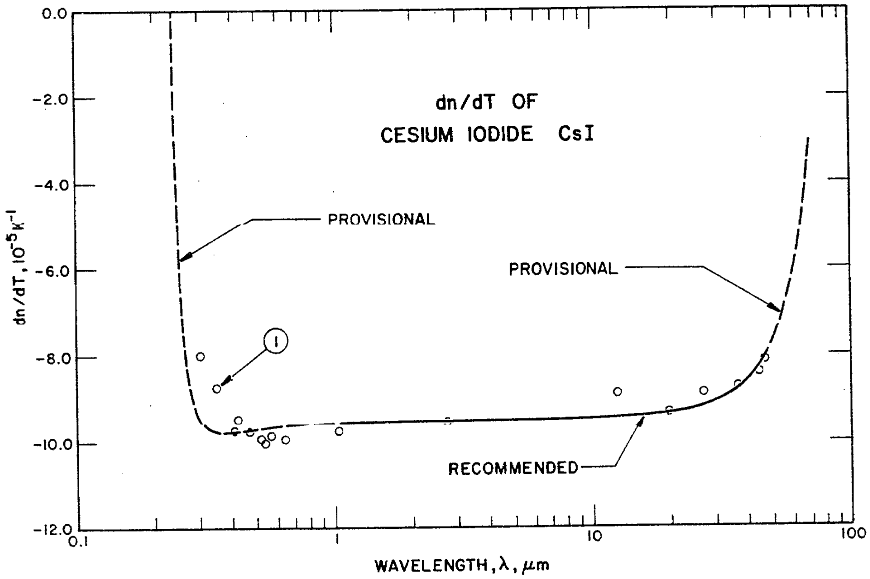

FIGURE 67. dn/dT of CsI

TABLE 84. SOURCE AND TECHNICAL INFORMATION ON THE REFRACTIVE INDEX AND dn/dT MEASUREMENTS OF CsI

Cur. No.	Ref. No.	Author(s)	Year	Method Used	Wavelength Range, μm	Temperature, K	Specifications, and Remarks
1	110	Rodney, W.S.	1955	D	0.296-53.12	297	Crystal; grown by the Harshaw Chemical Co.; prismatic specimen with apex angle of 25°; refractive indices were measured at temperatures near 16, 24 and 30 C, and dn/dT were then determined for each wavelength and all data were reduced to 24 C; digitized data were presented; smoothed dn/dT's were given.
2	111	Lamatsch, H., Rossel, J., and Saurer, E.	1972	T,R	0.20-0.25	300	Thin film vacuum evaporated on the substrate of fused silica; refractive indices were derived from the transmission and normal incident reflection spectra; data extracted from a figure.
3	111	Lamatsch, H., et al.	1972	T,R	0.20-0.25	77	Similar to above.
4	68	Dianov, E.M. and Irisova, N.A.	1966	T	2000	298	Plate specimens of 0.65 and 2.2 cm in thickness and 5.0 cm in diameter; refractive index was derived from the information of transmission interferogram; digitized datum was presented with an uncertainty of 0.01.
5	26	Vergnat, P., Claudel, J., Handi, A., Strimer, P., and Vermillard, F.	1969	R	101-308	290	Single crystal; specimen of 15° wedge in order to avoid the effect of interference during reflectance measurements; reflection spectrum was measured at incident angle less than 15°; refractive indices were deduced by Lorentz analysis; data extracted from a figure.
6	26	Vergnat, P., et al.	1969	R	144-306	80	Similar to above.
7	26	Vergnat, P., et al.	1969	R	66-306	25	Similar to above.
8	26	Vergnat, P., et al.	1969	R	90-198	290	Similar to above but refractive indices were deduced by Kramers-Kronig method.
9	26	Vergnat, P., et al.	1969	R	107-222	80	Similar to above.
10	26	Vergnat, P., et al.	1969	R	85-325	25	Similar to above.
11	47	Dianov, E.M. and Irisova, N.A.	1967	I	2000	300	Plate specimens with various thicknesses; refractive index was determined from the information of transmitted interferograms; digitized value was presented with uncertainty of 0.01.
12	47	Dianov, E.M. and Irisova, N.A.	1967	I	2000	77	Similar to above.
13	95	Sprockhoff, M.	1904	D	0.486-0.656	298	Crystal; seven prismatic specimens with apex angles of about 40°; averaged values of measurements were presented; temperature was not given, room temperature assumed.

TABLE 85. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF CsI

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 1	
T = 297.2 K	
0.296728	1.98704
0.30215	1.97347
0.31256	1.95095
0.31317	1.94978*
0.33414	1.91457
0.34662	1.89815
0.361051	1.88212*
0.365015	1.87822
0.404656	1.84725
0.435835	1.83013
0.508582	1.80395
0.546074	1.79495
0.576960	1.78902
0.579066	1.78864*
0.643847	1.77920
0.85212	1.76290
0.89440	1.76098
1.01398	1.75681
1.12866	1.75401
1.3673	1.75037
1.52952	1.74877
1.7011	1.74755
2.67	1.74442
3.4188	1.74353
4.258	1.74278
9.724	1.73937
11.035	1.73844
13.25	1.73632
14.29	1.73516
14.98	1.73429
17.40	1.73122
18.16	1.73030
18.47	1.72982*
19.50	1.72820
20.57	1.72662
22.76	1.72305
23.82	1.72116
25.16	1.71865
26.63	1.71532
28.38	1.71194
30.70	1.70639
33.00	1.70018
34.48	1.69571
25.67	1.69224*
27.56	1.68649
39.38	1.68046*
40.43	1.67650
44.05	1.66297
44.97	1.65954*
47.05	1.65069
47.98	1.64614*
49.40	1.63941
51.48	1.62923*
53.12	1.61925
CURVE 2	
T = 300.0 K	
0.2014	1.94
0.2034	1.42
0.2053	1.72
0.2064	1.75*
0.2073	1.77*
0.2083	1.81
0.2095	2.58
0.2104	2.39
0.2115	2.25
0.2134	2.22*
0.2153	2.20
0.2173	2.158
0.2194	1.41
0.2203	1.45
0.2213	2.27
0.2223	2.46
0.2234	2.46*
0.2243	2.27
0.2250	2.09
0.2262	2.05
0.2274	2.04
0.2293	2.17
0.2314	2.21
0.2345	2.27
0.2412	2.26
0.2497	2.26
CURVE 3	
T = 77.0 K	
0.2018	2.22
0.2031	2.19
0.2044	2.15*
0.2061	2.09
0.2068	2.01
0.2071	1.93
0.2077	1.79*
0.2082	1.38
0.2085	2.50
0.2090	2.08
0.2090	2.00
0.2105	2.00*
0.2112	1.98
0.2118	1.65
0.2129	1.66*
0.2139	1.82
0.2148	2.00
0.2155	2.05*
0.2158	1.88
0.2161	1.80
0.2165	1.48*
0.2169	1.10
0.2172	0.74
0.2177	2.28*
0.2183	2.50*
0.2189	2.24*
0.2196	1.21
0.2200	1.47
0.2209	1.73
0.2219	1.78
0.2228	1.88
0.2246	1.97
0.2260	2.05*
0.2307	2.15*
0.2401	2.20
0.2483	2.17
CURVE 4	
T = 298.0 K	
2000.	2.54
CURVE 5	
T = 290.0 K	
101.21	0.94
104.93	0.81
108.93	0.63
113.51	0.49
128.70	0.42
134.23	0.42
138.89	0.49
144.09	0.76
147.71	1.09
152.21	1.56
156.74	3.19
160.00	4.40
162.34	5.39
165.84	5.74
177.62	4.56
184.50	4.20
202.84	3.56
217.39	3.33
233.64	3.22
253.81	3.08
307.69	2.91
CURVE 6	
T = 80.0 K	
144.93	0.00
151.29	0.30
153.85	0.74
154.80	1.86
157.73	14.37
161.55	8.02
163.40	7.00
166.67	5.88
170.65	5.05
175.75	4.41
181.82	3.97
194.55	3.65
208.33	3.40
226.24	3.13
252.53	2.98
305.81	2.82
CURVE 7	
T = 25.0 K	
66.67	1.55
76.34	1.55
85.32	1.37
93.11	1.25
99.80	1.00
105.82	0.69
110.86	0.29
118.20	0.29
127.71	0.00
145.14	0.00
150.15	0.50
152.44	1.00
154.80	19.85
159.74	7.74
160.77	6.88
162.34	6.04
166.39	5.18
170.07	4.69
176.06	4.21
184.16	3.80
193.42	3.47
205.76	3.21
225.73	3.04
250.00	2.89
305.81	2.82
CURVE 8	
T = 290.0 K	
90.66	1.24
96.71	1.12
102.88	0.99
106.16	0.82
117.79	0.82
126.42	0.65
135.87	0.58
141.44	0.74
146.41	0.96
149.93	1.34
153.14	1.86*
156.49	3.22
159.24	6.59
164.47	8.75
168.92	7.04
173.91	5.49
180.51	4.57
187.62	3.59
197.63	3.31
CURVE 9	
T = 80.0 K	
107.07	0.51
118.76	0.34
131.75	0.09
141.84	0.09
145.35	0.38
147.06	0.87
149.03	1.54
153.61	18.93
159.24	9.06
161.29	6.64
164.20	5.64
167.50	4.98
171.53	4.40*
177.62	3.90
185.53	3.57
196.85	3.29
221.73	3.04*
CURVE 10	
T = 25.0 K	
85.18	1.27
90.66	1.22*
94.52	0.99
97.09	0.87
101.73	0.94*
105.60	0.68*
108.58	0.32
126.58	0.11
140.45	0.11*
145.35	0.38*
149.03	1.54*
153.14	26.55*
158.73	7.74*
162.34	6.26
164.20	5.64*
167.50	4.98*
171.53	4.40*
177.62	3.90*
185.53	3.57*
196.85	3.29*
221.73	3.04*
260.42	2.89
324.68	2.79
CURVE 11	
T = 300.0 K	
2000.	2.54

---

* Not shown in figure.

TABLE 85. EXPERIMENTAL DATA ON THE REFRACTIVE INDEX OF CsI (continued)

[Wavelength, λ, μm; Refractive Index, n]

λ	n
CURVE 12 T = 77.0 K	
2000.	2.51
CURVE 13 T = 298. K	
0.486	1.8115
0.589	1.7876
0.656	1.77845*

TABLE 86. EXPERIMENTAL DATA ON dn/dT OF CsI

[Wavelength, λ, μm; Temperature Derivative of Refractive Index, dn/dT, 10^{-5} K^{-1}; Mean Temperature, T_m, K]

λ	dn/dT
CURVE 1 T_m = 296.0 K	
0.305	-0.800
0.352	-0.872
0.410	-0.973
0.422	-0.944
0.469	-0.978
0.519	-0.993
0.541	-1.003
0.566	-0.986
0.644	-0.995
1.030	-0.975
2.729	-0.952
12.417	-0.890
19.498	-0.932*
26.607	-0.889
36.141	-0.873
43.752	-0.843
46.238	-0.816

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* Not shown in figure.

TABLE 87. COMPARISON OF DISPERSION EQUATIONS PROPOSED FOR CsI

Source	Wavelength and Temperature Ranges	Dispersion Equation λ in μm; ν in cm^{-1}
Rodney, W.S. [110] 1955	0.29-53.0 μm 297 K	$n^2 = 1 + \frac{0.34617251\,\lambda^2}{\lambda^2 - (0.0229567)^2} + \frac{1.0080886\,\lambda^2}{\lambda^2 - (0.1466)^2}$ $+ \frac{0.28551800\,\lambda^2}{\lambda^2 - (0.1810)^2} + \frac{0.39743178}{\lambda^2 - (0.2120)^2}$ $+ \frac{3.3605359}{\lambda^2 - (161.0)^2}$
Vergnat, P., Claudel, J., Hadni, A., Strimer, P., and Vermillard, F. [26] 1969	53-200 μm 290 K	$n^2 - k^2 = \epsilon_{uv} + \sum_i 4\pi\rho_i \frac{\nu_i^2 (\nu_i^2 - \nu^2)}{(\nu_i^2 - \nu^2)^2 + \delta_i^2 \nu_i^2 \nu^2}$, $2nk = \sum_i 4\pi\rho_i \frac{\nu_i^3 \nu \delta_i}{(\nu_i^2 - \nu^2)^2 + \delta_i^2 \nu_i^2 \nu^2}$ *
Present work 1975	0.28-67.0 μm 293 K	$n^2 = 1.27587 + \frac{0.68689\,\lambda^2}{\lambda^2 - (0.130)^2} + \frac{0.26090\,\lambda^2}{\lambda^2 - (0.147)^2}$ $+ \frac{0.06256\,\lambda^2}{\lambda^2 - (0.163)^2} + \frac{0.06527\,\lambda^2}{\lambda^2 - (0.177)^2}$ $+ \frac{0.14991\,\lambda^2}{\lambda^2 - (0.185)^2} + \frac{0.51818\,\lambda^2}{\lambda^2 - (0.206)^2}$ $+ \frac{0.01918\,\lambda^2}{\lambda^2 - (0.218)^2} + \frac{3.38229\,\lambda^2}{\lambda^2 - (161.29)^2}$

*$i = 1, 2$; $\nu_1 = 62$ cm^{-1}, $\nu_2 = 85$ cm^{-1}; $\delta_1 = 0.07$, $\delta_2 = 0.15$; $\rho_1 = 0.26$, $\rho_2 = 0.005$; $\epsilon_{uv} = 3.22$, $\epsilon_s = 6.56$.

4. Conclusions and Recommendations

Experimental data on the refractive index of alkali halides and its temperature coefficient are exhaustively surveyed and reviewed. In addition, a number of physical properties which are related to the dispersion phenomena are selected from the open literature.

The distribution of the refractive index data among the twenty alkali halides is not even. LiF, NaCl, KCl, and KBr were extensively measured; NaF, KI, CsBr, and CsI received reasonable care; NaBr, KF, RbCl, RbBr, RbI, and CsCl were scantily and limitedly observed; while LiCl, LiBr, LiI, NaI, RbF, and CsF were practically totally ignored, except at a single wavelength.

The situation is even worse in the case of the temperature coefficient of refractive index. LiF, NaF, NaCl, KCl, and CsI were scantily investigated over a sizable wavelength range; KBr and KI were measured only over a limited wavelength region. No observation was made for the remaining 13 alkali halides.

The purpose of the present work is to generate recommended values on the refractive index and its temperature coefficient for all of the twenty alkali halides. This objective is now achieved. Equations (23) to (62) were constructed by either least-squares fitting of the selected available data to eq (10) or by correlating the related properties and empirical parameters.

Based on the *dn*/*dT* data of the five materials, LiF, NaF, NaCl, KCl, and CsI, two interesting facts were discovered (as discussed in section 2.2) and used to predict the unknown parameters of eq (19) for all the alkali halides. The results calculated by the constructed *dn*/*dT* formulas agree very well with the available data.

Equations (23) to (62) were used to generate recommended values of n, $dn/d\lambda$ and dn/dT for bulk materials at 293 K; these are summarized in figures 68, 69, and 70. It should be noted that the formulas based on scanty or null data are subject to further modification and expansion when experimental data are available.

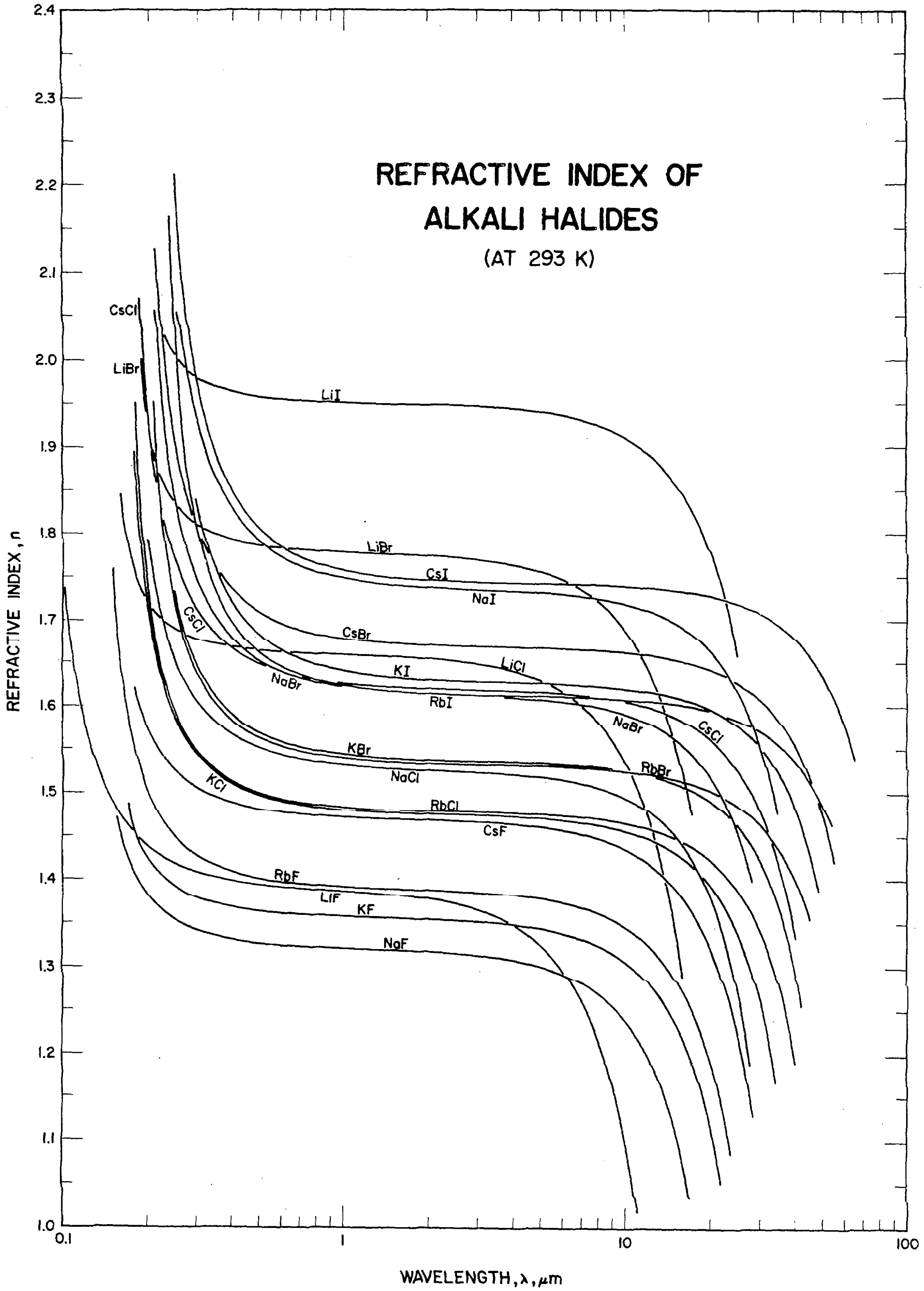

FIGURE 68. Refractive Index of Alkali Halides at 293 K

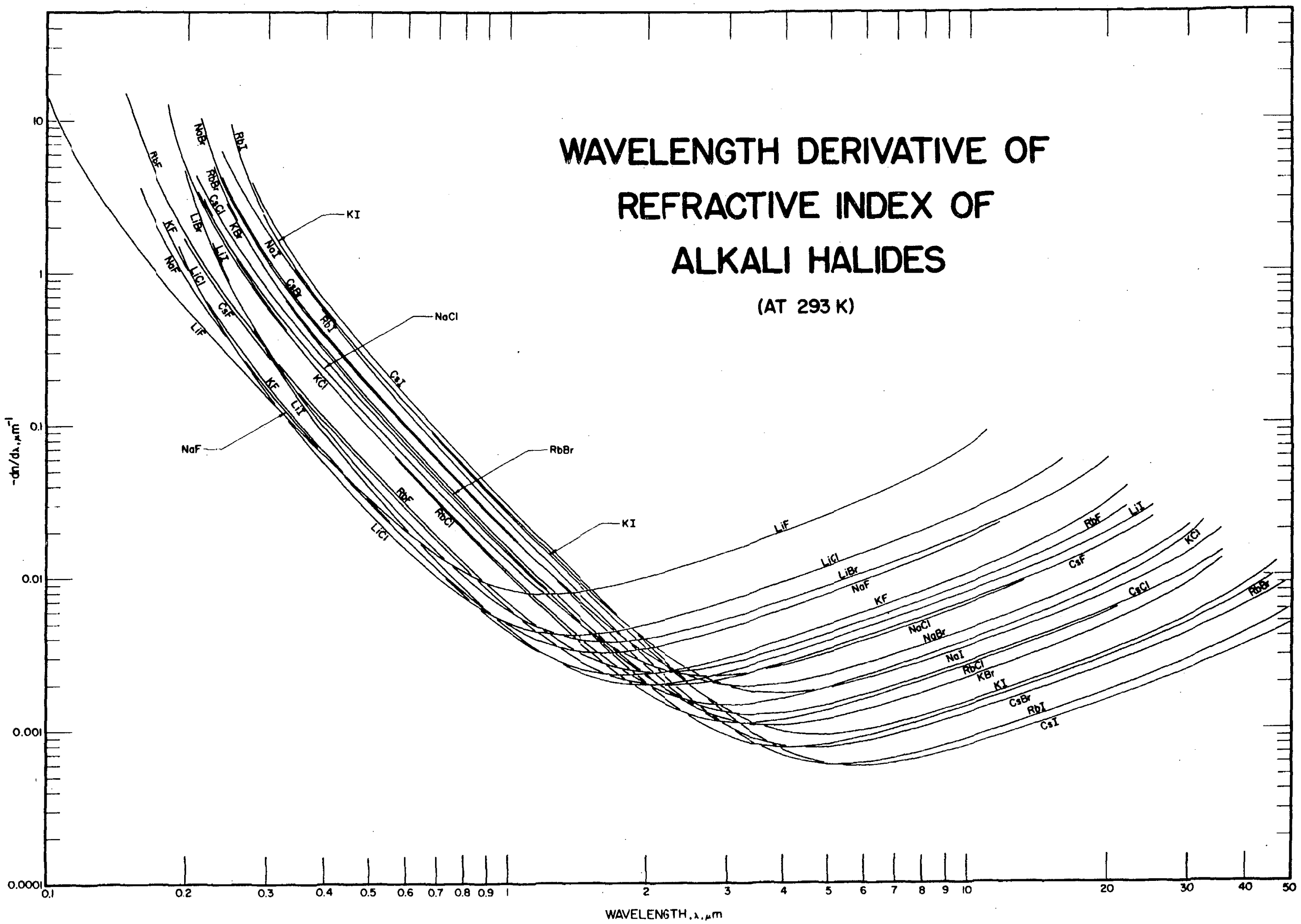

FIGURE 69. Wavelength Derivative of Refractive Index of Alkali Halides at 293 K

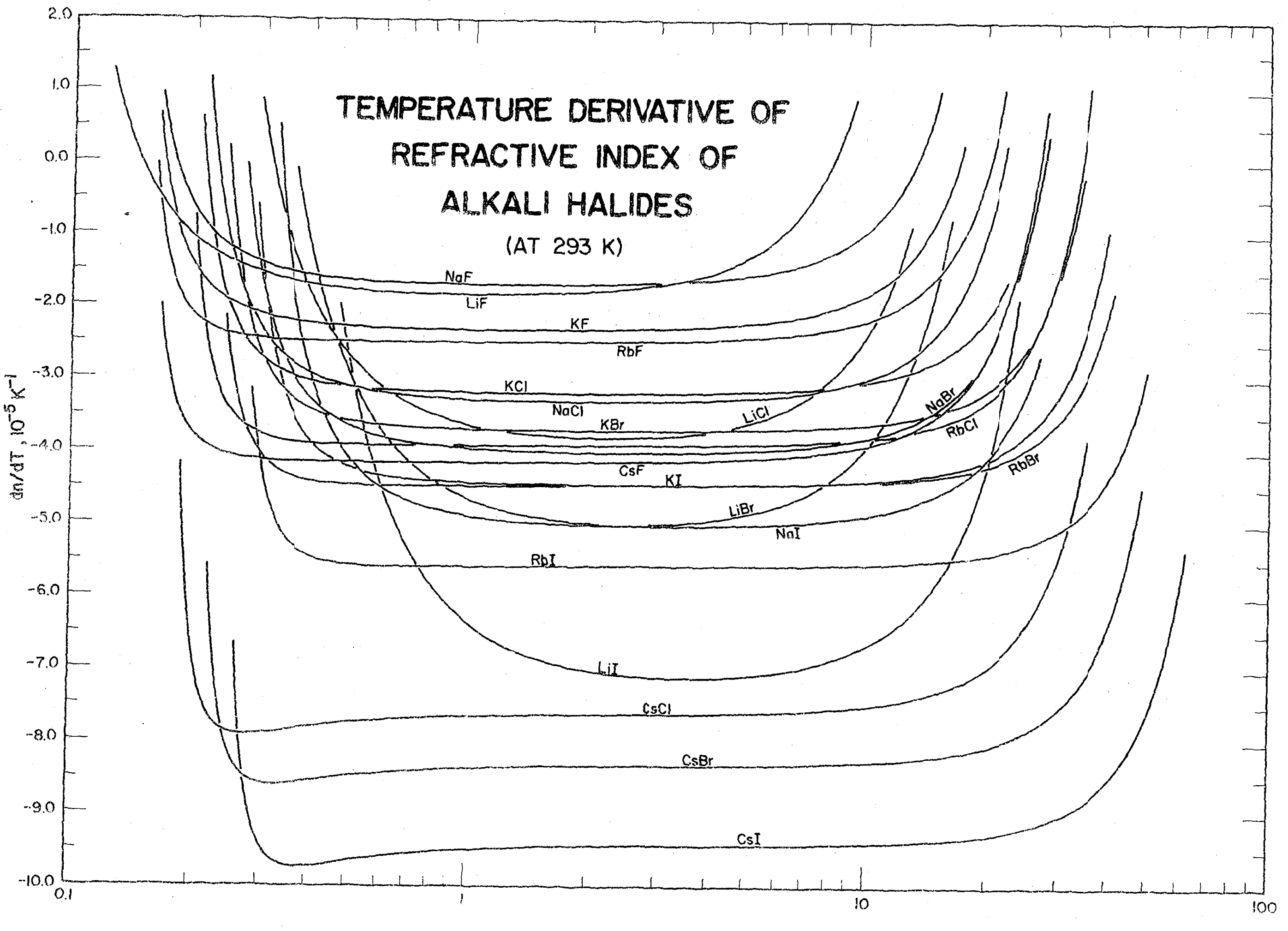

FIGURE 70. Temperature Derivative of Refractive Index of Alkali Halides at 293 K

The technology related to high-power infrared lasers is progressing rapidly and, consequently, there is an increasing need for determining the effects that exposures to high-power laser beams have on materials. Among other things, the refractive index of alkali halides at elevated temperatures are needed. Unfortunately, an exhaustive survey of the literature, as in the present work, shows that refractive indices are only available at about room temperature and at a few specified temperatures such as that of liquid nitrogen, liquid helium, etc. In a limited number of cases, the temperature coefficient of refractive index has also been measured in the vicinity of room temperature. Because of this lack in high-temperature data, some of the recent effort has been devoted to obtaining refractive indices at elevated temperatures. However, these activities are focused only on measurements at a few spectral lines characterizing the lasers of interest. Consequently, our basic knowledge of the refractive index at high temperatures is still scanty. For the purpose of providing useful data to modern science and technology, as well as for the future development of optical devices, a well-planned and systematic program of measurement of the refractive index for selected materials, including alkali halides, over a wide range of temperatures and wavelengths is highly recommended.

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