Refractive Index and Dispersion of Fluorides and Oxides

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The refractive indices of 509 oxides and 55 fluorides were analyzed using two forms of a one-term Sellmeier equation: (1) $1/(n^2-1)=-A/\lambda^2+B$, where A, the slope of the plot of $(n^2-1)^{-1}$ versus λ^{-2} in units of 10^{-16} m^2, gives a measure of dispersion and B, the intercept of the plot at $\lambda=\infty$, gives $n_\infty=(1+1/B)^{1/2}$ and (2) $n^2-1=E_dE_o/(E_o^2-(\hbar\omega)^2)$, where $\hbar\omega$=the photon energy, E_o=the average single oscillator (Sellmeier) energy gap, and E_d=the average oscillator strength, which measures the strength of interband optical transitions. Form (1) was used to calculate n at $\lambda=589.3$ nm (n_D) and n at $\lambda=\infty$ (n_∞), and the dispersion constant A. The total mean polarizabilility for each compound was calculated using the Lorenz–Lorentz equation: $\alpha_e=3/4\pi\ [(V_m)\ (n_\infty^2-1)/(n_\infty^2+2)]$, where V_m is the molar volume in Å^3. Provided for each compound are: n_D, n_∞, V_m, $\langle\alpha_e\rangle$, $\langle A\rangle$, $\langle B\rangle$, $\langle E_d\rangle$, $\langle E_o\rangle$, the literature reference, the method of measurement of n and estimated errors in n. Results obtained by prism, infrared reflectivity, ellipsometry, and interference methods are compared. Consistency of dispersion values among like compounds and structural families is used to evaluate the accuracy of refractive index data. Dispersion values range from 40 to 260×10^{-16} m^2 with the majority of values in the range of $60-100\times10^{-16}$ m^2. High dispersion is associated with s^2, p^6, d^{10}, and transition metal ions, H_2O, and crystalline hydrates, whereas normal dispersion values are found in borates, aluminates, gallates, silicates, germanates, phosphates, and sulfates not containing H_2O or any of the above ions. Exceptionally high dispersion is observed in liquid H_2O, Fe_2O_3, $Y_3Fe_5O_{12}$, FeOOH, $Fe_2(SO_4)_3$, UO_2, Cu_2O, V_2O_5, $MgCrO_4\cdot7H_2O$, and $Cs_2Mg(CrO_4)_2\cdot6H_2O$. © *2002 American Institute of Physics.* [DOI: 10.1063/1.1497384]

Key words: ellipsometry; infrared reflectivity; interband optical transitions; interference method; optical dispersion; oscillator strength; prism method; refractive index; Sellmeier equation; single oscillator energy gap

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1. Introduction

Refractive indices (n) and their dispersion are useful for the characterization of synthetic materials and minerals and for the prediction of linear and nonlinear refractive indices (n_2). Nonlinear refractive indices are defined by: $n = n_o + n_2\langle E^2 \rangle$ where n = observed refractive index at wavelength λ, n_o = the linear refractive index, and E = the applied optical electric field [Adair *et al.* (1989)]. For example, nonlinear refractive indices of crystalline and glassy optical crystals have been related to linear refractive indices and their dispersion [Boling *et al.* (1978); Adair *et al.* (1989); Dimitrov and Sakka (1996)]. Also, in conjunction with dispersion studies and derived values of n_∞, sets of empirical electronic ion polarizabilities α_e have been derived from (1) the Lorenz–Lorentz (LL) equation:

$$\alpha_e = 1/b[(V_m)(n_\infty^2 - 1)/(n_\infty^2 + 2)], \qquad (1)$$

where V_m is the molar volume in Å^3, $b = 4\pi/3$ [Lorentz (1880); Lorenz (1880); Tessman *et al.* (1953); Kip (1962); Anderson (1974)] and n_∞ is the value of n extrapolated to infinite wavelength from a Sellmeier equation and (2) the additivity rule for the compound $M_2M'X_4$. The additivity rule states

$$\alpha_e(M_2M'X_4) = 2\alpha_e(M^{2+}) + \alpha_e(M'^{4+}) + 4\alpha_e(X^{=}), \qquad (2)$$

where $\alpha_e(M_2M'X_4)$ is the total polarizability of the compound $M_2M'X_4$ and $\alpha_e(M^{2+})$, $\alpha_e(M'^{4+})$, and $\alpha_e(X^{=})$ are the electronic polarizabilities of M^{2+}, M'^{4+}, and $X^{=}$, respectively. Using these relations, sets of ion polarizabilities were derived from data on the alkali halides and alkaline earth chalcogenides by Tessman *et al.* (1953); Pirenne and Kartheuser (1964); Wilson and Curtis, (1970); Boswarva (1970); Coker (1976); Raghurama and Narayan (1983); and from data on a variety of minerals by Lasaga and Cygan (1982).

During the course of the determination of an improved set of electronic polarizabilities, it was necessary to obtain a relatively complete database of refractive indices and dispersion over the visible part of the spectrum (400–700 nm). Although dispersion data such as those given in the compilations of Hintze (1897), (1933), (1938), (1960); Doelter (1914), (1917); Li (1980) and the Landolt-Börnstein (1962), (1969), (1979), (1981), (1996), (hereafter referred to as LB) series have been published, there was no central location for these data and it was frequently necessary to go to original publications to obtain dispersion data. Often there is no indication of the reliability of the data. In order to obtain n_∞ and dispersion constants, it is convenient to use Sellmeier analyses. Sellmeier constants have been provided for many compounds in these publications, but because of the large variety of Sellmeier equations [Tropf *et al.* (1995)], analysis using a common Sellmeier equation was not available.

To remedy this situation a literature search from the mid 1800s to the present was done to provide a relatively complete list of refractive indices and dispersion for minerals and synthetic fluorides and oxides (509 oxides and 55 fluorides). To be of use in the LL analysis, it is necessary that composition and unit cell volumes be available. Using the dispersion data and the one-term Sellmeier equation described by DiDomenico and Wemple (1969), we calculate dispersion parameters, the long-wavelength index n_∞, and n_D, the index of refraction at the Na_D line. Using estimated experimental errors in n, comparisons of data on like compounds and trends in n and dispersion in structural families, we make a critical evaluation of the data. Finally, from the values of n_∞, the unit cell volumes, and the LL equation, we calculate the total mean polarizability $\langle \alpha_e \rangle$ for each compound.

2. Presentation of Data

2.1. Composition, Characterization, and Source

This publication provides the composition, the refractive indices at $\lambda = \infty$ (n_∞), and 589.3 nm (n_D), molar volume of the compounds V_m, volume per anion V_o, total mean electronic polarizabilities $\langle \alpha_e \rangle$, the mean dispersion parameters $\langle A \rangle$, $\langle B \rangle$, $\langle E_o \rangle$, and $\langle E_d \rangle$, along with documentation providing an indication of the method of measuring n, the precision of the measurement of n, and source reference in an easily accessible form. Molar volume V_m is the unit cell volume divided by Z, the number of molecules per unit cell. Volume

per anion V_o is defined as the molar volume divided by the number of water molecules and anions ($H_2O+O^{=}+OH^{-}+F^{-}$). In the text the values of $\langle A\rangle$, $\langle B\rangle$, $\langle E_o\rangle$, and $\langle E_d\rangle$ for uniaxial and biaxial compounds, although written A, B, E_o, and E_d, are mean values. The compositions of synthetic compounds are generally accepted as correct. In the case of synthetic compounds, we give, when known, the crystal grower. Almost all of the data reported here are from single crystals. Exceptions are PLZT (Pb–La–Zr–Ti–O_3) compositions. In this case the data from $PbTiO_3$ ceramic with $n=2.523$ ($\alpha_e=9.668$) was found to compare well to single crystal data where one paper (Singh 1971) reported $n_o=2.5218$ and $n_e=2.5226$ ($\alpha_e=9.665$) and another [Nomura *et al.* (1973)] $n=2.5617$ ($\alpha_e=9.792$). In those cases where single crystal data were not available, ceramic or polycrystalline sample is specified.

In the case of minerals we give the mineral name, the color, and where available, the source of the specimen. Mineral compositions are generally those given by the original author. Following the composition, the symbol * refers to well known compositions, either as-grown synthetic crystals or analyzed compositions of minerals. Many values of n and dispersion for oxides and minerals have been reported in the literature but we have only included those for which the unit cell is known and the composition is relatively certain. In some instances such as phenacite (Be_2SiO_4), even though no analysis was reported in the original papers, the data were included because of the high probability of the composition being correct. Many compositions, especially those reported in LB (1962), (1969), (1979), (1981), (1996); Hintze (1897), (1933), (1938), (1960); and Doelter (1914), (1917) are uncertain or questionable. In the case of the minerals, narsarsukite, leucosphenite, and sodalite, even though the analysis or unit cell dimensions are not well known, we have included the data because the refractive index was well determined. For these entries, we have used in parentheses the nominal or ideal compositions. In some cases, data from LB was omitted if the composition was uncertain and there were other examples available where the composition was known, e.g., garnets, cordierites, and beryls. In some instances such as for KH_2PO_4, where a number of accurate determinations of n have been made, we have included only 1 or 2 of the more accurate measurements.

Finally, we give the source of the data. In many cases, we give the compilation from which the data were taken, e.g., Palik (1991); Hintze (1897), (1933), (1938), (1960); or Landolt-Börnstein (1962), (1969), (1979), (1981), (1996). When convenient, we give the original reference using the CASSI (Coden listed in the Chemical Abstracts Service Source Index) (1999). Appendix 1 lists the Codens used in this paper. The effective cutoff date for literature search is January 2000, whereas the earliest source was around 1850. Although Table 1 lists many of the dispersion data published between 1850 and 2000, it is not meant to be a complete tabulation. Overall, we present data for 509 oxides and 55 fluorides.

2.2. Method of Measuring Dispersion or n_∞

Although prism techniques have been used in the majority of dispersion determinations, a variety of other techniques have also been used. We include a code describing the method used to measure the refractive indices. The prism method using either minimum deviation or perpendicular incidence [Tilton (1935); Tilton *et al.* (1949); Werner (1968); Tentori and Lerma (1990); Medenbach and Shannon (1997); Medenbach *et al.* (2001)] has been used most often (about 60% of the data given here) and can give the refractive indices accurate to the fourth or fifth decimal place. The immersion method [Werner (1968); Verkouteren *et al.* (1992)] (about 10% of the data given here) is less accurate but can give values accurate to the 4th decimal place. Infrared reflectivity (IR) measurements in conjunction with Kramers–Kronig analysis or the Lorentz oscillator model and classical dispersion theory [Barker (1964)] give the long wavelength dielectric constant, $\varepsilon_\infty=n_\infty^2$, from fitting the parameter ε_∞ to the reflectivity data. In general, data obtained in this manner (about 10% of the data given here) are accurate to the third decimal place. Some papers use an independent measurement of n_∞ and it is not always possible to distinguish these values from the fitted values. When both IR and minimum deviation measurements have been made, they have both been tabulated for comparison. Ellipsometer methods [Jellison (1997); Jellison and Modine (1997)] have been used more recently and give results somewhat less accurate than prism methods. We have compared several sets of data using both ellipsometer and prism methods and find agreement to $\pm 0.02-0.05$. Critical angle methods including the use of the Abbe–Pulfrich refractometer [Straat and Forrest (1939); Tilton (1942, 1943); Hurlbut (1984)] have been used often but not in determining dispersion. Finally, interference methods using a Michelson-type interferometer have also been used for determining dispersion [Grehn (1959); Werner (1968); Moskalev and Smirnova (1987); Shumate (1966)]. The method of measuring n is not always given. Values quoted to four decimal places in LB were assumed to be obtained by prism methods and therefore to be accurate to $\pm 0.0001-0.0005$, except when indicated otherwise.

2.3. Sellmeier Analysis

There are many dispersion formulas that have been developed to fit the refractive index over a wide range of frequencies. Many of the most common formulas are described by Tropf *et al.* (1995). However, the single-term Sellmeier equation used by DiDomenico and Wemple (1969) and Wemple and DiDomenico (1971) has the advantages of simplicity and of providing derived parameters that have physical significance. In the form

$$1/(n^2-1)=-A/\lambda^2+B, \tag{3a}$$

A, the slope of the plot of $(n^2-1)^{-1}$ versus λ^{-2} in units of 10^{-16} m^2 gives a measure of dispersion and B, the intercept

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
Simple Fluorides																			
LiF^{*+}	1.3858	1.3858	1.3858	1.3916	1.3916	1.3916	16.21	16.21	0.909	0.0064	1.0863	16.47	15.16	51	JRNBAG	47	25	1	1
NaF^{*+}	1.3196	1.3196	1.3196	1.3255	1.3255	1.3255	24.88	24.88	1.177	0.0096	1.3489	14.97	11.10	78	Ref. 7		7-105	1	2?
KF^{*}	1.355	1.355	1.355	1.360	1.360	1.360	38.07	38.07	1.981	0.0074	1.1977	16.04	13.39	76	JPCRBU	5	329	1	3
RbF^{*}	1.389	1.389	1.389	1.398	1.398	1.398	45.13	45.13	2.548	0.0101	1.0770	13.03	12.10	76	JPCRBU	5	329	1	3
CsF^{*} alpha	1.469	1.469	1.469	1.479	1.479	1.479	54.05	54.05	3.594	0.0074	0.8642	13.69	15.84	76	JPCRBU	5	329	1	3
CsF^{*} beta	1.566	1.566	1.566	1.578	1.578	1.578	54.38	54.38	4.235	0.0058	0.6884	13.78	20.02	62	Ref. 1	Rf	189	1	4
AgF film	1.73	1.73	1.73				29.77	29.77	2.837					72	JCPSA6	56	3735	4	5
MgF_2^{*+}	1.3722	1.3722	1.3838	1.3774	1.3774	1.3892	32.55	16.28	1.783	0.0062	1.1193	16.97	15.16	78	Ref. 7		7-95	1	1
MgF_2^{*}	1.38	1.38	1.38				32.55	16.28	1.800					64	PRVAAH	136	1290	3	5
CaF_2^{*+}	1.4255	1.4255	1.4255	1.4336	1.4336	1.4336	40.74	20.37	2.489	0.0074	0.9689	14.47	14.93	63	APOPAI	2	1103	1	1
CaF_2^{*}	1.430	1.430	1.430				40.74	20.37	2.512					62	PHRVAO	127	1950	3	4
SrF_2^{*+}	1.4306	1.4306	1.4306	1.4377	1.4377	1.4377	48.60	24.30	3.001	0.0064	0.9555	15.51	16.23	80	JPCRBU	9	161	1	1
SrF_2^{*}	1.44	1.44	1.44				48.60	24.30	3.058					62	PHRVAO	127	1950	3	5
BaF_2^{*+}	1.4655	1.4655	1.4655	1.4742	1.4742	1.4742	59.44	29.72	3.927	0.0066	0.8714	14.52	16.66	64	JOSAAH	54	628	1	1
BaF_2^{*}	1.47	1.47	1.47				59.44	29.74	3.959					62	PHRVAO	127	1950	3	5
MnF_2^{*}	1.462	1.462	1.491	1.472	1.472	1.501	39.30	19.65	2.626	0.0063	0.8547	14.76	17.27	73	PSSBBD	57	681	8	5
FeF_2^{*}	1.498	1.498	1.509	1.514	1.514	1.524	36.56	18.28	2.574	0.0095	0.7961	11.57	14.54	73	PSSBBD	57	681	8	5
FeF_2^{*}	1.508	1.508	1.512				36.56	18.28	2.608					80	JOPQAG	41	543	5	4
NiF_2^{*} FL	1.493	1.493	1.529	1.526	1.526	1.561	33.35	16.67	2.361	0.0198	0.7909	8.00	10.11	73	PSSBBD	57	681	8	5
ZnF_2^{*}	1.486	1.486	1.517	1.495	1.495	1.525	34.75	17.38	2.425	0.0059	0.8076	14.83	18.37	73	PSSBBD	57	681	8	5
ZnF_2^{*}	1.45	1.45	1.61				34.75	17.38	2.454					64	PRVAAH	136	1290	3	5
CdF_2^{*}	1.49	1.49	1.49				39.14	19.57	2.701					65	PRVAAH	139	1211	3	7
PbF_2^{*+}	1.7248	1.7248	1.7248	1.7668	1.7668	1.7668	52.38	26.19	4.964	0.0114	0.5042	8.41	16.67	86	Ref. 4		28	1	1
PbF_2^{*+}	1.7272	1.7272	1.7272	1.7680	1.7680	1.7680	52.38	26.19	4.977	0.0125	0.5063	8.05	15.90	78	Ref. 7		7-94	1	1
PbF_2^{*}	1.58	1.58	1.58				52.38	26.19	4.162					65	PRVAAH	139	1211	3	7
EuF_2^{*}	1.555	1.555	1.555				48.98	24.49	3.753					66	JPCSAW	27	621	2	4
LaF_3^{*+}	1.5954	1.5954	1.5910	1.6058	1.6058	1.6004	54.77	18.26	4.436	0.0046	0.6490	15.03	23.15	66	APOPAI	5	1966	1	1
LaF_3^{*+}	1.5934	1.5934	1.5860	1.6039	1.6039	1.5968	54.77	18.26	4.418	0.0049	0.6532	14.59	22.34	83	PMABDJ	48	203	1	2
CeF_3^{*+}	1.6050	1.6050	1.5985	1.6183	1.6183	1.6113	53.14	17.71	4.357	0.0058	0.6374	13.23	20.76	83	PMABDJ	48	203	1	2
PrF_3^{*+}	1.6077	1.6077	1.6017	1.6207	1.6207	1.6146	51.94	17.31	4.275	0.0057	0.6336	13.36	21.09	83	PMABDJ	48	203	1	2
NdF_3^{*+}	1.6074	1.6074	1.6016	1.6191	1.6191	1.6132	51.35	17.12	4.225	0.0051	0.6339	14.08	22.21	83	PMABDJ	48	203	1	2
TbF_3^{*+}	1.5931	1.5768	1.5510	1.6034	1.5868	1.5603	49.64	16.54	3.908	0.0049	0.6782	14.94	22.03	81	PRBMDO	23	6307	1	2
Complex Fluorides																			
$NaCoF_3^{*}$ IR	1.470	1.470	1.470				59.11	19.70	3.937					73	PSSABA	16	419	3	4
$NaNiF_3^{*}$ IR	1.442	1.442	1.442				57.13	19.04	3.609					73	PSSABA	16	419	3	4
$KMgF_3^{*+}$	1.3975	1.3975	1.3975	1.4030	1.4030	1.4030	64.00	21.33	3.683	0.0058	1.0494	16.96	16.16	75	OPSUA3	39	390	1	1
$KMgF_3^{*}$	1.43	1.43	1.43				64.00	21.33	3.947					67	JAPIAU	38	4616	3	5
$KMnF_3^{*}$	1.45	1.45	1.45				73.45	21.33	4.712					67	JAPIAU	38	4616	3	5
$KMnF_3^{*+}$ FL	1.4382	1.4382	1.4382	1.4469	1.4469	1.4469	73.45	24.48	4.605	0.0075	0.9360	14.17	15.14	75	OPSUA3	39	390	1	1
$KMnF_3^{*}$ FL	1.439	1.439	1.439				73.45	24.48	4.612					72	OPSUA3	33	97	3	4
$KCoF_3^{*}$	1.500	1.500	1.500				67.32	22.44	4.727					72	OPSUA3	33	97	3	4
$KCoF_3^{*}$	1.50	1.50	1.50				67.32	22.44	4.727					67	JAPIAU	38	4616	3	5
$KNiF_3^{*+}$	1.4827	1.4827	1.4827	1.4929	1.4929	1.4929	64.67	21.56	4.407	0.0071	0.8344	13.69	16.41	84	SPHJAR	59	1316	6	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.) —Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$KNiF_3^*$	1.52	1.52	1.52				64.67	21.56	4.694					67	JAPIAU	38	4616	3	5
$KZnF_3^*$	1.53	1.53	1.53				66.68	22.22	4.917					67	JAPIAU	38	4616	3	5
$RbMnF_3^{*+}$	1.4745	1.4745	1.4745	1.4837	1.4837	1.4837	76.20	25.40	5.117	0.0066	0.8516	14.32	16.81	84	SPHJAR	59	1316	6	1
$RbMnF_3^*$	1.59	1.59	1.59				76.20	25.40	6.139					67	JAPIAU	38	4616	3	5
$CsNiF_3^{*+}$	1.4681	1.4681	1.4983	1.4784	1.4784	1.5102	87.98	29.33	5.947	0.0077	0.8447	13.26	15.70	82	PRBMDO	25	6474	1	1
$BaLiF_3^*$	1.50	1.50	1.50				63.66	21.22	4.470					89	JCOMEL	1	5613	3	4
$LiYF_4^{*+}$	1.4464	1.4464	1.4684	1.4536	1.4536	1.4763	75.67	18.92	4.890	0.0059	0.8988	15.55	17.30	75	APOPAI	14	2056	1	1
$LiTbF_4^{*+}$	1.4648	1.4648	1.4934	1.4735	1.4735	1.5029	73.33	18.33	4.923	0.0066	0.8529	14.40	16.89	78	JAPIAU	49	3464	5	1
$NaBF_4^{*+}$	1.2973	1.3035	1.2971	1.3009	1.3071	1.3006	72.89	18.22	3.247	0.0067	1.4532	18.64	12.82	86	ZEKRDZ	174	313	1	1
KBF_4^{*+} avogadroite (synthetic)	1.3193	1.3197	1.3200	1.3243	1.3248	1.3113	83.42	20.85	3.947	0.0082	1.3706	16.36	11.94	38	Ref. 10C		48	1	2
$BaMgF_4^{*+}$ FE	1.4660	1.4411	1.4585	1.4724	1.4490	1.4657	86.93	21.73	5.633	0.0057	0.8953	15.79	17.64	77	APHYCC	14	403	1	1
$BaMgF_4^*$ FE	1.465	1.435	1.455	1.471	1.447	1.465	86.93	21.73	5.595	0.0075	0.9034	13.85	15.33	75	JAPIAU	46	4645	1	3?
$BaZnF_4^{*+}$ FE	1.5107	1.4871	1.5037	1.5214	1.4967	1.5144	89.38	22.35	6.281	0.0067	0.7994	13.80	17.27	75	JAPIAU	46	4645	1	2
$Na_2SbF_5^*$	1.441	1.463	1.422	1.467	1.476	1.435	123.63	24.73	7.809	0.0142	0.9276	10.23	11.0	78	JSSCBI	23	187	5	5
Na_2SiF_6 malladrite	1.3090	1.3090	1.3053	1.3124	1.3124	1.3088	114.44	19.07	5.230	0.0061	1.4078	19.26	13.6	62	Ref. 1	Rf	143	1	2
$Rb_2SiF_6^{*+}$	1.3484	1.3484	1.3484	1.3534	1.3534	1.3534	150.94	25.16	7.722	0.0068	1.2221	16.96	13.8	82	INOMAF	18	570	2	2
$Cs_2SiF_6^{*+}$	1.3793	1.3793	1.3793	1.3847	1.3847	1.3847	177.37	29.56	9.792	0.0062	1.1081	16.90	15.2	82	INOMAF	18	570	2	2
$Cs_2SiF_6^*$	1.382	1.382	1.382	1.391	1.391	1.391	177.37	29.56	9.854	0.0098	1.0985	13.39	12.1	35	ZPCBAL	31	292	2	3?
$Na_3Li_3Al_2F_{12}$ cryolithionite	1.3337	1.3337	1.3337	1.3395	1.3395	1.3395	222.82	18.57	10.963	0.0087	1.2841	15.40	12.0	62	Ref. 1	Rf	18	1	2
$Na_2GeF_6^{*+}$	1.3311	1.3311	1.3252	1.3376	1.3376	1.3317	121.01	20.17	5.880	0.0101	1.3047	14.40	11.0	82	INOMAF	18	570	2	2?
$Rb_2GeF_6^{*+}$	1.3904	1.3904	1.3839	1.3961	1.3961	1.3898	147.13	24.52	8.293	0.0064	1.0786	16.47	15.2	82	INOMAF	18	570	2	2
$Cs_2GeF_6^{*+}$	1.3921	1.3921	1.3921	1.3985	1.3985	1.3985	183.53	30.59	10.436	0.0068	1.0660	15.80	14.8	82	INOMAF	18	570	2	2
$Cs_2GeF_6^*$	1.417	1.417	1.417	1.430	1.430	1.430	183.53	30.59	11.018	0.0117	0.9918	11.67	11.7	35	ZPCBAL	31	292	2	3?
$LiCaAl_{.99}Cr_{.01}F_6^{*+}$	1.3869	1.3869	1.3854	1.3923	1.3923	1.3909	104.71	17.45	5.877	0.0061	1.0845	16.91	15.5	95	Ref. 13		599	1	1
$BaY_2F_8^{*+}$	1.5149	1.5266	1.5063	1.5235	1.5356	1.5145	154.39	19.30	11.131	0.0053	0.7707	15.28	19.8	95	Ref. 13		600	1	1
$MgSiF_6 \cdot 6\ H_2O^{*+}$ FL 298 K	1.3372	1.3372	1.3532	1.3440	1.3440	1.3601	255.66	21.30	12.880	0.0097	1.2470	14.34	11.5	74	ACPHAA	1	5	1	2
$MnSiF_6 \cdot 6\ H_2O^{*+}$ FL 223 K	1.3492	1.3492	1.3663	1.3568	1.3568	1.3738	265.60	22.13	13.816	0.0101	1.1974	13.78	11.5	62	Ref. 1	Rf	189	1	2
$FeSiF_6 \cdot 6\ H_2O^{*+}$ FL?	1.3556	1.3556	1.3780	1.3638	1.3638	1.3845	257.70	21.47	13.681	0.0097	1.1667	13.89	11.9	62	Ref. 1	Rf	589	1	2
$NiSiF_6 \cdot 6\ H_2O^{*+}$ FL?	1.3799	1.3799	1.3962	1.3902	1.3902	1.4060	240.65	20.05	13.474	0.0112	1.0885	12.45	11.4	74	ACPHAA	1	5	1	2
$CuSiF_6 \cdot 6\ H_2O^{*+}$ FL?	1.3998	1.3998	1.4017	1.4092	1.4092	1.4090	235.10	19.62	13.619	0.0089	1.0402	13.66	13.1	62	Ref. 1	Rf	2737	1	2
$ZnSiF_6 \cdot 6\ H_2O^{*+}$ FL?	1.3747	1.3747	1.3876	1.3823	1.3823	1.3954	245.30	20.44	13.533	0.0089	1.1093	14.14	12.7	62	Ref. 1	Rf	2737	1	2
$PbFCl^*$ matlockite (Cromford, Derbyshire)	2.058	2.058	1.944	2.145	2.145	2.006	61.00	30.55	7.378	0.0106	0.3260	7.01	21.50	62	Ref. 1	Rf	300	1	4
Chlorides																			
$LiCl^{*+}$	1.6580	1.6580	1.6580				33.94	33.94	2.984					76	JPCRBU	5	329	1	1
$NaCl^{*+}$ halite	1.5260	1.5260	1.5260	1.5443	1.5443	1.5443	44.86	44.86	3.287	0.0106	0.7527	10.64	14.14	62	Ref. 1	Rf	3905	1	1
KCl^{*+} sylvite	1.4732	1.4732	1.4732	1.4898	1.4898	1.4898	62.31	62.31	4.174	0.0120	0.8546	10.68	12.50	62	Ref. 1	Rf	237	1	1
$RbCl^{*+}$	1.4760	1.4760	1.4760				71.26	71.26	4.798					76	JPCRBU	5	329	1	1
$CuCl^*$	1.884	1.884	1.884	1.973	1.973	1.973	39.72	39.72	4.356	0.0161	0.3919	6.25	15.94	28	ZEKRDZ	68	82	2	3
$AgCl^{*+}$	1.9911	1.9911	1.9911	2.0615	2.0615	2.0615	42.72	42.72	5.069	0.0103	0.3373	7.24	21.46	62	Ref. 1	Rf	2749	1	2
$TlCl^*$	2.112	2.112	2.112	2.249	2.249	2.249	56.72	56.72	7.253	0.0148	0.2888	5.59	19.37	62	Ref. 1	Rf	12	1	4
$SrCl_2^*$	1.691	1.691	1.691				84.90	42.45	7.756					74	PSSBBD	62	511	3	4
Simple Oxides																			
H_2O^{*+} ice	1.3011	1.3011	1.3025	1.3091	1.3091	1.3105	32.14	32.14	1.442	0.0146	1.4408	12.57	8.72	62	Ref. 1	Rf	2835	1	1
H_2O^{*+} ice	1.3007	1.3007	1.3021	1.3090	1.3090	1.3105	32.14	32.14	1.440	0.0152	1.4428	12.31	8.53	62	Ref. 1	Rf	2835	1	1
H_2O^* water	1.319	1.319	1.319	1.333	1.333	1.333				0.0225	1.3536	9.80	7.24	91	Ref. 9		1059	8	3

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
Li_2O	1.637	1.637	1.637				24.51	24.51	2.100					84	SSCOA4	51	421	3	5
$LiOH^*$	1.4491	1.4491	1.4408	1.4639	1.4639	1.4518	27.44	27.44	1.748	0.0110	0.9160	11.53	12.59	33	ZPCBAL	20	65	2	1
Cu_2O cuprite film	2.54	2.54	2.54				38.91	38.91	5.992					63	JCPSA6	39	1789	3	5
Cu_2O cuprite polyxtal	2.55	2.55	2.55				38.91	38.91	6.012					73	JPCSAW	34	2201	3	5
Cu_2O cuprite polyxtal	2.57	2.57	2.57				38.91	38.91	6.051					66	PHRVAO	141	803	3	5
Cu_2O cuprite	2.27	2.27	2.27	2.67	2.67	2.67	38.91	38.91	5.393	0.0267	0.2401	3.79	15.80	62	Ref. 1	Rf	2749	8	5
Cu_2O cuprite [polyxtal reflectance data]	2.68	2.68	2.68	2.88	2.88	2.88	38.91	38.91	6.254	0.0086	0.1616	5.48	33.90	79	JJAPA5	18	1043	8	5?
BeO^{*+}	1.7050	1.7050	1.7201	1.7184	1.7184	1.7342	13.79	13.79	1.286	0.0043	0.5197	13.94	26.82	66	AMMIAY	51	141	1	1
MgO^{*+}	1.7147	1.7147	1.7147	1.7355	1.7355	1.7355	18.67	18.67	1.750	0.0064	0.5154	11.35	22.02	52	JRNBAG	49	249	1	1
$Mg(OH)_2^+$ brucite (Wood Mine, Lancaster, PA)	1.5501	1.5501	1.5728	1.5665	1.5665	1.5853	40.90	20.45	3.146	0.0079	0.7014	11.94	17.03	62	Ref. 1	Rf	697	1	2
CaO^{*+}	1.8053	1.8053	1.8053	1.8396	1.8396	1.8396	27.83	27.83	2.854	0.0080	0.4426	9.38	21.19	66	JAPIAU	37	2450	1	1
SrO^{*+}	1.8277	1.8277	1.8277	1.8710	1.8710	1.8710	33.16	33.16	3.469	0.0095	0.4272	8.48	19.85	66	PHRVAO	143	595	1	1
BaO^{*+}	1.9167	1.9167	1.9167	1.9841	1.9841	1.9841	42.48	42.48	4.779	0.0116	0.3740	7.17	19.17	75	JAPIAU	46	443	1	1
MnO^*	2.11	2.11	2.11				22.00	22.00	2.810					69	SSCOA4	7	977	3	5
MnO^*	2.22	2.22	2.22				22.00	22.00	2.978					69	SSCOA4	7	109	3	5
MnO [polyxtal reflectance data]	2.07	2.07	2.07	2.15	2.15	2.15	22.00	22.00	2.745	0.0099	0.3050	7.02	23.02	79	JJAPA5	18	1043	8	5
CoO^*	2.30	2.30	2.30				19.30	19.30	2.711					65	JAPIAU	36	2446	3	5
NiO^*	2.39	2.39	2.39				18.21	18.21	2.656					65	JAPIAU	36	2446	3	5
NiO^*	2.32	2.32	2.32				18.21	18.21	2.581					59	PHRVAO	114	1507	3	5
ZnO^{*+}	1.9102	1.9102	1.9245	2.0222	2.0222	2.0256	23.55	23.55	2.646	0.0159	0.3690	6.09	16.51	65	JAPIAU	36	1674	1	1
ZnO^*	1.901	1.901	1.911	2.008	2.008	2.023	23.55	23.55	2.624	0.0185	0.3808	5.74	15.08	54	ZAPHAX	6	257	1	3
ZnO^*	1.898	1.898	1.914	2.004	2.004	2.021	23.55	23.55	2.622	0.0182	0.3814	5.79	15.19	98	PRBMDO	58	3586	4	3
ZnO [polyxtal reflectance data]	1.90	1.90	1.90	1.99	1.99	1.99	23.55	23.55	2.616	0.0152	0.3813	6.33	16.61	79	JJAPA5	18	1043	8	5
CdO film	2.37	2.37	2.37				25.88	25.88	3.745					60	ZEPYAA	158	511	8	5
PbO^* red litharge FL 200 K	2.535	2.535	2.665				38.35	38.35	5.979					77	JCDTBI	1977	1096	3	4
EuO^*	1.960	1.960	1.960				34.00	34.00	3.948					68	PKOMA3	8	80	1	4
EuO^*	2.30	2.30	2.30				34.00	34.00	4.777					69	JPCSAW	30	1403	3	7
$B_2O_3^*$ (estimated n_∞ values)	1.635	1.635	1.602				45.26	15.09	3.815					38	AJSCAP	35	143	2	5
$B_2O_3^*$ (n_D values)	1.648	1.648	1.615				45.26	15.09	3.878					38	AJSCAP	35	143	2	5
$Al_2O_3^{*+}$	1.7520	1.7520	1.7449	1.7673	1.7673	1.7598	42.45	14.15	4.127	0.0042	0.4851	13.53	27.89	58	JOSAAH	48	629	1	1
$Al_2O_3^{*+}$	1.7504	1.7504	1.7430				42.45	14.15	4.120					94	JAPIAU	76	8032	4	2
$Al_2O_3^*$	1.79	1.79	1.76				42.45	14.15	4.252					63	PRVAAH	132	1474	3	5
$Al_{0.99}Fe_{.01}OOH^{*+}$ diaspore (Turkey)	1.6881	1.7070	1.7325	1.7028	1.7233	1.7503	29.51	14.75	2.750	0.0051	0.5209	12.77	24.51	97	JOBPDE	14	3299	1	1
$Sc_2O_3^{*+}$ (W. Yen)	1.9536	1.9536	1.9536	1.9943	1.9943	1.9943	59.64	19.88	6.894	0.0066	0.3550	9.24	26.03	01	JOAOF8	3	174	1	1
$Cr_2O_3^*$	2.490	2.490	2.470				48.10	16.03	7.265					65	PHVAAH	138	A530	3	4
Mn_2O_3 [polyxtal reflectance data]	2.81	2.81	2.81	2.62	2.62	2.62	52.15	17.38	8.676		0.1453	5.16	35.4	79	JJAPA5	18	1043	8	5?
$Fe_{1.98}Fe^{(2+)}_{.02}O_3^*$ hematite (Elba)	2.602	2.602	2.446	3.190	3.190	2.912	50.32	16.77	7.774	0.0226	0.1824	3.59	19.68	62	Ref. 1	Rf	685	8	3
Fe_2O_3 [average n, polyxtal reflectance data]	2.50	2.50	2.50	3.10	3.10	3.10	50.32	16.77	7.645	0.0255	0.1898	3.45	18.17	79	JJAPA5	18	1043	8	5
FeOOH goethite	2.123	2.209	2.220	2.274	2.403	2.409	34.65	17.33	4.606	0.0162	0.2658	5.12	19.28	62	Ref. 1	Rf	3562	8	3
FeOOH lepidocrocite	1.861	2.011	2.194	1.938	2.200	2.515	37.34	18.67	4.522	0.0215	0.3323	4.97	14.96	19	AJSCAP	47	311	2	5
$Y_2O_3^{*+}$	1.8915	1.8915	1.8915	1.9311	1.9311	1.9311	74.50	24.83	8.220	0.0075	0.3879	9.11	23.50	68	JJAPA5	7	404	8	2
$Y_2O_3^{*+}$	1.8962	1.8962	1.8962	1.9294	1.9294	1.9294	74.50	24.83	8.250	0.0062	0.3853	9.93	25.78	91	Ref. 9		1079	1	2?
$Y_2O_3^{*+}$	1.8903	1.8903	1.8903	1.9301	1.9301	1.9301	74.50	24.83	8.212	0.0075	0.3886	9.09	23.38	91	Ref. 9		1079	1	2
$Y_2O_3^{*+}$	1.8815	1.8815	1.8815	1.9489	1.9489	1.9489	74.50	24.83	8.154	0.0126	0.3937	7.07	17.95	91	Ref. 9		1079	1	2?

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Y_2O_3^*$	1.884	1.884	1.884	1.912	1.912	1.912	74.50	24.83	8.171	0.0053	0.3921	10.84	27.65	56	ANCHAM	28	2023	2	3?
In_2O_3 film	2.00	2.00	2.00				64.72	21.57	7.725					86	JAPIAU	60	R123	3	5
$As_2O_3^{*+}$ arsenolite (probably synthetic)	1.7185	1.7185	1.7185	1.7537	1.7537	1.7537	84.96	28.32	7.998	0.0105	0.5119	8.85	17.28	97	JOBPDE	14	3299	1	1
$As_2O_3^*$ arsenolite	1.725	1.725	1.725	1.755	1.755	1.755	84.96	28.32	8.053	0.0087	0.5059	9.63	19.03	62	Ref. 1	Rf	2565	8	3?
$Sb_2O_3^{*+}$ senarmontite (Algeria)	2.0000	2.0000	2.0000	2.0817	2.0817	2.0817	86.68	28.89	10.347	0.0116	0.3334	6.78	20.33	97	JOBPDE	14	3299	1	1
$Sb_2O_3^*$ senarmonite	2.03	2.03	2.03	2.09	2.09	2.09	86.68	28.89	10.551	0.0080	0.3209	8.03	25.02	62	Ref. 1	Rf	204	8	5?
$Bi_2O_3^*$ alpha	2.344	2.437	2.530	2.572	2.660	2.785	82.60	27.53	12.268	0.0138	0.2034	4.85	23.86	76	MRBUAC	11	1551	1	3
$Bi_2O_3^*$ [IR data, not accurate, not cubic]	2.0	2.0	2.0				82.60	27.53	9.860					70	PSSABA	2	K149	8	5
$Bi_{12}SiO_{20}^*$	2.370	2.370	2.370	2.558	2.558	2.558	514.80	25.74	74.494	0.0126	0.2167	5.25	24.2	71	JAPIAU	42	493	1	4
$Bi_{12}GeO_{20}^{*+}$	2.386	2.386	2.386	2.561	2.561	2.561	521.30	26.07	75.920	0.0115	0.2130	5.44	25.5	83	JOSAAH	73	495	8	6
$Bi_{12}TiO_{20}^{*+}$	2.4065	2.4065	2.4065	2.5873	2.5873	2.5873	526.54	26.33	77.301	0.0115	0.2087	5.39	25.8	97	JNOMFV	6	235	1	2
$Bi_{12}TiO_{20}:Ga^{*+}$	2.4005	2.4005	2.4005	2.5945	2.5945	2.5945	526.54	26.33	77.121	0.0123	0.2100	5.22	24.8	96	JOBPDE	13	908	1	2
$Bi_{12}TiO_{20}^*$	2.419	2.419	2.419	2.588	2.588	2.588	526.54	26.33	77.673	0.0106	0.2060	5.58	27.0	93	PSSABA	140	273	1	3
$Bi_{12}Ga_{.72}Bi_{.28}O_{19.5}$	2.403	2.403	2.403	2.611	2.611	2.611	526.60	26.33	77.205	0.0130	0.2094	5.07	24.2	96	JOBPDE	13	908	1	4
$Pr_2O_3^*$ cubic	1.88	1.88	1.88	1.94	1.94	1.94	86.87	28.96	9.497	0.0119	0.3947	7.28	18.44	73	JSTCAM	13	871	2	5?
$Nd_2O_3^*$ cubic FL 293 K	1.86	1.86	1.86	1.92	1.92	1.92	85.01	28.34	9.143	0.0126	0.4085	7.21	17.65	73	JSTCAM	13	871	2	5?
Nd_2O_3 hexagonal	2.067	2.067	2.067				76.78	25.59	9.563					01	JOAOF8	3	174	8	3
(n_∞ from extrapolation of α vs at. no.)																			
Sm_2O_3 monoclinic	2.052	2.052	2.052				74.87	24.96	9.240					01	JOAOF8	3	174	8	3
(n_∞ from extrapolation of α vs. at. no.)																			
$Eu_2O_3^*$	1.901	1.901	1.901	1.969	1.969	1.969	80.05	26.68	8.898	0.0121	0.3825	7.11	18.58	73	JSTCAM	13	871	2	5?
$Eu_2O_3^*$ cubic	1.940	1.940	1.940				80.05	26.68	9.163					01	JOAOF8	3	174	8	3
(n_∞ from interpolation of n_∞ vs at. no.)																			
$Gd_{1.98}Nd_{.02}O_3^*$ [Sci. Mat. Corp	2.021	2.055	2.055	2.065	2.102	2.102	72.41	24.13	8.890	0.0062	0.3151	9.01	28.61	01	JOAOF8	3	174	1	3
(assume $n_y=n_z$)]																			
$Gd_2O_3^*$ cubic	1.90	1.90	1.90	1.96	1.96	1.96	79.01	26.34	8.775	0.0122	0.3847	7.10	18.44	73	JSTCAM	13	871	2	5?
$Gd_2O_3^*$ cubic	1.935	1.935	1.935				79.01	26.34	9.011					01	JOAOF8	3	174	8	3
(n_∞ from interpolation of n_∞ vs at. no.)																			
$Tb_2O_3^*$	1.90	1.90	1.90	1.96	1.96	1.96	77.19	25.73	8.573	0.0122	0.3853	7.09	18.41	73	JSTCAM	13	871	2	5?
$Tb_2O_3^*$	1.935	1.935	1.935				77.19	25.73	8.804					01	JOAOF8	3	174	8	3
(n_∞ from interpolation of n_∞ vs at. no.)																			
$Dy_2O_3^{*+}$ (W. Yen)	1.9332	1.9332	1.9332	1.9757	1.9757	1.9757	75.86	25.29	8.640	0.0073	0.3653	8.97	24.54	01	JOAOF8	3	174	1	1
$Dy_2O_3^*$	1.895	1.895	1.895	1.963	1.963	1.963	75.86	25.29	8.393	0.0123	0.3858	7.09	18.38	73	JSTCAM	13	871	2	4?
$Ho_2O_3^*$	1.892	1.892	1.892	1.960	1.960	1.960	74.57	24.86	8.231	0.0124	0.3875	7.08	18.27	73	JSTCAM	13	871	2	4?
$Ho_2O_3^*$ (n_∞ from interpolation of n_∞ vs at. no.)	1.928	1.928	1.928				74.57	24.86	8.461					01	JOAOF8	3	174	8	4
$Er_2O_3^*$ (n_∞ from interpolation of n_∞ vs at. no.)	1.923	1.923	1.923				73.33	24.44	8.289					01	JOAOF8	3	174	8	3
$Er_2O_3^*$	1.930	1.930	1.930	1.959	1.959	1.959	73.33	24.44	8.333	0.0050	0.3668	10.82	29.51	56	ANCHAM	28	2023	2	3
$Er_2O_3^*$	1.888	1.888	1.888	1.956	1.956	1.956	73.33	24.44	8.068	0.0125	0.3898	7.07	18.14	73	JSTCAM	13	871	2	3?
$Er_2O_3^*$	1.95	1.95	1.95				73.33	24.44	8.455					87	SPSSA7	29	1904	4	5
$Tm_2O_3^*$	1.882	1.882	1.882	1.950	1.950	1.950	72.07	24.02	7.892	0.0126	0.3933	7.05	17.93	73	JSTCAM	13	871	2	3?
$Tm_2O_3^*$ (n_∞ from interpolation of n_∞ vs at. no.)	1.918	1.918	1.918				72.07	24.02	8.116					01	JOAOF8	3	174	8	3
$Yb_2O_3^{*+}$	1.9088	1.9088	1.9088	1.9468	1.9468	1.9468	70.98	23.66	7.937	0.0069	0.3782	9.38	24.81	97	JOBPDE	14	3299	1	1
$Yb_2O_3^{*+}$ (W. Yen)	1.9096	1.9096	1.9096	1.9470	1.9470	1.9470	70.98	23.66	7.942	0.0068	0.3778	9.44	24.98	01	JOAOF8	3	174	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Yb_2O_3^*$	1.879	1.879	1.879	1.942	1.942	1.942	70.98	23.66	7.754	0.0119	0.3953	7.27	18.41	73	JSTCAM	13	871	2	3?
$Lu_2O_3^{*+}$ (W. Yen)	1.8997	1.8997	1.8997	1.9349	1.9349	1.9349	70.10	23.37	7.784	0.0066	0.3833	9.67	25.23	01	JOAOF8	3	174	1	1
$Lu_2O_3^*$	1.867	1.867	1.867	1.930	1.930	1.930	70.10	23.37	7.583	0.0123	0.4024	7.24	17.99	73	JSTCAM	13	871	2	3?
SiO_2^{*+}	1.5324	1.5324	1.5411	1.5435	1.5435	1.5526	37.66	18.83	2.800	0.0063	0.7369	13.62	18.49	78	Ref. 7		7-82	1	1
SiO_2^{*+} smoky quartz	1.5306	1.5306	1.5393	1.5439	1.5439	1.5530	37.66	18.83	2.793	0.0076	0.7399	12.47	16.86	97	NJMIAK	11	259	1	1?
SiO_2^{*+} amethyst (Zambia)	1.5330	1.5330	1.5418	1.5444	1.5444	1.5535	37.66	18.83	2.803	0.0065	0.7359	13.45	18.28	97	JOBPDE	14	3299	1	1
SiO_2^{*+} amethyst (Para, Brazil)	1.5330	1.5330	1.5415	1.5444	1.5444	1.5533	37.66	18.83	2.803	0.0065	0.7360	13.46	18.28	97	JOBPDE	14	3299	1	1
SiO_2^{*+} (G. Rossman, X-O)	1.5327	1.5327	1.5412	1.5441	1.5441	1.5531	37.66	18.83	2.801	0.0065	0.7364	13.45	18.26	97	JOBPDE	14	3299	1	1
SiO_2^{*+} (G. Rossman, X-13)	1.5326	1.5326	1.5413	1.5441	1.5441	1.5531	37.66	18.83	2.801	0.0065	0.7365	13.41	18.21	97	JOBPDE	14	3299	1	1
SiO_2^{*+} (A. Ballman)	1.5328	1.5328	1.5416	1.5442	1.5442	1.5533	37.66	18.83	2.802	0.0065	0.7362	13.45	18.27	97	JOBPDE	14	3299	1	1
SiO_2^{*+} (G. Rossman, X-488-3)	1.5327	1.5327	1.5416	1.5441	1.5441	1.5533	37.66	18.83	2.802	0.0065	0.7363	13.44	18.26	97	JOBPDE	14	3299	1	1
SiO_2^{*+} smoky quartz	1.5331	1.5331	1.5417	1.5443	1.5443	1.5534	37.66	18.83	2.803	0.0064	0.7358	13.52	18.37	97	JOBPDE	14	3299	1	1
SiO_2^*	1.535	1.535	1.544				37.66	18.83	2.812					61	PHRVAO	121	1324	3	3
GeO_2^{*+}	1.9250	1.9250	2.0138	1.9577	1.9577	2.0454	27.62	13.81	3.195	0.0054	0.3555	10.30	28.97	00	Ref. 14			1	1
GeO_2^* tetragonal	1.927	1.927	2.018	1.960	1.960	2.048	27.62	13.81	3.201	0.0052	0.3540	10.40	29.37	82	MRBUAC	17	1313	1	3
GeO_2^* tetragonal	2.02	2.02	2.10				27.62	13.81	3.397					72	JPCSAW	33	293	3	7
TiO_2^{*+} rutile (synthetic?)	2.4252	2.4252	2.6666	2.6190	2.6190	2.9031	31.21	15.61	4.751	0.0113	0.1911	5.21	27.25	65	JAPIAU	36	1674	1	1
TiO_2^{*+} rutile (synthetic?)	2.4096	2.4096	2.6515	2.6098	2.6098	2.8976	31.21	15.61	4.725	0.0119	0.1940	5.11	26.35	97	JAPIAU	82	994	8	1
TiO_2^* rutile mineral	2.422	2.422	2.666	2.613	2.613	2.900	31.21	15.61	4.747	0.0111	0.1915	5.24	27.37	28	ZEKRDZ	67	485	1	3
TiO_2^*	2.38	2.38	2.63	2.65	2.65	2.93	31.21	15.61	4.680	0.0152	0.1987	4.57	23.00	97	OPLEDP	22	1808	4	5?
TiO_2^* [average n, polyxtal reflectance data]	2.41	2.41	2.41	2.54	2.54	2.54	31.21	15.61	4.588	0.0084	0.2070	6.27	30.29	79	JJAPA5	18	1043	8	5?
TiO_2^* brookite, brown	2.411	2.422	2.504	2.585	2.584	2.702	32.30	16.10	4.813	0.0107	0.2010	5.49	27.29	28	ZEKRDZ	67	485	1	3
TiO_2^{*+} anatase, yellow (Binnental)	2.3852	2.3852	2.3386	2.5621	2.5621	2.4889	34.07	17.03	4.929	0.0114	0.2168	5.52	25.46	28	ZEKRDZ	67	485	1	1
TiO_2^* anatase (Binnental)	2.3781	2.3781	2.3330	2.5621	2.5621	2.4891	34.07	17.03	4.916	0.0119	0.2182	5.42	24.82	16	NJGAAY	41	342	1	1
TiO_2^* anatase (Binnental)	2.3740	2.3740	2.3294	2.5608	2.5608	2.4879	34.07	17.03	4.908	0.0121	0.2191	5.37	24.53	08	ZEKRDZ	44	313	1	1
TeO_2^{*+} FL 9 KBAR	2.1614	2.1614	2.3024	2.2730	2.2730	2.4288	43.85	21.93	5.902	0.0108	0.2591	6.20	23.94	90	ZPSBAX	51	790	1	1
TeO_2^{*+} FL 9 KBAR	2.1690	2.1690	2.3070	2.2753	2.2753	2.4310	43.85	21.93	5.921	0.0103	0.2571	6.32	24.60	71	PLRBAQ	4	3736	1	2
TeO_2^* FL 9 KBAR	2.27	2.27	2.43				43.85	21.93	6.223					73	PLRBAQ	8	768	8	3
SnO_2^+ cassiterite (Araca, Bolivia)	1.9462	1.9462	2.0471	2.0004	2.0004	2.0971	35.77	17.87	4.212	0.0081	0.3436	8.22	23.93	62	Ref. 1	Rf	350	1	1
SnO_2^{*+} cassiterite (synthetic)	1.9442	1.9442	2.0449	1.9982	1.9982	2.0942	35.77	17.87	4.206	0.0081	0.3446	8.24	23.92	62	Ref. 1	Rf	2810	1	1
SnO_2^{*+} cassiterite (synthetic)	1.9319	1.9319	2.0298	1.9871	1.9871	2.0817	35.77	17.87	4.167	0.0086	0.3508	8.08	23.04	76	JCRGAE	32	259	1	1
SnO_2^*	1.945	1.945	2.043				35.77	17.87	4.206					68	JAPIAU	39	3762	3	4
ZrO_2^* cubic	2.256	2.256	2.256				34.97	17.48	4.816					86	JACTAW	69	277	8	3
$Zr_{.869}Y_{.131}O_{1.934}^{*+}$	2.1082	2.1082	2.1082	2.1581	2.1581	2.1581	33.86	17.51	4.321	0.0059	0.2903	8.89	30.64	82	APOPAI	21	2978	1	1
$Zr_{.671}Y_{.329}O_{1.835}^{*+}$	2.0180	2.0180	2.0180	2.0691	2.0691	2.0691	34.46	18.78	4.162	0.0072	0.3255	8.50	26.13	90	APOPAI	29	2485	1	1
$Zr_{.894}Y_{.095}Hf_{.011}O_{1.95}^{*+}$	2.1193	2.1193	2.1193	2.1698	2.1698	2.1698	33.98	17.42	4.363	0.0058	0.2863	8.91	31.14	97	JOBPDE	14	3299	1	1
$Hf_{.904}Y_{.096}O_{1.952}^{*+}$	2.0690	2.0690	2.0690	2.1109	2.1109	2.1109	33.64	17.23	4.195	0.0053	0.3047	9.56	31.38	90	APOPAI	29	604	1	1
$Hf_{.85}Y_{.15}O_{1.925}^{*+}$	2.0486	2.0486	2.0486	2.0881	2.0881	2.0881	33.90	17.61	4.175	0.0053	0.3128	9.74	31.14	77	INOMAF	13	1747	1	2
CeO_2^*	2.36	2.36	2.36				39.61	19.81	5.708					87	SPSSA7	29	1904	4	5
CeO_2^*	2.31	2.31	2.31				39.61	19.81	5.589					82	PSSBBD	114	189	3	5
ThO_2^{*+} (synthetic)	2.0679	2.0679	2.0679	2.1113	2.1113	2.1113	43.90	21.95	5.471	0.0056	0.3052	9.37	30.70	97	JOBPDE	14	3299	1	1
ThO_2^* (synthetic, Norton Refractories)	2.070	2.070	2.070	2.105	2.105	2.105	43.90	21.95	5.478	0.0044	0.3043	10.49	34.46	64	OPACAT	11	287	1	3
ThO_2^*	2.07	2.07	2.07				43.90	21.95	5.478					66	PHRVAO	151	676	1	3?
ThO_2^*	2.20	2.20	2.20				43.90	21.95	5.884					66	PHRVAO	151	676	3	7

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
UO_2^* crystalline FL 31 K	2.12	2.12	2.12	2.39	2.39	2.39	40.87	20.43	5.250	0.0264	0.2876	4.17	14.51	64	JOSAAH	54	265	8	5
UO_2 film FL 31 K	2.16	2.16	2.16	2.40	2.40	2.40	40.87	20.43	5.366	0.0210	0.2715	4.54	16.74	59	JOSAAH	49	1107	8	5
UO_2^* FL 31 K	2.30	2.30	2.30				40.87	20.43	5.742					66	PHRVAO	151	676	8	5
UO_2^* FL 31 K	2.35	2.35	2.35				40.87	20.43	5.866					66	PHRVAO	151	676	3	7
$V_2O_5^*$	2.07	1.97	2.12				89.52	17.90	11.057					66	JPCSAW	27	1237	8	5
$V_2O_5^*$	2.20	1.98	2.29	2.89	2.10	2.55	89.52	17.90	11.732	0.0264	0.2796	4.12	14.73	55	JACTAW	38	306	2	5
Beryllates																			
$BeAl_2O_4^{*+}$ chrysoberyl	1.7254	1.7270	1.7325	1.7397	1.7417	1.7473	56.99	14.25	5.421	0.0043	0.5033	13.61	27.05	80	IEJQA7	QE-16	1302	1	1
$BeAl_2O_4^{*+}$ chrysoberyl	1.7291	1.7309	1.7354	1.7442	1.7469	1.7528	56.99	14.25	5.441	0.0047	0.5002	12.98	25.94	62	Ref. 1	Rf	1838	1	1
$La_2Be_2O_5^{*+}$	1.9490	1.9820	2.0180	1.9897	2.0243	2.0629	102.90	20.58	12.143	0.0065	0.3415	9.14	26.7	76	JAPIAU	47	1496	1	1
$BeAlSiO_4OH^+$ euclase	1.6380	1.6412	1.6580	1.6509	1.6548	1.6713	78.05	15.61	6.761	0.0051	0.5854	13.58	23.20	62	Ref. 1	Rf	4106	1	1
$Be_{1.00}Al_{.99}Si_{1.00}O_4OH^{*+}$ euclase (San Sebastao de Maranhao, Minas Gerais)	1.6382	1.6425	1.6589	1.6524	1.6558	1.6730	78.05	15.61	6.768	0.0053	0.5846	13.28	22.71	97	JOBPDE	14	3299	1	1
$Be_{1.00}Al_{.99}Si_4OH^{*+}$ euclase (Diamantina, Minas Gerais)	1.6388	1.6422	1.6588	1.6523	1.6557	1.6727	78.05	15.61	6.768	0.0052	0.5845	13.42	22.96	97	JOBPDE	14	3299	1	1
$Be_3Al_2Si_6O_{18}^+$ beryl (no indication of H_2O content or method of preparation)	1.5650	1.5650	1.5589	1.5774	1.5774	1.5708	338.40	18.80	26.236	0.0062	0.6931	13.33	19.2	87	Ref. 5		305	1	2
$Be_3Al_2Si_6O_{18}^+$ beryl, colorless (Santa Rita, Minas Gerais)	1.5562	1.5562	1.5520	1.5684	1.5684	1.5640	338.40	18.80	25.922	0.0064	0.7056	13.27	18.8	62	Ref. 1	Rf	424	1	1
$Be_3Al_2Si_6O_{18}^+$ beryl, light-blue (Klein Spitzkopje, SW Africa)	1.5591	1.5591	1.5545	1.5715	1.5715	1.5667	338.40	18.80	26.029	0.0064	0.7012	13.25	18.8	62	Ref. 1	Rf	424	1	1
$Be_3Al_2Si_6O_{18}^+$ beryl, emerald, light-green (Columbia)	1.5617	1.5617	1.5565	1.5738	1.5738	1.5684	338.40	18.80	26.121	0.0062	0.6976	13.39	19.2	34	NJGAAY	68	401	1	1
$BeSO_4 \cdot 4\ H_2O^{*+}$	1.4585	1.4585	1.4233	1.4713	1.4713	1.4328	170.86	21.36	10.894	0.0095	0.9164	12.41	13.5	78	APPLAB	33	413	1	1
$NaBeSi_3O_7OH^+$ eudidymite	1.5380	1.5383	1.5424	1.5457	1.5461	1.5512	158.02	19.75	11.828	0.0046	0.7298	15.99	21.9	62	Ref. 1	Rf	2537	1	1
$NaBe_4SbO_7^+$ swedenborgite	1.7550	1.7550	1.7527	1.7732	1.7732	1.7704	113.46	16.21	11.082	0.0050	0.4814	12.47	25.9	24	ZEKRDZ	60	262	1	1
$Ba_{.98}Ca_{.02}Be_2Si_2O_7^{*+}$ barylite (Langban, Sweden)	1.6619	1.6659	1.6820	1.6921	1.6977	1.7029	134.37	19.20	11.982	0.0096	0.5592	9.63	17.2	62	Ref. 1	Rf	743	1	1
Borates																			
$BO(OH)^* = HBO_2$ I (estimated n_∞ values)	1.61	1.61	1.61				29.22	14.61	2.419					38	AJSCAP	35	143	2	4
$BO(OH)^* = HBO_2$ I (n_D values)	1.619	1.619	1.619				29.22	14.61	2.447					38	AJSCAP	35	143	2	3
$B_3O_4(OH) \cdot H_2O^* = HBO_2$ II (estimated n_∞ values)	1.42	1.56	1.57				35.48	17.73	2.561					38	AJSCAP	35	143	2	4
$B_3O_4(OH) \cdot H_2O^* = HBO_2$ (n_D values)	1.434	1.570	1.588				35.48	17.73	2.619					38	AJSCAP	35	143	2	4
$B(OH)_3^* = H_3BO_3$ sassolite (estimated n_∞ values)	1.33	1.44	1.45				68.52	22.84	4.024					57	AMMIAY	42	56	2	5
$B(OH)_3^* = H_3BO_3$ sassolite (n_D values)	1.340	1.457	1.459				68.52	22.84	4.128					57	AMMIAY	42	56	2	3
$B(OH)_3^* = H_3BO_3$ sassolite (estimated n_∞ values)	1.32	1.45	1.45				68.52	22.84	4.024					38	AJSCAP	35	143	02	5
$B(OH)_3^* = H_3BO_3$ sassolite (n_D values)	1.337	1.461	1.462				68.52	22.84	4.140					38	AJSCAP	35	143	02	3
$LiB_3O_5^{*+}$	1.5625	1.5889	1.6026	1.5752	1.6023	1.6172	80.09	16.02	6.405	0.0064	0.6624	12.89	19.46	89	JOBPDE	6	616	1	1
$Li_2B_4O_7^{*+}$ FE 863 K	1.5943	1.5943	1.5502	1.6075	1.6075	1.5620	115.47	16.49	9.169	0.0061	0.6699	13.27	19.8	85	JAPNDE	24	25	1	1
$CsB_3O_5^+$	1.5190	1.5376	1.5654	1.5308	1.5615	1.5892	121.37	24.27	9.100	0.0107	0.7291	10.45	14.3	93	APPLAB	62	2614	1	1?

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$CsB_3O_5^{*+}$	1.5298	1.5480	1.5746	1.5416	1.5605	1.5879	121.37	24.27	9.242	0.0067	0.7128	13.06	18.3	00	JJAPA5	39	L1164	1	1
$CsLiB_6O_{10}^{*+}$	1.4825	1.4825	1.4323	1.4943	1.4943	1.4421	246.10	24.61	16.265	0.0084	0.8735	12.93	14.8	98	JCRGAE	191	492	1	1
$Zn_4O(BO_2)_6^{*+}$	1.7257	1.7257	1.7257	1.7464	1.7464	1.7464	209.08	16.08	19.834	0.0061	0.5055	11.48	22.7	82	ZEKRDZ	161	157	1	1
$Be_2BO_3(OH)_{.96}F_{.04}^{*+}$ hambergite (Antsirabe, Tanarive, Madagascar)	1.5435	1.5759	1.6143	1.5546	1.5886	1.6285	66.06	16.51	5.233	0.0061	0.6734	13.26	19.69	97	JOBPDE	14	3299	1	1
$Be_2BO_3OH^{*+}$ hambergite	1.5434	1.5760	1.6148	1.5545	1.5885	1.6288	66.06	16.51	5.234	0.0060	0.6732	13.36	19.84	62	Ref. 1	Rf	2969	1	1
$Be_2BO_3OH^{*+}$ hambergite (Madagascar)	1.5433	1.5764	1.6147	1.5542	1.5885	1.6284	66.06	16.51	5.235	0.0059	0.6731	13.48	20.03	11	ZEKRDZ	48	473	1	1
$SrB_4O_7^{*+}$	1.7210	1.7222	1.7247	1.7340	1.7353	1.7377	100.35	14.33	9.489	0.0040	0.5083	14.35	28.2	95	OMATET	4	669	1	1?
$PbB_4O_7^{*+}$	1.8979	1.9013	1.9032	1.9304	1.9351	1.9368	102.45	14.64	11.386	0.0062	0.3827	9.94	25.9	95	OMATET	4	669	1	1
$PbB_4O_7^{*}$	1.897	1.901	1.902	1.930	1.934	1.936	102.45	14.64	11.379	0.0062	0.3829	9.95	25.9	97	OMATET	8	185	1	4
BaB_2O_4-alpha^{*+}	1.656	1.656	1.544	1.676	1.676	1.558	96.15	24.01	8.049	0.0072	0.6231	11.76	18.88	83	ZEKRDZ	165	91	1	3
BaB_2O_4-alpha^{*+}	1.6504	1.6504	1.5390	1.6699	1.6699	1.5523	96.46	24.11	8.018	0.0073	0.6303	11.73	18.61	87	JAPIAU	62	1968	1	1
$BiB_3O_6^{*+}$ piezoelectric	1.7473	1.7724	1.9025	1.7806	1.8111	1.9518	111.34	18.56	11.440	0.0093	0.4453	8.73	19.6	99	SSCOA4	109	249	5	1
$LiGeBO_4^{*+}$	1.6682	1.6682	1.6725	1.6857	1.6857	1.6914	69.90	17.47	6.231	0.0063	0.5594	11.89	21.25	01	CRTEDF	36	119	1	1
$Mg_{.98}Fe_{.02}AlBO_4^{*+}$ sinhalite (Ratnapura)	1.6529	1.6826	1.6904	1.6664	1.6967	1.7047	60.73	15.18	5.449	0.0049	0.5539	13.48	24.34	97	JOBPDE	14	3299	1	1
$KNbB_2O_6^{*}$	1.759	1.731	1.731	1.806	1.777	1.777	132.10	22.03	12.723	0.0127	0.4930	7.88	15.9	97	OMATET	8	215	6	4
$RbNbB_2O_6^{*}$	1.720	1.737	1.756	1.758	1.778	1.804	137.94	22.99	13.249	0.0117	0.4952	8.24	16.6	97	APOPAI	36	8587	6	3
$RbNbB_2O_6^{*}$	1.754	1.737	1.719	1.802	1.777	1.757	137.94	22.99	13.235	0.0117	0.4962	8.25	16.6	97	OMATET	8	215	6	3
$Ca_4YOB_3O_9^{*}$	1.6613	1.6926	1.7098	1.6815	1.7137	1.7268	223.79	22.39	20.372	0.0065	0.5415	11.53	21.2	00	CRTEDF	35	1361	1	1
$Ca_4GdOB_3O_9^{*+}$	1.6747	1.6995	1.7079	1.6957	1.7216	1.7300	226.24	22.62	20.738	0.0071	0.5351	11.00	20.5	97	JOBPDE	14	2238	1	1
$KBe_2BO_3F_2^{*}$	1.471	1.471	1.393	1.479	1.479	1.401	106.04	21.21	6.738	0.0068	0.9268	14.78	15.9	96	OMATET	5	105	8	3
$Mg_3BO_3F_3$ fluoborite, light brown	1.5004	1.5004	1.4798	1.5086	1.5086	1.4858	104.07	17.34	7.227	0.0050	0.8130	16.07	19.7	62	Ref. 1	Rf	688	1	1
$Mg_3B_7O_{13}Cl^{+}$ boracite FE 538K	1.6553	1.6553	1.6553	1.6713	1.6713	1.6713	220.62	15.76	19.334	0.0059	0.5747	12.46	21.6	62	Ref. 1	Rf	250	1	2
$Mg_3B_7O_{13}Cl^{+}$ boracite FE 538K	1.6608	1.6608	1.6608	1.6753	1.6753	1.6753	220.62	15.76	19.462	0.0053	0.5687	13.12	23.0	62	Ref. 1	Rf	250	1	2
$LaGeBO_5^{*+}$ FE 805 K	1.7948	1.7948	1.8314	1.8201	1.8201	1.8593	97.87	19.57	10.052	0.0062	0.4417	10.70	24.21	91	PSSABA	125	671	1	1
$Y_{.99}Nd_{.01}Al_3B_4O_{12}^{*+}$	1.7472	1.7472	1.6803	1.7743	1.7743	1.7023	180.62	15.05	17.119	0.0075	0.5076	10.40	20.4	90	OPCOB8	77	221	1	1
$Gd_{.99}Nd_{.01}Al_3B_4O_{12}^{*+}$	1.7732	1.7732	1.7005	1.7886	1.7886	1.7122	181.69	15.14	17.653	0.0040	0.4871	14.03	28.8	98	CHSCBU	43	1973	1	1?
$Na2B_4O_5(OH)_4 \cdot 8\ H_2O^{*+}$ borax	1.4356	1.4573	1.4605	1.4467	1.4693	1.4723	370.96	21.82	23.851	0.0093	0.9050	12.46	13.7	62	Ref. 1	Rf	2578	1	1
$Na_2B_4O_5(OH)_4 \cdot 3\ H_2O^{*+}$ tincalconite (synthetic)	1.4518	1.4518	1.4638	1.4625	1.4625	1.4746	250.18	20.84	16.229	0.0085	0.8936	12.98	14.5	00	CRTEDF	35	1151	1	1
$KB_5O_6(OH)_4 \cdot 2\ H_2O^{*+} = KB_5O_8 \cdot 4\ H_2O$	1.4745	1.4238	1.4121	1.4863	1.4336	1.4211	279.40	23.28	17.468	0.0088	0.9437	13.12	13.9	76	JOSAAH	66	72	1	2
$K_2B_4O_5(OH)_4 \cdot 2\ H_2O^{*+}$	1.4528	1.4556	1.4690	1.4632	1.4658	1.4799	260.42	23.67	17.000	0.0081	0.8859	13.19	14.8	00	CRTEDF	35	1151	1	1
$CaB_3O_4(OH)_3 \cdot H_2O^{+}$ colemanite FE 266 K	1.5734	1.5792	1.6002	1.5861	1.5919	1.6139	140.56	17.57	11.235	0.0061	0.6626	13.13	19.8	56	NJMMAW	1956	265	1	1
$Cs_{.44}K_{.31}Rb_{.16}Na_{.03}Al_4Be_4B_{11}O_{25}(OH)_4^{+}$ rhodizite (Manjaka, Madagascar)	1.6777	1.6777	1.6777	1.6932	1.6932	1.6932	391.74	13.50	35.249	0.0054	0.5510	12.83	23.2	62	Ref. 1	Rf	226	1	1
Aluminates																			
$LiAlO_2^{*+}$ gamma-tetragonal	1.6048	1.6048	1.5884	1.6223	1.6223	1.6038	42.02	21.01	3.429	0.0075	0.6421	11.73	18.27	81	JCRGAE	54	546	1	1
$Y_{.99}Nd_{.01}AlO_3^{*+}$ FL?	1.9030	1.9173	1.9249	1.9525	1.9432	1.9285	50.09	16.95	5.628	0.0048	0.3749	11.21	29.89	78	JAPAIU	49	4223	1	1
$Y_{.99}Nd_{.01}AlO_3^{*+}$ FL?	1.9035	1.9166	1.9252	1.9523	1.9432	1.9285	50.09	16.95	5.628	0.0048	0.3749	11.23	29.96	90	APOPAI	29	1281	1	1
$YAlO_3^{*+}$ FL?	1.9025	1.9162	1.9246	1.9277	1.9423	1.9515	50.09	16.95	5.626	0.0047	0.3753	11.26	30.02	73	APOPAI	12	941	1	1
$LaAlO_3^{*}$	2.00	2.00	2.00				54.44	18.15	6.498					94	JOBPDE	11	2252	3	5
$Mg_{1.02}Al_{1.98}Fe_{.01}O_4^{*+}$ spinel, purple (Sri Lanka)	1.6979	1.6979	1.6979	1.7153	1.7153	1.7153	66.14	16.53	6.089	0.0056	0.5311	12.27	23.10	97	JOBPDE	14	3299	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Mg_{1.00}Al_{1.98}Fe_{.02}O_4^{*+}$ spinel, blue-gray (Sri Lanka)	1.6991	1.6991	1.6991	1.7164	1.7164	1.7164	66.14	16.53	6.097	0.0056	0.5299	12.33	23.26	97	JOBPDE	14	3299	1	1
$Mg_{1.00}Al_{1.99}Fe_{.02}O_4^{*+}$ spinel, pink (Tanzania)	1.6981	1.6981	1.6981	1.7151	1.7151	1.7151	66.11	16.53	6.087	0.0055	0.5309	12.44	23.43	97	JOBPDE	14	3299	1	1
$Mg_{1.00}Al_{1.99}Fe_{.02}O_4^{*+}$ spinel, pink (Tanzania)	1.6976	1.6976	1.6976	1.7146	1.7146	1.7146	66.11	16.53	6.084	0.0055	0.5314	12.41	23.36	97	JOBPDE	14	3299	1	1
$Mg_{.97}Al_{2.01}Fe_{.01}O_4^{*+}$ spinel, colorless (unknown source)	1.6974	1.6974	1.6974	1.7142	1.7142	1.7142	66.11	16.53	6.083	0.0055	0.5316	12.47	23.46	97	JOBPDE	14	3299	1	1
$Mg_{1.00}Al_{2.00}O_4^{*+}$ spinel, colorless (Union Carbide)	1.6978	1.6978	1.6978	1.7150	1.7150	1.7150	65.98	16.49	6.073	0.0056	0.5312	12.32	23.19	97	JOBPDE	14	3299	1	1
$Mg_{.98}Fe_{.01}Al_{2.01}O_4^{*+}$ spinel (Siberia)	1.7002	1.7002	1.7002	1.7173	1.7173	1.7173	66.31	16.58	6.120	0.0055	0.5288	12.41	23.47	97	JOBPDE	14	3299	1	1
$MgAl_2O_4^{*+}$ spinel (Linde)	1.7008	1.7008	1.7008	1.7179	1.7179	1.7179	66.00	16.50	6.095	0.0055	0.5283	12.42	23.51	78	Ref. 7		7-106	1	1
$MgAl_2O_4^{+}$ spinel, red (Ceylon)	1.6989	1.6989	1.6989	1.7165	1.7165	1.7165	66.00	16.50	6.082	0.0057	0.5301	12.23	23.07	62	Ref. 1	Rf	244	1	1
$MgAl_2O_4^{+}$ spinel, dark-red (Ceylon)	1.7045	1.7045	1.7045	1.7219	1.7219	1.7219	66.00	16.50	6.120	0.0055	0.5249	12.32	23.47	62	Ref. 1	Rf	267	1	1
$MgAl_2O_4^{+}$ spinel, dark-red (Ceylon)	1.6985	1.6985	1.6985	1.7154	1.7154	1.7154	66.00	16.50	6.080	0.0054	0.5305	12.48	23.53	62	Ref. 1	Rf	267	1	1
$MgAl_2O_4^{+}$ spinel, dark-red (Ceylon)	1.7014	1.7014	1.7014	1.7187	1.7187	1.7187	66.00	16.50	6.099	0.0055	0.5277	12.34	23.38	62	Ref. 1	Rf	267	1	1
$MgAl_2O_4^{+}$ spinel, dark-red (Ceylon)	1.7010	1.7010	1.7010	1.7179	1.7179	1.7179	65.93	16.50	6.090	0.0054	0.5282	12.46	23.59	62	Ref. 1	Rf	267	1	1
$MgAl_2O_4^{+}$ spinel, dark-red (Ceylon)	1.7006	1.7006	1.7006	1.7174	1.7174	1.7174	66.00	16.50	6.094	0.0054	0.5285	12.50	23.66	62	Ref. 1	Rf	267	1	1
$MgAl_2O_4^{+}$ spinel, dark-red (Ceylon)	1.6992	1.6992	1.6992	1.7160	1.7160	1.7160	66.00	16.50	6.084	0.0054	0.5299	12.50	23.59	62	Ref. 1	Rf	267	1	1
$MgAl_2O_4^{+}$ spinel, brown (Ceylon)	1.6994	1.6994	1.6994	1.7161	1.7161	1.7161	66.00	16.50	6.086	0.0054	0.5297	12.52	23.65	62	Ref. 1	Rf	155	1	1
$MgAl_2O_4^{+}$ spinel, brown (Ceylon)	1.6997	1.6997	1.6997	1.7167	1.7167	1.7167	66.00	16.50	6.088	0.0055	0.5294	12.43	23.47	62	Ref. 1	Rf	155	1	1
$MgAl_2O_4^{*+}$ spinel (0.001% Co)	1.7108	1.7108	1.7108	1.7274	1.7274	1.7274	66.00	16.50	6.162	0.0052	0.5189	12.65	24.37	62	Ref. 1	Rf	173	1	1
$MgAl_2O_4^{*+}$ spinel (0.1% Co)	1.7102	1.7102	1.7102	1.7271	1.7271	1.7271	66.00	16.50	6.158	0.0053	0.5196	12.51	24.09	62	Ref. 1	Rf	173	1	1
$MgAl_2O_4^{*+}$ spinel (1.15% Co)	1.7130	1.7130	1.7130	1.7285	1.7285	1.7285	66.00	16.50	6.177	0.0048	0.5170	13.11	25.36	62	Ref. 1	Rf	173	1	1?
$MgAl_2O_4^{*+}$ spinel (Schott)	1.6994	1.6994	1.6994	1.7161	1.7161	1.7161	66.01	16.50	6.087	0.0054	0.5297	12.54	23.68	91	Ref. 9		883	1	1
$MgAl_2O_4^{*+}$ spinel (Kodak)	1.6977	1.6977	1.6977	1.7154	1.7154	1.7154	66.01	16.50	6.075	0.0057	0.5313	12.17	22.91	91	Ref. 9		883	1	1
$MgAl_2O_4^{*+}$ spinel (General Dynamics)	1.6986	1.6986	1.6986	1.7153	1.7153	1.7153	66.01	16.50	6.081	0.0054	0.5305	12.50	23.57	91	Ref. 9		883	1	1
$Mg_{.41}Al_{2.39}O_4^{*+}$ spinel, colorless (A. Mellor)	1.7095	1.7095	1.7095	1.7261	1.7261	1.7261	63.44	15.86	5.915	0.0052	0.5202	12.65	24.33	97	JOBPDE	14	3299	1	1
$Mg_{.41}Al_{2.39}O_4^{*+}$ spinel, dark-blue (A)	1.7107	1.7107	1.7107	1.7269	1.7269	1.7269	63.66	15.92	5.943	0.0051	0.5190	12.80	24.66	97	JOBPDE	14	3299	1	1
$Mg_{.38}Al_{2.41}O_4^{*+}$ spinel, blue (B)	1.7086	1.7086	1.7086	1.7251	1.7251	1.7251	63.71	15.93	5.934	0.0052	0.5210	12.70	24.38	97	JOBPDE	14	3299	1	1
$Mg_{.348}Al_{2.435}O_4^{*+}$ spinel	1.710	1.710	1.710	1.727	1.727	1.727	63.35	15.83	5.910	0.0055	0.5201	12.26	23.58	61	ACELAZ	6	120	8	3
$Mg_{.66}Zn_{.34}Fe_{.04}Al_{1.96}O_4^{*+}$ spinel, blue (Ceylon)	1.7282	1.7282	1.7282	1.7465	1.7465	1.7465	66.02	16.50	6.279	0.0054	0.5033	12.21	24.26	37	MNLMBB	24	547	1	1
$Zn_{.92}Fe_{.07}Mg_{.01}Al_{1.97}Fe_{.03}O_4^{*+}$ gahnite (Jos, Nigeria)	1.7725	1.7725	1.7725	1.7944	1.7944	1.7944	66.40	16.60	6.603	0.0056	0.4667	11.50	24.64	97	JOBPDE	14	3299	1	1
$Y_3Al_5O_{12}^{*+}$	1.8113	1.8113	1.8113	1.8352	1.8352	1.8352	216.50	18.04	22.323	0.0056	0.4384	11.19	25.5	65	JAPIAU	36	1674	1	1
$Y_3Al_5O_{12}^{*+}$	1.8087	1.8087	1.8087	1.8326	1.8326	1.8326	216.50	18.04	22.271	0.0056	0.4403	11.18	25.4	86	Ref. 3		120	1	1
$Y_3Al_5O_{12}^{*+}$	1.8093	1.8093	1.8093	1.8323	1.8323	1.8323	216.50	18.04	22.283	0.0054	0.4398	11.39	25.9	89	SPHCA6	34	712	1	1
$Y_3Al_5O_{12}^{*+}$	1.8095	1.8095	1.8095	1.8328	1.8328	1.8328	216.50	18.04	22.287	0.0054	0.4395	11.39	25.9	97	JOBPDE	14	3299	1	1
$Y_3Al_5O_{12}^{*+}$	1.8084	1.8084	1.8084	1.8324	1.8324	1.8324	216.50	18.04	22.265	0.0057	0.4406	11.12	25.2	81	INOMAF	17	308	1	1
$Dy_3Al_5O_{12}^{*+}$	1.8363	1.8363	1.8363	1.8613	1.8613	1.8613	218.00	18.17	22.980	0.0055	0.4216	11.08	26.2	97	JOBPDE	14	3299	1	1
$Ho_3Al_5O_{12}^{*+}$	1.8327	1.8327	1.8327	1.8567	1.8567	1.8567	216.80	18.07	22.782	0.0053	0.4239	11.28	26.6	97	JOBPDE	14	3299	1	1
$Er_3Al_5O_{12}^{*+}$	1.8279	1.8279	1.8279	1.8522	1.8522	1.8522	215.00	17.92	22.498	0.0055	0.4271	11.18	26.1	81	INOMAF	17	308	1	1
$Lu_3Al_5O_{12}^{*+}$	1.8184	1.8184	1.8184	1.8423	1.8423	1.8423	211.30	17.60	21.926	0.0055	0.4335	11.22	25.8	81	INOMAF	17	308	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Y_{1.5}Er_{1.5}Al_5O_{12}^{*+}$	1.8198	1.8198	1.8198	1.8432	1.8432	1.8432	215.50	17.96	22.390	0.0054	0.4326	11.33	26.2	97	JOBPDE	14	3299	1	1
$Y_{2.93}Nd_{.07}Sc_2Al_3O_{12}^{*+}$	1.8515	1.8515	1.8515	1.8795	1.8795	1.8795	230.90	19.24	24.658	0.0059	0.4119	10.55	25.6	97	JOBPDE	14	3299	1	1
$Gd_3Sc_2Al_3O_{12}^{*}$	1.87	1.87	1.87	1.90	1.90	1.90	238.60	19.88	25.874	0.0066	0.3999	9.81	24.5	73	JAPIAU	44	1395	6	5?
$CaYAlO_4^{*+}$	1.8767	1.8767	1.8990	1.9077	1.9077	1.9290	78.88	19.72	8.652	0.0059	0.3922	10.27	26.19	97	JOBPDE	14	3299	1	1
$CaYAlO_4^{*+}$	1.8757	1.8757	1.8978	1.9068	1.9068	1.9280	78.88	19.72	8.645	0.0060	0.3929	10.24	26.05	97	JOBPDE	14	3299	1	1
$CaNdAlO_4^{*+}$	1.9266	1.9266	1.9513	1.9620	1.9620	1.9867	82.30	20.57	9.385	0.0061	0.3646	9.80	26.87	97	JOBPDE	14	3299	1	1
$SrLaAlO_4^{*+}$	1.9316	1.9316	1.9516	1.9663	1.9663	1.9865	89.15	22.29	10.192	0.0059	0.3628	9.90	27.28	97	JOBPDE	14	3299	1	1
$SrLaAlO_4^{*}$	1.92	1.92	1.95	1.95	1.95	1.97	89.15	22.29	10.130	0.0039	0.3646	12.25	33.59	96	PSSBBD	195	625	8	5?
$SrLaAl_{.75}Ga_{.25}O_4^{*}$	1.92	1.92	1.94	1.96	1.96	1.99	90.06	22.51	10.208	0.0073	0.3694	8.97	24.27	96	PSSBBD	195	625	8	5
$La_{.8}Nd_{.2}MgAl_{11}O_{19}^{*}$	1.771	1.771	1.764	1.791	1.791	1.783	296.44	15.60	29.369	0.0052	0.4696	12.04	25.6	83	SJQEAF	13	1082	5	3
Gallates																			
$LiGaO_2^{*+}$	1.7061	1.7061	1.7339	1.7350	1.7350	1.7654	43.08	21.54	4.042	0.0090	0.5150	9.57	18.58	70	JAPIAU	41	3008	1	2
$LiGaO_2^{*}$	1.705	1.730	1.734	1.735	1.763	1.765	43.08	21.54	4.075	0.0092	0.5080	9.39	18.48	65	APOPAI	4	1036	5	3
$LaGaO_3^{*}$ IR FL	2.02	2.02	2.02				58.70	19.57	7.099					94	JOBPDE	11	2252	03	5
$NdGaO_3^{*}$ IR FL	2.02	2.02	2.02				57.56	19.19	6.962					94	JOBPDE	11	2252	03	5
$CoGa_2O_4^{*}$ [IR, not accurate]	2.00	2.00	2.00				72.50	18.12	8.654					78	SPSSA7	20	1451	03	5
$Y_3Ga_5O_{12}^{*}$	1.878	1.878	1.878	1.919	1.919	1.919	231.31	19.27	25.247	0.0080	0.3960	8.90	22.4	87	Ref. 5		314	8	3?
$Y_3Ga_5O_{12}^{*}$	1.882	1.882	1.882	1.916	1.916	1.916	231.31	19.27	25.328	0.0065	0.3933	9.83	24.9	74	PLRBAQ	10	971	1	3
$Nd_{3.01}Ga_{4.99}O_{12}^{*+}$	1.9470	1.9470	1.9470	1.9871	1.9871	1.9871	244.70	20.39	28.154	0.0067	0.3583	9.28	25.9	97	JOBPDE	14	3299	1	1
$Nd_3Ga_5O_{12}^{*+}$	1.9476	1.9476	1.9476	1.9872	1.9872	1.9872	244.49	20.37	28.142	0.0066	0.3580	9.33	26.0	84	SPHCA6	29	704	1	2
$Sm_{3.02}Ga_{4.98}O_{12}^{*+}$	1.9452	1.9452	1.9452	1.9840	1.9840	1.9840	240.50	20.02	27.634	0.0065	0.3592	9.43	26.2	97	JOBPDE	14	3299	1	1
$Eu_{3.02}Ga_{4.98}O_{12}^{*+}$	1.9407	1.9407	1.9407	1.9794	1.9794	1.9794	238.80	19.90	27.349	0.0065	0.3615	9.40	26.0	97	JOBPDE	14	3299	1	1
$Gd_3Ga_5O_{12}^{*+}$	1.9328	1.9328	1.9328	1.9698	1.9698	1.9698	237.30	19.77	27.020	0.0064	0.3655	9.59	26.2	87	Ref. 5		307	1	1
$Gd_3Ga_5O_{12}^{*+}$	1.9330	1.9330	1.9330	1.9698	1.9698	1.9698	237.30	19.77	27.024	0.0063	0.3654	9.60	26.2	78	KRTEAW	13	K10	1	1
$Gd_3Ga_5O_{12}^{*+}$	1.9326	1.9326	1.9326	1.9693	1.9693	1.9693	237.30	19.77	27.016	0.0063	0.3656	9.62	26.3	89	SPHCA6	34	712	1	1
$Gd_{3.03}Ga_{4.97}O_{12}^{*+}$	1.9332	1.9332	1.9332	1.9699	1.9699	1.9699	237.30	19.77	27.028	0.0063	0.3653	9.62	26.3	97	JOBPDE	14	3299	1	1
$Gd_3Ga_5O_{12}^{*+}$ (BTL)	1.9334	1.9334	1.9334	1.9702	1.9702	1.9702	237.30	19.77	27.032	0.0063	0.3652	9.62	26.3	90	APOPAI	29	3704	1	1
$Tb_{3.04}Ga_{4.96}O_{12}^{*+}$	1.9325	1.9325	1.9325	1.9707	1.9707	1.9707	235.40	19.61	26.798	0.0066	0.3657	9.45	25.8	97	JOBPDE	14	3299	1	1
$Tb_{3.04}Ga_{4.96}O_{12}^{*+}$ (Allied Signal)	1.9335	1.9335	1.9335	1.9710	1.9710	1.9710	235.40	19.61	26.818	0.0064	0.3651	9.54	26.1	97	JOBPDE	14	3299	1	1
$Tb_3Ga_5O_{12}^{*}$	1.932	1.932	1.932	1.971	1.971	1.971	235.40	19.61	26.788	0.0066	0.3659	9.40	25.6	94	PSSBBD	182	K91	6	3
$Dy_{3.05}Ga_{4.95}O_{12}^{*+}$	1.9311	1.9311	1.9311	1.9679	1.9679	1.9679	233.80	19.48	26.588	0.0063	0.3664	9.61	26.2	97	JOBPDE	14	3299	1	1
$Ho_{3.06}Ga_{4.94}O_{12}^{*+}$	1.9281	1.9281	1.9281	1.9638	1.9638	1.9638	232.40	19.37	26.370	0.0062	0.3680	9.73	26.4	97	JOBPDE	14	3299	1	1
$Tm_3Ga_5O_{12}^{*}$	1.9187	1.9187	1.9187	1.9582	1.9582	1.9582	230.00	19.16	25.915	0.0070	0.3729	9.24	24.7	82	JCRGAE	57	600	1	3?
$Y_3Sc_2Ga_3O_{12}^{*+}$	1.9068	1.9068	1.9068	1.9417	1.9417	1.9417	229.80	19.15	25.658	0.0064	0.3794	9.75	25.6	97	JOBPDE	14	3299	1	1
$Nd_3Sc_2Ga_3O_{12}^{*+}$	1.9300	1.9300	1.9300	1.9671	1.9671	1.9671	254.80	21.23	28.953	0.0064	0.3670	9.57	26.0	84	SPHCA6	29	704	1	2
$Sm_3Sc_2Ga_3O_{12}^{*+}$	1.9410	1.9410	1.9410	1.9797	1.9797	1.9797	252.40	21.03	28.913	0.0065	0.3613	9.41	26.0	97	JOBPDE	14	3299	1	1
$Gd_3Sc_2Ga_3O_{12}^{*+}$	1.9315	1.9315	1.9315	1.9687	1.9687	1.9687	248.10	20.67	28.223	0.0064	0.3662	9.56	26.0	87	Ref. 5		308	1	1
$La_3Lu_2Ga_3O_{12}^{*+}$	1.9187	1.9187	1.9187	1.9564	1.9564	1.9564	274.43	22.87	30.921	0.0067	0.3729	9.44	25.3	89	SPHCA6	34	712	1	1
$La_{2.7}Lu_{2.3}Ga_3O_{12}^{*+}$	1.9186	1.9186	1.9186	1.9561	1.9561	1.9561	273.40	22.78	30.802	0.0067	0.3730	9.47	25.3	89	SPHCA6	34	712	1	1
$La_{1.3}GdLu_{2.7}Ga_3O_{12}^{*+}$	1.9200	1.9200	1.9200	1.9575	1.9575	1.9575	270.20	22.52	30.474	0.0066	0.3722	9.49	25.4	89	SPHCA6	34	712	1	1
$Nd_3Lu_2Ga_3O_{12}^{*+}$	1.9295	1.9295	1.9295	1.9695	1.9695	1.9695				0.0069	0.3672	9.22	25.10	84	SPHCA6	29	704	1	2
$Y_{2.545}Er_{.455}Ga_{1.977}Cr_{.023}Ga_3O_{12}^{*+}$	1.9097	1.9097	1.9097	1.9444	1.9444	1.9444				0.0063	0.3778	9.78	25.89	89	SPHCA6	34	712	1	1
$Gd_{2.96}Nd_{.04}Ga_{4.8}Al_{.2}O_{12}^{*}$	1.929	1.929	1.929	1.964	1.964	1.964	236.67	19.72	26.873	0.0061	0.3676	9.79	26.6	88	JCRGAE	92	17	1	3
$Gd_{2.964}Nd_{.036}Ga_4AlO_{12}^{*}$	1.909	1.909	1.909	1.944	1.944	1.944	234.16	19.51	26.189	0.0063	0.3779	9.81	25.9	88	JCRGAE	92	17	1	3

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_O and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Gd_{2.286}Er_{.714}Ga_{1.976}Cr_{.024}Ga_3O_{12}^{*+}$	1.9319	1.9319	1.9319	1.9684	1.9684	1.9684				0.0063	0.3660	9.64	26.34	89	SPHCA6	34	712	1	1
$Nd_{2.7}Yb_{2.3}Ga_3O_{12}^{*+}$	1.9329	1.9329	1.9329	1.9722	1.9722	1.9722	265.60	22.13	30.245	0.0068	0.3655	9.31	25.4	84	SPHCA6	29	704	1	2
$LaEr_3ScGa_3O_{12}^{*+}$	1.9422	1.9422	1.9422	1.9668	1.9668	1.9668				0.0042	0.3607	11.71	32.46	84	SPHCA6	29	704	1	2?
$La_{2.37}Nd_{.07}Pb_{.01}Lu_{2.54}Cr_{.01}Ga_3O_{12}^{*+}$	1.9188	1.9188	1.9188	1.9561	1.9561	1.9561	270.20	22.51	30.446	0.0066	0.3729	9.49	25.4	97	JOBPDE	14	3299	1	1
$La_{2.37}Nd_{.07}Pb_{.01}Lu_{2.54}Cr_{.01}Ga_3O_{12}^{*+}$	1.9239	1.9239	1.9239	1.9616	1.9616	1.9616	270.20	22.51	30.564	0.0066	0.3702	9.47	25.5	97	JOBPDE	14	3299	1	1
$SrLaGa_3O_7^{*+}$	1.7947	1.7947	1.7831	1.8287	1.8287	1.8182	173.45	24.78	17.551	0.0084	0.4531	9.30	20.5	96	JOBPDE	13	1941	1	2
$SrGdGa_3O_7^{*}$	1.793	1.793	1.810	1.836	1.836	1.842	167.50	23.93	17.073	0.0094	0.4475	8.71	19.4	91	JOBPDE	8	1668	1	3?
$BaLaGa_3O_7^{*}$	1.845	1.845	1.850				178.40	25.49	18.973					84	PHBCDQ	123	215	8	6
$La_3Ga_5SiO_{14}^{*+}$	1.8712	1.8712	1.8829	1.9043	1.9043	1.9157	293.48	20.96	31.958	0.0065	0.3975	9.88	24.8	83	PSSABA	80	387	1	2
$La_3Ga_5GeO_{14}^{*+}$	1.8875	1.8875	1.9005	1.9249	1.9249	1.9377	296.91	21.21	32.767	0.0071	0.3878	9.38	24.1	87	SPHCA6	32	236	1	1
$La_3Ga_{5.5}Nb_{.5}O_{14}^{*+}$	1.9122	1.9122	1.9397	1.9543	1.9543	1.9846	299.56	21.40	33.820	0.0075	0.3716	8.88	23.8	87	SPHCA6	32	236	1	1
$La_3Ga_{5.5}Ta_{.5}O_{14}^{*+}$	1.9055	1.9055	1.9298	1.9434	1.9434	1.9699	300.13	21.43	33.686	0.0069	0.3758	9.31	24.7	87	SPHCA6	32	236	1	1
Ferrites																			
$MnFe_2O_4^{*}$	2.18	2.18	2.18				76.74	19.18	10.181					89	PSSBBD	152	657	3	5
$CoFe_2O_4$	2.480	2.480	2.480				73.98	18.49	11.161					78	SPSSA7	20	1451	3	5
$ZnFe_2O_4^{*}$	2.16	2.16	2.16				74.96	18.74	9.841					89	PSSBBD	152	657	3	5
$Y_3Fe_5O_{12}^{*+}$ (BTL)	2.1287	2.1287	2.1287	2.3266	2.3266	2.3266	236.90	19.74	30.578	0.0197	0.2832	4.80	16.9	97	JOBPDE	14	3299	1	2
$Y_3Fe_5O_{12}^{*}$	2.165	2.165	2.165	2.485	2.485	2.485	236.90	19.74	31.184	0.0271	0.2711	4.00	14.7	65	BJAPAJ	16	475	1	3?
$Y_3Fe_5O_{12}^{*}$	2.15	2.15	2.15	2.31	2.31	2.31	236.90	19.74	30.936	0.0159	0.2767	5.27	19.0	74	PLRBAQ	10	971	6	5
$Y_3Fe_5O_{12}^{*}$ films	2.17	2.17	2.17	2.34	2.34	2.34	236.90	19.74	31.266	0.0157	0.2696	5.24	19.4	73	APPLAB	23	702	7	5
Silicates																			
$Be_2SiO_4^{*+}$ phenacite	1.6403	1.6403	1.6559	1.6538	1.6538	1.6696	61.73	15.43	5.346	0.0052	0.5857	13.43	22.93	62	Ref. 1	Rf	2688	1	1
$Be_2SiO_4^{*+}$ phenacite	1.6392	1.6392	1.6561	1.6536	1.6536	1.6693	61.73	15.43	5.341	0.0054	0.5864	13.22	22.54	62	Ref. 1	Rf	2903	1	1
$Be_2SiO_4^{*}$ phenacite	1.66	1.66	1.66				61.73	15.43	5.440					73	PSSBBD	55	143	3	4
$Mg_2SiO_4^{*+}$ forsterite (synthetic)	1.6211	1.6353	1.6530	1.6358	1.6506	1.6687	72.48	18.12	6.207	0.0060	0.5962	12.61	21.14	28	AMMIAY	13	559	1	1
$Mg_2SiO_4^{+}$ (Fayal), contains Fe?	1.6529	1.6717	1.6902	1.6702	1.6897	1.7086	72.48	18.12	6.476	0.0063	0.5577	11.92	21.38	28	AMMIAY	13	559	1	1?
$Mg_{1.80}Fe_{.225}Ni_{.01}SiO_4^{*+}$ peridot (San Carlos, AZ)	1.6407	1.6569	1.6758	1.6569	1.6744	1.6934	73.06	18.27	6.422	0.0063	0.5723	12.08	21.11	97	JOBDE	14	3299	1	1
$Mg_2SiO_4^{*}$ forsterite (synthetic)	1.651	1.631	1.668				72.48	18.12	6.311					73	PSSBBD	55	677	3	3
$Mn_{1.98}Si_{1.00}O_4^{*+}$ tephroite (synthetic)	1.7545	1.7803	1.7937	1.7809	1.8092	1.8219	81.33	20.33	8.116	0.0071	0.4644	10.21	21.99	97	JOBPDE	14	3299	1	1
$Mn_2SiO_4^{*}$ tephroite (synthetic)	1.739	1.768	1.778	1.774	1.806	1.816	81.33	20.33	8.003	0.0098	0.4758	8.82	18.53	32	AMMIAY	17	135	2	3?
$Mn_{1.85}Mg_{.15}SiO_4^{*}$ tephroite (Pajsberg)	1.737	1.760	1.770	1.761	1.787	1.799	81.33	20.33	7.955	0.0072	0.4805	10.35	21.53	62	Ref. 1	Rf	1236	1	3
$Fe_2SiO_4^{*+}$ fayalite (Oberharz)	1.7918	1.8289	1.8429	1.8246	1.8662	1.8782	77.53	19.38	8.065	0.0079	0.4320	9.34	21.63	62	Ref. 1	Rf	1390	1	1
$Fe_{1.72}Mn_{.09}Mg_{.16}Ca_{.03}Si_{.98}Ti_{.02}O_4^{*+}$ fayalite (Cuddia Mida, Isola de Pantelleria, It.)	1.7708	1.8006	1.8085	1.8031	1.8368	1.8447	77.53	19.38	7.863	0.0085	0.4516	9.24	20.47	09	ZEKRDZ	46	138	1	1?
$Fe_2SiO_4^{*+}$ fayalite (synthetic-O. Kopp, C. Finch)	1.7933	1.8311	1.8414	1.8258	1.8664	1.8752	76.92	19.23	8.007	0.0076	0.4315	9.51	22.04	97	JOBPDE	14	3299	1	1
$Fe_2SiO_4^{*+}$ fayalite (synthetic-O. Kopp, C. Finch)	1.7924	1.8306	1.8410	1.8253	1.8660	1.8748	76.92	19.23	8.003	0.0077	0.4319	9.48	21.96	97	JOBPDE	14	3299	1	1
$Fe_2SiO_4^{*+}$ fayalite ($8A1^{+}8C2$)	1.7923	1.8306	1.8411	1.8253	1.8660	1.8747	76.92	19.23	8.003	0.0077	0.4321	9.46	21.90	97	JOBPDE	14	3299	1	1
$Fe_2SiO_4^{*+}$ fayalite ($8C2^{+}8B1$)	1.7927	1.8306	1.8406	1.8254	1.8660	1.8749	76.92	19.23	8.002	0.0077	0.4318	9.50	21.99	97	JOBPDE	14	3299	1	1
Zn_2SiO_4-alpha^{*+} willemite (Altenberg near Aachen)	1.6661	1.6661	1.6940	1.6893	1.6893	1.7179	87.02	21.75	7.809	0.0081	0.5537	10.48	18.93	23	ZEKRDZ	58	460	1	1?
Zn_2SiO_4 willemite	1.6728	1.6728	1.7020	1.6939	1.6939	1.7230	87.02	21.75	7.874	0.0071	0.5464	11.08	20.28	62	Ref. 1	Rf	2883	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$CaMnSiO_4^*$ (synthetic)	1.6570	1.6851	1.6974	1.6861	1.7117	1.7217	89.06	22.26	8.033	0.0090	0.5493	9.86	17.94	32	AMMIAY	17	135	2	3?
$Ca_{1.22}Fe_{.40}Mn_{.24}Mg_{.14}SiO_4^{*+}$ monticellite (Gute-Hoffnungshütte)	1.6554	1.6826	1.6857	1.6744	1.7043	1.7095				0.0074	0.5546	10.93	19.71	62	Ref. 1	Rf	843	1	1
$Ca_{.82}Fe_{1.02}Mg_{.10}Zn_{.06}SiO_4^{*+}$ olivine (Clausthaler Silberhütte)	1.6743	1.7090	1.7189	1.6957	1.7339	1.7431	87.60	21.90	8.089	0.0075	0.5289	10.64	20.11	62	Ref. 1	Rf	1082	1	1
$Sr_2SiO_4^*$ monoclinic (synthetic) FL 367 K	1.702	1.707	1.736	1.727	1.732	1.756	97.59	24.40	9.153	0.0072	0.5155	10.72	20.80	22	AJSCAP	4	331	2	3
Eu_2SiO_4-beta* monoclinic	1.813	1.817	1.841	1.889	1.896	1.914	97.77	24.44	10.193	0.0162	0.4300	6.52	15.17	71	PKOMA3	14	37	6	3
$CaMn_{1.69}Fe_{.24}Mg_{.07}Be_3Si_3O_{12}^{*+}$ trimerite (Harstigsgrube)	1.6990	1.7020	1.7100	1.7155	1.7192	1.7255	214.61	17.88	19.882	0.0053	0.5258	12.60	23.9	60	Ref. 10D		871	1	1
$ZrSiO_4^+$ zircon, colorless (Chantaboon, Thailand)	1.8911	1.8911	1.9508	1.9239	1.9239	1.9838	65.94	16.49	7.386	0.0060	0.3776	10.04	26.60	62	Ref. 1	Rf	514	1	1
$ZrSiO_4^+$ zircon	1.8819	1.8819	1.9433	1.9195	1.9195	1.9803	65.94	16.49	7.337	0.0069	0.3823	9.40	24.59	62	Ref. 1	Rf	514	1	1?
$ZrSiO_4^{*+}$ zircon, blue (Chantaboon, Thailand)	1.8942	1.8942	1.9519	1.9255	1.9255	1.9843	65.94	16.49	7.400	0.0057	0.3762	10.24	27.22	62	Ref. 1	Rf	595	1	1
$ZrSiO_4^+$ zircon (unknown source)	1.8898	1.8898	1.9463	1.9254	1.9254	1.9796	65.94	16.49	7.373	0.0064	0.3788	9.75	25.74	03	ZEKRDZ	37	235	1	1?
$ZrSiO_4$ zircon	1.8948	1.8948	1.9527	1.9262	1.9262	1.9841	65.94	16.49	7.404	0.0057	0.3759	10.29	27.37	10	ZEKRDZ	47	1	1	1
$Zr_{.99}Hf_{.01}SiO_4^{*+}$ zircon (Nigeria?)	1.8939	1.8939	1.9519	1.9256	1.9256	1.9847	65.32	16.33	7.329	0.0058	0.3764	10.17	27.02	97	JOBPDE	14	3299	1	1
$ZrSiO_4^*$ zircon, red-brown (North Burgess, Ontario)	1.908	1.908	1.956	1.936	1.936	1.990	65.94	16.49	7.459	0.0054	0.3705	10.51	28.37	62	Ref. 1	Rf	647	1	3
$Al_2SiO_5^{*+}$ kyanite	1.6984	1.7053	1.7114	1.7130	1.7221	1.7287	73.29	14.65	6.800	0.0051	0.5244	12.77	24.35	62	Ref. 1	Rf	4085	1	1
Al_2SiO_5 andalusite (Brazil)	1.6197	1.6257	1.6293	1.6327	1.6387	1.6439	85.54	17.11	7.219	0.0056	0.6097	13.24	21.72	08	ZEKRDZ	44	313	1	2
$Al_2SiO_5^+$ sillimanite, pale-blue (Mogok, Upper Burma)	1.6426	1.6443	1.6613	1.6581	1.6593	1.6785	82.92	16.58	7.215	0.0060	0.5813	12.45	21.41	62	Ref. 1	Rf	1520	1	1
$Al_2SiO_5^+$ sillimanite (Ceylon)	1.6408	1.6425	1.6610	1.6563	1.6577	1.6766	82.92	16.58	7.204	0.0059	0.5828	12.61	21.64	62	Ref. 1	Rf	4038	1	1
Al_2SiO_5 sillimanite	1.6407	1.6426	1.6600	1.6576	1.6592	1.6797	82.92	16.58	7.201	0.0067	0.5832	11.81	20.26	62	Ref. 1	Rf	4085	1	1?
Y_2SiO_5:Nd^{*+}	1.7629	1.7655	1.7851	1.7865	1.7894	1.8104	106.90	21.38	10.617	0.0063	0.4680	10.88	23.2	90	IEJQA7	26	1405	5	1
$Al_2SiO_4F_2^{*+}$ topaz (Schneckenstein)	1.6035	1.6063	1.6131	1.6153	1.6179	1.6248	85.84	14.30	7.083	0.0051	0.6312	14.07	22.28	62	Ref. 1	Rf	4046	1	1
$Al_2SiO_4F_2^{*+}$ topaz	1.6191	1.6217	1.6303	1.6293	1.6308	1.6379	85.84	14.30	7.233	0.0037	0.6110	16.31	26.69	62	Ref. 1	Rf	4071	1	1?
$Al_2SiO_4F_2$ topaz	1.6009	1.6036	1.6104	1.6120	1.6146	1.6215	85.84	14.30	7.058	0.0049	0.6346	14.44	22.75	62	Ref. 1	Rf	1833	1	1
$Al_2SiO_4F_{1.89}(OH)_{.11}^{*+}$ topaz	1.5998	1.6031	1.6094	1.6112	1.6142	1.6208	85.84	14.30	7.049	0.0050	0.6357	14.29	22.48	97	JOBPDE	14	3299	1	1
$Al_2SiO_4F_{1.89}(OH)_{.11}^{*+}$ topaz	1.5992	1.6023	1.6096	1.6107	1.6136	1.6209	85.84	14.30	7.046	0.0050	0.6363	14.20	22.32	97	JOBPDE	14	3299	1	1
$Bi_4Si_3O_{12}^{*+}$	1.9674	1.9674	1.9674	2.0293	2.0293	2.0293	273.10	22.76	31.881	0.0096	0.3483	7.62	21.8	72	JAPIAU	43	5110	1	1
$Bi_4Si_3O_{12}^{*+}$	1.9559	1.9559	1.9559	2.0217	2.0217	2.0217	273.10	22.76	31.623	0.0104	0.3539	7.37	20.8	95	OPSUA3	79	868	6	2
$CaBSiO_4OH^{*+}$ datolite (Serra dei Zanchetti)	1.6109	1.6377	1.6544	1.6246	1.6527	1.6694	88.59	17.72	7.566	0.0058	0.5990	12.89	21.51	62	Ref. 1	Rf	2950	1	1
$CaBSiO_4OH^{*+}$ datolite (Westfield, MA)	1.6121	1.6383	1.6550	1.6253	1.6530	1.6697	88.59	17.72	7.574	0.0056	0.5981	13.04	21.80	97	JOBPDE	14	3299	1	1
$Ca_{.95}Mg_{.05}B_2Si_2O_8^{*+}$ danburite (Okira, Japan)	1.6167	1.6200	1.6226	1.6302	1.6333	1.6361	136.30	17.04	11.427	0.0056	0.6159	13.23	21.4	62	Ref. 1	Rf	1044	1	1
$Ca_{1.00}B_{1.99}Al_{.01}Si_{2.00}O_8^{*+}$ danburite (Charcus, Mexico)	1.6166	1.6192	1.6227	1.6299	1.6327	1.6361	136.33	17.04	11.425	0.0056	0.6162	13.26	21.5	97	JOBPDE	14	3299	1	1
$Cu_6Si_6O_{18}\cdot 6\ H_2O^+$ dioptase	1.6338	1.6338	1.6800	1.6573	1.6573	1.7091	476.77	19.86	41.475	0.0094	0.5822	9.96	17.1	62	Ref. 1	Rf	621	1	1
$Cu_6Si_6O_{18}\cdot 6\ H_2O^+$ dioptase (Kirgensteppe)	1.6291	1.6291	1.6720	1.6611	1.6809	1.6886	476.77	19.86	41.181	0.0066	0.5711	11.79	20.6	62	Ref. 1	Rf	2889	1	1?
$Pb_9Mg_9Si_9O_{24}(OH)_{24}$ molybdophyllite (Langbanshuttan, Varmland, Sweden)	1.7836	1.7836	1.7309	1.8145	1.8145	1.7609	1043.38	21.74	103.106	0.0080	0.4726	9.70	20	38	Ref. 10C		368	1	1?
$Pb_3Al_2CaSi_{10}O_{27}\cdot 3\ H_2O^{*+}$ wickenburgite (Wickenburg, AZ)	1.6550	1.6550	1.6183	1.6911	1.6911	1.6478	635.17	21.17	54.820	0.0127	0.5893	8.62	14.6	68	AMMIAY	53	1433	2	2

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Be_{3.0}Al_{1.96}Cr_{.07}Si_{5.96}O_{18}^{*+}$ beryl (synthetic-Chatham)	1.5526	1.5526	1.5487	1.5650	1.5650	1.5610	338.41	18.80	25.787	0.0066	0.7110	13.14	18.4	97	JOBPDE	14	3299	1	1
$Be_{3.0}Al_{1.96}Cr_{.07}Si_{5.96}O_{18}^{*+}$ beryl (synthetic-Chatham)	1.5511	1.5511	1.5477	1.5633	1.5633	1.5598	338.41	18.80	25.736	0.0065	0.7130	13.26	18.6	97	JOBPDE	14	3299	1	1
$Na_{.02}Be_{3.04}Al_{1.95}Fe_{.02}Mg_{.01}Si_{5.99}O_{18}\cdot(.32H_2O)^{*+}$ aquamarine (Nuristan, Pakistan)	1.5633	1.5633	1.5581	1.5757	1.5757	1.5703	337.87	18.77	26.142	0.0063	0.6952	13.27	19.0	97	JOBPDE	14	3299	1	1
$Na_{.04}Cs_{.02}Be_{3.06}Al_{1.96}Fe_{.02}Zn_{.01}Si_{5.97}O_{18}\cdot(.41H_2O)^{*+}$ aquamarine (Nuristan, Pakistan)	1.5650	1.5650	1.5597	1.5775	1.5775	1.5721	337.90	18.77	26.208	0.0063	0.6927	13.21	19.0	97	JOBPDE	14	3299	1	1
$Na_{.04}Be_{3.06}Al_{1.93}Fe_{.03}Mg_{.02}Zn_{.01}Si_{5.97}O_{18}\cdot(.49H_2O)^{*+}$ beryl, green (Padre Paraiso, Minas Gerais)	1.5661	1.5661	1.5607	1.5784	1.5784	1.5730	338.09	18.28	26.263	0.0062	0.6911	13.30	19.2	97	JOBPDE	14	3299	1	1
$Na_{.04}Be_{3.06}Al_{1.93}Fe_{.03}Mg_{.02}Zn_{.01}Si_{5.97}O_{18}\cdot(.49H_2O)^{*+}$ beryl, green (Padre Paraiso, Minas Gerais)	1.5665	1.5665	1.5609	1.5788	1.5788	1.5732	338.09	18.28	26.276	0.0062	0.6905	13.32	19.2	97	JOBPDE	14	3299	1	1
$Na_{.03}Cs_{.04}Be_{3.05}Al_{1.97}Fe_{.01}Si_{5.97}O_{18}\cdot(.46H_2O)^{*+}$ goshenite (Hunza, Pakistan)	1.5653	1.5653	1.5600	1.5777	1.5777	1.5722	337.88	18.77	26.218	0.0063	0.6922	13.27	19.1	97	JOBPDE	14	3299	1	1
$Na_{.20}Cs_{.14}Be_{3.15}Al_{1.90}Si_{5.90}V_{.01}O_{18}\cdot(.88H_2O)^{*+}$ morganite (Brazil)	1.5794	1.5794	1.5722	1.5923	1.5923	1.5848	339.38	18.85	26.850	0.0062	0.6725	13.19	19.6	97	JOBPDE	14	3299	1	1
$Li_{.37}Na_{.24}Cs_{.11}Mg_{.04}Be_{2.58}B_{.06}Al_{2.02}Si_{5.94}O_{18}\cdot(67H_2O)^{*+}$ beryl, Maxize (Minas Gerais)	1.5792	1.5792	1.5720	1.5920	1.5920	1.5844	339.00	18.80	26.812	0.0062	0.6729	13.22	19.6	35	ZMGPAS	1935	37	1	1
$Na_{.04}Mg_{1.72}Fe_{.27}Al_{3.97}Fe^{*}_{.03}Si_5O_{18}\cdot(H_2O)_{.49}(CO_2)^{*+}_{.07}$ cordierite, blue (Madagascar)	1.5227	1.5285	1.5312	1.5358	1.5413	1.5442	388.39	21.57	28.527	0.0075	0.7501	12.62	16.8	97	JOBPDE	14	3299	1	1
$Na_{.03}Mg_{1.97}Fe_{.03}Al_{3.97}Fe^{*}_{.03}Si_5O_{18}\cdot(H_2O)_{.41}(CO_2)^{*+}_{.07}$ cordierite, colorless (unknown source)	1.5193	1.5231	1.5263	1.5318	1.5357	1.5389	387.67	21.53	28.267	0.0075	0.7580	12.75	16.8	97	JOBPDE	14	3299	1	1
$Mg_{2.04}Fe_{.53}Ca_{.43}Mn_{.02}Al_{1.96}Cr_{.03}Fe_{.01}Si_3O_{12}^{*+}$ pyrope (Northeast AZ)	1.7219	1.7219	1.7219	1.7395	1.7395	1.7395	191.88	15.99	18.129	0.0053	0.5089	12.38	24.3	97	JOBPDE	14	3299	1	1
$Mg_{1.95}Fe_{.99}Ca_{.09}Mn_{.01}Al_{1.98}Si_3O_{12}^{*+}$ pyrope (Madagascar)	1.7342	1.7342	1.7342	1.7525	1.7525	1.7525	189.74	15.81	18.159	0.0053	0.4982	12.22	24.5	97	JOBPDE	14	3299	1	1
$Mg_{1.64}Fe_{1.17}Ca_{.19}Mn_{.03}Al_2Si_3O_{12}^{*+}$ pyrope (Sri Lanka)	1.7489	1.7489	1.7489	1.7678	1.7678	1.7678	190.85	15.90	18.542	0.0053	0.4857	12.15	25.0	97	JOBPDE	14	3299	1	1
$Fe_{1.45}Mg_{1.18}Ca_{.20}Mn_{.04}Al_2Si_3O_{12}^{*+}$ almandine (North Creek, NY)	1.7536	1.7536	1.7536	1.7735	1.7735	1.7735	192.04	16.00	18.746	0.0055	0.4819	11.86	24.6	97	JOBPDE	14	3299	1	1
$Mg_{1.23}Fe_{.90}Mn_{.56}Ca_{.33}Al_{1.98}V_{.02}Cr_{.01}Zn_{.01}Si_3O_{12}^{*+}$ pyrope (Tanzania)	1.7511	1.7511	1.7511	1.7706	1.7706	1.7706	193.28	16.11	18.819	0.0054	0.4839	11.96	24.7	97	JOBPDE	14	3299	1	1
$Mg_3Al_2Si_3O_{12}^{*}$ pyrope	1.730	1.730	1.730	1.749	1.749	1.749	187.89	15.66	17.904	0.0055	0.5013	12.06	24.0	62	Ref. 1	Rf	138	1	3
$Mn_{2.80}Fe_{.17}Ca_{.01}Al_{2.03}Si_3O_{12}^{*+}$ spessartine (Ramona, CA)	1.7816	1.7816	1.7816	1.8028	1.8028	1.8028	195.79	16.32	19.640	0.0054	0.4599	11.70	25.4	97	JOBPDE	14	3299	1	1
$Mn_{2.16}Ca_{.14}Fe^{(2+)}_{.512}Fe^{(3+)}_{.123}Al_{2.01}Si_{2.98}O_{12}^{*+}$ spessartine (Kenya)	1.7794	1.7794	1.7794	1.8018	1.8018	1.8018	195.77	16.31	19.597	0.0057	0.4616	11.37	24.6	78	AFSLAO	29	275	1	1
$Ca_{2.92}Mn_{.04}Fe_{.135}Al_2Si_3O_{12}^{*+}$ grossular (Asbestos, Quebec)	1.7208	1.7208	1.7208	1.7383	1.7383	1.7383	207.89	17.32	19.619	0.0053	0.5099	12.40	24.3	97	JOBPDE	14	3299	1	1
$Ca_{2.95}Al_{1.97}Mg_{.04}Mn_{.01}Ti_{.02}Fe_{.01}Si_{2.99}O_{12}^{*+}$ grossular (Umba River, Tanzania)	1.7232	1.7232	1.7232	1.7414	1.7414	1.7414	208.04	17.34	19.683	0.0055	0.5077	12.18	23.9	97	JOBPDE	14	3299	1	1
$Ca_{2.98}Mn_{.01}Fe_{.01}Al_{1.97}Fe_{.02}Si_{2.94}O_{12}^{*+}$ grossular (Jeffrey Quarry, Quebec)	1.7169	1.7169	1.7169	1.7339	1.7339	1.7339	208.04	17.34	19.552	0.0052	0.5135	12.54	24.4	97	JOBPDE	14	3299	1	1
$Ca_{2.66}Mg_{.20}Fe_{.14}Al_{1.84}Fe_{.16}Si_3O_{12}^{*+}$ grossular (Passo del Termine)	1.7444	1.7444	1.7444	1.7565	1.7565	1.7565	206.97	17.25	20.017	0.0035	0.4895	15.03	30.7	62	Ref. 1	Rf	235	1	1?
$Ca_{3.00}Fe_{1.99}Mg_{.02}Al_{.01}Si_{2.98}O_{12}^{*+}$ demantoid (Val Malenco)	1.8344	1.8344	1.8344	1.8863	1.8863	1.8863	219.40	18.28	23.089	0.0110	0.4226	7.83	18.5	97	JOBPDE	14	3299	1	1
$Ca_{2.99}Fe_{2.00}Mg_{.02}Al_{.01}Si_{2.98}O_{12}^{*+}$ demantoid (Ala Valley)	1.8347	1.8347	1.8347	1.8867	1.8867	1.8867	219.40	18.28	23.095	0.0111	0.4226	7.81	18.4	97	JOBPDE	14	3299	1	1
$Ca_{3.00}Fe_{1.99}Mg_{.02}Al_{.01}Si_{2.98}O_{12}^{*+}$ demantoid (Val Malenco)	1.8319	1.8319	1.8319	1.8855	1.8855	1.8855	219.40	18.28	23.039	0.0115	0.4245	7.68	18.1	97	JOBPDE	14	3299	1	1
$Ca_3Fe_2Si_3O_{12}$ andradite	1.841	1.841	1.841	1.889	1.889	1.889	219.40	18.28	23.221	0.0101	0.4183	8.13	19.4	62	Ref. 1	Rf	244	1	6
$Ca_3Mn^{(3+)}_{1.95}Al_{0.04}Fe_{0.01}(SiO_4)_{2.07}(O_4H_4)^{*+}_{0.93}$ henritermierite, n data from O. Medenbach	1.7594	1.7594	1.8198	1.7967	1.7967	1.8726	232.19	19.34	23.246	0.0105	0.4623	8.40	18.1	00	Ref. 14			1	1
$Li_{1.00}Al_{.97}Si_{2.02}O_6^{*+}$ spodumene (Nuristan, Afghanistan)	1.6462	1.6504	1.6606	1.6601	1.6648	1.6755	97.31	16.22	8.498	0.0054	0.5780	13.08	22.63	97	JOBPDE	14	3299	1	1
$Li_{.95}Na_{.05}AlSi_2O_6^{*+}$ spodumene, rose (Maharitra, Madagascar)	1.6454	1.6509	1.6600	1.6602	1.6651	1.6759	97.31	16.22	8.495	0.0056	0.5783	12.85	22.22	13	ZEKRDZ	13	294	1	2
$LiAlSi_2O_6^{*+}$ spodumene, colorless	1.6454	1.6510	1.6597	1.6602	1.6649	1.6756	97.31	16.22	8.494	0.0056	0.5784	12.88	22.27	13	ZEKRDZ	13	294	1	2

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O- atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Li_{.95}Na_{.05}Al_{0.95}Fe^{(3+)}_{.05}Si_2O_6^*$ spodumene, green (Maharitra, Madagascar)	1.6541	1.6580	1.6666	1.6684	1.6713	1.6809	97.31	16.22	8.572	0.0051	0.5701	13.35	23.42	13	ZEKRDZ	13	294	1	2?
$LiAlSi_2O_6^+$ spodumene, colorless	1.6454	1.6510	1.6597	1.6602	1.6649	1.6756	97.31	16.22	8.494	0.0056	0.5784	12.88	22.27	62	Ref. 1	Rf	2966	1	2
$LiAlSi_2O_6^{*+}$ amorphous spodumene (Corning ESI glass)	1.5052	1.5052	1.5052	1.5176	1.5176	1.5176	129.37	21.56	9.164	0.0079	0.7901	12.66	16.0	97	JOBPDE	14	3299	1	1
$Li_{0.90}Na_{.10}Al_{1.0}Si_4O_{10}^*$ petalite (Karabib, SW Africa)	1.497	1.502	1.508	1.507	1.512	1.518	211.21	21.12	14.889	0.0067	0.7961	13.83	17.3	46	AMMIAY	31	51	2	3
$CaSiO_3^*$ pseudowollastonite (synthetic)	1.594	1.594	1.631	1.610	1.610	1.653	66.41	22.14	5.470	0.0078	0.6334	11.38	17.96	22	AJSCAP	4	331	2	3
$BaSiO_3^*$ (synthetic)	1.654	1.654	1.656	1.673	1.674	1.678	79.87	26.62	6.994	0.0074	0.5754	11.16	19.39	22	AJSCAP	4	331	2	3
$BaSi_2O_5^*$ sanbornite (synthetic)	1.587	1.602	1.601	1.597	1.612	1.621	120.52	24.10	9.799	0.0060	0.6454	13.11	20.3	22	AJSCAP	4	331	2	3
$Ca_{.46}Mg_{.35}Fe_{.15}Mn_{.01}Al_{.09}Si_{.93}O_3^{*+}$ pigeonite	1.6780	1.6843	1.7017	1.6981	1.7043	1.7228	54.13	18.04	4.928	0.0068	0.5408	11.31	20.90	62	Ref. 1	Rf	2173	1	1
$Ca_{1.47}Mn_{1.44}Mg_{.09}Si_3O_9^{*+}$ bustamite (Langban)	1.6528	1.6658	1.6671	1.6730	1.6860	1.6879	184.04	20.45	16.256	0.0073	0.5676	11.12	19.5	31	AMMIAY	16	488	1	1
$Mn_{.8}Ca_{.2}SiO_3^{*+}$ rhodonite (Broken Hill)	1.7081	1.7125	1.7200	1.7296	1.7344	1.7424	58.38	19.46	5.467	0.0067	0.5165	11.06	21.42	56	HAMBA6	1	137	1	1
$Mn_{.65}Fe_{.13}Ca_{.19}Mg_{.03}SiO_3^{*+}$ rhodonite (Morocco)	1.6980	1.7021	1.7101	1.7188	1.7231	1.7315	58.38	19.46	5.407	0.0067	0.5259	11.23	21.35	56	HAMBA6	1	137	1	1
$Mn_{.80}Ca_{.14}Mg_{.05}Fe_{.01}SiO_3^{*+}$ rhodonite (Harstigen)	1.6991	1.7030	1.7107	1.7219	1.7262	1.7338	58.38	19.46	5.412	0.0073	0.5251	10.75	20.47	31	AMMIAY	16	488	1	2
$CaMg_{.94}Fe^{(2+)}_{.06}Si_2O_6^{*+}$ diopside, colorless (Nordmarken)	1.6549	1.6618	1.6821	1.6712	1.6781	1.7003	109.83	18.30	9.752	0.0060	0.5631	12.20	21.6	97	Ref.10A		1027	1	1
$Ca_{.99}Mn_{.01}Mg_{.92}Fe^{(2+)}_{.08}Al_{.01}Si_{1.99}O_6^{*+}$ diopside, yellow-green (Nordmarken)	1.6573	1.6647	1.6877	1.6734	1.6804	1.7026	109.90	18.32	9.800	0.0055	0.5594	12.74	22.7	97	Ref.10A		1027	1	1
$CaMgSi_2O_6^+$ diopside, colorless (Zillertal)	1.6527	1.6621	1.6839	1.6726	1.6795	1.7024	109.90	18.32	9.758	0.0066	0.5632	11.65	20.6	62	Ref. 1	Rf	1697	5	1
$Ca_{.97}Na_{.02}Mg_{.93}Fe_{.03}Cr_{.02}Al_{.01}Si_2O_6^{*+}$ diopside (Russia)	1.6552	1.6621	1.6831	1.6715	1.6785	1.7001	109.94	18.32	9.768	0.0059	0.5626	12.34	21.9	97	JOBPDE	14	3299	1	1
$Ca_{.96}Mn_{.01}Fe^{(2+)}_{.03}Mg_{.42}Fe^{(2+)}_{.56}Fe^{(3+)}_{.02}Si_2O_6^{*+}$ diopside, black (Nordmarken)	1.6829	1.6898	1.7101	1.6991	1.7063	1.7281	110.94	18.49	10.172	0.0055	0.5348	12.42	23.2	97	Ref.10A		1027	1	1
$CaMg_{.92}Fe^{(2+)}_{.08}Si_2O_6^{*+}$ diopside (Ala Valley)	1.6552	1.6620	1.6828	1.6705	1.6775	1.6995	109.90	18.32	9.762	0.0057	0.5628	12.59	22.3	62	Ref. 1	Rf	1767	1	2
$CaMgSi_2O_6^*$ amorphous (Corning)	1.5968	1.5968	1.5968	1.6125	1.6125	1.6125	125.95	20.99	10.242	0.0071	0.6453	12.07	18.7	97	JOBPDE	14	3299	1	1
$Ca_2MgSi_2O_7^{*+}$ akermanite	1.6152	1.6152	1.6237	1.6326	1.6326	1.6407	153.63	21.95	12.850	0.0072	0.6181	11.71	18.9	97	JOBPDE	14	3299	1	1
$Ca_2MgSi_2O_7^+$ akermanite	1.6214	1.6214	1.6261	1.6391	1.6391	1.6431	153.63	21.95	12.933	0.0072	0.6120	11.70	19.1	62	Ref. 1	Rf	414	1	1
$Ca_2ZnSi_2O_7^+$ hardystonite	1.6530	1.6530	1.6431	1.6723	1.6723	1.6610	153.55	21.94	13.366	0.0071	0.5809	11.45	19.7	62	Ref. 1	Rf	414	1	1
$Ca_2ZnSi_2O_7^{*+}$ hardystonite (synthetic-Liebertz)	1.6542	1.6542	1.6440	1.6735	1.6735	1.6618	153.55	21.94	13.384	0.0070	0.5797	11.49	19.8	97	JOBPDE	14	3299	1	1
$Ca_2Al_2SiO_7^*$ gehlenite (synthetic)	1.646	1.646	1.639	1.665	1.665	1.657	149.09	21.30	12.882	0.0069	0.5872	11.64	19.8	93	JOAOD6	10	2246	1	3
$Ca_2Ga_2SiO_7^{*+}$	1.6998	1.6998	1.6909	1.7251	1.7251	1.7135	155.83	22.26	14.328	0.0078	0.5321	10.41	19.5	96	JOBPDE	13	1941	1	2
$Ca_2CoSi_2O_7^{*+}$	1.5731	1.5731	1.6490	1.6197	1.6197	1.6764	154.60	22.08	12.599	0.0178	0.6460	7.62	11.8	97	JOBPDE	14	3299	1	1?
$Sr_2CoSi_2O_7^{*+}$	1.6174	1.6174	1.6510	1.6487	1.6487	1.6766	166.50	23.78	14.117	0.0117	0.6057	9.10	15.0	97	JOBPDE	14	3299	1	1
$Na_{.87}K_{.02}Ca_{.02}Mn_{.02}Fe^{(3+)}_{.92}Al_{.05}Ti_{.03}Fe_{.03}Si_2O_{5.95}(OH)^*_{.05}$ aegirine (Quincy, MA)	1.731	1.758	1.769	1.768	1.806	1.823	107.28	17.99	10.462	0.0122	0.4826	7.97	16.5	27	AMMIAY	12	233	2	3
$Na_{.70}Ca_{.18}Mg_{.12}Fe^{(3+)}_{.78}Fe^{(2+)}_{.09}Al_{.04}Ti_{.02}Si_2O_{5.95}(OH)^*_{.05}$ aegirine (Laven, Norway)	1.706	1.729	1.740	1.743	1.768	1.782	107.75	17.96	10.214	0.0114	0.5064	8.44	16.6	27	AMMIAY	12	233	2	3
$Ca_{.90}Mn_{.01}Na_{.06}K_{.01}Mg_{.63}Fe^{(3+)}_{.11}Fe^{+}_{(2).16}Ti_{.12}Al_{.29}Si_{1.71}O_6^*$ titanaugite (Stoffel, Westerwald)	1.689	1.703	1.712	1.719	1.723	1.742	111.28	18.55	10.283	0.0086	0.5281	9.94	18.8	34	ZEKRDZ	87	1	2	3
$Ca_{.87}Mn_{.01}Na_{.05}K_{.03}Mg_{.69}Fe^{(3+)}_{.16}Fe^{(3+)}_{.10}Ti_{.10}Al_{.24}Si_{1.78}O_6^*$ titanaugite (Stoffel, Westerwald)	1.680	1.682	1.700	1.700	1.707	1.728	111.28	18.55	10.124	0.0080	0.5415	10.43	19.2	34	ZEKRDZ	87	1	2	3
$Fe^{(3+)}_{3.0}Mg_{.8}Al_{17.2}Fe^{(3+)}_{.3}Ti_{.1}Si_{7.7}O_{44}(OH)^{*+}_{3.2}$ staurolite (St. Gotthard)	1.7218	1.7267	1.7316	1.7392	1.7449	1.7508	369.95	15.41	35.131	0.0054	0.5047	12.19	24.1	23	ZEKRDZ	57	310	1	2
"$Na_2TiSi_4O_{11}^+$" narsarsukite [comp. not certain]	1.5351	1.5351	1.5702	1.5534	1.5534	1.5835	228.64	20.78	17.305	0.0090	0.7189	11.28	15.6	62	Ref. 1	Rf	365	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
"$BaNa_4Ti_2B_2Si_{10}O_{30}^{+}$" leucosphenite (Narsarsuk, Greenland?)	1.6277	1.6461	1.6671	1.6441	1.6607	1.6877	593.15	19.77	51.458	0.0065	0.5844	11.99	20.5	38	Ref. 10C		293	1	2
$CaTiSiO_5$:Fe^{+} titanite1 (Pfitschtal)	1.8513	1.8693	2.0049	1.9004	1.9117	2.0959	92.22	18.44	10.310	0.0104	0.3813	7.66	20.10	56	HAMBA6	1	285	1	1
$CaTiSiO_5$:Al,Fe^{+} titanite2 (Muttenhoernern)	1.8124	1.8327	1.9240	1.8713	1.8761	1.9941	92.22	18.44	9.888	0.0115	0.4106	7.56	18.42	56	HAMBA6	1	285	1	1
$Ca_{1.0}Ti_{1.0}SiO_5^{*+}$ titanite, light green (Eisbruckalp, Pfunders, Tirol)	1.8731	1.8785	1.9345	1.9057	1.9090	1.9913	92.22	18.44	10.206	0.0073	0.3863	9.18	23.76	97	Ref. 10A		1609	1	4?
$Ca_{1.0}Ti_{1.0}SiO_5^{*+}$ titanite, light brown (Glimmerschiefer, St.Gotthard)	1.8404	1.8508	1.9570	1.8879	1.8941	2.0087	92.22	18.44	10.104	0.0091	0.3949	8.32	21.08	97	Ref. 10A		1609	1	2?
$Ca_{1.0}Ti_{.98}Mn_{.02}SiO_5^{*+}$ titanite (Val Maggia, Tessin)	1.8232	1.8356	1.9233	1.8876	1.8942	1.9796	92.22	18.44	9.924	0.0120	0.4076	7.37	18.08	97	Ref. 10A		1609	1	2
$Ca_{1.0}Ti_{0.96}Fe_{.04}SiO_5^{*+}$ titanite (unknown source)	1.8595	1.8752	2.0199	1.9097	1.9178	2.1145	92.60	18.52	10.430	0.0104	0.3765	7.60	20.18	97	JOBPDE	14	3299	1	1
$Ca_{0.85}Ti_{1.02}Si_{1.04}O_5^{+}$ titanite (Schwarzenstein, Zillertal)	1.8698	1.8801	2.0028	1.9159	1.9216	2.0529	92.22	18.44	10.382	0.0081	0.3757	8.59	22.87	97	Ref. 10A		1609	1	3?
$Ca_{0.75}Ti_{1.05}Si_{1.07}O_5^{+}$ titanite (Wildkreuzjoch, Pfitsch, Tirol)	1.8457	1.8619	1.8739	1.9032	1.9057	1.9174	92.22	18.44	9.922	0.0097	0.4064	8.17	20.10	97	Ref. 10A		1609	1	3
$Na_4Al_3Si_3O_{12}Cl^{*+}$ sodalite (Tiahuanaco)	1.4741	1.4741	1.4741	1.4831	1.4831	1.4831	349.92	26.91	23.481	0.0065	0.8524	14.46	16.9	62	Ref. 1	Rf	2597	5	2?
$Na_4Al_3Si_3O_{12}Cl^{*+}$ sodalite (Tiahuanaco)	1.4710	1.4710	1.4710	1.4826	1.4826	1.4826	349.92	26.91	23.350	0.0085	0.8592	12.69	14.7	62	Ref. 1	Rf	2597	1	2
"$Na_4Al_3Si_3O_{12}Cl$"$^{+}$ sodalite (Vesuvius)	1.4705	1.4705	1.4705	1.4839	1.4839	1.4839	349.92	26.91	23.328	0.0098	0.8603	11.82	13.7	97	Ref. 10A		885	1	2?
"$Na_4Al_3Si_3O_{12}Cl$"$^{+}$ sodalite (Vesuvius)	1.4703	1.4703	1.4703	1.4825	1.4825	1.4825	349.92	26.91	23.320	0.0089	0.8606	12.41	14.4	97	Ref. 10A		885	1	2
$Ca_{19}Mg_{.1}AlFeMg_{1.7}Fe_{.6}Si_{18}O_{69}(OH)_{10}^{*+}$ vesuvianite (Ala Valley)	1.7020	1.7020	1.6992	1.7224	1.7224	1.7209	1431.09	18.11	132.203	0.0067	0.5281	11.25	21	97	JOBPDE	14	3299	1	1
$Ca_{18.1}Mg_{.1}Al_4FeAl_{5.2}Mg_{1.6}Fe \cdot {}_{0.5}Ti_{0.8}Si_{18}O_{69}(OH)_{10}^{*+}$ vesuvianite (Val D'Aosta)	1.7099	1.7099	1.7051	1.7314	1.7314	1.7275	1432.70	18.13	133.403	0.0068	0.5213	11.06	21	97	JOBPDE	14	3299	1	1
$Na_{.69}K_{.16}Ca_{.06}Al_{.98}Si_{1.02}O_4^{*}$ nepheline (Monte Somma, Mt. Vesuvius, xtal #2)	1.526	1.526	1.522	1.538	1.538	1.535	90.79	22.70	6.639	0.0075	0.7552	12.66	16.76	31	MNLMBB	22	569	1	3
$Na_{.69}K_{.16}Ca_{.06}Al_{.98}Si_{1.02}O_4^{*}$ nepheline (Monte Somma, Mt. Vesuvius, xtal #1)	1.524	1.524	1.521	1.537	1.537	1.534	90.79	22.70	6.621	0.0075	0.7576	12.69	16.76	31	MNLMBB	22	569	1	3
$Na_{.68}K_{.17}Ca_{.04}Al_{.93}Si_{1.06}O_4^{*}$ nepheline (Larvik, #VII) Norway	1.527	1.527	1.524	1.540	1.540	1.536	90.90	22.72	6.661	0.0072	0.7524	12.91	17.16	31	MNLMBB	22	569	1	
$Na_{.55}K_{.23}Ca_{.06}Al_{.82}Si_{1.16}O_4^{*}$ nepheline (Monte Somma, #VII) Mt. Vesuvius	1.528	1.528	1.525	1.541	1.541	1.537	91.00	22.75	6.679	0.0072	0.7505	12.88	17.17	31	MNLMBB	22	569	1	
$KAlSi_2O_6^{+}$ leucite, cubic but with tetragonal cell (Rome)	1.4970	1.4970	1.4970	1.5087	1.5087	1.5087	146.59	24.43	10.241	0.0077	0.8058	12.95	16.0	62	Ref. 1	Rf	2791	1	2
$CsAlSi_2O_6 \cdot x\ H_2O^{+}$ pollucite	1.5117	1.5117	1.5117	1.5246	1.5246	1.5246	159.80	26.63	11.442	0.0079	0.7780	12.52	16.0	62	Ref. 1	Rf	2748	1	1
$Na_{.97}K_{.02}AlSi_3O_8^{*+}$ albite (Amelia) FL 1250 K	1.5167	1.5203	1.5265	1.5285	1.5324	1.5386	166.00	20.75	12.070	0.0072	0.7611	13.04	17.1	24	ZEKRDZ	61	226	1	1
$Na_{.97}K_{.02}Ca_{.01}Al_{.97}Fe_{.01}Mg_{.02}Si_3O_8^{*+}$ albite (Rischuna) FL 1250 K	1.5168	1.5208	1.5267	1.5291	1.5330	1.5388	166.15	20.77	12.087	0.0073	0.7607	12.93	17.0	24	ZEKRDZ	61	226	1	1
$K_{.90}Na_{.10}AlSi_3O_8^{*+}$ adularia (St. Gotthard)	1.5060	1.5097	1.5120	1.5163	1.5199	1.5216	179.60	22.46	12.807	0.0063	0.7826	14.07	17.9	21	TTMMDZ	35	231	1	1?
$K_{.73}Na_{.24}Ca_{.03}Al_{1.03}Si_{2.97}O_8^{*+}$ orthoclase, moonstone (Ceylon)	1.5103	1.5147	1.5168	1.5224	1.5269	1.5289	180.10	22.51	12.943	0.0075	0.7740	12.88	16.6	16	MNLMBB	17	253	1	1
$KAlSi_3O_8^{+}$ orthoclase (Madagascar)	1.5092	1.5136	1.5136	1.5214	1.5258	1.5261	180.10	22.51	12.905	0.0076	0.7773	12.79	16.4	16	MNLMBB	17	253	1	1
$K_{.92}Na_{.08}Al_{.97}Fe_{.03}Si_3\ O_8^{*+}$ orthoclase (Madagascar)	1.5076	1.5115	1.5122	1.5193	1.5237	1.5242	180.10	22.51	12.868	0.0074	0.7804	12.96	16.6	97	JOBPDE	14	3299	1	1
$KAlSi_3O_8^{+}$ microcline, green amazonite	1.5063	1.5082	1.5102	1.5184	1.5221	1.5247	179.68	22.46	12.792	0.0085	0.7844	12.17	15.5	62	Ref. 1	Rf	2966	1	1?
$K_{.85}Na_{.15}AlSi_3O_8^{*+}$ sanidine (Eifel)	1.5091	1.5130	1.5133	1.5208	1.5253	1.5254	180.82	22.60	12.949	0.0075	0.7779	12.92	16.6	16	MNLMBB	17	237	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$CaAl_2Si_2O_8$ anorthite (Vesuvius) FL?	1.5613	1.5666	1.5740	1.5743	1.5824	1.5877	167.51	20.94	13.069	0.0071	0.6866	12.45	18.1	62	Ref. 1	Rf	1751	1	1
$CaAl_2Si_2O_8^+$ anorthite (hi-temp form) FL?	1.5591	1.5680	1.5714	1.5737	1.5820	1.5871	167.51	22.51	13.048	0.0074	0.6884	12.19	17.7	62	Ref. 1	Rf	4151	1	1
$CaAl_2Si_2O_8$ anorthite (Mijakejima) FL?	1.5589	1.5679	1.5737	1.5738	1.5818	1.5871	167.51	22.51	13.061	0.0070	0.6874	12.49	18.1	78	AMMIAY	63	394	2	1
$Ca_{0.96}Na_{.05}Al_{1.93}Fe_{.02}Si_{2.04}O_8^{*+}$ anorthite (Great Sitka Island) FL?	1.5600	1.5689	1.5729	1.5743	1.5829	1.5876	167.51	20.94	13.069	0.0072	0.6867	12.38	18.0	97	JOBPDE	14	3299	1	1
$CaAl_2Si_2O_8^{*+}$ amorphous (Corning)	1.5609	1.5609	1.5609	1.5751	1.5751	1.5751	172.05	21.50	13.299	0.0073	0.6962	12.35	17.7	97	JOBPDE	14	3299	1	1
$Na_{.56}Ca_{.36}K_{.08}Al_{1.40}Si_{2.60}O_8^{*+}$ andesine (Maeyama, Shinano, Japan)	1.5315	1.5357	1.5393	1.5449	1.5489	1.5528	166.90	20.86	12.414	0.0075	0.7365	12.50	16.9	23	MNLMBB	20	93	1	1
$Na_{.75}Ca_{.24}K_{.01}Al_{1.25}Si_{2.75}O_8^{*+}$ oligoclase (Hawke Mine, Bakersville, NC)	1.5275	1.5317	1.5354	1.5403	1.5447	1.5480	166.40	20.80	12.301	0.0074	0.7433	12.71	17.1	23	MNLMBB	20	93	1	1
$Ca_{.61}Na_{.32}K_{.05}Al_{1.62}Fe_{.01}Si_{2.37}O_8^{*+}$ labradorite (County Down, Ireland)	1.5477	1.5523	1.5568	1.5620	1.5661	1.5711	167.00	20.87	12.744	0.0075	0.7095	12.32	17.3	23	MNLMBB	20	93	1	1
$Ba_{.98}K_{.02}Al_{1.98}Si_{2.02}O_8$ celsian (1920) [anomalous dispersion]	1.6133	1.6168	1.6227	1.5885	1.5927	1.5984	183.95	22.99	15.378	−0.0109	0.6186	9.51	15.	65	MNLMBB	35	508	2	
$Ba_{.93}K_{.04}Na_{.02}Mg_{.01}Al_{1.98}Fe_{.02}Si_2O_8^{*+}$ paracelsian (Benallt mine, Rhiw, Carnarvonshire)	1.5472	1.5666	1.5743	1.5691	1.5829	1.5872	186.52	23.31	14.455	0.0087	0.6938	11.32	16.3	42	MNLMBB	26	231	1	2?
$Ca_3Si_2O_6(OH)_2(OH_2)_2^{*+}$ afwillite (Dutoitspan-Mine, Kimberley) used 3 n's	1.6043	1.6067	1.6206	1.6175	1.6209	1.6340	214.83	21.48	17.794	0.0059	0.6275	13.08	20.8	25	MNLMBB	20	277	5	2
$Ca_3Si_2O_6(OH)_2(OH_2)_2^{*+}$ afwillite (Dutoitspan-Mine, Kimberly) used only 2 n's	1.6076	1.6093	1.6230	1.6169	1.6204	1.6336	214.83	21.48	17.859	0.0044	0.6240	15.01	24.0	25	MNLMBB	20	277	5	2?
$Ca_2Al_3Si_3O_{12}OH^+$ clinozoisite (Schwarzensteinalpe, Zillertal)	1.6958	1.6990	1.6997	1.7139	1.7175	1.7191	225.80	17.37	20.793	0.0060	0.5309	11.86	22.3	17	TTMMDZ	34	23	1	1
$Ca_{1.99}Sr_{.01}Al_{2.99}Mg_{.01}V_{.01}Si_3O_{12}OH^{*+}$ zoisite1 (Merelani Hill, Arusha, Tanzania)	1.6752	1.6772	1.6839	1.6913	1.6933	1.7006	225.80	17.37	20.342	0.0056	0.5500	12.53	22.7	97	JOBPDE	14	3299	1	1
$Ca_{2.00}Al_{3.00}V_{.02}Si_{2.98}O_{12}OH^{*+}$ zoisite2 (Merelani Hills, Arusha, Tanzania)	1.6754	1.6775	1.6846	1.6914	1.6937	1.7010	225.40	17.34	20.316	0.0056	0.5496	12.58	22.8	97	JOBPDE	14	3299	1	1
$Ca_{1.90}Mg_{.04}Fe_{.06}Al_{2.4}Fe_{.6}Si_3O_{12}OH^{*+}$ epidote (Pfarreb, Zoptau)	1.7022	1.7184	1.7230	1.7215	1.7423	1.7501	227.80	17.52	21.354	0.0071	0.5157	10.74	20.8	62	Ref. 1	Rf	2983	1	1
$Ca_2Al_2FeSi_3O_{12}OH^{*+}$ epidote (pistazite, Rauhbeerstein, Zoptau)	1.7053	1.7438	1.7617	1.7287	1.7632	1.7794	227.80	17.52	21.863	0.0059	0.4965	11.62	23.4	62	Ref. 1	Rf	2983	1	1?
$Ca_{1.94}Fe_{.06}Al_{2.1}Fe_{.9}Si_3O_{12}OH^{*+}$ epidote (Knappenwand, Sulzbachtal)	1.6957	1.7293	1.7479	1.7266	1.7573	1.7742	227.80	17.52	21.578	0.0084	0.5074	9.81	19.3	62	Ref. 1	Rf	2983	1	1
$Ca_{2.00}Al_{2.46}Fe_{.52}Si_3O_{12}OH^{*+}$ epidote (Pakistan)	1.6950	1.6969	1.6993	1.7147	1.7191	1.7236	227.84	17.52	20.955	0.0071	0.5319	10.94	20.5	97	JOBPDE	14	3299	1	1
$Na_{2.67}K_{.28}Ca_{1.06}Sr_{.01}Al_{3.79}Si_{8.19}Fe_{.02}Cl_{.76}(CO_3)_{.19}(SO_4)_{.08}O_{24}^{*+}$ scapolite	1.5431	1.5431	1.5318	1.5569	1.5569	1.5449	552.19	22.09	41.318	0.0076	0.7303	12.42	17.0	97	JOBPDE	14	3299	1	1
$\langle(Na,K)_3Ca\rangle[Al_4Si_8](Cl,CO_3)O_{24}^+$ scapolite	1.5694	1.5694	1.5391	1.5833	1.5833	1.5516				0.0069	0.6991	12.72	18.20	62	Ref. 1	Rf	2852	1	1
scapolite$^+$	1.5713	1.5713	1.5419	1.5858	1.5858	1.5549				0.0072	0.6958	12.47	17.92	62	Ref. 1	Rf	2852	1	1
scapolite$^+$	1.5754	1.5754	1.5457	1.5904	1.5904	1.5590				0.0072	0.6898	12.34	17.89	62	Ref. 1	Rf	320	1	1
scapolite$^+$	1.5556	1.5556	1.5354	1.5696	1.5696	1.5485				0.0073	0.7151	12.51	17.49	62	Ref. 1	Rf	496	1	1
scapolite$^+$ (Lago Tremorgio)	1.5714	1.5714	1.5412	1.5850	1.5850	1.5531				0.0067	0.6960	12.93	18.58	62	Ref. 1	Rf	417	1	2
$Ca(UO_2)(UOOH)(SiO_4)(SiO_3OH)\cdot 4H_2O^*$ beta-uranophane (Mitchell County, NC)	1.654	1.676	1.676	1.663	1.687	1.697	353.37	22.08	31.464	0.0050	0.5608	13.44	23.9	39	AMMIAY	24	324	2	3?

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_O and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Ca(UO_2)(UOOH)(SiO_4)(SiO_3OH)\cdot 4\,H_2O^*$ beta-uranophane (Jachymov, Joachimstal)	1.653	1.658	1.665	1.661	1.681	1.689	353.37	22.08	31.093	0.0066	0.5711	11.79	20.6	39	AMMIAY	24	324	2	3?
Germanates																			
$Na_4Ge_9O_{20}^*$	1.665	1.665	1.675	1.688	1.688	1.699	417.82	20.88	37.188	0.0082	0.5605	10.44	18.6	82	MRBUAC	17	1313	1	3
$K_2Ge_4O_9^{*+}$ (synthetic-H. Weber)	1.7026	1.7026	1.7326	1.7273	1.7273	1.7591	198.19	22.02	18.540	0.0078	0.5176	10.33	19.9	00	Ref. 14			1	1
$K_2Ge_8O_{17}^{*+}$ (synthetic-H. Weber) FL?	1.6666	1.6679	1.6757	1.6913	1.6928	1.7012	395.50	23.26	35.273	0.0087	0.5589	10.13	18.1	95	Ref. 12			1	2
$Bi_4Ge_3O_{12}^{*+}$	2.0267	2.0267	2.0267	2.1077	2.1077	2.1077	291.60	24.30	35.420	0.0109	0.3218	6.88	21.3	72	JAPIAU	43	5110	1	1
$Bi_4Ge_3O_{12}^{*+}$	2.0218	2.0218	2.0218	2.1001	2.1001	2.1001	291.60	24.30	35.308	0.0106	0.3239	6.98	21.5	95	OPSUA3	79	868	6	2
$Bi_4Ge_3O_{12}^{*}$	2.022	2.022	2.022	2.097	2.097	2.097	291.60	24.30	35.313	0.0103	0.3237	7.10	21.9	71	Ref. 6		510	8	3
$Bi_4Ge_3O_{12}^{*+}$	2.0338	2.0338	2.0338	2.1083	2.1083	2.1083	291.60	24.30	35.581	0.0099	0.3189	7.17	22.4	96	APOPAI	35	3562	1	1
$Ca_3Ga_2Ge_3O_{12}^{*+}$	1.8186	1.8186	1.8186	1.8480	1.8480	1.8480	229.89	19.16	23.860	0.0067	0.4334	10.15	23.4	97	JOBPDE	14	3299	1	1
$CaY_2Mg_2Ge_3O_{12}^{*+}$	1.8137	1.8137	1.8137	1.8410	1.8410	1.8410	233.00	19.42	24.077	0.0063	0.4368	10.50	24.0	79	PRBMDO	20	4343	1	1
$Ca_{.90}Y_{1.88}Mg_{2.27}Ge_3O_{12}^{*+}$	1.8065	1.8065	1.8065	1.8341	1.8341	1.8341	233.01	19.42	23.921	0.0065	0.4418	10.41	23.5	97	JOBPDE	14	3299	1	1
$CaY_{1.92}Nd_{.08}Zn_2Ge_3O_{12}^{*+}$	1.8646	1.8646	1.8646	1.8975	1.8975	1.8975	237.50	19.79	25.641	0.0067	0.4037	9.84	24.3	97	JOBPDE	14	3299	1	1
$Nd_{2.95}Mg_{1.48}In_{.68}Ga_{1.54}Ge_{1.32}O_{12}^{*+}$	1.9039	1.9039	1.9039	1.9425	1.9425	1.9425	253.10	21.09	28.197	0.0071	0.3810	9.27	24.3	97	JOBPDE	14	3299	1	1
$Ca_3Ga_2Ge_4O_{14}^{*+}$	1.7701	1.7701	1.7954	1.7996	1.7996	1.8239	280.00	20.00	28.006	0.0074	0.4624	9.99	21.6	87	SPHCA6	32	236	1	1
$Sr_3Ga_2Ge_4O_{14}^{*+}$	1.7690	1.7690	1.7876	1.7984	1.7984	1.8166	299.28	21.38	29.839	0.0075	0.4649	9.96	21.4	87	SPHCA6	32	236	1	1
$Ba_{1.92}Nd_{.04}Ce_{.04}MgGe_2O_7^{*+}$	1.6833	1.6833	1.7211	1.7089	1.7089	1.7477	194.43	27.77	17.859	0.0084	0.5335	10.10	18.9	97	JOBPDE	14	3299	1	1
$Ba_{1.99}Nd_{.01}ZnGe_2O_7^{*}$	1.732	1.732	1.735	1.752	1.752	1.764	193.48	27.64	18.494	0.0066	0.4990	10.96	21.9	90	JOBPDE	7	1190	1	3?
$Pb_5Ge_3O_{11}^{*+}$ FE 450 K	2.0332	2.0332	2.0661	2.1304	2.1304	2.1662	325.12	29.47	39.930	0.0125	0.3147	6.34	20.1	72	JAPIAU	43	4907	1	2
$Pb_5Ge_3O_{11}^{*+}$ FE 450 K	2.0275	2.0275	2.0579	2.1262	2.1262	2.1606	325.12	29.47	39.767	0.0129	0.3173	6.27	19.7	97	PSSABA	159	559	1	2
Tellurites																			
$Bi_2TeO_5^{*+}$	2.2075	2.2520	2.2760	2.3402	2.3904	2.4264	131.85	26.37	18.065	0.0119	0.2477	5.77	23.2	94	PAOAE1	3	839	1	1
Titanates																			
$Li_2Ti_3O_7^{*+}$	2.0496	2.2204	2.2883	2.1600	2.3513	2.4297	141.19	20.17	18.790	0.0122	0.2676	5.92	22.1	84	WLHPAR	33	1301	1	1
$CaTiO_3$	1.5554	1.5554	1.3304	1.5849	1.5849	1.3358	56.03	18.68	3.803	0.0127	0.9026	10.65	11.80	78	Ref. 7		7-80	1	7
$CaTiO_3^{+}$	2.261	2.261	2.261	2.407	2.407	2.407	56.03	18.68	7.734	0.0120	0.2430	5.70	23.44	58	JCPSA6	28	824	7	5
$SrTiO_3^{*+}$ FE FL 100 K	2.2675	2.2675	2.2675	2.4088	2.4088	2.4088	59.20	19.70	8.196	0.0115	0.2415	5.78	23.96	86	Ref. 4		29	1	1
$SrTiO_3^{*+}$ FE FL 100 K	2.2629	2.2629	2.2629	2.4145	2.4145	2.4145	59.20	19.70	8.179	0.0124	0.2427	5.60	23.07	78	Ref. 7		7-106	1	1
$SrTiO_3^{*+}$ FE FL 100 K	2.2647	2.2647	2.2647	2.4152	2.4152	2.4152	59.20	19.70	8.185	0.0123	0.2422	5.62	23.21	79	Ref. 2B	Rf	72b1	1	1
$SrTiO_3^{*+}$ FE FL 100 K	2.2485	2.2485	2.2485	2.4053	2.4053	2.4053	59.20	19.70	8.124	0.0131	0.2466	5.50	22.29	95	SPHCA6	40	640	1	1
$SrTiO_{2.929}^{*+}$ FE FL	2.2950	2.2950	2.2950	2.4035	2.4035	2.4035	59.33	20.25	8.317	0.0087	0.2343	6.58	28.09	95	SPHCA6	40	640	1	1?
$SrTiO_3^{*}$ FE FL 100 K	2.268	2.268	2.268	2.410	2.410	2.410	59.20	19.70	8.198	0.0116	0.2414	5.77	23.92	65	JAPIAU	36	1674	1	3
$BaTiO_3^{*+}$ FE 403 K FL 393 K	2.2943	2.2943	2.2605	2.4408	2.4408	2.3833	64.60	21.50	9.007	0.0110	0.2375	5.87	24.71	71	Ref. 6		509	1	1
$BaTiO_3^{*+}$ FE 403 K FL 393 K	2.2957	2.2957	2.2613	2.4401	2.4401	2.3829	64.60	21.50	9.012	0.0109	0.2371	5.90	24.90	86	Ref. 4		24	1	1
$Ba_{.77}Ca_{.23}TiO_3^{*+}$ FE FL	2.2726	2.2726	2.2449	2.4197	2.4197	2.3708	63.30	21.10	8.747	0.0115	0.2426	5.81	23.93	97	PSSABA	159	559	1	2
$PbTiO_3^{*+}$ FE 763 K	2.5617	2.5617	2.5617	2.7899	2.7899	2.7899	63.14	21.05	9.792	0.0112	0.1798	5.06	28.14	73	JJAPA5	12	531	8	1
$PbTiO_3^{*+}$ FE 763 K	2.5218	2.5218	2.5226	2.6955	2.6955	2.6848	63.14	21.05	9.665	0.0092	0.1865	5.70	30.55	71	Ref. 6		513	1	2?
$PbTiO_3^{*}$ ceramic	2.523	2.523	2.523	2.693	2.693	2.693	63.14	21.05	9.668	0.0092	0.1864	5.71	30.61	77	APOPAI	16	3210	1	3?
$Pb_{.88}La_{.08}Zr_{.80}Ti_{.20}O_3^{*}$ ceramic	2.363	2.363	2.363	2.498	2.498	2.498	69.73	23.24	10.062	0.0096	0.2186	6.04	27.61	77	APOPAI	16	3210	1	3
$Pb_{.85}La_{.10}Zr_{.65}Ti_{.35}O_3^{*}$ ceramic	2.374	2.374	2.374	2.509	2.509	2.509	68.22	22.74	9.888	0.0093	0.2156	6.09	28.24	77	APOPAI	16	3210	1	3
$Pb_{.97}La_{.02}Zr_{.65}Ti_{.35}O_3^{*}$ ceramic	2.395	2.395	2.395	2.543	2.543	2.543	68.67	22.89	10.036	0.0098	0.2111	5.87	27.79	77	APOPAI	16	3210	1	3
$Pb_{.76}La_{.16}Ti_{.60}Zr_{.40}O_3^{*}$ ceramic	2.421	2.421	2.421	2.575	2.575	2.575	65.89	21.96	9.727	0.0098	0.2058	5.80	28.18	77	APOPAI	16	3210	1	3
$Pb_{.64}La_{.24}Ti_{.90}Zr_{.10}O_3^{*}$ ceramic	2.478	2.478	2.478	2.656	2.656	2.656	63.09	21.03	9.511	0.0102	0.1945	5.53	28.41	77	APOPAI	16	3210	1	3

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Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Pb_{.88}La_{.08}Ti_{.90}Zr_{.10}O_3^*$ ceramic	2.500	2.500	2.500	2.669	2.669	2.669	63.59	21.20	9.661	0.0094	0.1905	5.69	29.86	77	APOPAI	16	3210	1	3
$Ba_2TiSi_2O_8^{*+}$ fresnoite FE >670 K	1.7379	1.7379	1.7390	1.7641	1.7641	1.7617	189.00	23.62	18.164	0.0071	0.4947	10.53	21.2	77	JCRGAE	40	200	1	1
Phosphates																			
$AlPO_4^{*+}$ berlinite (synthetic)	1.5140	1.5140	1.5226	1.5244	1.5244	1.5335	77.34	19.34	5.585	0.0064	0.7687	13.83	18.00	65	JAPIAU	36	1674	1	1
$AlPO_4^{*+}$ berlinite, 20 ppm H_2O (synthetic)	1.5136	1.5136	1.5223	1.5247	1.5247	1.5339	77.34	19.34	5.581	0.0068	0.7694	13.41	17.42	97	JOBPDE	14	3299	1	1
$AlPO_4^{*+}$ berlinite, 100 ppm H_2O (synthetic)	1.5136	1.5136	1.5224	1.5244	1.5244	1.5336	77.34	19.34	5.582	0.0067	0.7694	13.56	17.62	97	JOBPDE	14	3299	1	1
$AlPO_4^{*+}$ berlinite, 250 ppm H_2O (synthetic)	1.5137	1.5137	1.5224	1.5247	1.5247	1.5338	77.34	19.34	5.582	0.0068	0.7693	13.44	17.48	97	JOBPDE	14	3299	1	1
$AlPO_4^{*+}$ berlinite, 1000 ppm H_2O (synthetic)	1.5136	1.5136	1.5223	1.5246	1.5246	1.5337	77.34	19.34	5.581	0.0068	0.7694	13.49	17.53	97	JOBPDE	14	3299	1	1
$AlP_3O_9^{*+}$	1.5488	1.5488	1.5488	1.5606	1.5606	1.5606	161.73	17.97	12.278	0.0063	0.7149	13.42	18.7	97	JOBPDE	14	3299	1	1
$GaPO_4^{*+}$	1.5862	1.5862	1.6036	1.6008	1.6008	1.6189	76.65	19.16	6.192	0.0068	0.6518	12.41	19.04	97	JOBPDE	14	3299	1	1
$ScPO_4^*$	1.696	1.696	1.894	1.718	1.718	1.922	62.57	15.64	6.159	0.0063	0.4839	11.04	22.82	00	OMATET	15	103	4	4
YPO_4^*	1.636	1.636	1.810	1.652	1.652	1.831	71.25	17.81	6.531	0.0059	0.5441	12.12	22.27	00	OMATET	15	103	4	4
$TbPO_4^*$	1.657	1.657	1.842	1.677	1.677	1.866	73.07	18.27	6.880	0.0064	0.5208	11.39	21.87	00	OMATET	15	103	4	4
$DyPO_4^*$	1.663	1.663	1.844	1.682	1.682	1.861	72.10	18.02	6.822	0.0057	0.5163	12.02	23.29	00	OMATET	15	103	4	4?
$HoPO_4^*$	1.660	1.660	1.843	1.678	1.678	1.861	71.35	17.84	6.735	0.0056	0.5185	12.20	23.53	00	OMATET	15	103	4	4?
$ErPO_4^*$	1.660	1.660	1.837	1.676	1.676	1.852	70.65	17.66	6.655	0.0048	0.5197	13.19	25.37	00	OMATET	15	103	4	4?
$TmPO_4^*$	1.660	1.660	1.832	1.678	1.678	1.849	70.00	17.50	6.582	0.0055	0.5211	12.26	23.54	00	OMATET	15	103	4	4?
$YbPO_4^*$	1.661	1.661	1.837	1.676	1.676	1.853	69.30	17.32	6.532	0.0048	0.5194	13.12	25.26	00	OMATET	15	103	4	4?
$LuPO_4^*$	1.659	1.659	1.834	1.675	1.675	1.855	68.67	17.17	6.457	0.0054	0.5214	12.39	23.76	00	OMATET	15	103	4	4?
$LuPO_4^*$	1.68	1.68	1.74				68.67	17.17	6.336					76	JPCSAW	37	321	7	4
$Pb_3P_2O_8^+$ ($Pb_5P_3O_{12}F$?) composition uncertain, FL 453 K	1.9144	1.9144	1.8873	1.9701	1.9701	1.9363	301.10	23.16	33.582	0.0096	0.3803	7.96	20.9	23	ZEKRDZ	58	226	1	2
$Pb_3P_2O_8$:2%$CePO_4^+$ ($Pb_5P_3O_{12}F$?) composition uncertain, FL	1.9157	1.9157	1.8832	1.9696	1.9696	1.9323	301.10	23.16	33.569	0.0094	0.3806	8.04	21.1	23	ZEKRDZ	58	226	1	2
$Pb_5P_3O_{12}Cl^{*+}$ pyromorphite, green (Ems, Naussau)	1.9929	1.9929	1.9835	2.0585	2.0585	2.0477	316.58	24.35	37.530	0.0096	0.3379	7.51	22.2	31	ZEKRDZ	77	437	1	1
$Pb_5P_3O_{12}Cl^{*+}$ pyromorphite, brown (Holzappel, Nassau)	1.9944	1.9944	1.9841	2.0587	2.0587	2.0476	316.58	24.35	37.561	0.0094	0.3374	7.57	22.4	31	ZEKRDZ	77	437	1	1
$NdP_5O_{14}^{*+}$ FL 419 K	1.5922	1.5972	1.6132	1.6116	1.6067	1.6285	256.90	18.35	21.006	0.0065	0.6400	12.53	19.5	97	JOBPDE	14	3299	1	1
$GdP_5O_{14}^*$ FL 175 K	1.6135	1.5883	1.5778	1.6298	1.6159	1.6097	250.81	17.91	20.296	0.0114	0.6506	9.53	14.6	87	WLHPAR	36	823	8	1?
$ErP_5O_{14}^{*+}$ FL?	1.6080	1.6022	1.5880	1.6128	1.6076	1.5954	248.54	17.75	20.282	0.0027	0.6420	19.62	30.5	87	WLHPAR	36	823	8	1?
$NaBePO_4^{*+}$ beryllonite (Stoneham, ME)	1.5404	1.5459	1.5531	1.5519	1.5578	1.5620	75.10	18.77	5.681	0.0059	0.7187	13.99	19.46	62	Ref. 1	Rf	2556	1	1
$NaBePO_4^{*+}$ beryllonite (Stoneham, ME)	1.5410	1.5477	1.5509	1.5523	1.5590	1.5624	75.11	18.78	5.682	0.0062	0.7185	13.66	19.01	97	JOBPDE	14	3299	1	1
$KGeOPO_4^{*+}$	1.6420	1.6472	1.6553	1.6585	1.6636	1.6732	99.45	19.89	8.640	0.0064	0.5826	12.07	20.72	94	CRTEDF	29	583	1	1
$KTiOPO_4^{*+}$ probable FE 1207 K	1.7252	1.7313	1.8091	1.7683	1.7780	1.8724	108.89	21.78	10.646	0.0133	0.4822	7.62	15.8	91	Ref. 8		103	8	1
$KTiOPO_4^*$ probable FE 1207 K	1.732	1.729	1.809	1.771	1.777	1.874	108.89	21.78	10.662	0.0130	0.4806	7.69	16.0	94	CRTEDF	29	583	1	3
$K_{.85}Rb_{.15}TiOPO_4^{*+}$	1.7304	1.7337	1.8117	1.7722	1.7794	1.8765	108.99	21.80	10.692	0.0131	0.4794	7.66	15.9	94	CRTEDF	29	583	1	2
$RbTiOPO_4^{*+}$ probable FE 1062 K	1.7508	1.7567	1.8300	1.7943	1.8057	1.8947	111.26	22.25	11.135	0.0128	0.4631	7.62	16.4	93	PSISDG	1863	43	5	1
$Li_{.95}Ca_{.03}Mg_{.02}Fe_{.59}Mn_{.41}PO_4^*$ triphylite (Grafton, NH)	1.670	1.670	1.678	1.687	1.688	1.694	73.24	18.31	6.552	0.0059	0.5560	12.27	22.07	33	Ref. 10B		227	8	4
$Ca_{4.91}Na_{.08}Y_{.04}(PO_4)_{2.95}(SiO_4)_{.03}(SO_4)_{.02}F_{1.90}Cl_{.12}^{*+}$ fluorapatite	1.6218	1.6218	1.6186	1.6363	1.6363	1.6328	262.65	20.53	22.046	0.0060	0.6147	12.81	20.8	97	JOBPDE	14	3299	1	1
$Ca_{4.95}Mn_{.03}Fe_{.02}(PO_4)_{2.96}F_{1.02}^{*+}$ fluorapatite (unknown source)	1.6198	1.6198	1.6175	1.6348	1.6348	1.6323	261.57	20.32	21.908	0.0062	0.6169	12.57	20.3	97	JOBPDE	14	3299	1	1
$Ca_5(PO_4)_3(OH_{.6}F_{.4})^+$ fluorapatite (Zillertal, Tirol)	1.6313	1.6313	1.6275	1.6461	1.6461	1.6417	262.00	20.15	22.255	0.0059	0.6035	12.81	21.2	62	Ref. 1	Rf	2850	1	1
$Ca_{4.98}Fe_{.02}(PO_4)_3F_{.99}Cl_{.01}^{*+}$ fluorapatite (Rotenkopf)	1.6318	1.6318	1.6283	1.6462	1.6462	1.6417	262.00	20.15	22.272	0.0057	0.6028	13.06	21.6	08	ZEKRDZ	45	555	1	1
$Ca_{4.98}Fe_{.02}(PO_4)_3F^{*+}$ fluorapatite (Knappenwand)	1.6253	1.6253	1.6227	1.6391	1.6391	1.6360	262.00	20.15	22.097	0.0056	0.6102	13.22	21.6	08	ZEKRDZ	45	555	1	1
$Li_{.97}Na_{.03}AlPO_4(OH)_{.88}F_{.12}^{*+}$ montebrasite	1.6000	1.6096	1.6259	1.6121	1.6219	1.6387	80.54	16.11	6.682	0.0053	0.6260	13.73	21.93	54	NJGMA2	1954	257	1	1
$Li_{1.93}Na_{.04}K_{.01}Mg_{.02}Al_2P_2O_8(F_{.9}OH_{1.1})^{*+}$ montebrasite (Karibib, SW Africa)	1.584	1.598	1.606	1.594	1.608	1.616	80.54	16.11	6.542	0.0047	0.6469	14.83	22.92	46	AMMIAY	31	51	2	3?
$Li_{1.0}Al_{1.0}P_{1.0}O_4(OH)_{.98}F_{.02}^{*+}$ montebrasite (Minas Gerais)	1.6083	1.6160	1.6347	1.6211	1.6290	1.6480	80.54	16.11	6.751	0.0054	0.6162	13.47	21.85	97	JOBPDE	14	3299	1	1
$KH_2PO_4^{*+}$ FE 123 K FL 220 K	1.4972	1.4972	1.4587	1.4682	1.4682	1.5092	96.85	24.21	6.619	0.0076	0.8596	13.46	15.65	69	Ref. 2A	Rf	93	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$KH_2PO_4^{*+}$ FE 123 K FL 220 K	1.4975	1.4975	1.4587	1.5093	1.5093	1.4682	96.85	24.21	6.622	0.0076	0.8322	13.19	15.85	64	JOSAAH	54	1215	1	1
$RbH_2PO_4^{*+}$ FE 147 K FL 144 K	1.4936	1.4936	1.4662	1.5054	1.5054	1.4764	105.60	26.40	7.218	0.0078	0.8315	13.07	15.7	67	SPHCA6	11	711	1	1
$RbH_2PO_4^{*+}$ FE 147 K FL 144 K	1.4937	1.4937	1.4660	1.5054	1.5054	1.4764	105.60	26.40	7.218	0.0078	0.8316	13.03	15.6	67	SPHCA6	11	711	1	1
$RbH_2PO_4^{*+}$ FE 147 K FL 144 K	1.4874	1.4874	1.4661	1.5052	1.5052	1.4767	105.60	26.40	7.165	0.0107	0.8398	11.21	13.3	67	SPHCA6	12	383	8	2?
$PbHPO_4^{*}$ FE 310 K	1.782	1.782	1.846	1.822	1.822	1.885	89.30	22.32	9.141	0.0093	0.4447	8.73	19.63	88	JPSOAW	21	1661	1	4
$NaH_2PO_4 \cdot H_2O^{*+}$	1.4433	1.4720	1.4738	1.4556	1.4852	1.4873	111.02	22.20	7.300	0.0099	0.8778	11.93	13.5	62	Ref. 1	Rf	2577	1	1
$NaH_2PO_4 \cdot 2\ H_2O^{*+}$	1.4296	1.4507	1.4679	1.4400	1.4628	1.4814	136.80	22.79	8.766	0.0096	0.9097	12.28	13.5	62	Ref. 1	Rf	2577	1	1
$Na_2HPO_4 \cdot 7\ H_2O^{*+}$	1.4290	1.4304	1.4404	1.4411	1.4423	1.4525	264.60	24.05	16.426	0.0105	0.9487	12.03	12.6	62	Ref. 1	Rf	2577	1	1
$Na_2HPO_4 \cdot 12\ H_2O^{*+}$	1.4193	1.4231	1.4239	1.4320	1.4361	1.4373	386.25	24.14	23.437	0.0119	0.9782	11.45	11.7	62	Ref. 1	Rf	2577	1	1
$Na_4P_2O_7 \cdot 10\ H_2O^{*+}$	1.4376	1.4403	1.4484	1.4499	1.4524	1.4603	407.50	23.97	25.745	0.0101	0.9263	12.09	13.0	62	Ref. 1	Rf	2577	1	1
$Cu(UO_2PO_4)_2 \cdot 8\ H_2O$ metatorbernite	1.594	1.594	1.603	1.624	1.624	1.626	421.07	21.05	34.250	0.0121	0.6447	9.24	14.3	62	Ref. 1	Rf	317	2	4
Vanadates																			
YVO_4^{*+}	1.9387	1.9387	2.1391	2.0022	2.0022	2.2285	79.70	19.93	9.548	0.0102	0.3349	7.26	21.67	90	REKEDA	18	616	1	1
YVO_4^{*+}	1.9330	1.9330	2.1322	2.0011	2.0011	2.2246	79.70	19.93	9.510	0.0109	0.3376	7.05	20.87	97	JOBPDE	14	3299	1	1
$Y_{.976}Nd_{.024}VO_4^{*+}$	1.9407	1.9407	2.1431	1.9996	1.9996	2.2269	79.70	19.93	9.565	0.0095	0.3338	7.51	22.51	78	JAPIAU	49	5517	8	1
$Y_{.95}Tm_{.05}VO_4^{*}$	1.901	1.901	2.249	2.003	2.003	2.419	79.72	19.93	9.623	0.0164	0.3370	5.74	17.03	93	JAPNDE	32	1651	8	3?
YVO_4^{*}	1.99	1.99	2.01				79.80	19.95	9.504					76	JPCSAW	37	321	3	4
$Gd_{.987}Nd_{.013}VO_4^{*+}$	1.9468	1.9468	2.1547	2.0164	2.0164	2.2563	82.61	20.65	9.966	0.0109	0.3304	6.95	21.03	95	SJQEAF	25	1162	1	1
$Gd_{.96}Tm_{.04}VO_4^{*+}$	1.9421	1.9421	2.1550	2.0145	2.0145	2.2566	82.39	20.60	9.920	0.0113	0.3320	6.85	20.65	95	SJQEAF	25	1162	1	1
$Gd_{.7}Er_{.3}VO_4^{*+}$	1.9521	1.9521	2.1576	2.0223	2.0223	2.2594	81.49	20.37	9.860	0.0109	0.3284	6.94	21.14	95	SJQEAF	25	1162	1	1
$LuVO_4^{*}$	1.97	1.97	2.00				76.90	19.27	9.056					76	JPCSAW	37	321	3	5
$Ca_3V_2O_8^{*+}$ probable FE 1380 K	1.8376	1.8376	1.8177	1.8919	1.8919	1.8682	183.28	22.90	19.231	0.0114	0.4252	7.72	8.1	78	OPCOB8	27	393	5	1
$NaCa_2Mg_2V_3O_{12}^{*+}$	1.8741	1.8741	1.8741	1.9342	1.9342	1.9342	241.51	20.12	26.277	0.0115	0.3981	7.42	18.6	97	JOBPDE	14	3299	1	1
$NaCa_2Mg_2V_3O_{12}^{*+}$	1.8720	1.8720	1.8720	1.9339	1.9339	1.9339	241.51	20.12	26.232	0.0119	0.3993	7.32	18.3	97	JOBPDE	14	3299	1	1
$Sr_5V_3O_{12}F^{*+}$	1.8067	1.8067	1.7911	1.8576	1.8576	1.8416	322.12	24.78	32.919	0.0118	0.4454	7.77	17.4	95	Ref. 13		604	5	2
$Pb_5V_{2.63}As_{.30}P_{.07}O_{12}Cl^{*+}$ vanadinite, yellow (Hillsboro, NM)	2.2477	2.2477	2.2132	2.4051	2.4051	2.3427	338.96	26.07	46.243	0.0126	0.2500	5.62	22.4	31	ZEKRDZ	77	437	1	2
$Pb_5V_{2.96}As_{.02}P_{.02}O_{12}Cl^{*+}$ vanadinite, red (Gila County, AZ)	2.2596	2.2596	2.2190	2.4112	2.4112	2.3469	338.96	26.07	46.461	0.0121	0.2473	5.71	23.1	31	ZEKRDZ	77	437	1	1
Arsenates																			
$YAsO_4^{*}$	1.70	1.70	1.76				78.50	19.62	7.402					76	JPCSAW	37	321	3	5
$SmAsO_4^{*}$	1.72	1.72	1.73				82.94	20.73	7.848					87	JPCSAW	48	509	3	5
$LuAsO_4^{*}$	1.83	1.83	1.85				75.17	18.79	7.926					76	JPCSAW	37	321	7	4
$KTiOAsO_4^{*+}$	1.7664	1.7701	1.8458	1.8139	1.8206	1.9137	116.42	23.28	11.816	0.0129	0.4520	7.48	16.5	93	PSISDG	1863	43	5	1
$KTiAsO_4^{*+}$	1.7679	1.7708	1.8470	1.8150	1.8210	1.9144	116.42	23.28	11.829	0.0128	0.4511	7.51	16.6	95	JOBPDE	12	794	1	1
$KTiOAsO_4^{*+}$	1.7692	1.7654	1.8488	1.8141	1.8193	1.9194	116.42	23.28	11.820	0.0131	0.4518	7.42	16.4	94	CRTEDF	29	583	1	2
$RbTiOAsO_4^{*+}$	1.7883	1.7934	1.8591	1.8358	1.8450	1.9279	119.31	23.86	12.328	0.0124	0.4378	7.51	17.1	93	PSISDG	1863	43	5	1
$RbTiOAsO_4^{*+}$	1.7892	1.7940	1.8596	1.8365	1.8455	1.9276	119.31	23.86	12.335	0.0123	0.4373	7.53	17.2	96	JOBPDE	13	1935	1	1
$CsTiOAsO_4^{*+}$	1.8341	1.8441	1.8953	1.8866	1.9023	1.9698	123.62	24.72	13.272	0.0122	0.4084	7.31	17.9	93	PSISDG	1863	43	5	1
$KH_2AsO_4^{*+}$ FE 97 K	1.5485	1.5485	1.5016	1.5671	1.5671	1.5178	104.12	26.03	7.713	0.0100	0.7425	10.87	14.6	64	Ref. 11B		187	8	1
$KH_2AsO_4^{*+}$ FE 97 K	1.5446	1.5446	1.5016	1.5630	1.5630	1.5164	104.12	26.03	7.681	0.0098	0.7467	11.05	14.8	87	FEROA8	72	95	1	1
$RbH_2AsO_4^{*+}$ FE 110 K	1.5411	1.5411	1.5064	1.5583	1.5583	1.5211	113.65	28.41	8.375	0.0094	0.7475	11.29	15.1	87	FEROA8	72	95	1	1
$CsH_2AsO_4^{*+}$ FE 143 K	1.5511	1.5511	1.5310	1.5688	1.5688	1.5472	125.75	31.43	9.483	0.0093	0.7222	11.14	15.4	87	FEROA8	72	95	1	1
$Pb_5As_3O_9Cl^{+}$ finnemanite	2.1786	2.1786	2.1814	2.2977	2.2977	2.2866	317.21	24.40	42.073	0.0111	0.2666	6.19	23.2	62	Ref. 1	Rf	288	1	1
$Pb_{4.95}Ca_{.05}As_3O_{12}Cl^{*+}$ mimetite (Wheal-Alfred, Cornwall)	2.0619	2.0619	2.0459	2.1469	2.1469	2.1282	338.63	26.05	41.910	0.0106	0.3097	6.84	22.0	31	ZEKRDZ	77	437	1	1
$Pb_{4.92}Ca_{.08}As_{2.93}P_{.07}O_{12}Cl^{*+}$ mimetite (Tsumeb, SW Africa)	2.0584	2.0584	2.0433	2.1434	2.1434	2.1261	338.63	26.05	41.828	0.0107	0.3109	6.82	21.9	31	ZEKRDZ	77	437	1	1
$NaD_2AsO_4 \cdot D_2O^{*+}$	1.5212	1.5362	1.5423	1.5381	1.5535	1.5606	117.25	23.45	8.691	0.0099	0.7406	10.95	14.7	62	Ref. 1	Rf	2577	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O- atom, V_O, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_O and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$Na_2HAsO_4 \cdot 7H_2O$*	1.4475	1.4512	1.4632	1.4622	1.4657	1.4781	274.40	24.94	17.739	0.0116	0.8978	11.14	12.4	62	Ref. 1	Rf	2577	1	1
$Mn_{6.5}Ca_{.25}Mg_{.25}As_2O_8(OH)_8^{*+}$ allactite (Langbanshuttan)	1.7300	1.7494	1.7490	1.7744	1.7786	1.7787	336.14	21.01	32.456	0.0081	0.4865	9.82	20.1	33	Ref. 10B		1181	1	1
Antimonates																			
$Ca_{1.0}Na_{.8}Mn_{.2}Sb_2O_7^{*+}$ atopite (Miguel Burnier, Minas Gerais)	1.8016	1.8016	1.8016	1.8384	1.8384	1.8384	135.80	19.40	13.879	0.0087	0.4452	9.05	20.3	33	Ref. 10B		392	1	1
Niobates																			
$LiNbO_3^{*+}$ FE 1483 K FL 1470 K	2.2093	2.2093	2.1311	2.3036	2.3036	2.2113	53.03	17.68	7.047	0.0088	0.2659	6.94	26.11	67	JAPIAU	38	1941	1	1
$LiNbO_3^{*+}$ Li:Nb = 0.946:1 (poled crystal) FE 1493 K FL 1470 K	2.2040	2.2040	2.1314	2.3002	2.3002	2.2144	53.08	17.69	7.041	0.0091	0.2669	6.86	25.69	74	JAPIAU	45	3688	1	1
$LiNbO_3^{*+}$ (vapor-grown crystal) FE 1493 K	2.2075	2.2075	2.1218	2.3010	2.3010	2.2000	53.08	17.69	7.038	0.0088	0.2673	6.98	26.10	90	IEJQA7	26	135	1	1
$LiNbO_3^{*+}$ (congruent melt) FE 1493 K	2.2044	2.2044	2.1316	2.2998	2.2998	2.2138	53.08	17.69	7.042	0.0090	0.2668	6.89	25.81	76	OPCOB8	17	332	1	1
$Li_{.97}Mg_{.03}NbO_3^{*+}$ FE FL	2.2011	2.2011	2.1235	2.2949	2.2949	2.2035	53.03	17.68	7.018	0.0089	0.2684	6.94	25.86	91	SJQEAF	21	225	1	1
$Li_{.95}Mg_{.05}NbO_3^{*+}$ FE FL	2.1994	2.1994	2.1219	2.2946	2.2946	2.2027	53.03	17.68	7.012	0.0091	0.2689	6.89	25.63	92	CPLEEU	9	427	1	1
$KNbO_3^{*+}$ FE 691 K	2.1879	2.2196	2.0931	2.2968	2.3504	2.1824	64.72	21.58	8.528	0.0109	0.2715	6.32	23.29	92	JOBPDE	9	380	1	1
$KNbO_3^{*+}$ FE 691 K	2.0923	2.1877	2.2180	2.1810	2.2957	2.3487	64.72	21.58	8.524	0.0106	0.2712	6.39	23.58	74	JJAPA5	13	1362	1	1
$KNbO_3^{*+}$ FE 691 K	2.0923	2.1877	2.2180	2.2952	2.3478	2.1810	64.72	21.58	8.524	0.0108	0.2718	6.35	23.36	74	JJAPA5	13	1362	1	1
$Sr_2Nb_2O_7^*$ FE 1615 K	2.09	2.00	2.09	2.17	2.06	2.16	149.35	21.53	18.523	0.0088	0.3088	7.49	24.2	97	FEROA8	203	75	1	5
$Sr_2Nb_2O_7^*$ FE 1615 K	2.09	2.00	2.09	2.17	2.06	2.16	150.95	21.56	18.721	0.0088	0.3088	7.49	24.2	89	JUPSUA	58	398	1	5
$LaNbO_4^*$ FL 792 K	2.136	2.053	2.036	2.200	2.105	2.087	83.29	20.82	10.424	0.0069	0.3032	8.37	27.61	70	OPSUA3	28	38	1	3
$Cs_8Nb_{22}O_{59}^*$	2.13	2.13	2.08	2.25	2.25	2.18	1408.40	23.47	180.236	0.0124	0.2893	6.12	21	78	JCRGAE	43	115	2	5?
$Ba_{.25}Sr_{.75}Nb_2O_6^{*+}$ FE 333 K	2.226	2.226	2.167	2.326	2.326	2.322	121.45	20.24	16.329	0.0110	0.2587	6.14	23.7	68	JAPIAU	39	343	1	3
$Ba_{.25}Sr_{.75}Nb_2O_6^*$ FE 333 K	2.217	2.217	2.205	2.328	2.328	2.316	121.45	20.24	16.383	0.0102	0.2565	6.34	24.7	84	SPHCA6	29	641	1	3
$Ba_{.39}Sr_{.61}Nb_2O_6^*$ FE 348 K	2.220	2.220	2.191	2.327	2.327	2.297	122.38	20.40	16.487	0.0099	0.2574	6.45	25.0	84	SPHCA6	29	641	1	3
$Ba_{.39}Sr_{.61}Nb_2O_6^*$ FE 348 K	2.218	2.218	2.195	2.330	2.330	2.299	122.38	20.40	16.487	0.0101	0.2575	6.38	24.7	96	PSSABA	154	K5	1	3
$Ba_{.5}Sr_{.5}Nb_2O_6^{*+}$ FE 403 K	2.223	2.223	2.193	2.327	2.327	2.287	123.00	20.50	16.592	0.0093	0.2566	6.64	25.8	68	JAPIAU	39	343	1	3
$Ba_{.54}Sr_{.46}Nb_2O_6^*$ FE	2.220	2.220	2.186	2.328	2.328	2.286	123.25	20.54	16.590	0.0098	0.2579	6.50	25.2	84	SPHCA6	29	641	1	3
$Ba_{.67}Sr_{.33}Nb_2O_6^*$ FE	2.220	2.220	2.182	2.329	2.329	2.280	124.08	20.67	16.691	0.0097	0.2582	6.52	25.2	84	SPHCA6	29	641	1	3
$Ba_{.75}Sr_{.25}Nb_2O_6^*$ FE 473 K	2.219	2.219	2.228	2.330	2.330	2.265	122.14	20.36	16.549	0.0079	0.2540	7.16	28.2	68	JAPIAU	39	343	1	4?
$K_3Li_2Nb_5O_{15}^{*+}$ FE 703 K	2.1697	2.1697	2.0857	2.2954	2.2954	2.1755	317.10	21.14	41.223	0.0118	0.2793	6.17	22.0	71	Ref. 6		517	8	2
$Sr_{4.25}Na_{1.25}Li_{.25}Nb_{10}O_{30}^{*+}$ FE 418 K	2.2237	2.2148	2.1911	2.3347	2.3228	2.2994	587.30	19.58	79.102	0.0101	0.2576	6.39	24.8	81	WHLPAR	30	1259	1	1
$Ba_3LaNb_3O_{12}^*$	2.187	2.187	2.049	2.270	2.270	2.104	268.97	22.41	34.953	0.0079	0.2804	7.55	26.9	86	INOMAF	22	401	1	3
$Ba_2NaNb_5O_{15}^{*+}$ FE 833 K FL	2.2251	2.2238	2.1454	2.3389	2.3376	2.2295	309.63	20.64	41.459	0.0098	0.2614	6.53	25.0	70	PLRBAQ	2	2709	1	1
$Ba_6Ti_2Nb_8O_{30}^*$ FE 518 K	2.219	2.219	2.190	2.333	2.333	2.294	629.56	20.98	84.771	0.0102	0.2577	6.35	24.6	73	JPCSAW	34	1639	1	3
$PbNb_4O_{11}^{*+}$ FE 813 K	2.2637	2.2671	2.2908	2.3819	2.3844	2.4103	242.96	22.09	33.735	0.0097	0.2398	6.28	26.1	71	Ref. 6		513	8	2
$PbMg_{.333}Nb_{.666}O_3^*$ FE 265 K	2.422	2.422	2.422	2.581	2.581	2.581	66.38	22.13	9.803	0.0101	0.2056	5.71	27.78	74	SPSSA7	15	2006	1	3
$PbMg_{.333}Nb_{.666}O_3$ FE 400 K	2.49	2.49	2.49				66.38	22.13	10.049					76	SPSSA7	18	1851	3	5
$PbZn_{.333}Nb_{.667}O_3^*$ FE 400 K	2.421	2.421	2.421	2.563	2.563	2.563	66.97	22.32	9.887	0.0091	0.2057	6.02	29.26	81	Ref. 2C	Rf	78K13	8	4
$Pb_2KNb_5O_{15}^{*+}$ FE 723 K	2.3134	2.2712	2.3230	2.4486	2.3883	2.4623	313.02	20.87	44.025	0.0101	0.2326	6.06	26.0	75	JAPIAU	46	2361	1	2
Tantalates																			
$LiTaO_3^{*+}$ FE 938 K FL 895 K	2.1156	2.1156	2.1193	2.1859	2.1859	2.1902	52.85	17.62	6.777	0.0080	0.2873	7.58	26.38	65	JAPIAU	36	1674	1	1
$LiTaO_3^{*+}$ FE 938 K FL 895 K	2.1167	2.1167	2.1204	2.1862	2.1862	2.1904	52.85	17.62	6.781	0.0079	0.2869	7.63	26.58	96	JAPIAU	80	6561	1	1
$LiTaO_3^{*+}$ (melt-grown) FE 938 K	2.1159	2.1159	2.1203	2.1863	2.1863	2.1912	52.85	17.62	6.779	0.0080	0.2871	7.57	26.38	77	JCRGAE	42	579	1	1
$LiTa_{.92}Nb_{.08}O_3^{*+}$ (melt-grown) FE	2.1263	2.1263	2.1223	2.1986	2.1986	2.1950	52.97	17.65	6.823	0.0081	0.2845	7.50	26.38	77	JCRGAE	42	579	1	1
$LiTa_{.81}Nb_{.19}O_3^{*+}$ (melt-grown) FE	2.1320	2.1320	2.1266	2.2057	2.2057	2.1987	52.97	17.65	6.843	0.0081	0.2827	7.48	26.48	77	JCRGAE	42	579	1	1
$KTaO_3^{*+}$ FE	2.1413	2.1413	2.1413	2.2425	2.2425	2.2425	63.40	21.13	8.240	0.0107	0.2789	6.47	23.18	76	JUPSUA	41	888	1	1
$KTa_{.66}Nb_{.34}O_3^*$ FE	2.191	2.191	2.191	2.302	2.302	2.302	63.41	21.14	8.460	0.0107	0.2632	6.29	23.88	66	JAPIAU	37	388	1	3

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$SnTa_2O_6^*$ thoreaulite	2.268	2.309	2.372	2.388	2.418	2.499	115.64	16.52	16.362	0.0091	0.2294	6.34	27.6	60	Ref. 10D		390	1	3
$La_{.294}Sr_{.706}Al_{.647}Ta_{.353}O_3^{*+}$ (synthetic-Mateika)	1.9846	1.9846	1.9846	2.0256	2.0256	2.0256	57.89	19.19	6.839	0.0062	0.3402	9.33	27.43	97	JOBPDE	14	3299	1	1
$La_{.272}Sr_{.728}Al_{.648}Ta_{.352}O_3^{*+}$ (synthetic-Hu)	1.9838	1.9838	1.9838	2.0243	2.0243	2.0243	57.77	19.26	6.821	0.0062	0.3407	9.37	27.51	01	CPLEEU	18	278	1	1
$Nd_{.390}Sr_{.610}Al_{.695}Ta_{.305}O_3^{*+}$ (synthetic-Mateika)	1.9922	1.9922	1.9937	1.8212	1.8212	1.8224	56.76	18.91	6.742	0.0074	0.4528	9.88	21.81	97	JOBPDE	14	3299	1	1
$Pb_2Sc_{0.5}Ta_{1.5}O_{6.5}^*$ pyrochlore	2.292	2.292	2.292	2.477	2.477	2.477	150.56	23.16	21.077	0.0139	0.2348	5.19	22.1	98	CRTEDF	33	119	1	4
$Ba_3LaTa_3O_{12}^*$	2.100	2.100	1.972	2.161	2.161	2.021	269.13	22.43	33.324	0.0073	0.3108	8.27	26.6	86	INOMAF	22	1208	1	3
$SbNb_{.43}Ta_{.57}O_4^{*+}$ stibiotantalite, probably FE 673 K	2.2624	2.2835	2.3344	2.3744	2.4045	2.4575	80.28	20.07	11.246	0.0095	0.2350	6.30	26.83	06	AJSCAP	22	61	1	2
$SbNb_{.69}Ta_{.31}O_4^{*+}$ stibiotantalite, probably FE 673 K	2.2797	2.2907	2.3319	2.3976	2.4193	2.4592	78.03	19.51	10.966	0.0098	0.2330	6.18	26.52	06	AJSCAP	22	61	1	2
Sulfates																			
$Na_2SO_4^{*+}$ thenardite (synthetic?)	1.4573	1.4635	1.4768	1.4669	1.4730	1.4809	88.57	22.14	5.855	0.0074	0.8750	13.78	15.75	34	ZEKRDZ	87	43	1	1
$K_2SO_4^{*+}$ arcanite (synthetic?) FL?	1.4843	1.4855	1.4879	1.4934	1.4947	1.4973	108.76	27.19	7.453	0.0064	0.8279	14.37	17.3	62	Ref. 1	Rf	2742	1	1
$Rb_2SO_4^{*+}$	1.5031	1.5031	1.5042	1.5131	1.5133	1.5144	122.13	30.53	8.626	0.0065	0.7933	13.96	17.5	62	Ref. 1	Rf	1567	1	1
$Cs_2SO_4^{*+}$	1.5474	1.5517	1.5534	1.5598	1.5644	1.5662	141.28	35.32	10.758	0.0067	0.7117	13.02	18.3	62	Ref. 1	Rf	2742	1	1
$Tl_2SO_4^{*+}$	1.8124	1.8188	1.8349	1.8604	1.8676	1.8857	123.56	30.89	12.863	0.0109	0.4311	7.97	18.4	08	ZEKRDZ	44	138	1	1
$CaSO_4^{*+}$ anhydrite	1.5586	1.5640	1.6011	1.5698	1.5755	1.6137	76.40	19.10	6.023	0.0057	0.6769	13.74	20.30	11	ZEKRDZ	49	14	1	1
$SrSO_4^{*+}$ celestite	1.6092	1.6109	1.6174	1.6214	1.6231	1.6303	76.79	19.20	6.377	0.0053	0.6250	13.69	21.91	11	ZEKRDZ	49	14	1	1
$BaSO_4^{*+}$ barite	1.6229	1.6240	1.6340	1.6362	1.6374	1.6480	86.66	21.66	7.333	0.0055	0.6072	13.27	21.85	62	Ref. 1	Rf	4046	1	1
$PbSO_4^{*+}$ anglesite	1.8414	1.8465	1.8566	1.8780	1.8834	1.8945	79.59	19.90	8.475	0.0078	0.4140	9.21	22.25	11	ZEKRDZ	49	14	1	1
$PbSO_4^{*+}$ anglesite (Monte Poni)	1.8403	1.8451	1.8560	1.8775	1.8827	1.8943	79.59	19.90	8.468	0.0079	0.4146	9.14	22.05	23	ZEKRDZ	58	460	1	1
$Fe_2(SO_4)_3^*$	1.701	1.701	1.692	1.770	1.770	1.760	217.17	18.09	19.994	0.0206	0.5307	6.41	12.0	22	JACSAT	44	1965	2	3
$Fe_2(SO_4)_3^*$ orthorhombic in LB but probably monoclinic	1.727	1.738	1.742	1.802	1.814	1.818	205.80	17.15	19.726	0.0203	0.4967	6.26	12.6	22	JACSAT	44	1965	2	3
$KLiSO_4^*$ FL 190, 900, 940 K	1.4634	1.4634	1.4623	1.4722	1.4722	1.4717	98.94	24.74	6.506	0.0069	0.8768	14.26	16.26	29	ZEKRDZ	71	141	1	1
$RbLiSO_4^{*+}$ Phase IV, RT FE 439 K	1.4700	1.4718	1.4700	1.4796	1.4818	1.4804	105.10	26.27	7.008	0.0074	0.8602	13.63	15.8	94	OPSUA3	75	473	8	2
$K_2Mg_2(SO_4)_3^{*+}$ langbeinite	1.5243	1.5243	1.5243	1.5341	1.5341	1.5341	243.97	20.33	17.829	0.0058	0.7555	14.42	19.0	87	SPHCA6	32	76	1	1
$K_2Co_2(SO_4)_3^{*+}$ FL	1.5886	1.5886	1.5886	1.6074	1.6074	1.6074	244.25	20.35	19.640	0.0087	0.6563	11.01	16.7	87	SPHCA6	32	76	1	1
$K_2Cd_2(SO_4)_3^*$ FL 430 K	1.575	1.577	1.577	1.590	1.592	1.593	266.89	22.23	21.095	0.0075	0.6737	11.99	17.7	84	SPSSA7	26	2222	1	3
$Rb_2Cd_2(SO_4)_3^{*+}$ FE 129 K FL 129 K	1.5795	1.5795	1.5795	1.5936	1.5936	1.5936	279.60	23.31	22.199	0.0067	0.6689	12.60	18.8	87	SPHCA6	32	76	1	1
$Tl_2Cd_2(SO_4)_3^{*+}$ FE 129 K FL 128 K	1.7029	1.7029	1.7029	1.7296	1.7296	1.7296	279.96	23.26	25.915	0.0084	0.5264	10.00	18.9	87	SPHCA6	32	76	1	1
$FeSO_4OH^*$	1.727	1.734	1.825	1.783	1.805	1.917	84.02	16.80	8.270	0.0181	0.4773	6.49	13.60	22	JACSAT	44	1965	2	3
$Li_2SO_4 \cdot H_2O^{*+}$	1.4522	1.4672	1.4761	1.4615	1.4765	1.4863	103.63	20.73	6.841	0.0072	0.8725	13.87	15.9	67	JAPIAU	38	4365	1	1
$MgSO_4 \cdot 7\ H_2O^{*+}$ epsomite	1.4225	1.4440	1.4486	1.4326	1.4555	1.4607	243.47	22.13	15.269	0.0096	0.9364	12.51	13.3	62	Ref. 1	Rf	2533	1	1
$CaSO_4 \cdot 2\ H_2O^{*+}$ gypsum	1.5094	1.5113	1.5190	1.5207	1.5227	1.5304	123.65	20.61	8.876	0.0070	0.7754	13.28	17.1	62	Ref. 1	Rf	2652	1	1
$FeSO_4OH \cdot 2\ H_2O^*$ butlerite (synthetic)	1.557	1.633	1.681	1.587	1.678	1.749	132.75	18.96	11.185	0.0180	0.6167	7.40	11.9	22	JACSAT	44	1965	2	3
$Fe_2(SO_4)_3 \cdot 7\ H_2O^*$ cornellite (synthetic)	1.545	1.553	1.593	1.572	1.586	1.640	387.47	20.39	30.072	0.0172	0.6935	8.03	11.5	22	JACSAT	44	1965	2	3
$NiSO_4 \cdot 6\ H_2O^{*+}$ retgersite (synthetic)	1.4973	1.4973	1.4746	1.5107	1.5107	1.4870	210.72	21.07	14.537	0.0088	0.8206	12.19	14.8	62	Ref. 1	Rf	2737	1	2
$CuSO_4 \cdot 5\ H_2O^{*+}$ chalcanthite (synthetic)	1.5008	1.5225	1.5288	1.5140	1.5367	1.5436	181.27	20.14	13.100	0.0085	0.7683	12.04	15.6	42	SMPTA8	22	1	1	1
$Pr_2(SO_4)_3 \cdot 8\ H_2O^{*+}$	1.5258	1.5348	1.5450	1.5399	1.5493	1.5608	419.68	20.98	31.202	0.0082	0.7368	12.01	16.2	62	Ref. 1	Rf	1769	1	2
$Nd_2(SO_4)_3 \cdot 8\ H_2O^{*+}$	1.5274	1.5360	1.5467	1.5412	1.5503	1.5619	417.50	20.87	31.113	0.0081	0.7347	12.07	16.4	62	Ref. 1	Rf	1769	1	2
$Sm_2(SO_4)_3 \cdot 8\ H_2O^*$	1.5288	1.5369	1.5477	1.5427	1.5521	1.5629	417.03	20.85	31.131	0.0082	0.7328	11.94	16.3	62	Ref. 1	Rf	1769	1	2
$K_2UO_2(SO_4)_2 \cdot 2\ H_2O^*$	1.499	1.510	1.545	1.514	1.527	1.571	291.37	24.28	21.078	0.0114	0.7681	10.36	13.4	19	CIWPAV	298	207	8	5
$K_2Mg(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4500	1.4523	1.4641	1.4606	1.4628	1.4754	330.20	23.59	21.407	0.0085	0.8943	12.97	14.5	62	Ref. 1	Rf	2743	1	1
$K_2Fe(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4649	1.4709	1.4851	1.4757	1.4821	1.4969	332.69	23.76	22.306	0.0082	0.8539	12.89	15.1	13	ZEKRDZ	52	433	1	1
$K_2Co(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4695	1.4754	1.4884	1.4806	1.4864	1.5001	328.88	23.49	22.215	0.0081	0.8451	12.92	15.2	62	Ref. 1	Rf	2743	1	1
$K_2Ni(SO_4)_2 \cdot\ H_2O^{*+}$	1.4724	1.4803	1.4923	1.4835	1.4916	1.5050	323.40	23.10	21.998	0.0080	0.8362	12.93	15.4	62	Ref. 1	Rf	4088	1	1
$K_2Cu(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4713	1.4738	1.4891	1.4835	1.4863	1.5019	327.50	23.39	22.134	0.0089	0.8443	12.32	14.5	62	Ref. 1	Rf	2743	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_O and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
$K_2Zn(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4667	1.4720	1.4844	1.4774	1.4832	1.4967	327.13	23.37	21.963	0.0082	0.8522	12.86	15.0	62	Ref. 1	Rf	2743	1	1
$Rb_2Mg(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4567	1.4583	1.4671	1.4672	1.4689	1.4780	344.94	24.64	22.584	0.0082	0.8822	13.10	14.8	62	Ref. 1	Rf	2743	1	1
$Rb_2Fe(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4701	1.4760	1.4859	1.4815	1.4873	1.4977	346.80	24.77	23.408	0.0082	0.8458	12.83	15.1	13	ZEKRDZ	52	433	1	1
$Rb_2Co(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4750	1.4806	1.4897	1.4858	1.4915	1.5012	341.76	24.41	23.251	0.0078	0.8365	13.10	15.6	62	Ref. 1	Rf	2743	1	1
$Rb_2Ni(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4780	1.4845	1.4932	1.4895	1.4960	1.5051	339.74	24.27	23.255	0.0081	0.8294	12.83	15.4	62	Ref. 1	Rf	2743	1	1
$Rb_2Cu(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4767	1.4785	1.4910	1.4886	1.4906	1.5036	343.00	24.50	23.347	0.0085	0.8359	12.51	14.9	62	Ref. 1	Rf	2743	1	1
$Rb_2Zn(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4723	1.4771	1.4857	1.4833	1.4883	1.4975	343.24	24.52	23.210	0.0081	0.8436	12.95	15.3	62	Ref. 1	Rf	2743	1	1
$Cs_2Mg(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4739	1.4743	1.4802	1.4855	1.4857	1.4915	364.50	26.04	24.549	0.0082	0.8482	12.85	15.1	62	Ref. 1	Rf	2743	1	1
$Cs_2Mn(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4830	1.4847	1.4903	1.4946	1.4964	1.5024	373.04	26.64	25.569	0.0081	0.8277	12.78	15.4	62	Ref. 1	Rf	2743	1	1
$Cs_2Fe(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4887	1.4917	1.4974	1.5003	1.5035	1.5093	368.06	26.29	25.519	0.0079	0.8145	12.84	15.7	13	ZEKRDZ	52	433	1	1
$Cs_2Co(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4938	1.4967	1.5010	1.5055	1.5084	1.5130	363.40	25.96	25.394	0.0078	0.8055	12.87	15.9	62	Ref. 1	Rf	2743	1	1
$Cs_2Cu(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4920	1.4934	1.5024	1.5047	1.5061	1.5152	363.70	25.98	25.361	0.0084	0.8079	12.40	15.3	62	Ref. 1	Rf	2743	1	1
$Cs_2Zn(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.4904	1.4930	1.4971	1.5021	1.5047	1.5092	363.89	25.99	25.269	0.0079	0.8127	12.80	15.7	62	Ref. 1	Rf	2743	1	1
$Tl_2Fe(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.5711	1.5866	1.5918	1.5930	1.6093	1.6166	346.79	24.77	27.675	0.0108	0.6640	9.94	14.9	62	Ref. 1	Rf	1572	1	1
$Tl_2Co(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.5789	1.5942	1.5996	1.6010	1.6176	1.6238	343.19	24.51	27.683	0.0105	0.6534	9.96	15.2	62	Ref. 1	Rf	1571	1	1
$Tl_2Ni(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.5847	1.6001	1.6047	1.6025	1.6186	1.6225	338.78	24.20	27.538	0.0081	0.6458	11.32	17.5	62	Ref. 1	Rf	1571	1	1?
$Tl_2Cu(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.5767	1.5866	1.5958	1.5997	1.6097	1.6191	344.00	24.57	27.575	0.0106	0.6595	9.95	15.0	62	Ref. 1	Rf	1572	1	1
$Tl_2Zn(SO_4)_2 \cdot 6\ H_2O^{*+}$	1.5723	1.5866	1.5934	1.5930	1.6092	1.6166	342.82	24.49	27.394	0.0103	0.6627	10.16	15.3	10	PPSAAM	83	211	1	1
$NaAl(SO_4)_2 \cdot 12\ H_2O^{*+}$	1.4274	1.4274	1.4274	1.4387	1.4387	1.4387	455.43	22.78	27.938	0.0101	0.9638	12.34	12.8	62	Ref. 1	Rf	3797	1	1
$KAl(SO_4)_2 \cdot 12\ H_2O^{*+}$	1.4447	1.4447	1.4447	1.4562	1.4562	1.4562	449.28	22.46	28.530	0.0096	0.9199	12.40	13.4	62	Ref. 1	Rf	3798	1	1?
$KAl(SO_4)_2 \cdot 12\ H_2O^{*+}$	1.4453	1.4453	1.4453	1.4560	1.4560	1.4560	449.28	22.46	28.563	0.0088	0.9183	12.88	14.0	33	ZEKRDZ	85	169	1	1
$KCr(SO_4)_2 \cdot 12\ H_2O$	1.4685	1.4685	1.4685	1.4813	1.4813	1.4813	453.51	22.67	30.124	0.0095	0.8646	12.10	13.9	62	Ref. 1	Rf	189	8	1
$KFe(SO_4)_2 \cdot 12\ H_2O$	1.4657	1.4657	1.4657	1.4815	1.4815	1.4815	458.89	22.94	30.325	0.0118	0.8708	10.88	12.4	62	Ref. 1	Rf	189	8	1
$KGa(SO_4)_2 \cdot 12\ H_2O$	1.4538	1.4538	1.4538	1.4653	1.4653	1.4653	452.40	22.62	29.236	0.0091	0.8981	12.54	13.9	62	Ref. 1	Rf	189	8	1
$RbAl(SO_4)_2 \cdot 12\ H_2O$	1.4453	1.4453	1.4453	1.4565	1.4565	1.4565	458.78	22.94	29.167	0.0092	0.9183	12.62	13.7	62	Ref. 1	Rf	189	8	1
$RbCr(SO_4)_2 \cdot 12\ H_2O$	1.4682	1.4682	1.4682	1.4814	1.4814	1.4814	462.84	23.14	30.727	0.0098	0.8653	11.90	13.7	62	Ref. 1	Rf	189	8	1
$RbFe(SO_4)_2 \cdot 12\ H_2O$	1.4662	1.4662	1.4662	1.4822	1.4822	1.4822	467.60	23.38	30.929	0.0119	0.8697	10.83	12.4	62	Ref. 1	Rf	189	8	1
$RbGa(SO_4)_2 \cdot 12\ H_2O$	1.4541	1.4541	1.4541	1.4657	1.4657	1.4657	462.05	23.10	29.877	0.0092	0.8974	12.50	13.9	62	Ref. 1	Rf	189	8	1
$RbIn(SO_4)_2 \cdot 12\ H_2O$	1.4517	1.4517	1.4517	1.4637	1.4637	1.4637	479.66	23.98	30.874	0.0096	0.9030	12.24	13.5	62	Ref. 1	Rf	189	8	1
$CsAl(SO_4)_2 \cdot 12\ H_2O$	1.4473	1.4473	1.4473	1.4585	1.4585	1.4585	471.94	23.60	30.121	0.0091	0.9135	12.64	13.8	62	Ref. 1	Rf	189	8	1
$CsCr(SO_4)_2 \cdot 12\ H_2O$	1.4682	1.4682	1.4682	1.4809	1.4809	1.4809	477.23	23.86	31.682	0.0095	0.8654	12.07	13.9	62	Ref. 1	Rf	189	8	1
$CsFe(SO_4)_2 \cdot 12\ H_2O$	1.4679	1.4679	1.4679	1.4836	1.4836	1.4836	480.59	24.03	31.888	0.0117	0.8661	10.90	12.5	62	Ref. 1	Rf	189	8	1
$CsGa(SO_4)_2 \cdot 12\ H_2O$	1.4534	1.4534	1.4534	1.4648	1.4648	1.4648	476.72	23.84	30.785	0.0091	0.8990	12.59	14.0	62	Ref. 1	Rf	189	8	1
$CsIn(SO_4)_2 \cdot 12\ H_2O$	1.4531	1.4531	1.4531	1.4652	1.4652	1.4652	492.39	24.62	31.778	0.0096	0.8997	12.24	13.6	62	Ref. 1	Rf	189	8	1
$TlAl(SO_4)_2 \cdot 12\ H_2O$	1.4827	1.4827	1.4827	1.4974	1.4974	1.4974	457.32	22.87	31.164	0.0102	0.8345	11.42	13.6	62	Ref. 1	Rf	189	8	1
$TlCr(SO_4)_2 \cdot 12\ H_2O$	1.5060	1.5060	1.5060	1.5226	1.5226	1.5226	461.03	23.05	32.700	0.0105	0.7887	10.97	13.9	62	Ref. 1	Rf	189	8	1
$TlFe(SO_4)_2 \cdot 12\ H_2O$	1.5043	1.5043	1.5043	1.5234	1.5234	1.5234	466.00	23.30	32.958	0.0120	0.7918	10.26	12.9	62	Ref. 1	Rf	189	8	1
$TlGa(SO_4)_2 \cdot 12\ H_2O$	1.4916	1.4916	1.4916	1.5066	1.5066	1.5066	463.85	23.19	32.104	0.0100	0.8165	11.41	13.9	62	Ref. 1	Rf	189	8	1
Selenites and Selenates																			
$LiHSeO_3^*$	1.561	1.632	1.643	1.580	1.655	1.669	73.80	24.60	6.125	0.0096	0.6288	10.25	16.30	84	ZEKRDZ	169	249	1	3
$K_2SeO_4^{*+}$ FE 93 K	1.5212	1.5247	1.5301	1.5352	1.5390	1.5446	120.10	30.02	8.791	0.0084	0.7539	12.00	15.9	62	Ref. 1	Rf	2744	1	2
$Rb_2SeO_4^{*+}$	1.5369	1.5391	1.5434	1.5515	1.5538	1.5583	133.26	33.31	9.978	0.0081	0.7294	11.98	16.4	62	Ref. 1	Rf	2744	1	2
SeO_4^{*+}	1.5827	1.5830	1.5834	1.5991	1.5998	1.6002	152.48	38.12	12.166	0.0078	0.6640	11.65	17.5	62	Ref. 1	Rf	2744	1	2
$Tl_2SeO_4^{*+}$	1.8834	1.8922	1.8976	1.9490	1.9588	1.9636	132.19	33.05	14.580	0.0121	0.3882	7.16	18.4	08	ZEKRDZ	44	138	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O atom, V_o, and mean values of electronic polarizabilities $\langle\alpha_e\rangle$, mean dispersion values $\langle A\rangle$ and $\langle B\rangle$ according to Eq. (3a), and average of E_o and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle\alpha_e\rangle$	$\langle A\rangle$	$\langle B\rangle$	$\langle E_o\rangle$	$\langle E_d\rangle$	Year	Coden	Vol	Page	M	E
Cs_2																			
$NiSeO_4 \cdot 6\ H_2O^{*+}$	1.5226	1.5226	1.4969	1.5391	1.5391	1.5122	220.82	22.08	15.872	0.0098	0.7744	11.22	14.4	62	Ref. 1	Rf	2737	1	2
$ZnSeO_4 \cdot 6\ H_2O^{*+}$	1.5132	1.5132	1.4890	1.5288	1.5288	1.5036	222.92	22.29	15.788	0.0097	0.7908	11.43	14.4	62	Ref. 1	Rf	2737	1	2
$K_2Mg(SeO_4)_2 \cdot 6\ H_2O^{*+}$	1.4832	1.4855	1.4995	1.4967	1.4991	1.5138	348.42	24.89	24.023	0.0093	0.8210	11.85	14.4	62	Ref. 1	Rf	2112	1	1
$K_2Cu(SeO_4)_2 \cdot 6\ H_2O^{*+}$	1.4954	1.5034	1.5161	1.5098	1.5182	1.5318	345.30	24.66	24.449	0.0095	0.7909	11.53	14.5	23	ZEKRDZ	58	40	1	1
$Rb_2Mg(SeO_4)_2 \cdot 6\ H_2O^{*+}$	1.4876	1.4894	1.4991	1.5011	1.5030	1.5134	363.55	25.96	25.181	0.0092	0.8156	11.90	14.5	62	Ref. 1	Rf	2112	1	1
$Cs_2Mg(SeO_4)_2 \cdot 6\ H_2O^{*+}$	1.5036	1.5039	1.5093	1.5177	1.5178	1.5235	385.24	27.52	27.306	0.0089	0.7894	11.89	15.0	62	Ref. 1	Rf	2112	1	1
$KAl(SeO_4)_2 \cdot 12\ H_2O$	1.4666	1.4666	1.4666	1.4806	1.4806	1.4806	475.04	23.75	31.444	0.0104	0.8689	11.54	13.2	33	ZEKRDZ	85	169	5	1
$KAl(SeO_4)_2 \cdot 12\ H_2O$	1.4663	1.4663	1.4663	1.4800	1.4800	1.4800	475.04	23.75	31.427	0.0103	0.8696	11.63	13.3	62	Ref. 1	Rf	189	8	1
Molybdates																			
$CaMoO_4^{*+}$	1.9287	1.9287	1.9345	1.9789	1.9789	1.9891	78.03	19.51	8.871	0.0088	0.3667	8.17	22.28	78	Ref. 7		7-79	1	1
$CaMoO_4^{*+}$	1.9432	1.9432	1.9479	1.9916	1.9916	2.0012	78.03	19.51	8.963	0.0083	0.3594	8.35	23.22	65	JAPIAU	36	1674	1	1?
$CaMoO_4^{*+}$	1.9367	1.9367	1.9441	1.9909	1.9909	2.0005	78.03	19.51	8.927	0.0091	0.3623	7.96	21.98	77	SJOTBH	44	542	1	1
$SrMoO_4^{*+}$	1.8649	1.8649	1.8670	1.9083	1.9083	1.9132	86.62	21.65	9.359	0.0088	0.4032	8.54	21.17	65	JAPIAU	36	1674	1	1
$SrMoO_4^{*+}$	1.8628	1.8628	1.8654	1.9078	1.9078	1.9125	86.62	21.65	9.344	0.0091	0.4043	8.41	20.80	77	SJOTBH	44	542	1	1
$CdMoO_4^{*+}$	2.1292	2.1292	2.1062	2.2190	2.2190	2.1916	74.37	18.59	9.561	0.0098	0.2857	6.84	23.94	77	SJOTBH	44	542	1	1
$PbMoO_4^{*+}$ wulfenite	2.2508	2.2508	2.1705	2.4152	2.4152	2.2788	89.42	22.36	12.128	0.0126	0.2538	5.67	22.35	78	Ref. 7		7-94	1	1
$PbMoO_4^{*+}$ wulfenite	2.2525	2.2525	2.1853	2.4061	2.4061	2.2830	89.42	22.36	12.164	0.0117	0.2519	5.88	23.33	62	Ref. 1	Rf	353	1	1
$PbMoO_4^{*+}$ wulfenite	2.2491	2.2491	2.1756	2.4103	2.4103	2.2795	89.42	22.36	12.131	0.0123	0.2535	5.74	22.62	62	Ref. 1	Rf	2810	1	1
$PbMoO_4^{*+}$ wulfenite	2.2371	2.2371	2.1684	2.4090	2.4090	2.2767	89.42	22.36	12.070	0.0132	0.2565	5.57	21.72	77	SJOTBH	44	542	1	1
$Pb_2MoO_5^{*+}$	2.0848	2.0936	2.1944	2.1885	2.1965	2.3260	137.97	27.59	17.765	0.0121	0.2855	6.15	21.5	70	JOSAAH	60	1375	1	2
$Bi_6Mo_2O_{15}^{*}$	2.233	2.222	2.197	2.370	2.361	2.323	366.59	24.44	49.557	0.0120	0.2554	5.84	22.8	74	MRBUAC	9	41	1	4
$Bi_2Mo_3O_{12}^{*}$	2.165	2.187	2.265	2.284	2.329	2.478	240.62	20.05	32.341	0.0139	0.2591	5.47	21.1	74	MRBUAC	9	41	1	4
$Bi_2Mo_3O_{12}^{*}$	2.065	2.047	2.245	2.210	2.182	2.424	240.62	20.05	30.891	0.0160	0.2890	5.37	18.5	99	Ref. 15		525	1	2
$Ce_2Mo_3O_{12}^{+}$	1.9657	1.9657	1.9567	2.0347	2.0347	2.0221				0.0105	0.3506	7.29	20.80	23	ZEKRDZ	58	226	1	1
$Nd_2Mo_3O_{12}^{+}$ FL 1233 K	1.9622	1.9622	1.9618	2.0186	2.0186	2.0168	246.36	20.53	28.652	0.0088	0.3509	7.97	22.7	23	ZEKRDZ	58	226	1	1?
$Gd_2Mo_3O_{12}^{*+}$ FE 432 K FL 432 K	1.8014	1.8018	1.8492	1.8445	1.8449	1.8983	289.50	24.12	30.016	0.0101	0.4346	8.29	19.0	71	Ref. 6		511	8	1
$Gd_2Mo_3O_{12}^{*+}$ FE 432 K FL 432 K	1.7990	1.7990	1.8461	1.8427	1.8427	1.8964	289.50	24.12	29.942	0.0104	0.4365	8.21	18.8	79	Ref. 2B	Rf	69N5	1	1
$Tb_2Mo_3O_{12}^{*+}$ FE 435 K	1.8090	1.8095	1.8556	1.8538	1.8542	1.9063	286.17	23.84	29.862	0.0103	0.4297	8.17	19.0	86	Ref. 3		155	8	1
$Li_{.286}Gd_{.571}MoO_4^{*+}$	1.9922	1.9922	1.9838	2.0567	2.0567	2.0489	77.44	19.04	9.178	0.0095	0.3381	7.53	22.27	77	SPHCA6	22	371	1	1
Tungstates																			
$CaWO_4^{*+}$	1.8816	1.8816	1.8951	1.9196	1.9196	1.9359	78.10	19.53	8.580	0.0074	0.3911	9.17	23.44	65	JAPIAU	36	1674	1	1
$CaWO_4^{*+}$	1.8812	1.8812	1.8948	1.9184	1.9184	1.9347	78.10	19.53	8.577	0.0073	0.3913	9.25	23.65	63	JOSAAH	53	1286	1	1
$CaWO_4^{*+}$	1.8828	1.8828	1.8958	1.9203	1.9203	1.9359	78.10	19.53	8.587	0.0073	0.3905	9.23	23.63	77	SJOTBH	44	542	1	1
$SrWO_4^{*+}$	1.8289	1.8289	1.8368	1.8618	1.8618	1.8719	86.91	21.73	9.124	0.0074	0.4247	9.58	22.55	77	SJOTBH	44	542	1	1
$BaWO_4^{*+}$	1.8102	1.8102	1.8077	1.8426	1.8426	1.8405	100.90	25.22	10.386	0.0076	0.4398	9.64	21.9	77	SJOTBH	44	542	1	1
$ZnWO_4^{*+}$	2.1058	2.1201	2.2475	2.1767	2.1934	2.3412	66.33	16.58	8.698	0.0082	0.2747	7.31	26.60	65	JAPIAU	36	1674	1	1
$ZnWO_4^{*+}$	2.1018	2.1198	2.2467	2.1740	2.1925	2.3386	66.33	16.58	8.690	0.0082	0.2753	7.32	26.58	64	APOPAI	3	1084	1	1
$ZnWO_4^{*+}$	2.1026	2.1164	2.2435	2.1756	2.1935	2.3403	66.33	16.58	8.681	0.0086	0.2759	7.17	26.00	89	WLHPAR	38	670	1	1
$PbWO_4^{*+}$ stolzite	2.1622	2.1622	2.1009	2.2704	2.2704	2.1817	88.92	22.23	11.560	0.0104	0.2790	6.55	23.49	77	SJOTBH	44	542	1	1
$PbWO_4^{*}$	2.155	2.155	2.112	2.246	2.246	2.170	88.92	22.23	11.553	0.0086	0.2794	7.23	25.87	97	NIMAER	385	209	8	4?
$NaY(WO_4)_2$	1.94	1.94	1.94	1.94	1.94	1.95				0.0009	0.3620	25.76	71.17	72	INOMAF	8	1957	8	5?
$NaLa(WO_4)_2$	1.93	1.93	1.92	1.94	1.94	1.96	166.35	20.79	18.856	0.0038	0.3692	12.39	33.5	72	INOMAF	8	1957	8	5
Chlorates and Perchlorates																			
$NaClO_3^{*+}$	1.5022	1.5022	1.5022	1.5152	1.5152	1.5152	71.08	23.69	5.009	0.0084	0.7959	12.32	15.48	10	NJGAAY	29	53	1	1

TABLE 1. Refractive index and dispersion data, listing refractive indices (n_x, n_y, n_z) at $\lambda = \infty$, refractive indices (n_{Dx}, n_{Dy}, n_{Dz}) at $\lambda = 589.3$ nm, molar volume, V_m, volume per O- atom, V_O, and mean values of electronic polarizabilities $\langle \alpha_e \rangle$, mean dispersion values $\langle A \rangle$ and $\langle B \rangle$ according to Eq. (3a), and average of E_O and E_d according to Eq. (3b). Source references use Codens from the American Chemical Society, Chemical Abstracts Service Source Index 1907–1999 Cumulative (American Chemical Society, Washington, DC, 2000). (Symbols * and + and numerical values for method and error can be found at the end of the table.)—Continued

Chemical composition, sample designations	n_x	n_y	n_z	n_{Dx}	n_{Dy}	n_{Dz}	V_m	V_o	$\langle \alpha_e \rangle$	$\langle A \rangle$	$\langle B \rangle$	$\langle E_o \rangle$	$E_d \rangle$	Year	Coden	Vol	Page	*M*	*E*
$KClO_4^{*+}$	1.4640	1.4647	1.4678	1.4730	1.4736	1.4768	90.96	22.74	6.009	0.0068	0.8713	14.35	16.47	26	PPSAAM	111	462	1	1
$RbClO_4^{*+}$	1.4606	1.4616	1.4645	1.4691	1.4701	1.4732	100.91	25.22	6.626	0.0066	0.8786	14.64	16.6	26	PPSAAM	111	462	1	1
$CsClO_4^{*+}$	1.4661	1.4696	1.4711	1.4752	1.4788	1.4804	115.97	28.99	7.709	0.0068	0.8637	14.21	16.4	26	PPSAAM	111	462	1	1
$TlClO_4^{*+}$	1.6186	1.6202	1.6288	1.6427	1.6446	1.6542	102.10	25.52	8.590	0.0100	0.6126	9.90	16.1	34	ZEKRDZ	87	43	1	1
$Sr(ClO_3)_2^{+}$	1.5560	1.5894	1.6089	1.5667	1.6045	1.6256	134.31	22.38	10.742	0.0066	0.6628	12.69	19.1	62	Ref. 1	Rf	4065	1	1
$LiClO_4 \cdot 3\ H_2O^{*+}$	1.4711	1.4711	1.4281	1.4832	1.4832	1.4384	140.73	20.10	9.146	0.0090	0.8933	12.61	14.1	96	JAPIAU	80	6097	5	2
Bromates																			
$NaBrO_3^{*+}$	1.5954	1.5954	1.5954	1.6168	1.6168	1.6168	75.14	25.14	6.099	0.0096	0.6471	10.39	16.05	10	NJGAAY	29	53	1	1
$AgBrO_3$	1.789	1.789	1.835	1.847	1.847	1.920	74.54	24.84	7.637	0.0149	0.4436	6.90	15.55	31	Ref. 11A		205	2	3
Iodates and Periodates																			
$LiIO_3$-alpha^{*+}	1.8414	1.8414	1.7041	1.8868	1.8868	1.7390	67.18	22.59	6.828	0.0100	0.4539	8.51	18.75	77	OPCOB8	23	279	1	1
$LiIO_3$-alpha^{*+}	1.8439	1.8439	1.7065	1.8870	1.8870	1.7394	67.18	22.59	6.844	0.0095	0.4521	8.75	19.34	76	PLRBAQ	14	1693	1	1
KIO_3-alpha^{*+}	1.6629	1.7831	1.7855	1.6976	1.8342	1.8379	88.90	29.63	8.593	0.0124	0.4941	7.97	16.13	96	Ref. 2D	Rf	87Y4	1	1
KIO_3-alpha^{*+}	1.6627	1.7812	1.7834	1.6968	1.8334	1.8363	88.90	29.63	8.581	0.0126	0.4952	7.94	16.04	92	CPLEEU	9	77	1	1
KIO_4^{*+}	1.5917	1.5917	1.6129	1.6205	1.6205	1.6476	103.46	25.86	8.436	0.0133	0.6428	8.78	13.6	62	Ref. 1	Rf	466	8	1
HIO_3^{*+} = alpha iodic acid = IO_2OH	1.7986	1.9078	1.9248	1.8436	1.9687	1.9956	62.99	21.00	6.870	0.0111	0.3986	7.57	18.99	68	APPLAB	12	186	1	1
$KIO_2F_2^{*}$	1.589	1.549	1.587	1.615	1.565	1.611	105.18	26.29	8.298	0.0104	0.6761	10.22	15.1	74	JCPSA6	60	2470	1	3
Chromates																			
$MgCrO_4 \cdot 7\ H_2O$	1.545	1.509	1.482	1.568	1.550	1.521	245.97	22.36	17.620	0.0209	0.7800	7.73	9.9	31	Ref. 11A		228	2	5
$Cs_2Mg(CrO_4)_2 \cdot 6\ H_2O^{*+}$	1.5867	1.5910	1.5997	1.6376	1.6432	1.6555	381.95	27.28	30.876	0.0227	0.6511	6.77	10.4	12	MNLMBB	16	175	1	1
$Rb_2Mg(CrO_4)_2 \cdot 6\ H_2O^{*+}$	1.5715	1.5782	1.5876	1.6224	1.6338	1.6444	359.98	25.70	28.564	0.0244	0.6697	6.63	9.9	12	MNLMBB	16	175	1	1

*Composition well-known – synthetic crystals or analyzed minerals.
+Refractive index accurate to ± 0.0001–0.0010.
[1]Prism method.
[2]Immersion method.
[3]Reflectivity data, classical oscillator model, Kramers-Kronig analysis.
[4]Ellipsometry method.
[5]Critical angle method.
[6]Interference method.
[7]Brewster method.
[8]Unknown or other.
*E*Error.
*M*Method.

Error limits.
[1]0.0001–0.0005.
[2]0.0006–0.0010.
[3]0.0011–0.0050.
[4]0.0051–0.0100.
[5]> 0.0100.
[6]Not given.
[7]Doubtful.
?Dispersion, A, not consistent with like compounds or structural family trends.
??Probably contains Fe.

TABLE 2. Comparison of n_∞ values determined by prism methods and reflectivity methods

Compound	Space group	Prism method $\langle n_\infty \rangle$	Reflectivity $\langle n_\infty \rangle$	Error	Ellipsometer $\langle n_\infty \rangle$	Error	Interference method		Delta[a] IR-prism	Delta ellips-prism	Delta Interf-prism
MgF_2	$P4_2/mnm$	1.3761	1.38	>.01					0.00		
CaF_2	$Fm3m$	1.4255	1.430	0.01					0.00		
SrF_2	$Fm3m$	1.4306	1.44	>.01					0.01		
BaF_2	$Fm3m$	1.4655	1.47	>.01					0.00		
ZnF_2	$P4_2/mnm$	1.4963	1.503	0.01					0.01		
PbF_2	$Fm3m$	1.7248	1.58	>.01					**−0.14**		
		1.7272	1.58	>.01					**−0.14**		
$KMgF_3$	$Pm3n$	1.3975	1.43	0.05					0.03		
$KNiF_3$	$Pm3n$		1.52	0.05			1.4827		0.04		
$KMnF_3$	$Pm3n$	1.4382	1.44	0.01					0.00		
			1.45	0.05					0.01		
$RbMnF_3$	$Pm3n$		1.59	0.05			1.4745		**0.12**		
Cu_2O	$Pn3m$	2.27	2.54	0.02					**0.27**		
			2.55	0.05					**0.28**		
			2.57	0.05					**0.30**		
ZnO		1.9150			1.903	0.003				−0.012	
		1.904			1.903	0.003				−0.001	
EuO	$Fm\bar{3}m$	1.960	2.30	0.08					**0.34**		
Al_2O_3	$R\bar{3}c$	1.7496	1.78		1.7480				0.03	−0.002	
Er_2O_3	$Ia\bar{3}$	1.923			1.95					0.03	
		1.930			1.95					0.02	
SiO_2	$P3_121$	1.5353	1.538	0.005					0.003		
GeO_2	$P4_2/mnm$	1.9546	2.05						**0.09**		
		1.957							**0.09**		
TiO_2	$P4_2/mnm$	2.506			2.46	0.02				−0.05	
		2.490			2.46	0.02				−0.03	
ThO_2	$Fm\bar{3}m$	2.0679	2.20	0.01					**0.13**		
		2.07	2.20	0.01					**0.13**		
CeO_2	$Fm\bar{3}m$		2.31		2.36					0.05	
UO_2	$Fm3m$	2.12	2.35						**0.23**		
		2.16									
$Tb_3Ga_5O_{12}$		1.9335					1.932	0.002			−0.001
$Y_3Fe_5O_{12}$	$Ia\bar{3}d$	2.1287					2.15			0.02	
		2.165					2.15			0.02	
Be_2SiO_4	$R\bar{3}$	1.6448	1.66	0.01					0.02		
		1.6455	1.66	0.01					0.01		
Mg_2SiO_4	$Pmnb$	1.6365	1.650	0.005					0.014		
$Bi_4Si_3O_{12}$		1.9674					1.9559	0.001			−0.011
$Bi_4Ge_3O_{12}$		2.0267					2.0218				−0.005
		2.0338									−0.012
YVO_4	$I4_1/amd$	2.0055	2.00	0.01					−0.01		
		1.9994	2.00	0.01					0.00		
$PbMg_{.33}Nb_{.67}O_3$	$Pm3m$	2.422	2.49						**0.07**		

[a]Boldfaced values refer to discrepancies greater than experimental values.

of the plot at $\lambda=\infty$, gives $n_\infty=(1+1/B)^{1/2}$. In Appendix 2, we give alternative forms of this equation. The n_∞ values derived from Eq. (3a) are necessary for the correct application of the Lorenz–Lorentz relation to obtain ion polarizabilities. The values of n_∞ derived in this paper from one-term Sellmeier analyses of data from the visible region results in n_∞ that comes only from electronic transitions. This n_∞ is distinctly different from the dielectric n_∞ derived from the dielectric constant $\varepsilon_o=n_\infty^2$, obtained in the kHz–MHz region where both lattice vibrations and electronic transitions contribute to the dielectric constant. This is shown graphically by Tropf *et al.* (1995) in their Fig. 1, p. 33.13 and is illustrated numerically by the value of refractive indices of quartz where from optical data, $\langle n_\infty \rangle=1.547$, and from dielectric constant data at 1 kHz, $\langle n_\infty \rangle=2.135$ (Shannon, 1993).

An alternative form [Wemple and DiDomenico (1971); Wemple (1973, 1977)] is

$$n^2-1=E_dE_o/(E_o^2-(\hbar\omega)^2), \tag{3b}$$

where in a single oscillator model $\hbar\omega=$ the photon energy, $E_o=$ the average single oscillator (Sellmeier) energy gap in eV, and E_d = the average oscillator strength in eV, which measures the average strength of interband optical transitions and E_d is related to physical parameters by the expression $E_d=\beta N_cZ_aN_e$, where N_c is the cation coordination number, Z_a is the formal valence of the anion, N_e is the effective

TABLE 3. Inconsistent dispersion values

Compound	Mineral	Reference	$\langle A \rangle$ 10^{-16} m^2	E_o (eV)	E_d (eV)	Accuracy index[a]	$\langle A \rangle$
NaF		78 Ref. 7 7-105	96	15.0	11.1	2	high
Cs_2SiF_6		35 ZPCBAL 31 292	98	13.4	12.2	3	high
Na_2GeF_6		82 INOMAF 18 570	101	14.4	11.0	2	high
Cs_2GeF_6		35 ZPCBAL 31 292	117	11.7	11.8	3	high
$BaMgF_4$		75 JAPIAU 46 4645	75	13.8	15.3	3	high
Cu_2O	cuprite	79 JJAPA5 18 1043	86	5.5	33.9	5	low
Y_2O_3		91 Ref. 9 1079	126	7.1	18.0	2	high
Y_2O_3		91 Ref. 9 1079	62	9.9	25.8	2	low
Y_2O_3		56 ANCHAM 28 2023	53	10.8	27.6	3	low
As_2O_3	arsenolite	62 Ref. 1 Rf 2565	87	9.6	19.0	3	low
Sb_2O_3	senarmontite	62 Ref. 1 Rf 204	80	8.0	25.0	5	low
SrB_4O_7		95 OMATET 4 669	40	14.3	28.2	1	low
$Gd_{.99}Nd_{.01}Al_3B_4O_{12}$		98 CHSCBU 43 1973	40	14.0	28.8	1	low
$MgAl_2O_4$ (1.15% Co)	spinel	62 Ref. 1 Rf 173	48	13.1	25.4	1	low
$SrLaAlO_4$		96 PSSBBD 195 625	39	12.2	33.6	5	low
$Gd_3Sc_2Al_3O_{12}$		73 JAPIAU 44 1395	66	9.8	24.5	5	high
$Y_3Ga_5O_{12}$		87 Ref. 5 314	80	8.9	22.5	3	high
$Tm_3Ga_5O_{12}$		82 JCRGAE 57 600	70	9.2	24.8	3	high
$LaEr_3ScGa_3O_{12}$		84 SPHCA6 29 704	42	11.7	32.5	2	low
$SrGdGa_3O_7$		91 JOBPDE 8 1668	94	8.7	19.5	3	high
$Y_3Fe_5O_{12}$		65 BJAPJA 16 475	271	4.0	14.8	3	high
SiO_2	smoky quartz	97 NJMIAK 11 259	76	12.5	16.9	1	high
$ZrSiO_4$	zircon	62 Ref. 1 Rf 514	69	9.4	24.6	1	high
$Al_2SiO_4F_2$	topaz	62 Ref. 1 Rf 4071	37	16.3	26.7	1	low
Mn_2SiO_4	tephroite	32 AMMIAY 17 135	98	8.8	18.5	3	high
$CaMnSiO_4$		32 AMMIAY 17 135	90	9.9	17.9	3	high
$Fe_{1.7}Mn_{.1}Mg_{.2}SiO_4$	fayalite	09 ZEKRDZ 46 138	85	9.2	20.5	1	high
Zn_2SiO_4	willemite	23 ZEKRDZ 58 460	81	10.5	18.9	1	high
$ZrSiO_4$	zircon	03 ZEKRDZ 37 235	64	9.7	25.7	1	high
Al_2SiO_5	sillimanite	62 Ref. 1 Rf 4085	67	11.8	20.3	1	high
$Ca_{2.7}Mg_{.2}Fe_{.1}Al_{1.8}Fe_{.2}Si_3O_{12}$	grossular	62 Ref. 1 Rf 235	35	15.0	30.7	1	low
$Ca_2CoSi_2O_7$		97 JOBPDE 14 3299	178	7.6	11.8	1	high
$Li_{.95}Na_{.05}Al_{.95}Fe_{.05}Si_2O_6$	spodumene	13 ZEKRDZ 13 294	51	13.3	23.4	2	low
$CaTiSiO_5$	titanite	97 Ref. 10A 1609	73	9.2	23.8	4	low
$CaTiSiO_5$	titanite	97 Ref. 10A 1609	91	8.3	21.1	2	low
$Na_4Al_3Si_3O_{12}Cl$	sodalite	62 Ref. 1 Rf 2597	65	14.5	17.0	2	low
$Na_4Al_3Si_3O_{12}Cl$	sodalite	97 Ref. 10A 885	98	11.8	13.7	2	high
$K_{.9}Na_{.1}AlSi_3O_8$	adularia	21 TTMMDZ 35 231	63	14.1	18.0	1	low
$KAlSi_3O_8$	microcline	62 Ref. 1 Rf 2966	85	12.2	15.5	1	high
$Ba_{.93}K_{.04}Na_{.02}Al_2Si_2O_8$	paracelsian	42 MNLMBB 26 231	87	11.3	16.3	2	high
$Ca_3Si_2O_6(OH)_2(OH_2)_2$	afwillite	25 MNLMBB 20 277	44	15.0	24.1	2	low
$Ca_2Al_2FeSi_3O_{12}OH$	epidote	62 Ref. 1 Rf 2983	59	11.6	23.4	1	low
$Cu_6Si_6O_{18}\cdot 6\,H_2O$	dioptase	62 Ref. 1 Rf 2889	66	11.8	20.6	1	low
$Pb_9Mg_9Si_9O_{24}(OH)_{24}$	molybdophyllite	38 Ref. 10C 368	80	9.7	20.5	1	low
$Ca(UO_2)(UOOH)(SiO_4)(SiO_3OH)\cdot 4\,H_2O$	beta-uranophane	39 AMMIAY 24 324	50	13.4	24.0	3	?
$Ca(UO_2)(UOOH)(SiO_4)(SiO_3OH)\cdot 4\,H_2O$	beta-uranophane	39 AMMIAY 24 324	66	11.8	20.6	3	?
$Ba_{1.99}Nd_{.01}ZnGe_2O_7$		90 JOBPDE 7 1190	66	11.0	22.0	3?	low
TiO_2	rutile	97 OPLEDP 22 1808	152	4.6	23.0	5	high
TiO_2	rutile	79 JJAPA5 18 1043	84	6.3	30.3	5	low
$SrTiO_{2.929}$		95 SPHCA6 40 640	87	6.6	28.1	1	low
$PbTiO_3$	ceramic	71 Ref. 6 513	92	5.7	30.5	2	low
$PbTiO_3$	ceramic	77 APOPAI 16 3210	92	5.7	30.6	3	low
ThO_2		64 OPACAT 11 287	44	10.5	34.5	3	low
RbH_2PO_4		67 SPHCA6 12 383	107	11.2	13.3	2	high
$DyPO_4$		00 OMATET 15 103	57	12.0	23.3	4	low
$HoPO_4$		00 OMATET 15 103	56	12.2	23.5	4	low
$ErPO_4$		00 OMATET 15 103	48	13.2	25.4	4	low
$TmPO_4$		00 OMATET 15 103	55	12.3	23.5	4	low
$YbPO_4$		00 OMATET 15 103	48	13.1	25.3	4	low

TABLE 3. Inconsistent dispersion values—Continued

Compound	Mineral	Reference	$\langle A \rangle$ 10^{-16} m^2	E_o (eV)	E_d (eV)	Accuracy index[a]	$\langle A \rangle$
$LuPO_4$		00 OMATET 15 103	54	12.4	23.8	4	low
GdP_5O_{14}		87 WLHPAR 36 823	114	9.5	14.6	1	high
ErP_5O_{14}		87 WLHPAR 36 823	27	19.6	30.6	1	low
$Li_{1.93}Na_{.04}Mg_{.02}Al_2P_2O_8(F_{.9}OH_{1.1})$	montebrasite	46 AMMIAY 31 51	47	14.8	22.9	3	low
$Y_{.95}Tm_{.05}VO_4$		93 JAPNDE 32 1651	164	5.7	17.0	3	high
$Cs_8Nb_{22}O_{59}$		78 JCRGAE 43 115	124	6.1	21.1	5	high
$Ba_{.75}Sr_{.25}Nb_2O_6$		68 JAPIAU 39 343	79	7.2	28.2	4	low
$KAl(SO_4)_2 \cdot 12\,H_2O$		62 Ref. 1 Rf 3798	96	12.4	13.5	1	high
$Tl_2Ni(SO_4)_2 \cdot 6\,H_2O$		62 Ref. 1 Rf 1571	81	11.3	17.5	1	low
$CaMoO_4$		65 JAPIAU 36 1674	83	8.4	23.2	1	low
$Nd_2Mo_3O_{12}$		23 ZDKRDZ 58 226	88	8.0	22.7	1	low
$PbWO_4$	stolzite	97 NIMAER 385 209	86	7.2	25.9	4	low
$NaY(WO_4)_2$		72 INOMAF 8 1957	9	25.8	71.2	5	low

[a]Accuracy index defined in Table 1.

number of valence electrons/anion, $\beta = 0.26$ for ionic compounds, and $\beta = 0.37$ for covalent compounds. These parameters were analyzed for more than 100 compounds by-Wemple and DiDomenico (1971). The scheme was found to work well for simple single-bond halides and oxides as well as a number of more complex multibond oxides containing two cations of differing coordination. However, it was necessary to assume covalent character ($\beta = 0.37$) for scheelite-type molybdates and tungstates and several iodates and carbonates. In this paper we consider both single-bond and multibond oxides and fluorides.

In general, dispersion parameters are not identical for light polarized along the different axes of uniaxial and biaxial crystals. This results in dispersion parameters that vary with the crystal orientation. However, for simplicity in the tables, we list only mean values of $\langle A \rangle$, $\langle B \rangle$, $\langle E_o \rangle$, and $\langle E_d \rangle$. In the text following, although we omit the brackets, all values of A, B, E_o, and E_d are understood to be mean values.

When numerical values were given, we have used those data to determine the one-term Sellmeier parameters [Eq. (3a)]. When data were presented in the form of different Sellmeier equations, we used the equations to calculate numerical dispersion data for use in Eq. (3a) and when data were provided only in graphical form, the dispersion data were taken from these plots.

2.4. Error Limits

Where possible, we have given error limits as reported; when no error limits were reported, we have either stated that or estimated the errors. Following the composition, the symbol + refers to compounds with the most reliable refractive indices, generally with $\delta n = \pm 0.0001 - 0.0005$. When refractive indices are quoted to four decimal places in Landolt-Börnstein, as for example for the many sulfates studied by Tutton over the years 1890–1930, we have assumed error limits of $\pm 0.0001 - 0.0005$. Estimated error limits are only valid for the refractive index and do not take errors in composition into consideration. Crystals studied before the early

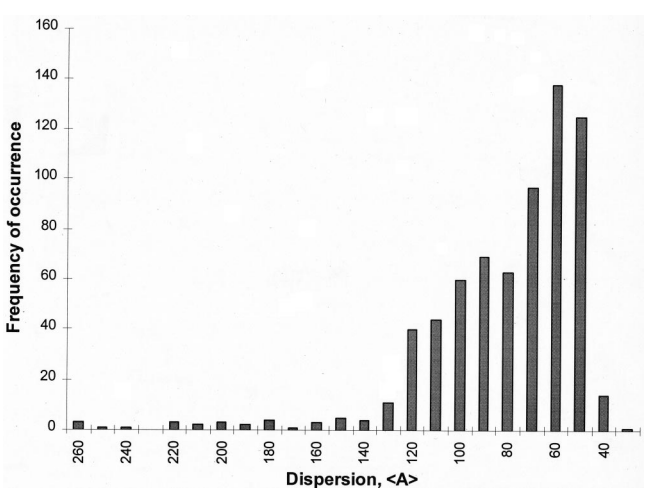

FIG. 1. Mean dispersion value $\langle A \rangle$ vs frequency of occurrence.

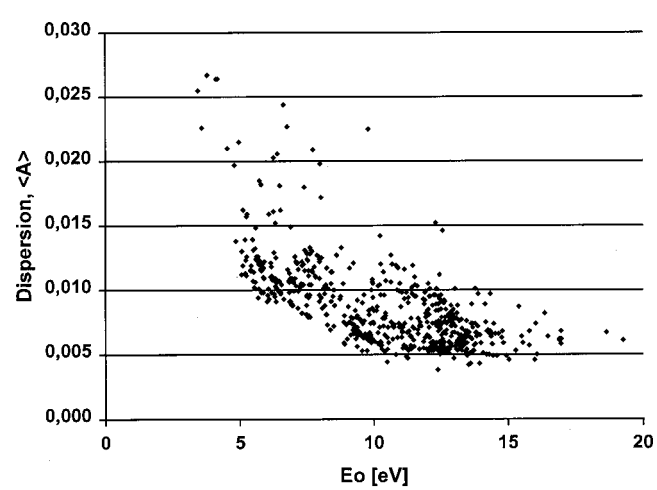

FIG. 2. Dispersion A vs average Sellmeier energy gap E_o.

1900s and for which four significant figures are quoted in the original papers are assumed to be measured by prism methods.

3. Results and Discussion

Table 1 provides 73 measurements on 55 fluorides, 9 measurements on chlorides, and 750 measurements on 509 oxides. In the table we give the specimen composition and source, the refractive indices at $\lambda = \infty$ and 589.3 nm, molar volume V_m, volume per anion V_o, electronic polarizabilities α_e, the mean dispersion parameters, A, B, E_o, and E_d, along with indices that provide an indication of the method of measuring n, the estimated error in n, the reliability of the composition and refractive index data, and source reference in an easily accessible form.

3.1. Comparison of Data Using Different Methods

In Table 2 we compare the results of determinations of n_∞ by prism, IR, ellipsometer, and interference methods. In general, results obtained for prism or interference and IR methods are identical within experimental error. Exceptions are PbF_2, $RbMnF_3$, Cu_2O, EuO, GeO_2, ThO_2, UO_2, and $PbMg_{.33}Nb_{.67}O_3$, as noted by boldfaced values in Table 2. The discrepancy in $n_\infty(PbF_2)$ was noted by Axe *et al.* (1965) and attributed to an inadequacy of the Lyddane–Sachs–Teller (LST) relation. Similarly, the high value for $n_\infty(RbMnF_3)$ was noted by Perry and Young (1967). The three IR values of $n_\infty(Cu_2O) = 2.54$, 2.55, and 2.57, obtained from the IR measurements, agree reasonably well and are probably more accurate than the value of $n_\infty(Cu_2O) = 2.27$ obtained from prism data in LB. This value derived from data determined in 1871 appears systematically low compared with the IR values and the 643.8 nm value of 2.89 determined by Medenbach and Shannon (1997).

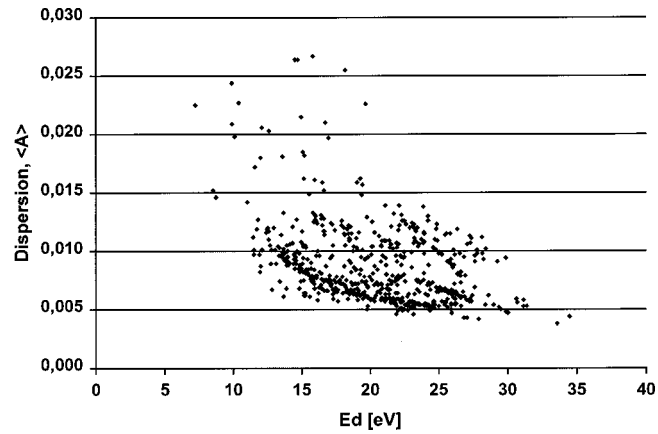

FIG. 3. Dispersion A vs average oscillator strength.

TABLE 4. Dispersion parameters for oxides and fluorides: Transition metal

Compound	Chemical composition	Mineral	Atom (%)[a]	$\langle A \rangle$[b] 10^{-16} m^2	$\langle E_o \rangle$[c] (eV)	$\langle E_d \rangle$[c] (eV)	Why low $\langle A \rangle$?
Fe^{3+} $3d^5$	Fe_2O_3	hematite	40	**226**	**3.6**	19.7	
	FeOOH	lepidocrocite	33	**215**	**5.0**	**15.0**	
	FeOOH	goethite	33	**162**	**5.1**	19.3	
	$Fe_2(SO_4)_3$		12	**206**	**6.4**	**12.1**	
	$FeSO_4OH$		14	**181**	**6.5**	**13.6**	
	$FeSO_4OH \cdot 2\ H_2O$	butlerite	33	**180**	**7.4**	**12.0**	
	$Fe_2(SO_4)_3 \cdot 7\ H_2O$	cornellite	27	**172**	**8.0**	**11.6**	
	$Y_3Fe_5O_{12}$	garnet	25	**197–160**	**4.8–5.3**	17.0–19.0	
	$MFe(SO_4)_2 \cdot 12\ H_2O$	M=K,Rb,Cs,Tl	54	**120–117**	10.3–10.9	**12.6**	
	$Ca_3Fe_2Si_3O_{12}$	andradite	10	**115–101**	**7.7–8.1**	18.1–19.4	
	$Na_{.87}Fe_{.92}Al_{.05}Ti_{.03}Si_2O_6$	aegirine	9	**122**	**8.0**	16.5	
	$Na_{.7}Ca_{.2}Mg_{.1}Fe_{.9}Si_2O_6$	aegirine	9	**114**	**8.4**	16.7	
Cr^{3+} $3d^3$	$MCr(SO4)_2 \cdot 12\ H_2O$	M=K,Rb,Cs,Tl	54	**105–95**	11.0–12.1	**13.8–14.0**	
Mn^{3+} $3d^4$	$Ca_3Mn_{1.95}(SiO_4)_{2.1}(O_4H_4)_{.9}$	henritermierite	12	**105**	**8.4**	18.2	
Co^{2+} $3d^7$	$Ca_2CoSi_2O_7$		8	**178**	**7.6**	11.8	
	$Sr_2CoSi_2O_7$		8	**117**	**9.1**	**15.0**	
Ni^{2+} $3d^8$	NiF_2		33	**198**	**8.0**	**10.1**	
	$MNiF_3$	M=K,Cs	20	77–71	13.3–13.7	**15.7–16.4**	F
Eu^{2+} $4f^7$	Eu_2SiO_4 - beta		28	**162**	**6.5**	**15.2**	
U^{4+} $5f^2$	UO_2		33	**264,210**	**4.2,4.5**	**14.5,16.7**	

[a]Atom % =(total "soft ions"+H_2O)/(total cations+anions).
[b]Boldfaced values of $\langle A \rangle$ are relatively high.
[c]Boldfaced values of $\langle E_o \rangle$ and $\langle E_d \rangle$ are relatively low.

TABLE 5. Dispersion parameters for oxides and fluorides d^{10}

Compound	Chemical composition	Mineral	Atom (%)[a]	$\langle A\rangle$[b] 10^{-16} m^2	$\langle E_o\rangle$[c] (eV)	$\langle E_d\rangle$[c] (eV)	Why low $\langle A\rangle$?
Cu^+ $3d^{10}$	Cu_2O	cuprite	67	**267**[b]	**3.8**	**15.8**	
	CuCl		50	**161**	**6.3**	**15.9**	
Zn $3d^{10}$	ZnO		50	**185–159**	**5.74–6.09**	**15.1–16.5**	
	$ZnWO_4$		33	**86– 82**	**7.2–7.3**	26.0–26.6	
	Zn_2SiO_4	willemite	28	71	11.1	20.3	Si
	$Ca_2ZnSi_2O_7$	hardystonite	8	71	11.5	19.7–19.8	Ca, Si
	$BaZnF_4$		53	67	13.8	17.3	Ba, F
	$CaY_{1.92}Nd_{.08}Zn_2Ge_3O_{12}$		10	67	**9.8**	24.4	Ca
	$Zn_4O(BO_2)_6$		17	61	11.5	22.7	
	ZnF_2		33	59	14.8	18.4	F
As^{5+} $3d^{10}$	KH_2AsO_4		16	**98–100**	10.9–11.0	**14.6–14.8**	
	RbH_2AsO_4		16	**94**	11.3	**15.1**	
	CsH_2AsO_4		16	**93**	11.1	**15.4**	
	$Mn_{6.5}Ca_{.25}Mg_{.25}As_2O_8(OH)_8$	allactite	8	81	**9.8**	20.2	Ca, Mg
I^{7+} $4d^{10}$	KIO_4		17	**133**	**8.8**	**13.7**	

[a]Atom % =(total "soft ions"+H_2O)/(total cations+anions).
[b]Boldfaced values of $\langle A\rangle$ are relatively high.
[c]Boldfaced values of $\langle E_o\rangle$ and $\langle E_d\rangle$ are relatively low.

There is a large discrepancy between the EuO prism value of $n=1.96$ quoted by Wachter (1968) and the IR value of 2.30 from Axe (1969). An alternative method of deciding which of these is more correct is to use the data from β-Eu_2SiO_4 along with the additivity rule [Eq. (2)] where the total polarizability $\alpha_e(\beta\text{-}Eu_2SiO_4)$ is 10.19 A^3 (see Table 1). Subtracting $\alpha_e(SiO_2)=2.803$ A^3, we arrive at $\alpha_e(EuO)=3.69$ A^3, which corresponds to $n_\infty=1.87$, much closer to the prism value $n_\infty=1.96$ than the IR value.

The large discrepancy between prism and IR data from GeO_2 is probably caused by poor data or IR analysis. This is evident from the $n_\infty(GeO_2)$ IR values of $n_o=2.02$ and $n_e=2.10$, which are improbably larger than $n_\infty(SnO_2)$ prism values of $n_o=1.9442$ and $n_e=2.0449$. The IR values of $n_\infty(ThO_2)=2.20$ and $n_\infty(UO_2)=2.33$ by Axe and Pettit (1966) are significantly larger than the value of 2.070 obtained by Ellis and Lindstrom (1964) for ThO_2 and the UO_2 value of 2.16 by Ellis (1964) using prism methods. Axe and Pettit noted this fact and attributed the discrepancy to an inadequacy of the LST relation. The final example of the deviation of IR results from prism methods concerning $PbMg_{.33}Nb_{.67}O_3$ where IR data give 2.49 (Karamyan, 1976) and prism method results in a value of $n_\infty=2.422$ (Kamzina, 1974). Here the results may be within experimental error since the errors were not given.

3.2. Comparison of Dispersion Values

An independent method of checking accuracy is to compare dispersion constants A with values from like compounds and from trends in structural families. The value of A is perhaps as sensitive a test for accuracy as estimated errors in n. Table 3 shows a number of examples of inconsistencies in A. Some examples of like-compound discrepancies are Cs_2SiF_6, Cs_2GeF_6, Y_2O_3, SiO_2, TiO_2, ThO_2, $BaMgF_4$, Zn_2SiO_4, Mn_2SiO_4, $Y_3Ga_5O_{12}$, $Ca_3Al_2Si_3O_{12}$, $CaTiSiO_5$, YVO_4, $CaMoO_4$, $PbWO_4$, and $KAl(SO_4)_2\cdot 12\,H_2O$. Examples of deviations from structural family trends are Na_2GeF_6 in the M_2GeF_6 family (M=Na,Rb,Cs), $Y_3Ga_5O_{12}$ in the $M_3Ga_5O_{12}$ garnet family (M=Y,Nd,Dy,Ho,Tm), $Ba_{.75}Sr_{.25}Nb_2O_6$ in the $Ba_{1-x}Sr_xNb_2O_6$ family, $Tl_2Ni(SO_4)_2\cdot 6\,H_2O$ in the $Tl_2M(SO_4)_2\cdot 6\,H_2O$ family (M=Fe,Co,Cu,Ni), and $KAl(SO_4)_2\cdot 12\,H_2O$ in the alum family $MAl(SO_4)_2\cdot 12\,H_2O$ (M=K, Rb). The samples which show values differing substantially from the values in like compounds and values shown in family trends have been marked in Table 1 with a question mark following the accuracy index, as defined in Table 1.

In the example of Y_2O_3, the value of $A=75\times10^{-16}$ m^2 is consistent with accurate RE_2O_3 values from Sc_2O_3 (66×10^{-16} m^2), Lu_2O_3 (66×10^{-16} m^2), Yb_2O_3 ($68-69\times10^{-16}$ m^2), and Dy_2O_3(73×10^{-16} m^2). The measurements for the outliers Y_2O_3 of 125, 62, and 53×10^{-16} m^2 probably resulted from systematic errors that influence A more than n_∞. The dispersion parameter A for $Y_{.95}Tm_{.05}VO_4$ of 164×10^{-16} m^2 [Ohta *et al.* (1993)] seems high in light of the values of 109 and 102×10^{-16} m^2 for YVO_4 [Kuwano and Saito (1990); Medenbach and Shannon (1997)] and 98×10^{-16} m^2 for $Y_{.98}Nd_{.02}VO_4$ [Lonheim and DeShazer (1978)]. Similarly, the dispersion value for $Ba_{.75}Sr_{.25}Nb_2O_6$ of 79×10^{-16} m^2 seems inconsistently lower than the values of $102-93\times10^{-16}$ m^2 observed for other members of the family $Ba_{1-x}Sr_xNb_2O_6$. The value 79 was derived from only two values of n at 633 and 1050 nm [Venturini *et al.* (1968)]; the value at 1050 nm is perhaps out of range of validity for the Sellmeier equation. Dispersion from eight samples of ti-

TABLE 6. Dispersion parameters for oxides and fluorides p^6

Compound	Chemical composition	Mineral	Atom (%)[a]	$\langle A \rangle$[b] 10^{-16} m^2	$\langle E_o \rangle$[c] (eV)	$\langle E_d \rangle$[c] (eV)	Why low $\langle A \rangle$?
Ti^{4+} $3p^6$	TiO_2	rutile	33	**119–111**	**5.1–5.2**[c]	26.3–27.4	
	TiO_2	anatase	33	**119–114**	**5.4–5.5**	24.8–25.5	
	TiO_2	brookite	33	**107**	**5.5**	27.3	
	$Li_2Ti_3O_7$		25	**122**	**5.9**	22.1	
	$CaTiO_3$		20	**120**	**5.7**	23.4	
	$SrTiO_3$		20	**131–115**	**5.5–5.8**	22.3–24.0	
	$BaTiO_3$		20	**110–109**	**5.9**	24.7–24.9	
	$Ba_{.77}Ca_{.23}TiO_3$		20	**115**	**5.8**	23.9	
	$PbTiO_3$		40	**112**	**5.1**	28.1	
	$MTiOPO_4$	M=K,Rb	12	**133–128**	**7.6**	**15.8–16.5**	
	$MTiOAsO_4$	M=K,Rb,Cs	12	**131–122**	**7.3–7.5**	**16.4–**17.9	
	$CaTiSiO_5$		12	**120–104**	**7.4–7.7**	18.1–20.1	
	$Pb_{1-x}La_xZr_{1-y}Ti_yO_3$		20–16	**102–93**	**5.5–6.1**	27.6–29.9	
	$Ba_2TiSi_2O_8$	fresnoite	8	71	10.5	21.3	Ba
V^{5+} $3p^6$	V_2O_5		28	**264**	**4.1**	**14.7**	
	YVO_4		17	**109–95**	**5.7–7.5**	20.9–22.5	
	$NaCa_2Mg_2V_3O_{12}$		15	**119–115**	**7.3–7.4**	18.3–18.7	
	$Sr_5V_3O_{12}F$		14	**118**	**7.8**	17.4	
	$Ca_3V_2O_8$		15	**114**	**7.7**	18.2	
	$GdVO_4$		16	**113–109**	**6.8–7.0**	20.7–21.1	
Cr^{6+} $3p^6$	$M_2Mg(CrO_4)_2 \cdot 6\ H_2O$	M=Rb,Cs	42	**227–244**	**6.6–6.8**	**9.9–10.4**	
	$MgCrO_4 \cdot 7\ H_2O$		61	**209**	**7.7**	9.9	
Nb^{5+} $4p^6$	$Cs_8Nb_{22}O_{59}$		24	**124**	**6.1**	21.1	
	$KNbO_3$		20	**109–106**	**6.3–6.4**	23.3–23.4	
	$MNbB_2O_6$	M=K,Rb	10	**127–117**	**7.9–8.2**	**16.0–16.7**	
	$KTa_{.66}Nb_{.33}O_3$		20	**107**	**6.3**	23.9	
	$K_3Li_2Nb_5O_{15}$		25	**118**	**6.2**	22.1	
	$Ba_6Ti_2Nb_8O_{30}$		21	**102**	**6.3**	24.7	
	$Pb_2KNb_5O_{15}$		30	**101**	**6.1**	26.1	
	$Ba_2NaNb_5O_{15}$		43	**98**	**6.5**	25.0	
	$Sr_{4.25}Na_{1.25}Li_{.25}Nb_{10}O_{30}$		21	**101**	**6.4**	24.8	
	$Ba_{1-x}Sr_xNb_2O_6$		22	**110–93**	**6.1–6.6**	23.7–25.9	
	$LiNbO_3$		20	**91–88**	**6.9–7.0**	25.7–26.1	Li
	$Sr_2Nb_2O_7$		18	88	**7.5**	24.3	Sr
	$Ba_3LaNb_3O_{12}$		31	79	**7.6**	26.9	Ba
	$LaNbO_4$		17	69	**8.4**	27.6	La
Mo^{6+} $4p^6$	$PbMoO_4$	wulfenite	17	**132–117**	**5.6–5.9**	21.7–22.3	
	$Bi_2Mo_3O_{12}$		42	**160–139**	**5.4–5.5**	21.1	
	$Ce_2Mo_3O_{12}$		42	**105**	**7.3**	20.8	
	$Gd_2Mo_3O_{12}$		42	**104–101**	**8.2–8.3**	18.8–19.1	
	$Tb_2Mo_3O_{12}$		42	**103**	**8.2**	19.0	
	$CdMoO_4$		33	**98**	**6.8**	23.9	
	$Li_{2.86}Gd_{.57}MoO_4$		12	**95**	**7.5**	22.3	
	$SrMoO_4$		16	**91–88**	**8.4–8.5**	20.8–21.2	Sr
	$CaMoO_4$		16	**91–88**	**8.0–8.2**	22.0–22.3	Ca
Ta^{5+} $5p^6$	$KTaO_3$		20	**107**	**6.5**	23.2	
	$LiTa_{1-x}Nb_xO_3$		20	81–79	**7.5–7.6**	26.4–26.6	Li
	$Ba_3LaTa_3O_{12}$		16	73	**8.3**	26.6	Ba
W^{6+} $5p^6$	$PbWO_4$	stolzite	33	**104**	**6.6**	23.5	
	$CaWO_4$		17	73–74	**9.2**	23.4–23.6	
	$SrWO_4$		17	74	**9.6**	22.6	Sr
	$BaWO_4$		33	76	**9.6**	21.9	Ba
	$ZnWO_4$		33	82	**7.3**	26.6	
Ba^{2+} $5p^6$	BaO		50	**116**	**7.2**	19.2	
	$BaBe_2Si_2O_7$	barylite	8	**96**	**9.6**	17.2	
	$BaAl_2Si_2O_8$	paracelsian	8	87	11.3	**16.3**	Ba
	$Ba_2MgGe_2O_7$		17	84	10.1	18.9	Ba

TABLE 6. Dispersion parameters for oxides and fluorides p^6—Continued

Compound	Chemical composition	Mineral	Atom (%)[a]	$\langle A\rangle$[b] 10^{-16} m^2	$\langle E_o\rangle$[c] (eV)	$\langle E_d\rangle$[c] (eV)	Why low $\langle A\rangle$?
	BaO		50	**116**	**7.2**	19.2	
	SrO		50	**95**	**8.5**	19.9	
	CaO		50	80	**9.4**	21.2	
	MgO		50	64	11.3	22.0	
U^{6+} $6p^6$	$Cu(UO_2PO_4)_2 \cdot 8\ H_2O$	metatorbernite	40	**121**	**9.2**	**14.3**	
	$K_2UO_2(SO_4)_2 \cdot 2\ H_2O$		18	**114**	10.4	**13.5**	
	$Ca(UO_2)(UOOH)SiO_4(SiO_3OH) \cdot 4\ H_2O$	beta-uranophane	33	66	11.8	20.6	

[a]Atom % =(total "soft ions"+H_2O)/(total cations+anions).
[b]Boldfaced values of $\langle A\rangle$ are relatively high.
[c]Boldfaced values of $\langle E_o\rangle$ and $\langle E_d\rangle$ are relatively low.

tanite with a nominal composition $CaTiSiO_5$ showed an unusually large variation with values ranging from 73 to 120 $\times 10^{-16}$ m^2. This is perhaps not surprising in light of the presence of twinning in most samples and a variation in composition with analyzed compositions ranging from $Ca_{.75}Ti_{1.05}Si_{1.07}O_5$ to $Ca_{1.0}Ti_{0.98}Mn_{0.05}Si_{0.99}O_5$ [Hintze (1897)]. However, we have judged the values of 73 and 91 in $CaTiSiO_5$ from Eisbruckalp in Pfunders, Tirol and Glimmerschiefer in St. Gotthard to be lower than expected for titanites.

Although many of the outliers, such as Cs_2SiF_6, Cs_2GeF_6, RbH_2PO_4, Mn_2SiO_4, $PbWO_4$, $Gd_3Sc_2Al_3O_{12}$, and $CaTiSiO_5$ have lower reported accuracies, others were reported to have good accuracy, i.e., $\delta n = \pm 0.0001-0.0005$. Although the dispersion value for $CaTiO_3$ (127×10^{-16} m^2) quoted from Driscoll and Vaughn[7] (Table 1) is consistent with the values of A from $SrTiO_3$ and $BaTiO_3$, the values of n_∞ of 1.5554 and 1.3304 are far too low. The value of n_∞ of 2.261 obtained using the Chaulnes method by Linz and Herrington (1958) is more reasonable, suggesting either a calculation error or that the value obtained by Driscoll and Vaughn[7] was from a compound other than $CaTiO_3$.

3.3. Analysis of Dispersion Values

Dispersion values A range from $\sim$40 to 260×10^{-16} m^2. Their distribution is shown in Fig. 1. The largest number of values is centered around 60×10^{-16} m^2 with a second distribution centered around $90-100\times 10^{-16}$ m^2 and much smaller numbers distributed over the range 140–250 $\times 10^{-16}$ m^2. For convenience we arbitrarily call the range from 50 to 80 "normal dispersion," and 80 to 250 "high dispersion." In this section we make an effort to rationalize the high dispersion values A. As a framework for the analysis of dispersion parameters, we use the analysis of Wemple and DiDomenico (1971) and Wemple (1977). In this scheme A is proportional to $1/E_oE_d$, where E_o=the average single oscillator energy and E_d=the oscillator strength which measures the average strength of interband optical transitions. According to DiDomenico and Wemple (1971), E_d is related to physical parameters by the expression

$$E_d = \beta N_c Z_a N_e, \tag{4}$$

where N_c is the cation coordination number, Z_a is the formal valence of the anion, N_e is the effective number of valence electrons/anion, $\beta=0.26$ for ionic compounds, and $\beta=0.37$ for covalent compounds. Using this scheme high dispersion values should result for compounds with:

(1) low energy gaps,
(2) ionic character,
(3) cations having low N_c,
(4) fluoride rather than oxide anions; and
(5) cations with low N_e.

DiDomenico and Wemple (1969) and Wemple (1977) concentrated primarily on optical dielectric constants (refractive indices) and their relationships to the above variables but they were not concerned specifically with dispersion, although DiDomenico and Wemple (1969) noted that the refractive index dispersion is approximately inversely related to the average single oscillator Sellmeier gap E_o. In this section we focus primarily on the dispersion A and the relationship to chemical composition and electron configuration of the atoms involved and find that many of the trends in A can be explained by the above five factors. Wemple and DiDomenico (1971) and Wemple (1977) showed that low values of E_o are associated with the d^{10} cations Cu^+ and Ag^+, and the s^2 cations As^{3+}, Te^{4+}, I^{5+}, Tl^+, Pb^{2+}, and Bi^{3+}.

Figures 2 and 3 show plots of A vs E_o and A vs E_d,respectively. The plot of A vs E_o shows a better fit to $1/E_o$ than $1/E_d$ which we interpret to mean that variations in E_o are more important in explaining dispersion than variations in E_d. We shall analyze this assumption in Secs. 3.3.1–3.3.5. A survey of the dispersion parameters of the compounds in Table 1 shows high dispersion values A associated with certain ions which we call "soft" ions, i.e., s^2, p^6, d^{10} and transition metal ions, H_2O, and crystalline hydrates. In Tables 4–8 we have listed the dispersion parameters A, E_o, and E_d of compounds containing s^2, p^6, d^{10}, and transition metal ions. Normal values of dispersion ($A=50-80$ $\times 10^{-16}$ m^2) were found in borates, aluminates, gallates, silicates, germanates, phosphates, and sulfates not containing

TABLE 7. Dispersion parameters for oxides and fluorides s^2

Compound	Chemical composition	Mineral	Atom (%)[a]	$\langle A \rangle$[b] 10^{-16} m^2	$\langle E_o \rangle$[c] (eV)	$\langle E_d \rangle$[c] (eV)	Why low $\langle A \rangle$?
As^{3+} $4s^2$	As_2O_3	arsenolite	40	**105**	**8.9**	17.3	
Sb^{3+} $5s^2$	Sb_2O_3	senarmontite	40	**116**	**6.8**	20.3	
	Na_2SbF_5		12	**142**	10.2	**11**	
Te^{4+} $5s^2$	TeO_2		33	**108-103**	**6.2–6.3**	23.0–24.6	
I^{5+} $5s^2$	HIO_3		25	**111**	**7.6**	19.0	
	MIO_3	M=Li,K	20	**126–95**	**7.9–8.8**	**16.0**–19.3	
	KIO_2F_2		17	**104**	10.2	**15.1**	
Tl^{+} $6s^2$	TlCl		50	**148**	**5.6**	19.4	
	Tl_2SeO_4		43	**121**	**7.2**	18.5	
	Tl_2SO_4		28	**109**	**8.0**	18.5	
	$TlClO_4$		33	**100**	**9.9**	16.2	
	$Tl_2Cd_2(SO_4)_3$		20	84	**10.0**	19.0	
Pb^{2+} $6s^2$	$PbMoO_4$	wulfenite	33	**132–117**	**5.6–5.9**	21.7–22.3	
	$Pb_5Ge_3O_{11}$		26	**132–125**	**6.3**	19.8–20.2	
	$Pb_2Sc_{.5}Ta_{1.5}O_{6.5}$		33	**139**	**5.2**	22.1	
	$Pb_3Al_2CaSi_{10}O_{27}\cdot 3\,H_2O$	wickenburgite	13	**127**	**8.6**	**14.6**	
	$Pb_5V_{2.5}As_{.3}O_{12}Cl$	vanadinite	38	**126–121**	**5.6–5.7**	22.5–23.1	
	Pb_2MoO_5		37	**121**	**6.2**	21.5	
	$PbTiO_3$		40	**112–92**	**5.1**	28.1	
	$Pb_5As_3O_9Cl$	finnemanite	44	**111**	**6.2**	23.2	
	$Pb_5As_3O_{12}Cl$	mimetite	38	**107–106**	**6.8**	21.9–22.1	
	PbF_2		33	**114–125**	**8.0–8.4**	**15.9–**16.7	
	PbFCl	matlockite	33	**106**	**7.0**	21.5	
	$PbWO_4$	stolzite	33	**104**	**6.5–7.2**	23.5–25.9	
	$Pb_{1-x}La_xTi_{1-y}Zr_yO_3$		40	**102–94**	**5.5–6.0**	27.6–29.9	
	$PbNb_4O_{11}$		31	**97**	**6.3**	26.2	
	$Pb_2KNb_5O_{15}$		30	**101**	**6.1**	26.1	
	$PbM_{.33}Nb_{.67}O_3$	M=Mg,Zn	33	**101–91**	**5.7–6.0**	27.8–29.3	
	$Pb_3P_2O_8$		23	**96–94**	**8.0**	20.9–21.1	
	$Pb_5P_3O_{12}Cl$	pyromorphite	24	**96**	**7.6–7.5**	22.2–22.4	
	$PbHPO_4$		17	**93**	**8.7**	19.6	
	$Pb_9Mg_9Si_9O_{24}(OH)_{24}$	molybdophyllite	12	80	**9.7**	20.5	Mg, Si
	$PbSO_4$		17	79	**9.1–9.2**	22.0–22.2	SO4
	PbB_4O_7		8	62	**10.0**	26.0	
Bi^{3+} $6s^2$	Bi_2O_3		40	**138**	**4.8**	23.9	
	$Bi_2Mo_3O_{12}$		29	**139,160**	**5.5, 5.4**	21.1, 18.6	
	$Bi_6Mo_2O_{15}$		35	**120**	**5.8**	22.9	
	$Bi_{12}MO_{20}$	M=Si,Ge,Ti	36	**126–115**	**5.2–5.4**	24.2–25.8	
	$Bi_4M_3O_{12}$	M=Si,Ge	21	**109–96**	**6.9–7.6**	20.8–22.5	
	BiB_3O_6		10	**93**	**8.7**	19.6	

[a]Atom % =(total "soft ions"+H_2O)/(total cations+anions).
[b]Boldfaced values of $\langle A \rangle$ are relatively high.
[c]Boldfaced values of $\langle E_o \rangle$ and $\langle E_d \rangle$ are relatively low.

any of the above "soft" ions. It appears that A depends on the total concentration of "soft" ions where these ions must be in concentrations >10%–15%. This number seems to depend on the ion, being lower for Fe^{3+}, Co^{2+}, Ti^{4+}, and Bi^{3+}, and higher for Zn^{2+}, Nb^{5+}, Ta^{5+}, Tl^{+}, and Pb^{2+}. In Tables 4–9 values of $\langle A \rangle$ in boldface type are relatively high, whereas boldface values of $\langle E_o \rangle$ and $\langle E_d \rangle$ are relatively low.

3.3.1. Transition Metal Ions

Table 4 shows that many of the compounds containing the transition metal ions Fe^{3+}, Co^{2+}, Ni^{2+}, Eu^{2+}, and U^{4+} with $A=150–265$ have some of the highest dispersion values of all oxides. Fe_2O_3 (hematite), FeOOH (lepidocrocite), and $Fe_2(SO_4)_3$ all have dispersion values greater than 200 $\times 10^{-16}$ m^2. The high dispersion values in transition metal

TABLE 8. Dispersion parameters for H_2O and crystalline hydrates

Compound	Mineral	Atom (%)[a]	$\langle A \rangle$[b] 10^{-16} m^2	$\langle E_o \rangle$[c] (eV)	$\langle E_d \rangle$[c] (eV)	Why low $\langle A \rangle$?
H_2O (liquid)		100	**225**	9.8	**7.2**	
H_2O (ice)		100	**152**	12.3	**8.5**	
H_2O (ice)		100	**146**	12.6	**8.7**	
$Na_2HPO_4 \cdot 12\ H_2O$		63	**119**	11.4	**11.7**	
$Na_2HPO_4 \cdot 7$ H2O		50	**105**	12.0	**12.7**	
$Na_4P_2O_7 \cdot 10\ H_2O$		43	**101**	12.1	**13.1**	
$NaH_2PO_4 \cdot H_2O$		14	**99**	11.9	**13.6**	
$NaH_2PO_4 \cdot 2\ H_2O$		25	**96**	12.3	**13.5**	
$MAl(SO_4)_2 \cdot 12\ H_2O$	M=Na,K,Rb,Cs	60	**101–91**	12.3–12.6	**12.8–13.8**	
$MGa(SO_4)_2 \cdot 12\ H_2O$	M=K,Rb,Cs	60	**91–92**	12.5–12.6	**13.9–14.0**	
$MIn(SO_4)_2 \cdot 12\ H_2O$	M=Rb,Cs	60	**96**	12.2	**13.6**	
$MSiF_6 \cdot 6\ H_2O$	M=Mg,Mn,Fe	43	**97–101**	13.8–14.3	**11.5–11.9**	
$MSiF_6 \cdot 6\ H_2O$	M=Cu,Zn	43	**89**	13.7–14.1	**12.8–13.1**	
$Cu_6Si_6O_{18} \cdot 6\ H_2O$	dioptase	17	**94**	**10.0**	17.1	
$MgSO_4 \cdot 7\ H_2O$	epsomite	54	**96**	12.5	**13.4**	
$BeSO_4 \cdot 4\ H_2O$		33	**95**	12.4	**13.6**	
$CuSO_4 \cdot 5\ H_2O$	chalcanthite	45	**85**	12	**15.7**	
$LiSO_4 \cdot H_2O$		14	72	13.9	**15.9**	Li
$CaSO_4 \cdot 2\ H_2O$	gypsum	25	70	13.3	17.1	Ca
$LiClO_4 \cdot 3\ H_2O$		43	**90**	12.6	**14.1**	
$M_2Cu(SO_4)_2 \cdot 6\ H_2O$	M=K,Rb,Cs	31	**84–89**	12.3–12.5	**14.6–15.3**	
$M_2Mg(SO_4)_2 \cdot 6\ H_2O$	M=K,Rb,Cs	31	**82–85**	12.9–13.1	**14.5–15.1**	
$M_2Zn(SO_4)_2 \cdot 6\ H_2O$	M=K,Rb,Cs	31	**79–82**	12.8–13.0	**15.1–15.7**	
$M_2Fe(SO_4)_2 \cdot 6\ H_2O$	M=K,Rb,Cs	31	**79–82**	12.8–12.9	**15.1–15.8**	
$Cs_2Mn(SO_4)_2 \cdot 6\ H_2O$		31	**81**	12.8	**15.4**	
$Na_2B_4O_5(OH)_4 \cdot 8\ H_2O$	borax	35	**93**	12.5	**13.8**	
$KB_5O_6(OH)_4 \cdot 2\ H_2O$		11	**88**	13.1	**13.9**	
$CaB_3O_4(OH)_3 \cdot H_2O$	colemanite	8	61	13.1	19.8	Ca
		32				
$M_2(SO_4)_3 \cdot 8\ H_2O$	M = Sm,Pr,Nd	32	**81–82**	11.9–12.1	**16.3–16.4**	
$CsAlSi_2O_6 \cdot 2\ H_2O$	pollucite		79	12.5	**16.1**	low H_2O
$Ca_3Si_2O_6(OH)_2 \cdot 2\ H_2O$	afwillite	13	59	13.1	20.8	Ca

[a]Atom % =(total "soft ions"+H_2O)/(total cations+anions).
[b]Boldfaced values of $\langle A \rangle$ are relatively high.
[c]Boldfaced values of $\langle E_o \rangle$ and $\langle E_d \rangle$ are relatively low.

oxides correlate well with values of the parameter E_o(4–8 eV) and, in general, low values of the parameter E_d. Even with relatively low concentrations (10%) of Fe^{3+} rather high dispersion values result. Note that although there is only 4 at % of Fe in $MFe(SO_4)_2 \cdot 12\ H_2O$ and 8% in cornellite, $Fe_2(SO_4)_3 \cdot 7\ H_2O$, the total concentrations of "soft" ions (Fe^{3+}) and H_2O are 54% and 37%, respectively. Similarly, in $MCr(SO_4)_2 \cdot 12\ H_2O$, both Cr^{3+} and H_2O contribute to the dispersion. It is apparently not necessary for the ions to be linked, e.g., compounds with isolated Fe^{3+} such as $Ca_3Fe_2Si_3O_{12}$, $Na_{.87}Fe_{.92}Al_{.05}Ti_{.03}Si_2O_6$ (aegirine), and $M_2CoSi_2O_7$ (M=Ca, Sr) have high dispersion (A =100–175). Hydrates such as $FeSO_4OH \cdot 2\ H_2O$ and $MFe(SO_4)_2 \cdot 2\ H_2O$ (M=K, Rb, Cs and Tl) have higher values of E_o (8–10 eV) but because of low E_d (12–13 eV) as for other hydrates (see below) still show high dispersion.

3.3.2. d^{10} Ions

Table 5 shows the dispersion parameters for compounds containing Cu^+, Zn^{2+}, As^{5+}, and I^{7+}. Among the oxides Cu_2O has one of the highest dispersions (A=267), apparently because of the exceptionally low energy gap of 3.8 eV. Among the Zn-containing compounds only ZnO (A =159–185) and $ZnWO_4$ (A=82–86) have high dispersion. ZnO has both low E_o and E_d (CN=IV), whereas $ZnWO_4$ has low E_o but a higher E_d caused by CN=6 for both Zn and W. Note that the high dispersion of $ZnWO_4$ results from the

TABLE 9. Dispersion parameters associated with ions. N_c is the cation coordination number, N_e the effective number of valence electrons per anion, and Z_a the formal valence of the anion

	Ion	No. of compounds	$\langle A\rangle$[a] 10^{-16} m^2	$\langle A\rangle$[a] 10^{-16} m^2 mean	$\langle E_o\rangle$ (eV) range	$\langle E_o\rangle$[b] (eV) mean	$\langle E_d\rangle$ (eV) range	$\langle E_d\rangle$[b] (eV) mean	E_d (eV) predicted	Beta	N_c	N_e	Z_a
d^{10}	Cu^{+}	2	**161–267**	**214**	4–6	**5.0**	16	**15.9**	17	.26	2	16	2
	Zn^{2+}	8	59–**185**	91	6–15	9.7	15–26	21.0	17	.26	4	8	2
	As^{5+}	4	81–**100**	93	10–11	10.8	15–20	**16.0**	17	.26	4	8	2
	I^{7+}	1	**133**	**133**	9	8.8		**13.7**	17	.26	4	8	2
s^2	As^{3+}	1	**105–111**	**105**	9	8.8		17.3	14	.26	3?	9?	2
	Sb^{3+}	2	95–**142**	**129**	7–10	8.5	11–20	**15.7**	14	.26	3?	9?	2
	Te^{4+}	2	**103–119**	**110**	6	**6.2**	23–25	24.0	19	.26	4?	9?	2
	I^{5+}	4	95–**126**	**110**	8–10	8.5	15–19	17.4	18	.26	3?	8?	2
	Tl^{+}	5	84–**148**	**112**	6–10	8.1	15–16	18.3		.26	~8	10?	2
	Pb^{2+}	26	62–**139**	**104**	6–10	6.9	16–30	23.1		.26	~8	10?	2
	Bi^{3+}	9	93–**160**	**116**	5–9	**6.2**	20–24	23.1		.26	~8	10?	2
p^6	Ti^{4+}	20	71–**119**	**115**	5–10	**6.2**	16–30	22.5	25	.26	6	8	2
	V^{5+}	6	**109–264**	**124**	4–8	7.5	15–22	19.6	17	.26	4	8	2
	Cr^{6+}	3 hydrates	**209–244**	**227**	7–8	7.0	10	**10.1**					
	Mo^{6+}	8	88–**160**	**107**	6–8	7.3	19–24	21.4	17,25	.26	4,6	8	2
	W^{6+}	5	73–**104**	80	7–10	8.3	22–27	24.2	17,25	.26	4,6	8	2
	Nb^{5+}	15	69–**124**	**99**	6–8	6.8	21–26	24.6	25	.26	6	8	2
	Ta^{5+}	3	73–**107**	86	6–8	7.3	23–26	25.7	25	.26	6	8	2
	U^{6+}	3 hydrates		**117**		9.8	13–14	**13.9**		.26			
	Cs^{+}	11	58–**107**	82		14.9	14–20	17.8					
	Ba^{2+}	16	53–**116**	78		10.9	17–22	17.1					
d^5	Fe^{3+}	12	**114–225**	**159**	4–11	**6.4**	17–20	17.0	19	.26	6	6	2
d^3	Cr^{3+}	4 hydrates	95–**105**	**98**	11–12	11.8	14	**13.9**					
d^7	Co^{2+}	2	**117**	**117**	8	7.6	12	**11.8**	19	.26	6	6	2
d^8	Ni^{2+}	3 fluorides	71–**198**	**115**	8–14	11.7	10–16	**14.1**	13	.26	6	6	1
f^2	U^{4+}	1	**264**	**264**	5	**4.2**		14.5		.26	8	6	2
f^7	Eu^{2+}	1	**162**	**162**	6	**6.5**		15.1	19	.26		6	2
H_2O		1	**225**	**225**		9.8		**7.2**					
ice		2	**146–152**	**149**		12.4		**8.6**					
hydrates		73	59–**119**	90.6	10–14	12.3	11–20	**14.4**					

[a]Boldfaced values of $\langle A\rangle$ are relatively high.
[b]Boldfaced values of $\langle E_o\rangle$ and $\langle E_d\rangle$ are relatively low.

combined presence of Zn^{2+} and W^{6+}. All the other Zn-containing compounds have relatively high oscillator energies and therefore lower dispersion. Arsenates which might be expected to have low dispersion because of their high E_o have relatively high dispersion resulting from tetrahedral As^{5+} and low E_d. KIO_4, the only example of an iodate, has high dispersion ($A=133$) because of both low E_o and E_d (CN=IV for I^{7+}).

3.3.3. p^6 Ions

In Table 6 we list the dispersion parameters for titanates, vanadates, chromates, niobates, tantalates, molybdates, and tungstates. All titanium-bearing compounds with >10% Ti content have high dispersion, and are associated with E_o values in the range of 5–8 eV. Between 12% and 33% Ti there is no obvious concentration dependence. Fresnoite, $Ba_2TiSi_2O_8$, the one Ti compound with Ti<10% has normal dispersion.

Similarly all vanadates have high dispersion values with V_2O_5 having one of the highest values ($A=264$) and one of lowest values of $E_o=4.1$ eV. Values of the vanadate parameter E_o are similar to those of the titanates, being in the range 4–8 eV. Although chromate dispersions are augmented by the presence of H_2O (see below), we believe because of the exceptionally high values of A, the primary contributor to the high dispersion is the presence of the Cr^{6+} ion. Most niobates and tantalates have high dispersion but the values depend on the concentration with significantly lower dispersion for $Ba_3LaNb_3O_{12}$ and $LaNbO_4$, where E_o has increased to 8.4 eV. Tantalates, because of slightly higher E_o values, have slightly lower dispersion than niobates, e.g., compare $LiNbO_3$ with $A=91-88$ and $LiTaO_3$ with $A=81-79$. All reported molybdates have high dispersion. Following the same behavior as niobates and tantalates where the compounds lower in the periodic table have lower dispersion, the tungstates have slightly lower dispersion than the molybdates. Among the uranyl compounds, meta-

torbernite $[Cu(UO_2PO_4)_2 \cdot 8\,H_2O]$ and $K_2UO_2(SO_4)_2 \cdot 2\,H_2O$ have high dispersion but this high dispersion may arise partially from the presence of water of hydration. β-uranophane, $Ca(UO_2)(UOOH)SiO_4)(SiO_3OH) \cdot 4\,H_2O$, containing $4\,H_2O$ has, however, normal dispersion.

Cs^+ and Ba^{2+} compounds seem to be conditionally "soft" ions. A few Cs compounds such as CsB_3O_5, $CsLiB_6O_{10}$, $CsAlSi_2O_6 \cdot x\,H_2O$ and Cs_2SeO_4, and Ba compounds such as BaO, $BaBe_2Si_2O_7$, $BaAlSi_2O_8$, and $Ba_2MgGe_2O_7$ have moderately high dispersion.

3.3.4. s^2 Ions

Wemple (1977) noted the reduced average energy gaps E_o for the s^2 ions Tl^+, Pb^{2+}, and Bi^{3+}. We note in Table 7 that all the lone-pair cations lead to high dispersion. In general E_o values are low, varying from 5 to 9 eV. The highest dispersion is observed in TlCl, Na_2SbF_5, $PbMoO_4$, $Pb_5Ge_3O_{11}$, $Pb_2Sc_{0.5}Ta_{1.5}O_{6.5}$, Bi_2O_3, and $Bi_2Mo_3O_{12}$. As for other compounds, the critical concentration of metal ion or combination of "soft" ions appears to be ~10%. Both $Tl_2Cd_2(SO_4)_3$ ($A=84$) and PbB_4O_7 ($A=62$) with ~10% metal ions have reduced dispersion.

3.3.5. H_2O and Hydrates

DiDomenico and Wemple (1969) and Wemple (1977) noted the low values of the parameter E_d for both liquid H_2O and ice (9.5 and 8.6 eV, respectively). We find a slightly lower value for liquid H_2O of 7.3 eV. Table 8 shows that almost all hydrates have relatively low values of E_d, generally in the range 12–16 eV. Exceptions are dioptase ($Cu_6Si_6O_{18} \cdot 6\,H_2O$), $K_2UO_2(SO_4)_2 \cdot 2\,H_2O$, gypsum ($CaSO_4 \cdot 2\,H_2O$), and afwillite $[Ca_3Si_2O_6(OH)_2 \cdot 2\,H_2O]$. The combination of moderate E_o and low E_d results in most hydrates having relatively high dispersion.

3.3.6. Summary of Effect of Electron Configuration and E_o and E_d on Dispersion

Table 9 summarizes the mean and maximum dispersion parameters A, E_o, and E_d along with their range for H_2O, hydrates and compounds containing the d^{10} ions Cu^+, Zn^{2+}, As^{5+}, and I^{7+}, the s^2 ions As^{3+}, Sb^{3+}, Te^{4+}, I^{5+}, Tl^+, Pb^{2+}, and Bi^{3+}, the p^6 ions Ti^{4+}, V^{5+}, Cr^{6+}, Mo^{6+}, Nb^{5+}, and Ta^{5+}, and the transition metal ions, Fe^{3+}, Cr^{3+}, Co^{2+}, Ni^{2+}, U^{4+}, and Eu^{2+}. High dispersion ($A = \sim 140-250$) is especially noticeable for H_2O and the ions Cu^+, Zn^{2+}, I^{7+}, Sb^{3+}, V^{5+}, Cr^{6+}, Fe^{3+}, U^{4+}, and Eu^{2+} and for the compounds having a high concentration of H_2O and these ions: liquid H_2O, ice, CuCl, Cu_2O, ZnO, KIO_4, Na_2SbF_5, V_2O_5, Fe_2O_3, FeOOH, $Fe_2(SO_4)_3$, $FeSO_4OH$, $Y_3Fe_5O_{12}$, UO_2, and β-Eu_2SiO_4. In addition compounds containing combinations of these ions and others associated with slightly lower A values have high dispersion: $PbMoO_4$, Pb_2MoO_5, $Pb_2Sc_{0.5}Ta_{1.5}O_{6.5}$, $Pb_5V_{2.5}As_{.3}O_{12}Cl$, $Bi_2Mo_3O_{12}$, and $Bi_6Mo_2O_{15}$.

As noted in Sec. 3.3, dispersion is controlled by the combined effects of E_o and E_d. It is apparent from Fig. 2 that the low E_o values associated with these ions go a long way toward explaining the high dispersion values of compounds containing these ions. Note for example the low energy gaps associated with compounds containing Cu^+, Te^{4+}, Bi^{3+}, Ti^{4+}, Fe^{3+}, U^{4+}, and Eu^{2+}.

However, it is clear that not only is low E_o necessary for high dispersion but also E_d must be reasonably low. Although the plot of A versus E_d shows a poorer fit to $1/E_o$ than $1/E_d$, the effects of E_d can be clearly seen in many cases. The effects of formal valence Z_a can be seen in low E_d and the relatively high dispersion of CuCl, Na_2SbF_5, TlCl, and NiF_2 caused by lowered E_d and the effects of cation coordination can be observed in Cu_2O, ZnO, arsenates, vanadates, iodates, molybdates, and the ions As^{3+}, Sb^{3+}, Te^{4+}, and I^{5+}. As we have shown above, all hydrates have a relatively low E_d. The effects of water of hydration are apparent in the high dispersion of $FeSO_4OH \cdot 2\,H_2O$, $Fe_2(SO_4)_3 \cdot 7\,H_2O$, $Cs_2Mg(CrO_4)_2 \cdot 6\,H_2O$, $MgCrO_4 \cdot 7\,H_2O$, $Pb_3Al_2CaSi_{10}O_{27} \cdot 3\,H_2O$, and $Cu(UO_2PO_4)_2 \cdot 8\,H_2O$.

It is tempting to try to complement this rationalization of high dispersion values by correlating observed and calculated values of E_d with dispersion. Using the Wemple and DiDomenico (1971) scheme for calculating E_d for single ion compounds, it is not possible to calculate E_d for most compounds in Table 1 because of uncertainty over what to use for: (1) covalency; (2) N_e for s^2 and certain d^{10} compounds; and (3) cation coordination when there are two or more cations with differing N_c, i.e., YVO_4, $CaTiO_3$, $CaMoO_4$, $Y_3Fe_5O_{12}$, and more complex compounds such as crystalline hydrates. Indeed, Wemple and DiDomenico noted that the scheelite compounds $MMoO_4$ with M=Ca, Sr, and Pb did not fit the scheme with $\beta=0.27$. On the other hand Wemple found that "anion radical" groups such as phosphates, sulfates, selenates, and chlorates resulted in good agreement between observed and calculated E_d but that a good fit was obtained for the iodates HIO_3 and $LiIO_3$ only by using $\beta = 0.42-0.44$. We have compared E_d values calculated using the properties of the anion groups such as BO_3^{3-}, BO_4^{5-}, PO_4^{3-}, VO_4^{3-}, SO_4^{2-}, SeO_4^{2-}, MoO_4^{2-}, and WO_4^{2-} and find that the counter ion almost always has an effect on E_d. These uncertainties added to those about N_e and N_c make it difficult to rely on calculated E_d values in the majority of multiion compounds. Thus, we make only the very general observation that the presence of H_2O, halide ions, and cations with low CNs such as Cu^+, Zn^{2+}, As^{3+}, As^{5+}, Sb^{3+}, Te^{4+}, I^{5+}, V^{5+}, and Mo^{6+} sometimes contribute to lower E_d and therefore higher dispersion.

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7. Appendix 1. List of Codens

CHEMICAL ABSTRACTS SERVICE SOURCE INDEX 1907–1999 (CASSI6 1907–1999)

A

ACELAZ Acta. Electronica
ACPHAA Ann. Chim. Phys.
AFSLAO Aufschluss
AJSCAP Am. J. Science
AMMIAY Am. Mineral.
ANCHAM Anal. Chem.
APHYCC Appl. Phys. v1(1973)–v25(1981)
APOPAI Appl. Opt.
APPLAB Appl. Phys. Lett.

B

BJAPAJ Br. J. Appl. Phys. (1950–1969) see J. Phys. D.

C

CHSCBU Chin. Sci. Bull.
CIWPAV Carnegie Institution of Washington Publication
CPLEEU Chinese Phys. Lett.
CRTEDF Cryst. Res. Technol. (formerly Krist. Tech. - KRTEAW 1966–1980)

F

FEROA8 Ferroelectrics

H

HAMBA6 Hamberger Beitr. Z. Angew. Mineralogie u. Kristallphys.

I

IEJQA7 IEEE J. Quantum Electron.
INOMAF Inorg. Mater. (Eng. transl.)

J

JACSAT J. Am. Chem. Soc.
JACTAW J. Am. Ceram. Soc.
JAPIAU J. Appl. Phys. (formerly Physics 1937–)
JAPNDE Jpn. J. Appl. Phys., Part 1 (1982–)
JCDTBI J. Chem. Soc., Dalton Trans.
JCOMEL J. Phys. Condens. Matter
JCPSA6 J. Chem. Phys.
JCRGAE J. Cryst. Growth
JJAPA5 Jpn. J. Appl. Phys. (1962–1981)
JNOMFV J. Nonlinear Opt. Phys. Mater.
JOAOD6 J. Opt. Soc. Am. A (1984–)
JOBPDE J. Opt. Soc. Am. B (1989–)
JOAOF8 J. Optics A: Pure Appl. Opt.
JOPQAG J. Phys.
JOSAAH J. Opt. Soc. Am. (1917–1983)
JPCRBU J. Phys. Chem. Ref. Data
JPCSAW J. Phys. Chem. Solids
JPSOAW J. Phys. C
JRNBAG J. Res. Natl. Bur. Stds. (1934–)
JSSCBI J. Solid State Chem.
JSTCAM J. Struct. Chem. (Eng. transl. of Zh. Strukt. Khim)
JUPSUA J. Phys. Soc. Jpn.

K

KRTEAW Krist. Tech. (1966–1980) now Cryst. Res. Technol.

M

MNLMBB Min. Mag.
MRBUAC Mater. Res. Bull.

N

NIMAER Nucl. Instrum. Methods A
NJGAAY Neues Jb. Mineral. Geol. Paläont. Beilageband Abt. A.

NJGAAY	Neues Jb. Geol. Paläont., Abh. Abt. A. (1925–1950)
NJGMA2	Neues Jb. Geol. Paläont., Monatsh. (1950–)
NJMIAK	Neues Jb. Mineral., Abh. (1950–)
NJMMAW	Neues Jb. Mineral., Monatsh. 1950–
O	
OMATET	Opt. Mater. (Amsterdam)
OPACAT	Optica Acta.
OPCOB8	Opt. Commun.
OPLEDP	Opt. Lett.
OPSUA3	Opt. Spectrosc.
P	
PAOAE1	Pure Appl. Optics
PHBCDQ	Physica B and C
PHRVAO	Phys. Rev. v1(1893)–v132(1963)
PKOMA3	Phys. Kondens. Mater. v1(1963)–v16(1973)
PLRBAQ	Phys. Rev. B: Solid State (1970–1978)
PMABDJ	Philos. Mag. B.
PPSAAM	Proc. Phys. Soc. London, Sect. A.
PPSBAP	Proc. Phys. Soc. London, Sect. B.
PRBMDO	Phys. Rev. B: Condens. Matter (1978–)
PRVAAH	Phys. Rev., Sect. A. v133(1964)–v140(1965)
PSISDG	SPIE Opt. Thin Films Applicat. (1990) (Proc. SPIE)
PSSABA	Phys. Status Solidi A (1970–)
PSSBBD	Phys. Status Solidi B (1971–)
R	
REKEDA	Rev. Laser Engineer. Jpn. (Reza Kenkyu)
S	
SJOTBH	Sov. J. Opt. Tech. (Eng. transl. of Opt.-Mekh. Promysh.)
SJQEAF	Sov. J. Quantum Electron.
SMPTA8	Schweiz. Mineral. Petrogr. Mitt.
SPHCA6	Sov. Phys. - Crystallogr. (Eng. transl. of Kristallogr.)
SPHJAR	Sov. Phys. - JETP.
SPSSA7	Sov. Phys. - Solid State (Eng. transl. - Fiz. Tverd. Tela Leningrad)
SSCOA4	Solid State Commun.
T	
TTMMDZ	Tschermaks Min. Petr. Mitt.
W	
WLHPAR	Wuli Xuebao=Acta Physica Sinica (Chinese)
Z	
ZAPHAX	Z. Angewandte Physik
ZEKRDZ	Z. Kristallogr.
ZEPYAA	Z. Phys. (1920–1974)
ZMGPAS	Zbl. Mineral. Geol. Paleont., Abt. A
ZPCBAL	Z. Phys. Chem., Abt. B
ZPSBAX	J. Appl. Spectrosc.=Zh. Prikladnoi Spektroskopy

8. Appendix 2. Alternative Forms of the Sellmeier Equation

The general form of the Sellmeier equation is usually given as

$$n^2 = 1 + \sum_j \frac{A_j \lambda^2}{\lambda^2 - \lambda_j^2}$$

with the wavelength λ of the incident light, and the wavelengths λ_j with the corresponding constants A_j representing the wavelengths of maximum absorption at several absorption bands. The refractive indices used in the current work are sufficiently approximated using a one-term Sellmeier equation with wavelengths λ far distant from the immediate region of the absorption band at λ_o, thus yielding

$$n^2 = 1 + \frac{A_o \lambda^2}{\lambda^2 - \lambda_o^2}.$$

Rearranging this equation gives

$$\frac{1}{n^2 - 1} = -\frac{\lambda_o^2}{A_o \lambda^2} + \frac{1}{A_o}$$

and finally

$$\frac{1}{n^2 - 1} = -\frac{A}{\lambda^2} + B$$

[Eq. (3a)] with $A = \lambda_o^2 / A_o$ and $B = 1/A_o$ or $\lambda_o^2 = A/B$. The constant A_o is related to Eq. (3b) by the expression $E_d = A_o \cdot E_o$.