# Correlation Between Refractive Index and Electronegativity Difference for $A^NB^{8-N}$ Type Binary Semiconductors

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A simple correlation between the high-frequency refractive index and electronegativity difference has been established for large number of  $A^N B^{8-N}$  type binary semiconductors. The proposed relation has been applied satisfactorily to evaluate the refractive index of binary semiconductors belonging to groups I-VII, II-VI, III-V and IV-VI. The estimated values of refractive index from present relation are utilized to calculate the electronic polarizability of compounds by applying the Lorentz-Lorentz formula. Our calculated values of refractive index and electronic polarizability are in good agreement with the values evaluated by earlier researchers.

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## 1. Introduction

The compound semiconductors have potential applications in the fields of electronics, optical, optoelectronic devices and nowadays in nanotechnology and biotechnology [1–5]. Due to technological importance of these materials, the experimental and theoretical study of fundamental properties of such compounds has attracted much attention [6–10]. The optical refractive index is one of the fundamental properties of materials because it is closely related to the electronic polarizability of ions and local field inside the material, which plays an important role in determining the electrical properties of such materials. Therefore, the evaluation of refractive index has been a matter of considerable importance and several investigations have been carried out for this purpose [11–21].

Moss [11] made first attempt to interrelate the refractive index and energy band gap in semiconductors and proposed a relation as

$$E_{\rm g}n^4 = 95eV, \tag{1}$$

where n,  $E_{\rm g}$  are the optical refractive index and the energy band gap, respectively. This relation was based on the general assumption that all energy levels in a solid are scaled down by a factor of  $1/\varepsilon_{\rm eff}^2$ , where  $\varepsilon_{\rm eff}$  is effective dielectric constant. A review article on this subject can be found in Ref. [12]. Ravindra et al. [13] have proposed a linear relation governing the variation of optical refractive index with energy gap between bonding and antibonding states as

$$n = 4.08 - 0.62E_{\rm g}. (2)$$

But this relation does not provide reasonably good results for compounds having low values of the refractive index. Finkenrath [14] has widely pointed out the shortcomings of Ravindra's relation at low and high values of refractive index. Gopal [15] has modified Penn model [16] for semiconductors possessing high frequency dielectric constant and proposed a general formula relating refractive index with energy band gap. In order to remove the shortcomings of Moss [11] and Ravindra's relation [13], Reddy et al. [17] have proposed another relation between refractive index and energy gap in the semiconductors. This relation is as follows:

$$n = 3.59 - \log_{\rm e} E_{\rm g}.$$
 (3)

Based on the theory of vibrations, Hervé and Vandamme [18] proposed the following relation for refractive index as:

$$n = \sqrt{1 + \left(\frac{A}{E_{\rm g} + B}\right)^2},\tag{4}$$

where A = 13.6 eV and B = 3.4 eV are constants. Hervé and Vandamme [18] predicted that this relation provides the lowest deviation for III-V, I-VII group semiconductors and chalcopyrite. This model is accurate for most materials usually employed in the optoelectronic device structures and high band gap materials. However, it does not explain the behavior of the IV-VI group semiconductors. Bussmann-Holder [19] has investigated the interplay of polarizability and ionicity in some IV-VI compounds within a diatomic linear chain model. Pan et al. [20] have studied the effect of the electronegativity and bond ionicity on energy band gap  $(E_g)$  and the refractive index (n) in nitrogen-doped  $SnO_2$  and other doped semiconductors by extending Bussmann-Holder's model. Recently Reddy et al. [21] have proposed an interesting relation between optical refractive index and electronggativity difference for large number of binary and ternary chalcopyrite semiconductors, insulators, oxides and alkali halides. For binary compound semiconductors having low values of the refractive index (1-2), this relation gives better results, but for high value of refractive index (4.0-5.7) the deviation is very high (45.5%). Several models based on energy gap and electronegativity

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difference have been proposed by earlier researchers for calculating the refractive index of materials, but they are mostly applicable to limited number of materials.

In the present work, we propose a simple correlation between optical refractive index and electronegativity difference for  $\mathbf{A}^N\mathbf{B}^{8-N}$  type binary compound semiconductors (including I–VII, II–VI, III–V and IV–VI group compound semiconductors). The results obtained from present approach are found to be consistent with the known values and reported by other authors. The validity of earlier proposed relations [21] have been examined for these compound semiconductors and pronounced deviations between known and evaluated values of refractive index were observed. Employing the Lorentz–Lorentz formula in classical theory, the electronic polarizability of these group semiconductors has also been calculated.

#### 2. Theory and calculation

The optical electronegativity is a key parameter to understand the nature of chemical bonding and other important parameters. Duffy [22, 23] has correlated the energy gap and optical electronegativity difference for various binary systems as

$$E_{\rm g}=3.72\,(\Delta\chi^*)\,,$$
 (5) where  $\Delta\chi^*=[\Delta\chi^*_{\rm anion}-\Delta\chi^*_{\rm cation}]$  and  $\Delta\chi^*_{\rm anion}$  and  $\Delta\chi^*_{\rm cation}$  are optical electronegativites of anion and cation, respectively. Using Duffy relation, Eq. (5), Reddy et al. [21] have modified Hervé and Vandamme relation [18] and proposed an interesting relationship between re-

fractive index, energy gap and optical electronegativity

$$n = \sqrt{1 + \left(\frac{A}{3.72\Delta\chi^* + B}\right)^2}. (6)$$

In addition, they have also modified Moss [11] and Ravindra's relation [13] which are given as follows:

$$n = \left[\frac{25.54}{\Delta \chi^*}\right]^{1/4} \tag{7}$$

and

$$n = 4.08 - 2.3064 \left(\Delta \chi^*\right). \tag{8}$$

Singh et al. [24] have correlated electronic dielectric constant and average energy gap as

$$\varepsilon_{\infty} = 1 + bE_{\rm g}^S,\tag{9}$$

where  $\varepsilon_{\infty}$  is optical dielectric constant, b and S are an ion characteristic constant and family characteristic constant, respectively. Using Eq. (5), above relation (9) can be written as

$$\varepsilon_{\infty} = 1 + b \left( 3.72 \Delta \chi^* \right)^S. \tag{10}$$

Since optical refractive index is related to dielectric constant as  $n^2 = \varepsilon_{\infty}$ , Eq. (10) can be rewritten as

$$\frac{n^2 - 1}{b} = (3.72\Delta \chi^*)^S. (11)$$

 $\Delta \chi^{*S} = \frac{n^2 - 1}{c}$ , where  $c = b3.72^S$  is a constant.

$$\Delta \chi^* = c^{-1/S} n^{2/S} \left[ 1 - \frac{1}{n^2} \right]^{1/S},$$

$$\Delta \chi^* = c^{-1/S} n^{2/S} \left[ 1 - \frac{1}{nS^2} + \dots \right],$$

using binomial expansion up-to the second term since  $\frac{1}{n^2} \ll 1$ ,

$$\Delta \chi^* = c^{-1/S} n^{2/S} - \frac{1}{Sc^{1/S}} n^{-2\left(1 - \frac{1}{S}\right)},$$

$$\Delta \chi^* = ln^m + l'n^{m'}$$

where  $l=c^{-1/S}$ ,  $l'=\frac{-1}{Sc^{1/S}}$  and  $m=\frac{2}{S}$ ,  $m'=-2\left(1-\frac{1}{S}\right)$ . Employing values of constants, the contribution due to second term,  $l'n^{m'}$  is found negligible and hence.

$$\Delta \chi^* = ln^m,$$

$$n = \frac{1}{l^{1/m}} \Delta \chi^{*1/m},\tag{12}$$

$$n = k\Delta \chi^{*\gamma},\tag{13}$$

which is our proposed relation between refractive index and electronegativity difference. Here k and  $\gamma$  $(\gamma = -0.32)$  are constants, which have been obtained by optimizing known values of refractive index (n) and electronegativity difference  $(\Delta \chi^*)$  data in regression software. In present work, the necessary optical electronegativity difference data were taken from Refs. [25, 26]. Using Eq. (13), we have calculated the refractive indices for binary compound semiconductors belonging to groups I-VII, II-VI, III-V and IV-VI, and presented in Table I. The proposed relation is found to hold well with a constant value of k for each group of compounds such as I-VII (k = 2.0), II-VI (k = 2.4), III-V (k = 2.38), and IV-VI (k = 4.0) compounds. The evaluated values show a systematic trend and are consistent with the available data reported so far, which proves the validity of the present approach. The value of the constant k is considered to be the characteristics of each group of semiconductors. It is not unique for all groups of semiconductor, in contrast with the unique values as predicted by other authors. In Table I a comparison has also been made between our calculated values with the Reddy modified relations Eqs. (6), (7) and (8).

The calculated refractive index from Eq. (13) has been utilized to evaluate the electronic polarizability ( $\alpha_{\rm e}$ ) by applying the Lorentz–Lorentz formula [31] as

$$\alpha_{\rm e} = \frac{n^2 - 1}{n^2 + 2} \frac{M}{d} 3.95 \times 10^{-25} \text{ cm}^3,$$
(14)

where M and d are molecular weight and density of compounds, respectively. The present calculated and known values of electronic polarizability have been presented in Table II. A comparison has also been made between our calculated values and reported by earlier researchers in the same table. Our calculated values of  $\alpha_{\rm e}$  are in closer agreement with the known [27, 28, 32] one and earlier reported values [13, 15, 17, 29].

Refractive index (n) of binary compounds.

TABLE I

			-									
G 1	$\Delta \chi^*$	Known	Present		y Reddy							
Compounds	[25, 26]	values [13, 27-30]	work Eq. (13)	Hervé Eq. (6)	Moss Eq. (7)	Ravindra Eq. (8)						
			I-VII	1 ( )	1 1 ( /	1 ( )						
LiF	3.0	1.39	1.41	1.37	1.71	NA						
LiCl	2.0	1.66	1.60	1.60	1.89	NA						
$_{ m LiBr}$	1.8	1.78	1.66	1.68	1.94	NA						
LiI	1.5	1.95	1.76	1.81	2.03	0.62						
NaF	3.1	1.34	1.39	1.35	1.69	NA						
NaCl NaBr	2.1 1.9	1.54 1.64	1.58 1.63	1.51* 1.58*	1.82*	NA NA						
NaI	1.6	1.77	1.72	1.76	2.00	0.39						
KF	3.2	1.36	1.38	1.34	1.68	NA						
KCl	2.2	1.49	1.55	1.52*	1.83*	NA						
KBr	2.0	1.56	1.60	1.58*	1.87*	NA						
KI	1.7	1.68	1.69	1.72	1.97	0.159						
RbF	3.2	1.40	1.38	1.34	1.68	NA						
RbCl	2.2	1.49	1.55	1.54*	1.85*	NA						
RbBr	2.0	1.55	1.60	1.58*	1.88*	NA						
RbI	1.7	1.65	1.69	1.72	1.97	0.159						
CsF	3.3	1.48	1.36	1.32	1.67	NA						
CsCl	2.3	1.61	1.53	1.56*	1.86*	NA						
CsBr	2.1	1.67	1.58	1.60*	1.89*	NA						
CsI	1.8	1.79	1.66	1.72*	1.97*	0.19*						
CuF CuCl	2.1 1.1	1.58 1.93	1.58 1.94	1.57 2.26*	1.87 2.32*	NA 2.03*						
CuBr	0.9	2.10	2.07	2.38*	2.32	2.03						
CuI	0.6	2.35	2.36	2.37*	2.38*	2.26*						
AgF	2.0	1.70	1.60	1.60	1.89	NA						
AgCl	1.0	2.00	2.00	2.16	2.25	1.77						
AgBr	0.9	2.15	2.07	2.25	2.31	2.00						
AgI	0.6	2.22	2.36	2.61	2.55	2.70						
			II–VI									
$_{\rm MgO}$	1.93	1.63	1.94	1.63*	1.91*	NA						
MgS	1.27	2.26	2.22	1.75	1.99	0.339						
$_{ m MgSe}$	1.20	2.43	2.26	1.54	1.85	NA						
MgTe	0.79	2.65	2.59	1.48	1.80	NA						
CaO CaS	2.50 1.50	1.82	1.79	1.73* 2.49	1.98* 2.46	0.21* 2.48						
CaSe	1.40	2.12 2.26	2.11 2.16	2.49	2.28	1.91						
SrO	2.50	1.80	1.79	1.70*	1.96*	0.06*						
SrS	1.50	2.10	2.11	2.10	2.21	1.63						
SrSe	1.40	2.21	2.16	2.01	2.15	1.34						
SrTe	1.10	2.41	2.33	1.78	2.01	0.482						
BaO	2.55	1.98	1.78	1.87*	2.07*	0.87*						
BaS	1.60	2.15	2.06	1.78	2.01	0.48						
BaSe	1.50	2.27	2.11	1.62	1.90	NA						
ZnO	1.90	2.00	1.95	2.16*	2.25*	1.79*						
ZnS	0.90	2.39	2.48	2.20*	2.28*	1.89*						
ZnSe	0.80	2.43	2.58	2.49*	2.47*	2.49*						
ZnTe	0.50	2.70	3.00	2.61*	2.55* 2.48*	2.68* 2.53*						
CdS CdS	0.67 0.90	2.68 2.38	2.73 2.48	2.52* 2.55*	2.48**	2.53**						
CdSe	0.86	2.44	2.48	2.85*	2.74*	3.03*						
CdTe	0.38	3.23	3.27	2.99*	2.85*	3.19*						
	00		II-V									
AlN	1.43	2.20	2.12	2.14*	2.24*	1.73*						
AlP	0.60	2.75	2.80	2.35*	2.37*	2.23*						
AlAs	0.50	2.92	2.97	2.65*	2.58*	2.75*						
AlSb	0.40	3.19	3.19	2.90*	2.78*	3.09*						
$_{\rm GaN}$	1.40	2.24	2.14	2.28*	2.33*	2.07*						
$_{\mathrm{GaP}}$	0.50	2.90	2.97	2.61*	2.55*	2.70*						
GaAs	0.37	3.30	3.27	3.04*	2.90*	3.25*						
GaSb	0.24	3.75	3.76	3.38*	3.29*	3.58*						
InN	1.26	2.35	2.21	1.96	2.12	1.17						
InP	0.41 0.30	3.10	3.17	3.08*	2.94*	3.30*						
In As In Sb		3.51	3.50	3.76*	4.04*	3.86*						
InSb 0.23 3.96 3.81 3.93* 4.80* 3.97* IV-VI												
11100					0.46	2.47						
	0.70		4 48									
SnS	0.70	4.42	4.48 4.71	2.48 2.61	2.46 2.55							
SnS SnSe	0.60	4.42 4.79	4.71	2.61	2.55	2.70						
SnS		4.42		I	1							
SnS SnSe PbS	0.60 0.70	4.42 4.79 4.15	4.71 4.48	2.61 2.48	2.55 2.46	2.70 2.47						

Quantities with an asterisk\* are taken from Ref. [21], those without are from present calculations; NA — not applicable

### 3. Results and discussions

In the present paper, we have presented an empirical relation relating refractive index with the electronegativity difference between constituent atoms of binary compound semiconductor. The computed refractive index from proposed relation for I-VII, II-VI, III-V and IV-VI

TABLE II Electronic polarizability ( $\alpha_e$ ) of binary compounds.

Density				<i>v</i> ( <i>v</i> )					
Seminary   Seminary		Density Electronic polarizability [10 <sup>-24</sup> cm <sup>3</sup>							
LiF   25.937   2.64   0.89   0.96   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.14   1.03   1.04   1.14   1.03   1.04   1.04   1.04   1.05   1.04   1.05	Compounds		[g/cm <sup>3</sup> ]				Gopal	Reddy	
Lic    25.937   2.64   0.89   0.96     1.14   1.03     Lic    42.392   2.07   2.98   2.78   2.78   2.55   2.55   3.51     Lill   133.843   3.49   6.15   6.21   1.64   1.81   1.89     NaF   41.988   2.56   1.15   1.54   1.81   1.89     NaBr   41.988   2.56   1.15   1.54   1.81   1.89     NaBr   102.894   3.20   4.38   4.51   4.48   4.42     NaI   149.894   3.67   6.41   6.38   6.97   6.46     KF   58.10   2.48   1.99   2.14   2.28   2.38     KCI   74.555   1.98   4.08   4.77   4.69   4.99     KBr   119.006   2.75   5.22   5.86   2.96   6.57   4.59     KBr   104.408   3.56   2.54   2.68   2.96   3.39     RbCI   120.923   2.50   4.63   5.47   5.40   5.75     RbI   212.374   3.55   5.77   6.69   6.51   6.79     RbI   183.83   3.99   5.69   5.17   5.44   5.99     Cagl   183.83   3.99   5.69   5.17   5.44   5.69     Cagl   212.809   4.44   6.83   6.28   6.28   6.46   6.46     Cal   298.899   4.14   4.50   4.53   4.82   5.75   5.77     CuBr   413.45   4.98   6.05   5.94   6.58   7.27   7.27     CuBr   184.345   4.98   6.05   5.94   6.58   7.27   7.27     CuBr   184.345   4.98   6.05   5.94   6.58   7.27   7.27     CuBr   187.78   6.47   6.27   5.99   6.81   7.42   7.39     AgB   234.77   6.00   8.76   9.31   9.29   10.07   9.97     AgB   234.77   6.00   8.76   9.31   9.29   10.07   9.97     AgB   234.78   6.00   6.83   6.98   6.83   8.93   8.88     Cas   19.04   6.52   8.86   8.20     BaSe   216.30   5.02   9.88   9.10     Zno   81.37   5.61   2.86   2.78   2.43   3.31   3.34     AgB   234.47   6.00   6.63   6.87   6.65   7.04   7.00     Alm   51.91   4.54   8.82   8.66   6.87   6.57   7.49   7.78   8.10     Cas   119.04   6.28   6.53   6.86   6.87   6.57   7.49   7.78   8.10     Alm   6.40   6.40   6.40   6.40   6.40   6.40			[27, 33]			[13]	[15]		
LiBr	LiF	25.937	2.64	0.89				1.14	1.03
Lii 133.843 3.49 6.15 6.21				!	!				
NaCl   58.443   2.17   3.24   3.53   3.64   3.47   3.49     NaBr   102.894   3.20   4.38   4.51   4.48   4.42     NaBr   102.894   3.67   6.41   6.38   6.67   6.46     KF   58.10   2.48   1.99   2.14   2.28   2.63     KCl   74.555   1.98   4.08   4.77   4.69   4.90     KBr   119.006   2.75   5.22   5.86   5.74   5.92     KI   166.006   3.13   7.25   7.99   8.47   8.13     RbCl   120.923   2.80   4.63   5.47   5.40   9.57     RbBr   102.486   3.56   2.54   2.68   2.96   3.39     RbCl   120.923   2.80   4.63   5.47   5.40   9.57     RbBr   163.374   3.35   5.77   6.69   6.51   6.79     RbI   121.374   3.55   7.80   9.01   9.57   6.46     CaF   151.903   4.12   3.60   3.25   3.85   4.37     CaCl   168.358   3.99   5.69   5.17   5.44   5.69     CaBr   212.809   4.44   6.83   6.28   6.46   6.46     CaBr   212.809   4.44   6.83   6.28   6.46   6.46     CaBr   212.809   4.44   4.50   4.53   4.82   5.75   5.77     CuUI   98.99   4.14   4.50   4.53   4.82   5.75   5.77     CuII   190.44   5.62   8.05   5.94   6.58   7.27   7.27     CuII   190.44   5.62   8.05   5.94   6.58   7.27   7.27     CuII   190.44   5.62   8.05   5.94   6.58   7.27   7.39     AgBr   187.78   6.47   6.27   5.99   6.81   7.42   7.39     AgBr   187.78   6.47   6.27   5.99   6.81   7.42   7.39     AgBr   151.91   4.54   8.82   8.66     CaG   5.08   3.32   2.90   2.83     CaS   72.14   2.50   6.13   6.09     CaSe   119.04   3.57   7.62   7.22     SrO   103.62   4.70   3.72   3.69   2.73   4.29   4.84     BaS   169.40   4.25   8.61   8.20     BaSe   216.30   5.02   9.88   9.10     CaSe   119.43   5.51   5.12   9.88   9.10     CaSe   119.44   5.50   6.13   6.09     CaSe   119.47   5.61   2.86   2.78   2.43   3.31   3.34     ZhG   97.43   3.98   5.91   6.12   4.46   5.72   5.76     Cads   144.46   4.82   7.20   7.49   7.78   8.10   8.04     All   57.96   2.85   5.51   5.59   6.65   7.04   7.00     All   4.45   4.82   6.65   6.66   7.04   7.00     CaSe   119.47   5.61   6.89   7.49   7.78   8.10   8.04     All   4.50   4.40   6.52   6.65   7.04   7.00									
NaCl   \$5.443   2.17   3.24   3.53   4.48   4.42   4.48   4.42   4.48   4.42   4.48   4.42   4.48   4.42   4.48   4.42   4.48   4.48   4.42   4.48   4.48   4.42   4.48   4.48   4.42   4.48   4.48   4.42   4.48								!	!
NaBr									
Nai				1	l			l	l
KF         58.10         2.48         1.99         2.14         4.69         4.90         4.08         4.77         4.69         4.99         4.90         4.09         4.90         4.09         4.90         4.90         4.90         4.90         4.90         4.69         4.90         4.90         4.81         5.74         5.74         5.92         KI         160.006         3.13         7.25         7.99         8.47         8.13         8.10         1.00         8.47         8.13         8.10         1.00         8.47         8.13         8.10         1.00         8.47         8.13         8.47         8.13         8.47         8.13         8.47         8.13         8.10         1.11         9.57         2.24         8.57         8.40         6.60         9.01         6.51         6.70         8.44         5.75         8.44         5.75         8.44         5.75         8.44         4.50         8.51         8.60         8.37         6.44         5.62         8.05         8.62         8.37         6.44         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         8.43 <th< td=""><td></td><td></td><td></td><td>l</td><td>I</td><td></td><td></td><td></td><td></td></th<>				l	I				
KCI         74.555         1.98         4.08         4.77         KB         4.69         4.90           KBr         119.006         2.75         5.22         5.86         5.74         5.92           KI         166.006         3.13         7.25         7.99         8.47         8.13           RbCI         1104.468         3.56         2.54         2.68         2.96         3.39           RbBF         165.374         3.35         5.77         6.69         6.51         6.51         6.79           RbI         212.374         3.55         7.80         9.01         9.01         9.57         9.24           CsF         151.993         4.12         3.60         3.25         3.83         4.37           CsBr         212.809         4.44         6.83         6.28         6.46         6.46         6.46           CsI         259,809         4.51         8.86         8.37         8.72         7.27         7.27           CuI         190.44         4.50         4.53         4.82         5.75         5.77           CuI         190.49         4.14         4.50         4.53         4.82         5.75         5.77				1	1				
KI         166,066         3.13         7.25         7.99         8         8.47         3.39           RbCI         104,468         3.56         2.54         2.68         2.68         3.39           RbDF         105,374         3.35         5.77         6.69         6.51         6.79           RbI         122,374         3.55         7.80         9.01         9.57         9.24           CsF         151,903         4.12         3.60         3.25         3.85         4.37           CsBr         212,809         4.44         6.83         6.28         6.46         6.46         6.46           CuI         98.99         4.51         8.86         8.37         8.97         8.78           CuCI         98.99         4.14         4.50         4.53         4.82         5.75         5.77           CuBr         143.45         4.98         6.05         5.94         6.58         7.27         7.27           CuI         190.44         4.50         4.53         4.82         5.75         5.77           CuBr         143.35         4.98         6.05         5.94         6.58         7.27         7.27	KCl	74.555	1.98	4.08	4.77			4.69	4.90
RbF         104.468         3.56         2.54         2.68         2.98         3.39           RbBI         120.923         2.80         4.63         5.47         6.69         5.40         5.75           RbI         212.374         3.55         7.80         9.01         9.57         9.24           CsF         151.903         4.12         3.60         3.25         3.85         4.37           CaCl         168.358         3.99         5.69         5.17         5.44         5.69           CBT         212.809         4.44         6.83         6.28         6.46         6.46         6.46           CuF         225.4         4.23         2.57         2.56         2.57         5.77         7.22         8.05         8.0	KBr	119.006	2.75	5.22	5.86			5.74	5.92
RbC    120,923				!					
RbBr				l					l .
RBI 212.374 3.55 7.80 9.01 9.01 3.85 4.37 0.5CI 168.358 3.99 5.69 5.17 5.44 5.69 0.5CST 168.358 3.99 5.69 5.17 5.44 5.69 0.646 6.46 6.46 6.46 6.46 6.46 6.46 6.4									
CsF         151.903         4.12         3.60         3.25         3.85         4.37           CsCl         168.358         3.99         5.69         5.17         5.44         5.69           CsI         259.809         4.51         8.86         8.37         8.97         8.78           CuF         82.54         4.23         2.57         2.56         8.06         8.97         8.78           CuCI         98.99         4.14         4.50         4.53         4.82         5.75         5.77         7.27           CuII         190.44         5.62         8.05         8.06         8.43         8.93         8.88           AgF         126.87         5.85         3.31         2.94         8.48         8.93         8.88           AgI         134.32         5.66         5.09         5.09         5.60         6.36         6.39           AgBI         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgB         160.88         2.84         4.53         4.45         4.45         4.45           MgS         103.27         4.21         6.00         5.61         8.61					1				1
CsCl         168.358         3.99         5.69         5.17         5.44         5.69           CsBr         212.809         4.44         6.83         6.28         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.46         6.58         7.27         7.29         8.88         8.83         8.83         8.88         8.88         8.88         8.86									
CsBr         212,809         4.44         6.83         6.28         6.46         6.46           CsI         259,809         4.51         8.86         8.37         2.56         8.97         8.78           CuCl         98,99         4.14         4.50         4.53         4.82         5.75         5.77           CuBr         143,45         4.98         6.05         5.94         6.58         7.27         7.27           CuI         190,44         5.62         8.05         8.06         8.43         8.93         8.88           AgF         126,87         5.85         3.31         2.94         8.63         8.893         8.88           AgBr         187.78         6.47         6.27         5.99         5.60         6.36         6.39           AgBr         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgSe         103.27         4.21         6.00         5.61         Mg         6.10         7.22           CaS         72.14         2.50         6.13				1					
Csl         259,809         4.51         8.86         8.37         8.78           CuF         82.54         4.23         2.57         2.56           CuCl         98.99         4.14         4.50         4.53         4.82         5.75         5.77           CuBr         143.45         4.98         6.05         5.94         6.58         7.27         7.27           CuI         190.44         5.62         8.05         8.06         8.43         8.93         8.88           AgCI         143.32         5.56         5.09         5.09         5.60         6.36         6.39           AgI         143.7         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45         4.64         8.82         8.66           CaO         56.08         3.32         2.90         2.83         4.01         7.02         7.02           SrD         103.62         4.70         3.72         3.69         2.73         4.29         4.84 <td></td> <td></td> <td></td> <td>!</td> <td></td> <td></td> <td></td> <td></td> <td></td>				!					
CuF         82.54         4.23         2.57         2.56         2.57         2.57         CuB         CuCl         98.99         4.14         4.50         4.53         4.82         5.75         5.77           CuBr         143.45         4.98         6.05         5.94         6.58         7.27         7.27           CuI         190.44         5.62         8.05         8.06         8.43         8.93         8.88           AgFI         126.87         5.85         3.31         2.94         4.84         8.93         8.88           AgCI         143.32         5.56         5.09         5.09         5.60         6.36         6.39           AgBr         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgSe         103.27         4.21         6.00         5.61         MgBe         151.91         4.54         8.82         8.66         6         6         6         6         6         6         7         22         25         0         2.83         6         0				1					
CuCl         98.99         4.14         4.50         4.53         4.82         5.75         5.77           CuBr         143.45         4.98         6.05         5.94         6.58         7.27         7.27           CuI         190.44         5.62         8.05         5.94         6.58         7.27         7.27           AgF         126.87         5.85         3.31         2.94         8.43         8.93         8.88           AgCl         143.32         5.56         5.09         5.09         5.60         6.36         6.39           AgB         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45         Mg         6.8         7.42         7.39           MgTe         151.91         4.54         8.82         8.66         6         7.00         7.07         9.97           MgTe         151.94         4.54         8.82         8.66         6         6         7.22         7.22         7.22         7.				l	1				
CuI         190.44         5.62         8.05         8.06         8.43         8.93         8.88           AgF         126.87         5.85         3.31         2.94         5.60         6.36         6.39           AgCI         143.32         5.56         5.09         5.09         5.60         6.36         6.39           AgBr         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45         MgSe         103.27         4.21         6.00         5.61           MgTe         151.91         4.54         8.82         8.66         6         6         6         6         6         6         6         6         6         6         6         7         7         7         7         7         7         7         7         7         7         8         7         8         9         2         73         4.29         4.84         4.84         8         4         8         8         6         6						4.82	5.75	5.77	
AgF         126.87         5.85         3.31         2.94         AgCl         143.32         5.56         5.09         5.09         5.09         5.60         6.36         6.39           AgBr         183.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45           MgTe         151.91         4.54         8.82         8.66           CaO         56.08         3.32         2.90         2.83           CaS         71.14         2.50         6.13         6.09           CaS         119.04         3.57         7.62         7.22           SrO         103.62         4.70         3.72         3.69         2.73         4.29         4.84           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrSe         166.58         4.38         8.47         8.24           SrTe         215.22         4.83         10.84         10.5         8 <td>CuBr</td> <td>143.45</td> <td>4.98</td> <td>6.05</td> <td>5.94</td> <td>6.58</td> <td>7.27</td> <td>7.27</td> <td></td>	CuBr	143.45	4.98	6.05	5.94	6.58	7.27	7.27	
AgCl         143.32         5.56         5.09         5.09         5.60         6.36         6.39           AgBr         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45           MgTe         151.91         4.54         8.82         8.66         Coo         5.61           Cao         56.08         3.32         2.90         2.83         2.73         4.29         4.84           CaS         72.14         2.50         6.13         6.09         2.73         4.29         4.84           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrSe         166.58         4.38         8.47         8.24         8.57         7.02         7.22           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrSe         166.58         4.38         8.47         8.24         8.51         8.20 </td <td>CuI</td> <td>190.44</td> <td>5.62</td> <td>8.05</td> <td>8.06</td> <td>8.43</td> <td>8.93</td> <td>8.88</td> <td></td>	CuI	190.44	5.62	8.05	8.06	8.43	8.93	8.88	
AgBr         187.78         6.47         6.27         5.99         6.81         7.42         7.39           AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45           MgTe         151.91         4.54         8.82         8.66           CaO         56.08         3.32         2.90         2.83           CaS         72.14         2.50         6.13         6.09           CaSe         119.04         3.57         7.62         7.22           SrO         103.62         4.70         3.72         3.69         2.73         4.29         4.84           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrSe         166.58         4.38         8.47         8.24         SrTe         215.22         4.83         10.84         10.5           BaO         153.34         5.72         5.22         4.44         4         4         4         4         4         4         4         4         4         4         4         4         4 <td></td> <td></td> <td></td> <td>!</td> <td>!</td> <td></td> <td></td> <td></td> <td></td>				!	!				
AgI         234.77         6.00         8.76         9.31         9.29         10.07         9.97           MgS         56.38         2.84         4.53         4.45         M.gSe         103.27         4.21         6.00         5.61         MgTe         151.91         4.54         8.82         8.66         CaO         56.08         3.32         2.90         2.83         CaS         CaSe         119.04         3.57         7.62         7.22         7.22         7.72         7.72         7.72         7.72         7.72         7.72         7.72         7.70         7.72         7.72         7.72         7.70         7.72         7.72         7.70         7.72									
MgS         56.38         2.84         4.53         4.45         MgSe         103.27         4.21         6.00         5.61         MgTe         151.91         4.54         8.82         8.66         8         8.62         8.66         8         8.62         8.66         8         8.62         8.66         8         8.67         8.62         8.66         8         8.66         8         8.66         8         8.66         8         8.68         9         9         9         2         73         4         29         4.84         8         9         9         10 <th< td=""><td></td><td></td><td></td><td></td><td>l</td><td></td><td></td><td>!</td><td></td></th<>					l			!	
MgSe         103.27         4.21         6.00         5.61         MgTe         151.91         4.54         8.82         8.66         CaO         56.08         3.32         2.90         2.83         2.90         2.83         2.72         2.72         2.73         4.29         4.84         3.70         6.80         6.83         4.01         7.03         7.10         7.10         8.85         8.60         6.83         4.01         7.03         7.10         7.10         8.71         8.84         8.20         8.88         9.10         8.20         8.88         9.10         2.88         9.10         2.88         9.10         2.88         9.10         2.88         9.10				1	1	9.29	10.07	9.97	
MgTe         151.91         4.54         8.82         8.66         8.67         8.66         8.67         8.61         8.68         8.67         8.62         8.61         8.68         8.67         8.61         8.68         8.67         8.62         8.61         8.68         8.67         8.61         8.68         8.67         8.61         8.61         8.63         8.61         8.62         8.61         8.62         8.62         8.62         8.62         <				1					
CaO         56.08         3.32         2.90         2.83         CaS         72.14         2.50         6.13         6.09         CaSe         119.04         3.57         7.62         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.22         7.23         4.29         4.84         8.47         8.24         8.24         8.28         8.28         8.28         8.28         8.28         8.28         8.28         8.28         8.28         8.28         8.29         8.28         8.29         8.28         8.20         <				!					
CaS         72.14         2.50         6.13         6.09         CaSe         119.04         3.57         7.62         7.22           SrO         103.62         4.70         3.72         3.69         2.73         4.29         4.84           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrSe         166.58         4.38         8.47         8.24         8.77         215.22         4.83         10.84         10.5         88         9.10         8.37         5.61         8.20         8.81         8.61         8.20         8.81         8.61         8.20         8.81         8.72         8.88         9.10         8.72         8.72         8.243         3.31         3.34         5.72         5.62         9.88         9.10         8.72         8.74         8.09         8.38         8.20         8.84         8.74         8.00         8.38         8.29         8.78         2.43         3.31         3.34         7.70         7.74         7.00         7.74         7.00         7.74         7.00         7.74         7.00         7.74         7.00         7.74         7.00         7.74         7.78				!					
CaSe         119.04         3.57         7.62         7.22         S.C         S.C         103.62         4.70         3.72         3.69         2.73         4.29         4.84           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrSe         166.58         4.38         8.47         8.24         8.24         S.TE         215.22         4.83         10.84         10.5         BaSC         163.34         5.72         5.22         4.44         4.25         8.61         8.20         8.83         8.20         8.83         8.20         8.83         8.20         8.83         8.910         8.84         8.94         8.84         8.94         8.84         8.94         8.14         8.74         8.09         8.38         8.82         8.36					1				
SrO         103.62         4,70         3.72         3.69         2.73         4.29         4.84           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrS         119.68         3.70         6.80         6.83         4.01         7.03         7.10           SrS         166.88         4.38         8.47         8.24         8.61         8.24           BaS         169.40         4.25         8.61         8.20         8.61         8.20           BaS         169.40         4.25         8.61         8.20         8.83         8.38         8.29           ZnO         81.37         5.61         2.86         2.78         2.43         3.31         3.34           ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnS         144.33         5.42         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         <				1	1				
SrSe         166.58         4.38         8.47         8.24           SrTe         215.22         4.83         10.84         10.5           BaO         153.34         5.72         5.22         4.44           BaS         169.40         4.25         8.61         8.20           BaSe         216.30         5.02         9.88         9.10           ZnO         81.37         5.61         2.86         2.78         2.43         3.31         3.34           ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnSe         144.33         5.42         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09 <td< td=""><td></td><td>103.62</td><td>4.70</td><td></td><td></td><td>2.73</td><td>4.29</td><td>4.84</td><td></td></td<>		103.62	4.70			2.73	4.29	4.84	
SrTe         215.22         4.83         10.84         10.5         BaO         153.34         5.72         5.22         4.44         BaS         169.40         4.25         8.61         8.20         BaSe         169.40         4.25         8.61         8.20         BaSe         216.30         5.02         9.88         9.10         9.10         2.86         2.78         2.43         3.31         3.34         3.34         3.34         3.31         3.34         3.34         3.34         3.31	SrS	119.68	3.70	6.80	6.83	4.01	7.03	7.10	
BaO         153.34         5.72         5.22         4.44         Augusta           BaS         169.40         4.25         8.61         8.20           BaS         216.30         5.02         9.88         9.10           ZnO         81.37         5.61         2.86         2.78         2.43         3.31         3.34           ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AlAs         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AlSb         148.73	SrSe		4.38	8.47					
BaS         169.40         4.25         8.61         8.20           BaSe         216.30         5.02         9.88         9.10           ZnO         81.37         5.61         2.88         9.10           ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnSe         144.33         5.42         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.99         4.55         5.09         5.09           AIR         57.96         2.85         5.51         5.69         4.55         5.09         5.09           AIP         57.96         2.85	SrTe	215.22		10.84	10.5				
BaSe         216.30         5.02         9.88         9.10         2.43         3.31         3.34           ZnO         88.37         5.61         2.86         2.78         2.43         3.31         3.34           ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnSe         144.33         5.42         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAS         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AIS         148.73         4.22				!					
ZnO         81.37         5.61         2.86         2.78         2.43         3.31         3.34           ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnSe         14.43         3.542         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAs         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AISb         148.73         4.22         10.49         10.5         10.3         10.47         10.36           GaN         83.73         6.10				1					
ZnS         97.43         3.98         5.91         6.12         4.46         5.72         5.76           ZnSe         144.33         5.42         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAs         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AISb         148.73         4.22         10.49         10.5         10.3         10.47         10.36           GaN         83.73         6.10         3.10         2.94         2.83         3.33         3.34           GaP         100.99         4.13				!		0.40	0.01	0.04	
ZnSe         144.33         5.42         6.53         6.87         6.65         7.04         7.00           ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAs         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AISb         148.73         4.22         10.49         10.5         10.3         10.47         10.36           GaN         83.73         6.10         3.10         2.94         2.83         3.33         3.34           GaP         10.69         4.13         6.85         6.96         6.52         6.73         6.66           GaAs         144.64         5.32				1					
ZnTe         192.97         6.34         8.14         8.74         8.09         8.38         8.29           CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAS         101.9         3.81         7.55         7.64         7.38         AIS           AISb         148.73         4.22         10.49         10.5         10.3         10.47         10.36           GaN         83.73         6.10         3.10         2.94         2.83         3.33         3.34           GaP         100.69         4.13         6.85         6.96         6.52         6.73         6.66           GaAs         191.47         5.62         10.94         11.0         10.73         11.05         11.00           InN         128.83         6.88         4.45				l				ı	
CdS         144.46         4.82         7.20         7.49         7.78         8.10         8.04           CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAs         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AISb         148.73         4.22         10.49         10.5         10.3         10.47         10.36           GaN         83.73         6.10         3.10         2.94         2.83         3.33         3.34           GaP         100.69         4.13         6.85         6.96         6.52         6.73         6.66           GaAs         144.64         5.32         8.24         8.20         8.16         8.31         8.23           GaSb         191.47         5.62         10.94         11.0         10.73         11.05         11.00           InN         128.83         6.88				l				!	
CdSe         191.36         5.51         8.10         8.79         9.52         9.67         9.58           AIN         40.99         3.26         2.79         2.68         1.98         2.84         2.86           AIP         57.96         2.85         5.51         5.59         4.55         5.09         5.09           AIAs         101.9         3.81         7.55         7.64         7.23         7.45         7.38           AISb         148.73         4.22         10.49         10.5         10.3         10.47         10.36           GaN         83.73         6.10         3.10         2.94         2.83         3.33         3.34           GaP         100.69         4.13         6.85         6.96         6.52         6.73         6.66           GaAs         144.64         5.32         8.24         8.20         8.16         8.31         8.23           GaSb         191.47         5.62         10.94         11.0         10.73         11.05         11.00           InN         128.83         6.88         4.45         4.17         5.19         5.31         5.26           InP         145.79         4.79									
A1P 57.96 2.85 5.51 5.59 4.55 5.09 5.09 A1As 101.9 3.81 7.55 7.64 7.23 7.45 7.38 A1Sb 148.73 4.22 10.49 10.5 10.3 10.47 10.36 GaN 83.73 6.10 3.10 2.94 2.83 3.33 3.34 GaP 100.69 4.13 6.85 6.96 6.52 6.73 6.66 GaAs 144.64 5.32 8.24 8.20 8.16 8.31 8.23 GaSb 191.47 5.62 10.94 11.0 10.73 11.05 11.00 InN 128.83 6.88 4.45 4.17 5.19 5.31 5.26 InP 145.79 4.79 8.92 9.02 9.22 9.39 9.29 InAs 189.74 5.66 10.47 10.5 10.89 11.35 11.53 InSb 236.57 5.78 13.42 13.2 13.44 14.09 14.56 SnS 150.75 5.22 9.82 9.86 SnSe 197.65 6.18 11.11 11.1 PbS 239.26 7.61 10.48 10.7 10.18 10.60 10.73 PbSe 286.15 8.15 12.19 12.1 11.45 11.97 12.16 PbTe 334.79 8.16 14.81 14.9 13.36 13.95 14.21		191.36	5.51				9.67	9.58	
AlAs 101.9 3.81 7.55 7.64 7.23 7.45 7.38 AlSb 148.73 4.22 10.49 10.5 10.3 10.47 10.36 GaN 83.73 6.10 3.10 2.94 2.83 3.33 3.34 GaP 100.69 4.13 6.85 6.96 6.52 6.73 6.66 GaAs 144.64 5.32 8.24 8.20 8.16 8.31 8.23 GaSb 191.47 5.62 10.94 11.0 10.73 11.05 11.00 InN 128.83 6.88 4.45 4.17 5.19 5.31 5.26 InP 145.79 4.79 8.92 9.02 9.22 9.39 9.29 InAs 189.74 5.66 10.47 10.5 10.89 11.35 11.53 InSb 236.57 5.78 13.42 13.2 13.44 14.09 14.56 SnS 150.75 5.22 9.82 9.86 SnSe 197.65 6.18 11.11 11.1 PbS 239.26 7.61 10.48 10.7 10.18 10.60 10.73 PbSe 286.15 8.15 12.19 12.1 11.45 11.97 12.16 PbTe 334.79 8.16 14.81 14.9 13.36 13.95 14.21	AlN		3.26	2.79	2.68	1.98			
AlSb 148.73 4.22 10.49 10.5 10.3 10.47 10.36 GaN 83.73 6.10 3.10 2.94 2.83 3.33 3.34 GaS 10.47 5.32 8.24 8.20 8.16 8.31 8.23 GaSb 191.47 5.62 10.94 11.0 10.73 11.05 11.00 InN 128.83 6.88 4.45 4.17 5.19 5.31 5.26 InP 145.79 4.79 8.92 9.02 9.22 9.39 9.29 InAs 18.9.74 5.66 10.47 10.5 10.89 11.35 11.53 InSb 236.57 5.78 13.42 13.2 13.44 14.09 14.56 SnS 150.75 5.22 9.82 9.86 SnSe 197.65 6.18 11.11 11.1 PbS 239.26 7.61 10.48 10.7 10.18 10.60 10.73 PbSe 286.15 8.15 12.19 12.1 11.45 11.97 12.16 PbTe 334.79 8.16 14.81 14.9 13.36 13.95 14.21				1	1			!	
GaN         83.73         6.10         3.10         2.94         2.83         3.33         3.34           GaP         100.69         4.13         6.85         6.96         6.52         6.73         6.66           GaAs         144.64         5.32         8.24         8.20         8.16         8.31         8.23           GaSb         191.47         5.62         10.94         11.0         10.73         11.05         11.00           InN         128.83         6.88         4.45         4.17         5.19         5.31         5.26           InP         145.79         4.79         8.92         9.02         9.22         9.39         9.29           InAs         189.74         5.66         10.47         10.5         10.89         11.35         11.53           InSb         236.57         5.78         13.42         13.2         13.44         14.09         14.56           SnS         150.75         5.22         9.82         9.86           SnSe         197.65         6.18         11.11         11.1         10.18         10.60         10.73           PbS         286.15         8.15         12.19         12.1         <									
GaP         100.69         4.13         6.85         6.96         6.52         6.73         6.66           GaAs         144.64         5.32         8.24         8.20         8.16         8.31         8.23           GaSb         191.47         5.62         10.94         11.0         10.73         11.05         11.00           InN         128.83         6.88         4.45         4.17         5.19         5.31         5.26           InP         145.79         4.79         8.92         9.02         9.22         9.39         9.29           InAs         189.74         5.66         10.47         10.5         10.89         11.35         11.53           InSb         236.57         5.78         13.42         13.2         13.44         14.09         14.56           SnS         150.75         5.22         9.82         9.86           SnSe         197.65         6.18         11.11         11.1         10.18         10.60         10.73           PbS         239.26         7.61         10.48         10.7         10.18         10.60         10.73           PbTe         334.79         8.16         14.81         14.9				!	1			!	
GaAs         144.64         5.32         8.24         8.20         8.16         8.31         8.23           GaSb         191.47         5.62         10.94         11.0         10.73         11.05         11.05         11.05         11.05         11.05         11.05         11.05         11.05         11.05         11.05         10.89         12.99         10.29         9.22         9.39         9.29         9.29         11.35         11.53         11.53         11.53         11.53         11.53         11.53         11.53         11.53         11.53         11.54         13.22         13.44         14.09         14.56         8.58         8.15         15.75         5.22         9.82         9.86         8.58         197.65         6.18         11.11         11.1         11.1         10.18         10.60         10.73         10.78         10.58         10.73         10.73         10.78         10.73         10.78         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.73         10.74         10.74				!	!				
GaSb         191.47         5.62         10.94         11.0         10.73         11.05         11.00           InN         128.83         6.88         4.45         4.17         5.19         5.31         5.26           InP         145.79         4.79         8.92         9.02         9.22         9.39         9.29           InAs         189.74         5.66         10.47         10.5         10.89         11.35         11.53           InSb         236.57         5.78         13.42         13.2         13.44         14.09         14.56           SnS         150.75         5.22         9.82         9.86         8.6         8.11.11         11.1         11.1         PbS         239.26         7.61         10.48         10.7         10.18         10.60         10.73         PbSe         286.15         8.15         12.19         12.1         11.45         11.97         12.16         PbTe         334.79         8.16         14.81         14.9         13.36         13.95         14.21         14.81         14.9         13.36         13.95         14.21									
InN         128.83         6.88         4.45         4.17         5.19         5.31         5.26           InP         145.79         4.79         8.92         9.02         9.22         9.39         9.29           InAs         189.74         5.66         10.47         10.5         10.89         11.35         11.53           InSb         236.57         5.78         13.42         13.2         13.44         14.09         14.56           SnS         150.75         5.22         9.82         9.86           SnSe         197.65         6.18         11.11         11.1           PbS         239.26         7.61         10.48         10.7         10.18         10.60         10.73           PbSe         286.15         8.15         12.19         12.1         11.45         11.97         12.16           PbTe         334.79         8.16         14.81         14.9         13.36         13.95         14.21				1	1			1	
InP									
In As         189.74         5.66         10.47         10.5         10.89         11.35         11.53           InSb         236.57         5.78         13.42         13.2         13.44         14.09         14.56           SnS         150.75         5.22         9.82         9.86         8.0         9.86         11.11									
InSb   236.57   5.78   13.42   13.2   13.44   14.09   14.56       SnS   150.75   5.22   9.82   9.86       SnSe   197.65   6.18   11.11   11.1       PbS   239.26   7.61   10.48   10.7   10.18   10.60   10.73     PbSe   286.15   8.15   12.19   12.1   11.45   11.97   12.16     PbTe   334.79   8.16   14.81   14.9   13.36   13.95   14.21					1				
SnSe         197.65         6.18         11.11         11.1         10.18         10.60         10.73           PbS         239.26         7.61         10.48         10.7         10.18         10.60         10.73           PbSe         286.15         8.15         12.19         12.1         11.45         11.97         12.16           PbTe         334.79         8.16         14.81         14.9         13.36         13.95         14.21									
PbS         239.26         7.61         10.48         10.7         10.18         10.60         10.73           PbSe         286.15         8.15         12.19         12.1         11.45         11.97         12.16           PbTe         334.79         8.16         14.81         14.9         13.36         13.95         14.21	SnS	150.75	5.22	9.82	9.86				
PbSe         286.15         8.15         12.19         12.1         11.45         11.97         12.16           PbTe         334.79         8.16         14.81         14.9         13.36         13.95         14.21									
PbTe 334.79 8.16 14.81 14.9 13.36 13.95 14.21									
				!	!			!	
Average dev. [%]     5.38   10.1   9.64   11.63   16.51			8.16	14.81					10.71
	Average de	: v. [%]	I	I	0.38	10.1	9.64	11.63	10.51

groups binary semiconductor agree well with the recently reported [18] and known values [13, 27-30]. The behavior of different compounds within a group of compounds has been found almost similar, but significantly different from the compounds of the other groups. It is interesting to note that all groups of binary compound exhibit linear variation of electronegativity difference with the optical refractive index. Our calculated refractive index from proposed relation hardly deviates 0.27% to 11% and the maximum discrepancy for refractive index is 19.0% (MgO) from known values. In addition, the maximum deviation for low values of n (1–2) has been found to 10.2% in comparison to earlier modified Eqs. (6), (7) and (8) which give 17.1%, 26.1%, and 96.7%, respectively. Similarly, for high values of n (4.0–5.7) it has been found to be 7.95% in comparison to recently modified Eqs. (6), (7) and (8) which give 45.5%, 46.8% and 44.1%, respectively. This indicates that our proposed relation, Eq. (13) makes reasonably good predictions for both low and high values of refractive index. The low values of the average percentage deviation (5.38%) in electronic polarizabilities for all studied binary compound semiconductors indicate the correctness of the estimated refractive indices in the present work.

#### 4. Conclusion

From the above results and discussions obtained by using the present approach, we conclude that the proposed relation between optical refractive index and electronegativity difference holds well for large number of  $\mathbf{A}^N \mathbf{B}^{8-N}$ type binary semiconductors and gives better results in comparison to earlier proposed relations. The reasonable agreement between our calculated and previously known values of  $\alpha_e$  indicates that the proposed relation is useful and more accurate for estimating the optical refractive index. The minimum average percentage deviation (3.53%) for refractive index obtained in present study indicates the soundness of present approach. It is natural to say that present approach can easily be extended to the other complex compounds for which work is in progress and will be appearing in the forthcoming papers.

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