

The three – phonon processes(τ_{3ph}^{-1}) are dominant at high temperature and also give a substantial contribution near the conductivity maximum . As a result, the combined scattering relaxation rates for transverse phonons take the forms [18]:

$$\tau_{3ph,T}^{-1} = \left(B_{TN,I} + B_{TU,I} e^{-\theta_D/\alpha T} \right) \omega T^m m_{T,I}(T) \quad \text{for } 0 < \omega < \omega^4 \quad (5)$$

and for longitudinal phonons

$$\tau_{3ph,L}^{-1} = \left(B_{LN,I} + B_{LU,I} e^{-\theta_D/\alpha T} \right) \omega^2 T^m m_{L,I}(T) + \left(B_{LN,II} + B_{LU,II} e^{-\theta_D/\alpha T} \right) \omega^2 T^m m_{L,II}(T) \quad \text{for } 0 < \omega < \omega^4 \quad (6)$$

Dubey suggested the use of the average value of the upper and lower bounds of $m(T)$ reported by Guthrie [19], and $m(T)$ is given by:

$$[m(T)]_I = x_{\max} \left(e^{x_{\max}} - 1 \right)^{-1} + 0.5x_{\max}$$

for class I events, and

$$[m(T)]_{II} = 0.5x_{\max} \left(e^{x_{\max}} - 1 \right)^{-1} e^{0.5x_{\max}} + 0.5$$

for class II events. In these expressions,

$$x_{\max} = \hbar \omega_{\max} / K_B T$$

Become,

$$\tau^{-1} = \tau_B^{-1} + \tau_P^{-1} + \tau_{3ph}^{-1}$$

3. Results and Discussion

The lattice thermal conductivity of ZnSe compound calculated for dispersion relation on by using the adjustable parameters of the phonon scattering appearing in tables (II) the results represented in figures (1). Best fitting can be noticed of these results with experimental data [7, 9-15] . especially at the maximum conductivity curve , where The obtained resultsshow a good agreement with the experimental data .as The contribution of transverse phonons towards thermal conductivity is in general greater than that of longitudinal phonons ,is approximately 100% of the total conductivity at high temperatures , these results are shown in figure (2) ,and is agreement with[15,20] .

Table 1: The adjustable parameters values calculated and used for theoretical curves.

Parameter	Value
$\tau_{BT}^{-1} (s^{-1})$	1.2×10^6
$\tau_{BL}^{-1} (s^{-1})$	3.5×10^5
$A_T S^3$	2.7×10^{-44}
$A_L S^3$	1×10^{-46}
$B_{TN} \text{ deg}^{-m}$	2.5×10^{-10}
$B_{TU} \text{ deg}^{-m}$	2×10^{-6}
$B_{LN,I} \text{ s.deg}^{-m}$	3.8×10^{-24}
$B_{LU,I} \text{ s.deg}^{-m}$	1.5×10^{-19}
$B_{LN,II} \text{ s.deg}^{-m}$	3×10^{-21}
$B_{LU,II} \text{ s.deg}^{-m}$	1.8×10^{-16}

Table 2: Value of constant used to calculate thermal conductivity of ZnSe compound.

$a(A^0)$	θ_D	θ_T	θ_L	$M_1(\text{mkg})$	$M_2(\text{mkg})$
5.67	315 ⁰ K	104 ⁰ K	278 ⁰ K	5.65×10^{-23}	4.98×10^{-23}

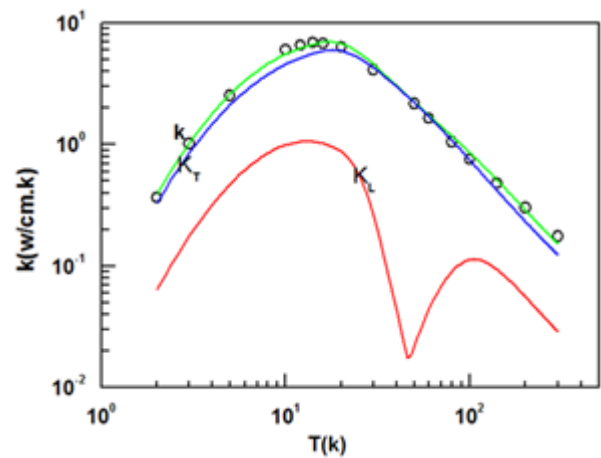


Figure 1:Conductivity curves of ZnSe compound. Solid line is the present work.

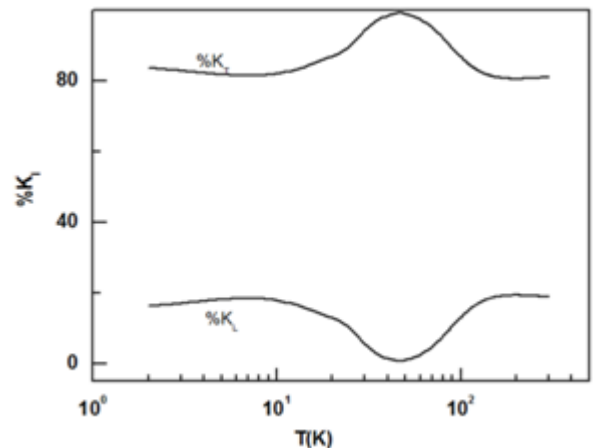
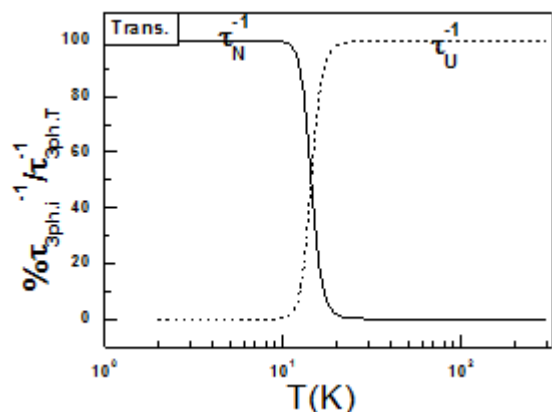


Figure 2:The percentage contribution for transverse phonons and longitudinal phonons .



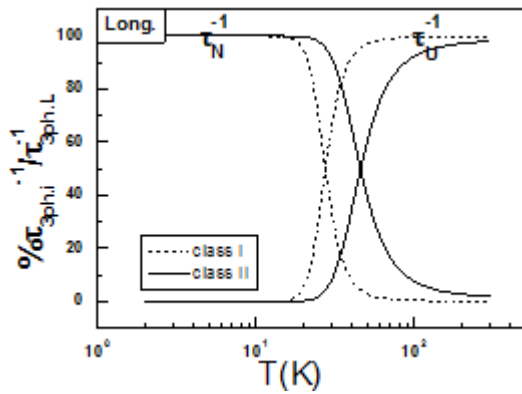


Figure 3: The percentage contribution for the relaxation rate of normal and umklapp processes towards the relaxation rate of three phonon scattering for transverse phonons and longitudinal phonons.

In figure (3), the normal processes of three phonon scattering were dominant at temperatures low less than ($T < 50K$), but at high temperatures the umklapp processes were dominant, this is an agreement with the results of authors [7,9-11,15] .

In figures (4,5), The phonon scattering processes of the point defects and boundary show the domination at low frequencies, but three phonon scattering of two kinds (normal and umklapp processes) dominate at high frequencies. At constant temperature ($T = 20K, T = 100K$) for transverse phonons and longitudinal phonons and within low frequencies range, the figure (4) appearing dominance for the boundary and phonon scattering over another kinds of scatters , this is an agreement with the results of the authors [5,7,10]. on the umklapp processes other hand the scattering dominion at high frequencies and at temperature ($T = 20K, T = 100K$) for transverse phonons, ($T = 100K$) for longitudinal phonons as the figure (5), while at temperature ($T = 20K$) for longitudinal phonons and within same frequencies range appearing dominance for normal processes of three phonon scattering and phonon scattering over another kinds of scatters as the figure (5) , this is an agreement with the results of the authors [5,7,10,15].

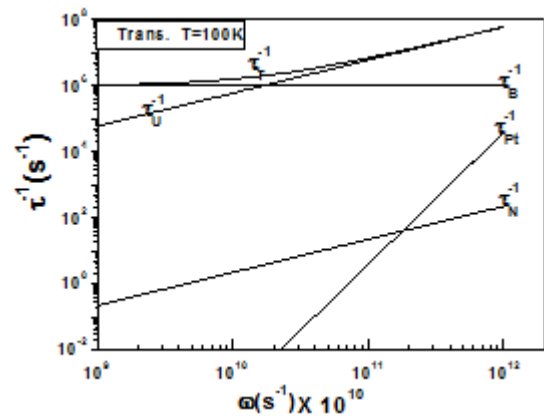
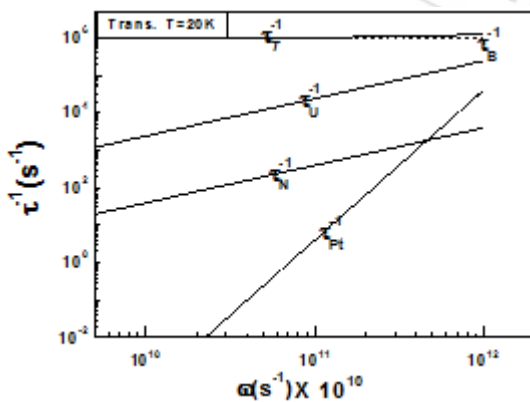


Figure 4: Relaxation rates of the deferent phonon scattering for for transverse phonons as a function to the Frequency at constant temperature($T = 20, 100K$) .

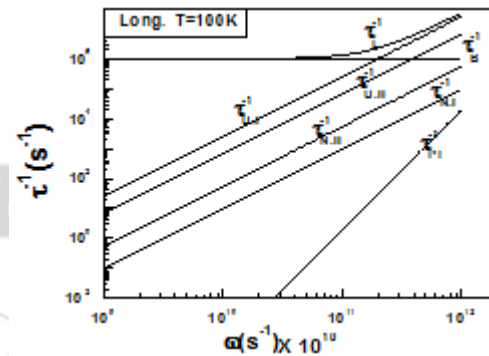
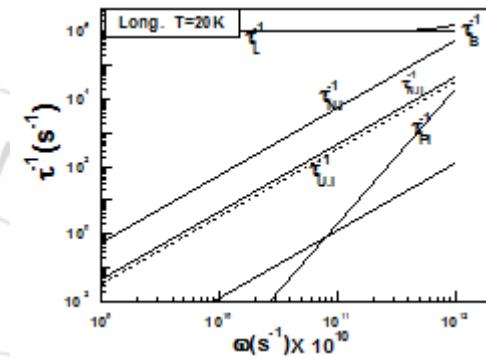


Figure 5: Relaxation rates of the deferent phonon scattering for for longitudinal phonons as a function to the frequency at constant temperature($T = 20, 100K$) .

4. Conclusion

In this paper, is showed that the Awad model can be successfully applied to explain the thermal conductivity of ZnSe compound at temperature range between (2-300K) ,where The obtained results show a good agreement between the theoretical and experimental values of the lattice thermal conductivity for this compound ,As it is also found that the transverse phonons give a major contribution towards the thermal conductivity of semiconductors. We have used the phonon scattering rates boundary ,point defect and three phonon scattering in the calculation lattice thermal conductivity, noted at constant temperature and within low frequencies the boundary show the domination over another kinds of scatters , but three phonon scattering of two kinds (normal and umklapp processes) dominate at high low frequencies for transverse phonons and longitudinal phonons . and at temperatures low appeared the normal processes of

three phonon scattering were dominant, but at high temperatures the umklapp processes were dominant.

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