

## Analysis of Band Gap of Thermoelectric materials

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### I. Introduction

Thermoelectric properties are based on some parameters as Figure of merit, thermal conductivity, Electrical conductivity and Seebeck Coefficient. Electrical conductivity depends upon the energy Band Gap of thermoelectric material. As soon as Band Gap reduces increases thermoelectric performance. Band Gap of semiconductor tends to decrease as the temperature is increase. Because interatomic spacing increases when the amplitude of atomic vibrations increases due to the increased thermal energy.

In this research paper, calculate the electrical property (Band Gap) by using the formula:-

$$E_g(T) = E_g(0) - \frac{\alpha T^2}{T + \beta}$$

Where  $E_g(0)$ ,  $\alpha$  and  $\beta$  are material Constant [2].

Energy Band Gap [eV]						
Temp. Material	0 K	300 K	600 K	900 K	1200 K	1500 K
Ge	0.74	0.66	0.54	0.40	0.27	0.13
Si	1.16	1.12	1.02	0.91	0.79	0.66
GaAs	1.51	1.42	1.27	1.12	0.96	0.80

According to table, as the temperature increases band gap of thermoelectric material decreases. Large reduction of band gap found in germanium. Germanium is useful for doping or as a catalyst in any reaction for enhancing the thermoelectric figure of merit.

### References

- [1]. Kittal, C, Introduction to solid state Physics, 6<sup>th</sup> Ed, New York, John Wiley 1986,P 185.
- [2]. Temperature dependence of Energy band gap, Ece-www.colorado.edu, Retrieved on 2013-04-03.