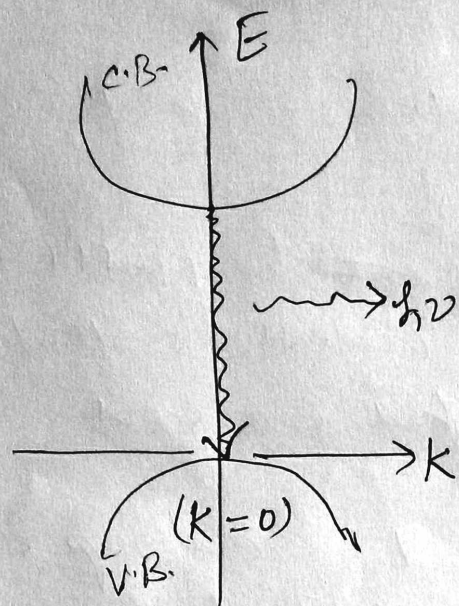


Direct band gap Semiconductor :-



Theory:-

when an electron moves from higher Energy level to lower energy level, it requires some momentum.



That momentum depends upon the propagation constant ' k '

In direct band gap, the minimum of the conduction band and maximum of the valence band occurs at the same propagation constant ' k '



[' $k=0$ ']

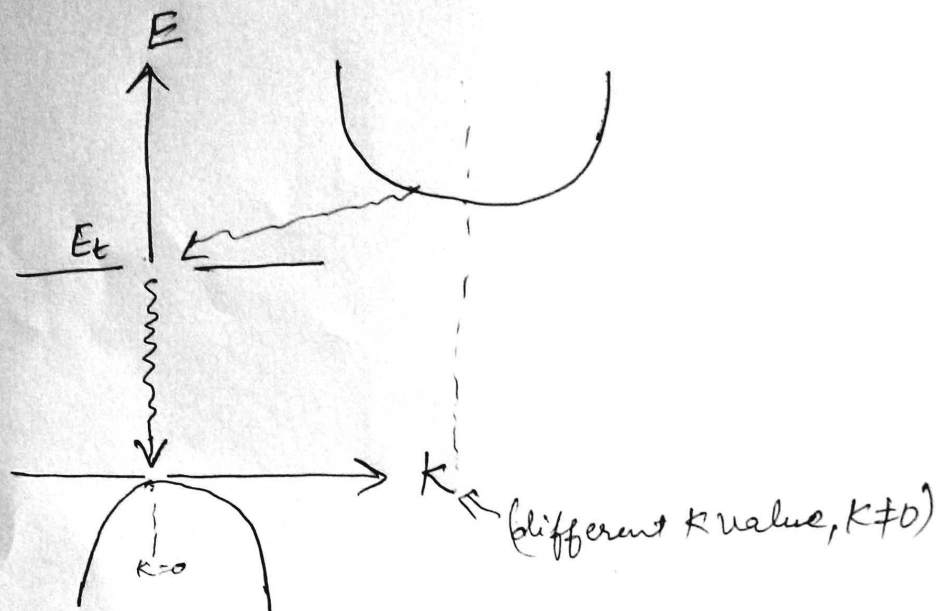
which means, No momentum is required for electron to fall ^{directly} from the conduction band to valence band without any momentum change.

Useful Band

Use:- Direct band gap semiconductors are used in the LED or Laser because they are radiating their whole energy in form of light. & there is direct fall of electron from C.B to valence band without change of momentum of electron.

eg:- GaAs, GaN \rightarrow LED Lasers

Indirect band gap semiconductor



In indirect band gap, the minimum of the conduction band (C.B.) is occurring at the different ~~energy~~ value of k , as compared to the maximum of the valence band (V.B.)

↓

Theory : When electron tries to move from C.B. to V.B., it requires some momentum [i.e. different k value, $k \neq 0$]

↓

Firstly, electron goes to some defect state then it comes to V.B.

↓

During this process, it radiates some energy in form of heat in the lattice

↓

e.g. Si, Ge, SiC, GaP.