Optoelectronics devices introduction

Optical absorption

Semiconductor. E_g - band gap

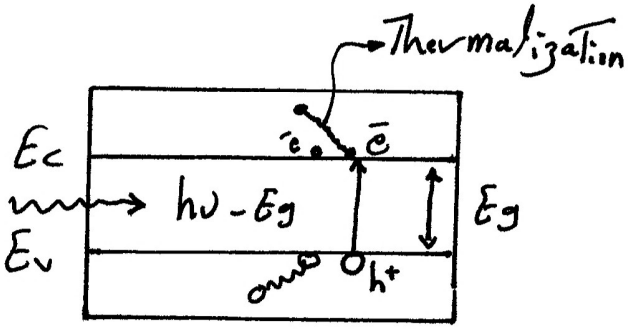
$E < E_g$ - Transparent

$E > E_g$ - opaque (absorb the light)

↳ $\bar{e}$ - hole pairs (EHP)

↓ ↓

CB VB



$h\nu > E_g \Rightarrow h\nu - E_g$ access energy

↳ Lost by Thermalization

↳ Transferred to lattice.

I = intensity of incident Radiation (W/A)

$h\nu$ = Energy of incident radiation $E = \frac{hc}{\lambda}$ (J)

Γ_{ph} = no of photons incendent on the surface = $\frac{I}{h\nu}$

α = absorption coefficient (cm^{-1})

I_0 = incident inensity at the surface

x = depth within material

$I(x) = I_0 \exp(-\alpha x)$ Beer-Lambert law

$\frac{1}{\alpha}$ = Penetration depth $I = \frac{I_0}{e} = 0.37\, I_0$