

Answer on Question #73580, Physics / Other

for an intrinsic semiconductor with a band gap of 0.75 eV , determine the position of the fermi level at $t=300$ k if $m_h=6m_e$.

Solution:

The fermi level for intrinsic semiconductor is given as,

$$E_F = \frac{E_C + E_V}{2} + \frac{3kT}{4} \ln\left(\frac{m_h}{m_e}\right)$$

where E_C is the conduction band, E_V is the valence band.

The bandgap is

$$E_g = E_C - E_V$$

If $E_V = 0$ eV

$$E_F = \frac{E_g}{2} + \frac{3kT}{4} \ln\left(\frac{m_h}{m_e}\right)$$

At $T = 300$ K, the value of $kT = 0.02586$ eV.

So,

$$E_F = \frac{0.75}{2} + \frac{3 \times 0.02586}{4} \ln(6) = 0.41 \text{ eV.}$$

Answer: The Fermi level is located 0.41 eV above the valence band.

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