HW11

20202041 Park, Nuri

In a 3D box, The eigen energy is

$$E_{l,m,n} = \frac{\hbar^2}{2m_{xx}}\frac{\pi^2}{L_x^2}l^2 + \frac{\hbar^2}{2m_{yy}}\frac{\pi^2}{L_y^2}m^2 + \frac{\hbar^2}{2m_{zz}}\frac{\pi^2}{L_z^2}n^2$$

We assume that $L_z \ll L_x$ & $L_z \ll L_y$. Since n makes big difference in the eigen energy, n values correspond to different subbands.

$$\frac{Total\ \#\ of\ e}{L_x L_y} = \sum_{n=1}^{\infty}\frac{1}{\pi}\frac{m_d}{\hbar^2}kTlog\left(1+\exp\left(-\frac{E_{z,n}}{kT}-\frac{E_f}{kT}\right)\right) = integrated\ e\ density$$

$$E_{z,n} = \frac{\hbar^2}{2m_{zz}}\frac{\pi}{L_z^2}n^2, m_d = \sqrt{m_{xx}m_{yy}}, m_{xx} = 0.19, m_{yy} = 0.19, m_{zz} = 0.91, L_z = 5 * 10^{-9}m.$$

Fermi energy : -0.3eV ~ + 0.1eV

**Result**