FIZ1951-MÜHENDİSLİK İÇİN YARIİLETKEN FİZİĞİ DERSİ FORMÜL KAĞIDI

$$I_{ort} = \frac{\Delta q}{\Delta t} \rightarrow \frac{c}{s}$$

$$l_{ani} = \frac{dq}{dt} \rightarrow A$$

$$I_{ani} = \frac{dq}{dt} \rightarrow A \qquad \underbrace{\begin{array}{c} (Yayılan\ fotonun\ frekansı)\\ v_{21} = \frac{E_2 - E_1}{h} \end{array}}_{l} = eA(\sqrt{\frac{D_p}{\tau_p}}p_{no} + \sqrt{\frac{D_n}{\tau_n}}n_{po})(e^{\frac{eV}{k_pT}} - 1)$$

$$\lim_{\vec{k} \in Kuantum \ verimi = \frac{J \ oton \ yayma \ nizi}{elektron \ sağlama \ hizi} \Rightarrow \vec{\theta} = \frac{-e\vec{E}\tau}{m_e^*} \quad \text{sürüklenme} \quad hizi \quad \mu = \frac{\vec{\theta}}{\vec{E}} = \frac{-e\tau}{m_e^*}$$

$$ec{E}=rac{V}{l}$$
 $\mu_{\mathcal{P}}=rac{\mathrm{e} au}{m_{\mathcal{P}}^*}$ $\mu_{n}=rac{\mathrm{e} au}{m_{\mathcal{E}}^*}$ $J_{p}=\mathrm{f}_{p}E=nq\mu_{p}E=pqv_{s}$ Boşluklar için akım yoğunluğu

$$\mu_n = \frac{e\tau}{m_e^*}$$

$$J_p = 6_p E = nq \mu_p E = pqv_s$$

Bosluklar icin akım yoğunluğu

$$J_n = 6nE = nq\mu_nE = nqv_s$$

Elektronlar için akım yoğunluğu

$$J = J_n + J_p = q(n\mu_n + p\mu_p)E$$

$$J = \sigma E$$

$$J = e(p\mu_p + n\mu_n) E$$

$$\vartheta_{th} = \frac{l}{\tau_c} \quad J_n = qD_n \frac{dn}{dx}$$

$$J_p = -qD_p \frac{dp}{dx} \quad \frac{kT}{2} = \frac{m^*\vartheta_{th}^2}{2} \quad D_n = \frac{kT}{q}\mu_n \Rightarrow = \mu_n\vartheta_t \quad D_p = \frac{kT}{q}\mu_p \Rightarrow = \mu_p\vartheta_t$$

$$J = \sigma E
J = e(p\mu_p + n\mu_n) E$$

$$\vartheta_{th} = \frac{l}{\tau_c}$$

$$J_n = qD_n \frac{dn}{dx}$$

$$J_p = -qD_p \frac{dp}{dx}$$

$$\frac{kT}{2} = \frac{m^* \vartheta_{th}^2}{2}$$

$$D_n = \frac{kT}{a} \mu_n \Rightarrow = \mu_n \vartheta_t$$

$$D_p = \frac{kT}{q} \mu_p \Rightarrow = \mu_p \vartheta_t$$

$$J_n = qn\mu_n E + qD_n \frac{dn}{dx}$$

$$J_{p} = qp\mu_{p}E - qD_{p}\frac{dp}{dx}$$

$$J_n = qn\mu_nE + qD_n\frac{dn}{dx}$$
 $J_p = qp\mu_pE - qD_p\frac{dp}{dx}$ $J_{toplam} = en\mu_nE + eD_n\frac{dn}{dx} + ep\mu_pE - eD_p\frac{dp}{dx}$

$$\frac{\mu_n}{D_n} = \frac{\mu_p}{D_p} = \frac{e}{k_B T}$$

$$\chi = \frac{C}{T}$$

$$F_B = F_E$$

$$\mu_o = 4\pi \times 10^{-7} \text{ H/m}$$

$$B \rightarrow Tesla$$
, $1T = 1N/A.m$
 $1T = 10^4$ Gauss (G)

$$\chi = \frac{C}{T - T_c}$$

$$\bullet \ qv_sB=qE_{Hall}$$

$$\chi = \frac{C}{T - T}$$

•
$$V_{Hatt} = E_{Hatt}W = v_sBW = \frac{I}{nqtw}BW = \frac{IB}{nqt}$$

• $E_{Hall} = v_s B$, $v_s = \frac{I}{nqA}$, A = t.W , $R_{Hall} = \frac{1}{nq}$

$$\begin{array}{c} \overrightarrow{M} = \overrightarrow{X}\overrightarrow{H} \\ \overrightarrow{H} = \mu_0 (1 + X) \\ \overrightarrow{B} = \mu_0 (1 + X) \overrightarrow{H} \end{array} \qquad \begin{array}{c} \mu = \mu_0 (1 + X) \\ \mu_r = \frac{\mu}{\mu_0} \\ I_S = \frac{A_E q D_n n_{p0}}{W} \end{array}$$

$$\mu = \mu_0(1 + X)$$

$$\mu_r = \frac{\mu}{\mu_0} I_S = \frac{A_c q D_n n_{p0}}{W}$$

•
$$V_{Hall} = R_{Hall} \frac{IB}{t}$$

which
$$\vec{M} = \frac{\vec{\mu}_{top}}{\vec{M}}$$

$$E = \frac{hc}{\lambda} \ ve \ E(eV) = \frac{1.24}{\lambda(\mu m)}$$

$$I_{\mathrm{B}} = \left(\frac{I_{\mathrm{S}}}{\beta}\right) e^{v_{\mathrm{BB}}/v_{\mathrm{T}}}$$

$$\beta = \frac{I_{\rm C}}{I_{\rm B}}$$

$$I_{\rm C}=I_{S}(e^{v_{\rm an}/v_{\tau}}-1),\,I_{\rm C}\gg I_{S}$$
 partille $I_{\rm C}=I_{S}e^{v_{\rm an}/v_{\tau}}$

$$\varepsilon_o = 8.85 x 10^{-12} \frac{F}{m}$$
, $\mu_o = 4 \pi x 10^{-7} \frac{N}{A^2}$, $h = 6.64 x 10^{-24} J.s$, $c = 3 x 10^8 \ m/s$
 $q = e = 1.6 x 10^{-19} C$, $k_B = 1.38 x 10^{-23} J/K$ $m_0 = 9.1 x 10^{-31} \ kg$

$$\alpha = \frac{4\Pi k}{\lambda} , \quad \alpha = A(h \mathcal{V} - E_g)^{\gamma}$$

$$\gamma = \frac{1}{2} \text{ direk bant aralıklı yarıiletkenlerde kullanılır}$$

$$\gamma = \frac{3}{2} \text{ indirek bant aralıklı yarıiletkenlerde kullanılır}$$

$$R = \frac{(n_r - 1)^2 + k^2}{(n_r + 1)^2 + k^2}$$

$$Valsayisi$$

$$I_l = I_0 exp(-\alpha l)$$

$$I_0 = I_0 exp(-\alpha l)$$

$$I_1 = I_0 exp(-\alpha l)$$

$$I_1 = I_0 exp(-\alpha l)$$

$$I_2 = I_0 exp(-\alpha l)$$

$$I_3 = I_1 = I_0 exp(-\alpha l)$$

$$I_4 = I_1 - I_1 = I_2 exp(-\alpha l)$$

$$I_5 = I_1 = I_1 - I_2 exp(-\alpha l)$$

$$I_7 = I_1 - I_2 exp(-\alpha l)$$

$$I_7 = I_1 - I_2 exp(-\alpha l)$$

$$I_8 = I_1 - I_1 - I_2 exp(-\alpha l)$$

$$I_8 = I_1 - I_1 - I_2 exp(-\alpha l)$$

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$$I_8 = I_1 - I_1 - I_2 ex$$

$$T = (1 - R^2) exp(-\alpha l)$$
Li Geniral Katsayısı malzene M

$$F_B = F_E$$

•
$$qv_sB = qE_{Hall}$$

•
$$E_{Hall} = v_s B$$
 , $v_s = \frac{I}{nqA}$, $A = t.W$, $R_{Hall} = \frac{1}{nq}$

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$$V_{Hall} = E_{Hall}W = v_sBW = \frac{l}{nqtw}BW = \frac{lB}{nqt}$$

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$$V_{Hall} = R_{Hall} \frac{IB}{t}$$

 Benzer denklemler p tipi yarıiletkenler için de türetilebilir.