Carrier Concentrations

Last updated 2/9/19

Carrier Concentrations

- Equilibrium – Simplified Carrier Concentrations

$$n = n_i^{(E_F - E_i)/KT}$$

$$p = n_i^{(E_i - E_F)/KT}$$

$$np = n_i^2$$

Carrier Concentrations

- Equilibrium – Charge Neutrality
  - Donor sites leave behind positively charged ions
  - Acceptor sites create negatively charged ions

$$qp - qn + qN_D^+ - qN_A^- = 0$$
$$p - n + N_D^+ - N_A^- = 0$$

  - Assuming full ionization

$$N_D^+ = N_D$$
$$N_A^- = N_A$$

$$p - n + N_D - N_A = 0$$

Carrier Concentrations

- Equilibrium – Doped Semiconductors
  - N-Type

$n = N_D$	Majority carrier
$p = n_i^2/N_D$	Minority carrier

  - P-Type

$p = N_A$	Majority carrier
$n = n_i^2/N_A$	Minority carrier