Dispositivos Fotovoltaicos: Materiais e Tecnologia

Série 2

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1. A silicon wafer is doped with 10^{16} arsenic atoms/cm^3. Find the carrier concentrations and the Fermi level at room temperature (300K).

2. The intrinsic temperature of a semiconductor is the temperature at which the intrinsic carrier concentration equals the impurity concentration. Find the intrinsic temperature for a silicon sample doped with 10^{15} phosphorus atoms/cm^3. Use Fig 1

3. A silicon sample at 300 K contains an acceptor impurity concentration of 10^{16} cm^{-3}. Determine the concentration of donor impurity atoms that must be added so that the silicon is n-type and the Fermi energy is 0.20 eV below the conduction band edge.

4. Find the electron and hole concentrations and Fermi level in silicon at 300 K
a) for 10^{15} boron atoms/cm^3
b) for 3 ×10^{16} boron atoms/cm3 and 2.9 ×10^{16} arsenic atoms/cm^3.

5. A Si sample is doped with 10^{17} Arsenic atoms/cm^3. What is the equilibrium hole concentration p_o at 300 K? Where is E_F relative to E_i?

6. Silicon at T=300K is uniformly doped with arsenic atoms at a concentration of 2x10^{16} cm^{-3} and boron atoms at a concentration of 1x10^{16} cm^{-3}.
a) Determine the thermal equilibrium concentrations of majority and minority carriers.

b) Repeat a) if impurity concentrations are 2x10^{15} cm^{-3} phosphorous atoms and 3x10^{16} cm^{-3} boron atoms