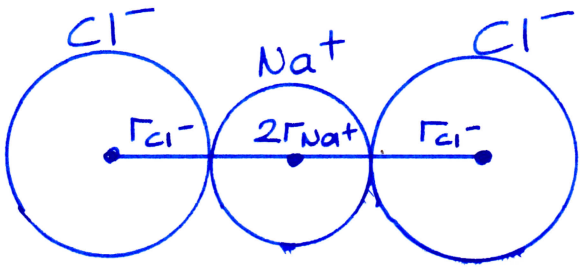
SOLUTIONS OF INCLASS #5

(1)



$$a = 2r_{Na^+} + 2r_{Cl^-}$$

$$\Sigma A_{Cl^-} = 35{,}45\ g/mol$$

$$\Sigma A_{Na^+} = 22{,}99\ g/mol$$

$$V_c = a^3 = (2r_{Na^+} + 2r_{Cl^-})$$

Theoretical density for NaCl:

$$\rho = \frac{n'(A_{Na^+} + A_{Cl^-})}{(2r_{Na^+} + 2r_{Cl^-})^3 \cdot N_A}$$

$$\rho = \frac{n' \cdot (22{,}99 + 35{,}45)}{\left[2 \cdot (0{,}102 \times 10^{-7}) + 2 \cdot (0{,}181 \times 10^{-7})\right]^3 \cdot (6{,}022 \times 10^{23})}$$

$n' \Rightarrow$ FCC structure for both Na^+ and Cl^-

$$n' = 4$$

$$\rho = 2{,}14\ g/cm^3$$

(2)

$$N = \frac{N_A \cdot \rho}{A_{K^+} + A_{Cl^-}}$$

$$N = \frac{(6{,}022 \times 10^{23}\ atom/mol)(1{,}955\ g/cm^3)\cdot(10^6\ cm^3/m^3)}{39{,}10\ g/mol + 35{,}45\ g/mol}$$

$$N = 1{,}58 \times 10^{28}\ \frac{\text{lattice point (kafes konumu)}}{m^3}$$

$$N_S = N \cdot \exp\left(\frac{-\theta_{fS}}{2kT}\right)$$

$$N_S = 1{,}58 \times 10^{28} \cdot \exp\left[\frac{-2{,}6\,eV}{(2)(8{,}62 \times 10^{-5}\,eV/K)(500+273K)}\right]$$

$N_S = 5{,}31 \times 10^{19}$ number of Schottky defects per cubic meter