

Question

What type of defect can arise when a solid is heated?

Answer:

Vacancy defect can arise when a solid is heated. Due to vacancy defect density of solid decreases.

Question

What type of stoichiometric defect is shown by

i) ZnS and ii) $AgBr$

Answer:

i) ZnS shows Frenkel defect

ii) $AgBr$ shows Frenkel as well as Schottky defect

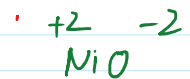
Question:

Analysis shows that nickel oxide has the formula

$Ni_{0.98}O_{1.00}$. What fractions of nickel exist as Ni^{2+}

and Ni^{3+} ions?

Answer:



Let formula of compound be $Ni_x Ni'_{0.98-x} O_{1.00}$.

where Ni has oxidation state of $+2$ and Ni' has oxidation state $+3$. Oxygen has oxidation state of -2 . As sum of oxidation states in a compound is zero.

$$x(+2) + (0.98-x)(+3) + 1(-2) = 0$$

$$x = 0.94$$

$$\text{Fraction of } Ni^{2+} = \frac{x}{0.98} = \frac{0.94}{0.98} = 0.96$$

$$\text{Fraction of } Ni^{3+} = 1 - 0.96 = 0.04$$

Question :

9F NaCl is doped with 10^{-3} mol% of SrCl_2 , what is the concentration of cation vacancies?

Answer:

When NaCl is doped with SrCl_2 , some of the sites of Na^+ ions are occupied by Sr^{2+} . Each Sr^{2+} replaces two Na^+ ions in order to maintain electrical neutrality. It occupies the site of one ion and the other site remains vacant. The cationic vacancies thus produced are equal in number to that of Sr^{2+} ions. Thus if NaCl is doped with 10^{-3} mol% of SrCl_2 , concentration of cationic vacancies is also 10^{-3} mol% i.e

10^{-3} mol vacancies per 100 mol NaCl

10^{-5} mol vacancies per 1 mol NaCl

$10^{-5} \times 6.022 \times 10^{23}$ " " /mol NaCl

6.022×10^{18} " " /mol NaCl.

Question

Explain how vacancies are introduced in an ionic solid when a cation of higher valence is added as an impurity in it.

Question

Ionic solids which have anionic vacancies due to metal excess defect, develop colour. Explain with help of suitable example.

Question

Explain the following terms with suitable examples:

i) Schottky defect ii) Frenkel defect iii) Interstitial

defect D) F-centre.