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Lecture for M. Sc. Physics IV Semester students

Paper-I: Condensed Matter Physics

Unit-2: Defects in Solid

Interstitial -

In this case there is presence of an extra atom somewhere in the interstice of the lattice but not in a regular lattice position. This may be an impurity atom or an atom of some type as the regular lattice atom.



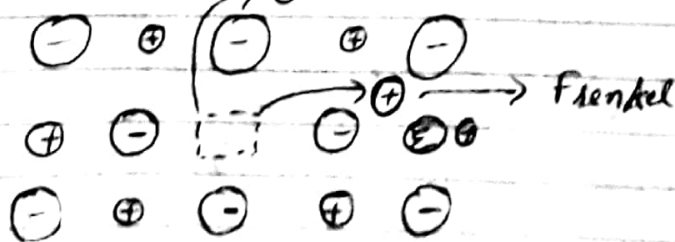
Vacancy :-

(i) Schottky Defects :-

Schottky defect is a defect in which atom or ion is found to be missing from its correct position. This defect is caused in a perfect crystal by transferring an atom from a lattice site in the interior to a lattice site on the surface of the crystal.

(ii) Frenkel Defect :-

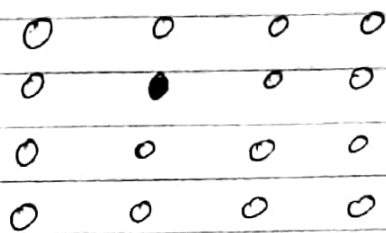
Frenkel defect is caused when an atom or ion leaves its normal lattice site & transferred to an interstitial position [a position not normally occupied by atom or ion.]



Schottky & Frenkel defects in an ionic crystal

Impurity:-

Impurity defect is caused by the presence of foreign atom in the lattice. It may be present at any interstitial position or at any substitutional position i.e., in place of any regular lattice site. In the latter case it is assumed to have the same valence shell configuration as that of the atom which is replaced.



Impurity defect.

The role of a dislocation in plastic deformation & crystal growth :-

The development of the theory of dislocation was given a great impetus by the consideration of strength of a perfect crystal. A crystal can be deformed ~~class~~ elastically by applying stresses on it, but it can regain its original condition when the stresses are removed. If the stresses applied be very large of the order of $10^6 - 10^7$ dyne/cm², then a small amount of deformation will be left on removing these stresses & the crystal is said to suffer a PLASTIC DEFORMATION. It will be seen that the atomic interpretation of the plastic flow of the crystal requires the introduction of a new type of defect called DISLOCATION.