



MATERIALS ENGINEERING

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Imperfection in solids

Imperfection in solids

• Any deviation from completely ordered arrangement of constituent particles in a crystal is called disorder or a defect.

- Point
- Line
- Interfacial
- Volume defects



Point Defect

- Also Known as zero-dimension defect
- Imperfect in point like region or another word only one to two atomic dimeters only.

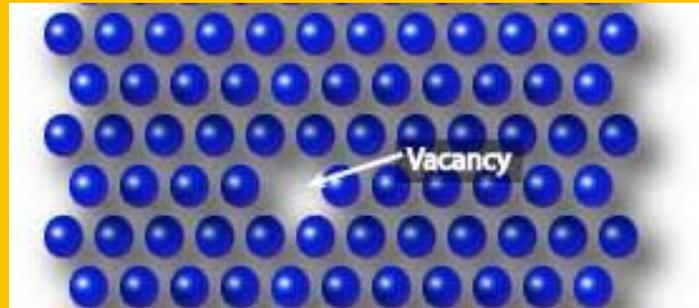
Sub types :

- Vacancy
- Substitutional Impurity
- Interstitial impurity
- Frenkel's defect
- Schottky's defect



Vacancy

Vacancies are empty spaces where an atom should be, but is missing.

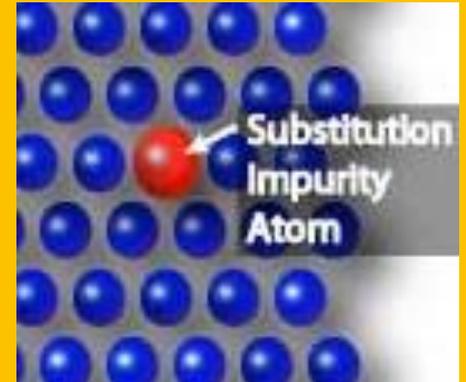


Substitutional Impurity

A substitutional impurity atom is an atom of a different type than the bulk atoms, which has replaced one of the bulk atoms in the lattice.

Note: *Substitutional impurity atoms are usually close in size*

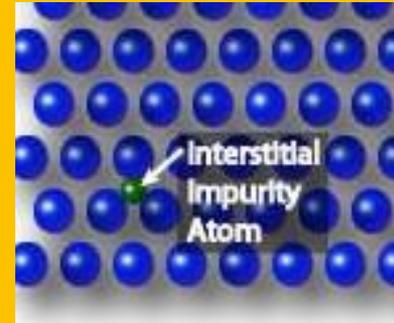
An example of substitutional impurity atoms is the zinc atoms in brass.



Interstitial impurity

Interstitial impurity atoms are much smaller than the atoms in the bulk matrix. Interstitial impurity atoms fit into the open space between the bulk atoms of the lattice structure.

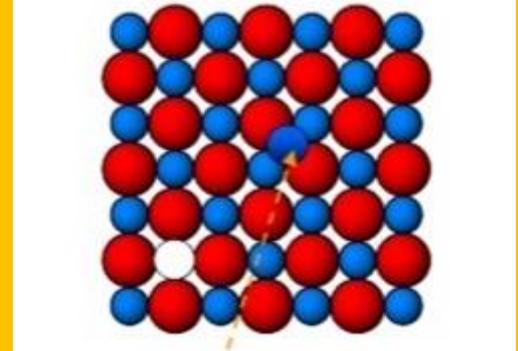
An example of interstitial impurity atoms is the carbon atoms that are added to iron to make steel.



Frenkel defect

An ion, displaced from a regular location to an interstitial location, In an ionic solid is called Frenkel's defect

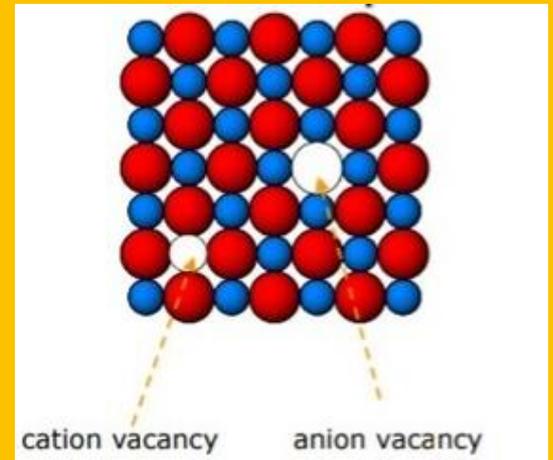
- *The presence of the defect does not change the overall electrical neutrality*
- *Density of crystal remain same*



Schottky's defect

When a pair of cation and anion are absent from a ionic crystal, the defect is called Schottky's defect

- *Electrical Neutrality remain unchanged*
- *Density Decreases*





References

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Thank You

