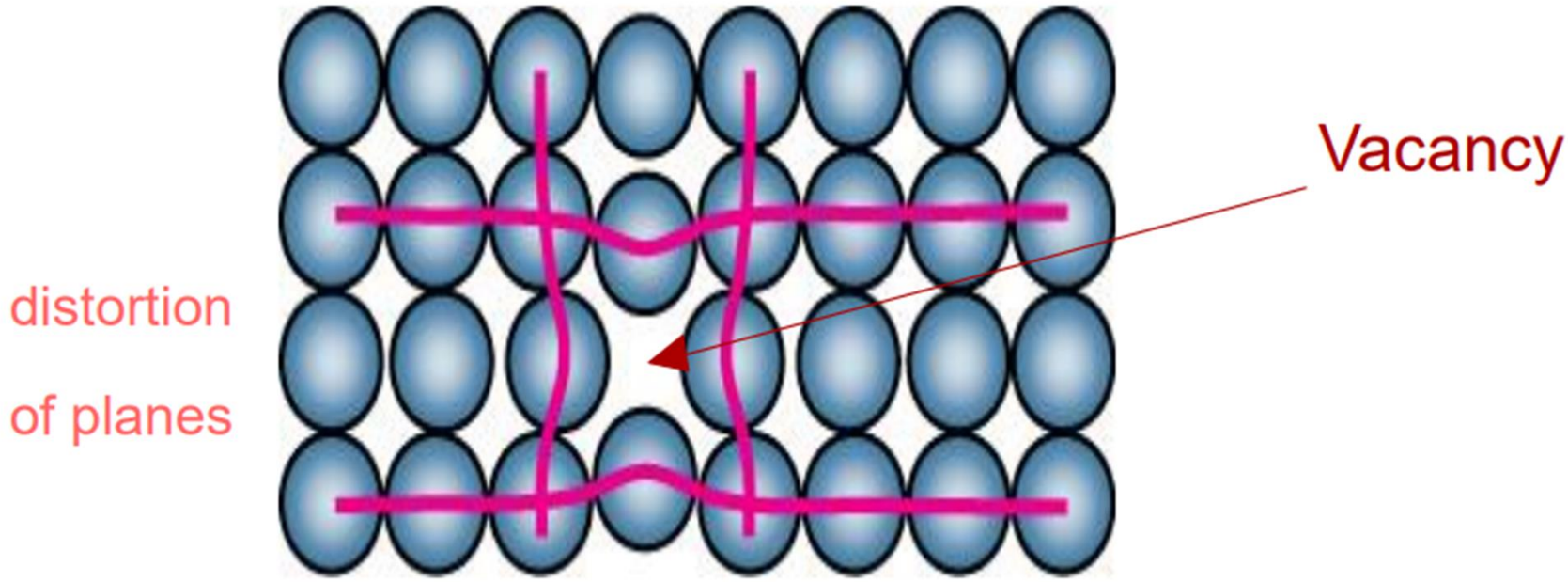
Vacancies

- A lattice position that is vacant because the atom is missing
- There are naturally occurring vacancies in all crystals
- The concentrations of vacancies increase with:

- increasing temperature
- decreasing activation energy

Vacancies

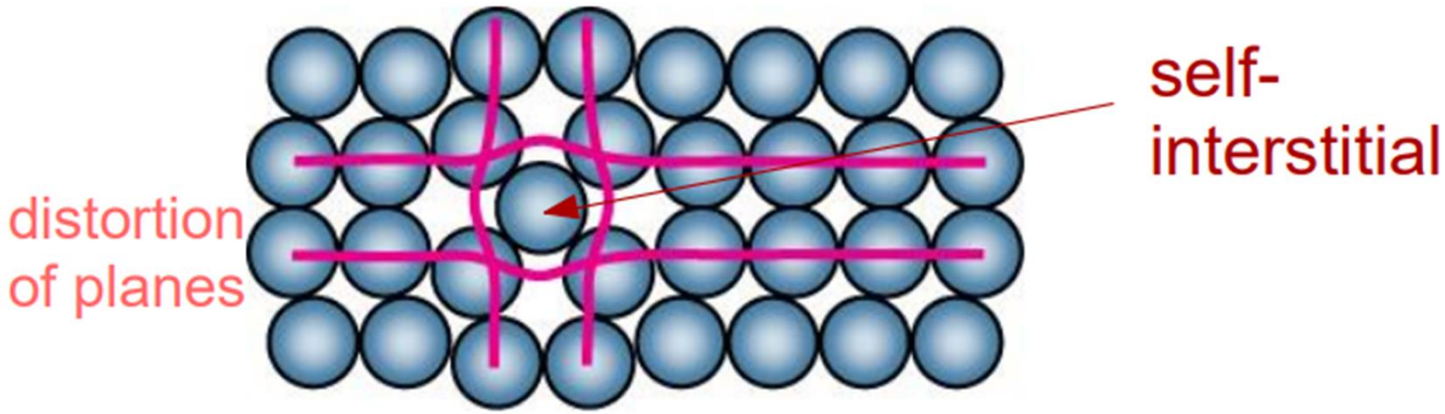
-vacant atomic sites in a structure.



Self-Interstitial

- If the matrix atom occupies its own interstitial site, the defect is called Self Interstitial.

- Self-interstitials in metals introduce large distortions in the surrounding lattice.



For Ionic Solids, Frenkel and Schottky defects are likely to form.

Schottky Defects

When cation vacancy is associated with anion vacancy, the defect is called Schottky Defect.

Frenkel Defects

When an atom leaves its regular site and occupy nearby interstitial site it gives rise to two defects i.e. one vacancy and other self interstitial these two defects are called as

2. ***Line Defects*** *(One dimensional)*

- A *dislocation* is a line discontinuity in the regular crystal structure.
- A part of the line will be missing from its regular site and this missing row is dislocation. The dislocation is centered along a line and hence the line defect is called dislocation.

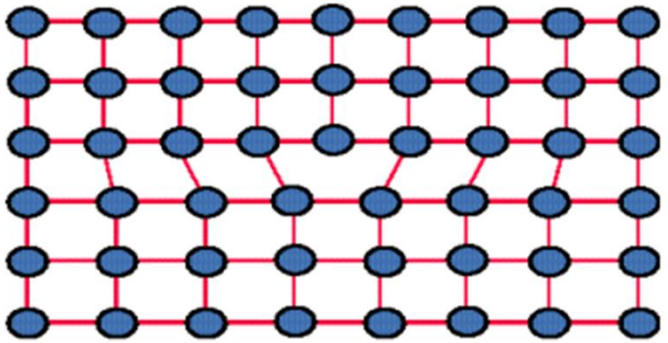
The dislocation is a boundary between the slipped and unslipped region and lies in the slip plane

- The structure and behaviour of dislocations affect many of the properties of engineering materials.
- There are two basic types:

1) Edge dislocations

2) Screw dislocations.

1) *Edge dislocation*



- An *Edge dislocation* in a metal may be regarded as the insertion (or removal) of an extra half plane of atoms in the crystal structure.
- In Ionic and Covalent solids edge dislocations involve extra half planes of *unit cells*.

- If we consider a perfect crystal to be made up of vertical planes parallel to one another and to the side faces. If one of these vertical planes does not extend from the top to the bottom of crystals but ends part way within crystal, it is called as edge dislocation.

2) Screw dislocation

- In screw dislocation ,there is transformation of successive atomic planes into the surface of helix around dislocation line due to shear stress i.e. it follows

  helical or *screw* path.

- A screw dislocation can be imagined as being produced by cutting the crystal partway through with a knife and then shearing one part of the crystal with respect to the other parallel to the cut.

- *Berger vector* is parallel to dislocation line.