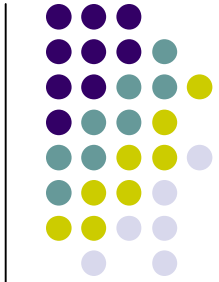
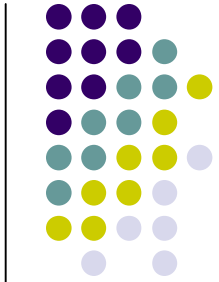


METALURGI FISIK

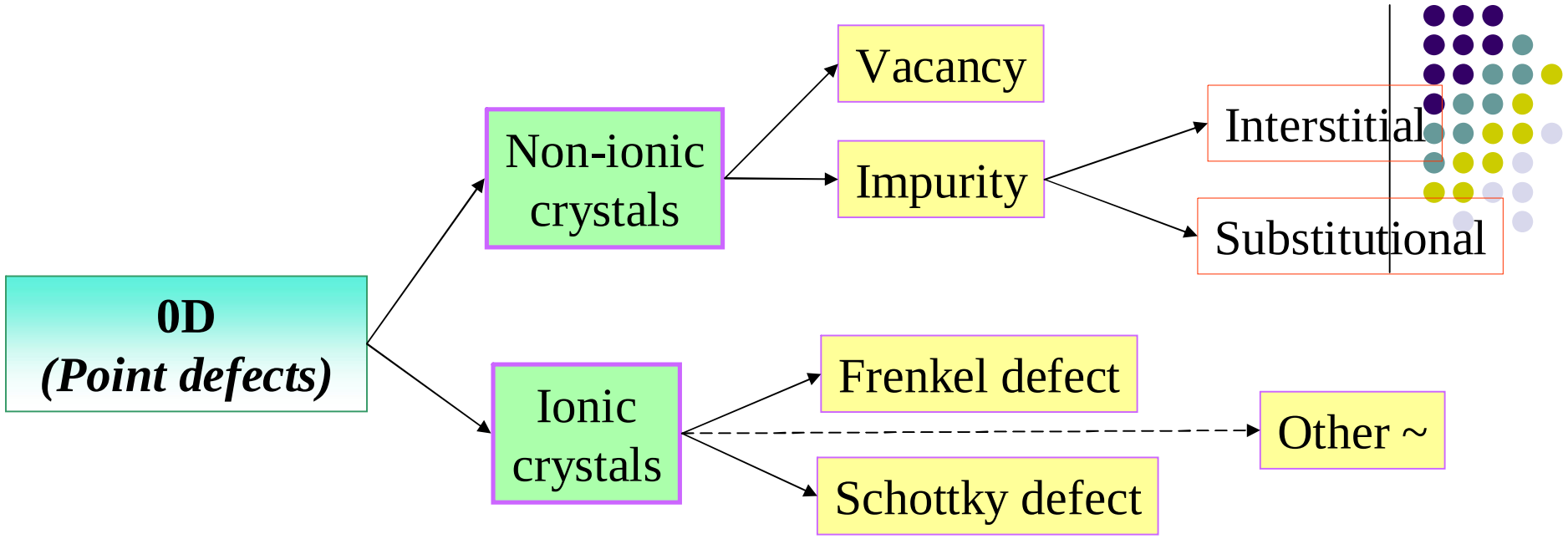
Cacat Kristal

Cacat Kristal



1. Ketidaksempurnaan kristal
2. Sejumlah cacat kecil dapat menyebabkan kristal logam 1000 x lebih ulet dari yang tanpa cacat
3. Terbentuk pola yang tidak berulang pada struktur kristal
4. Jenis cacat berdasarkan ukuran cacat :

   * cacat titik / point defects (0-Dimension)
   * cacat garis / Line defects (1-D)
   * cacat bidang / Interfacial defects (2-D)
   * cacat ruang / Bulk defects (3-D)



- Imperfect point-like regions in the crystal about the size of 1-2 atomic diameters

Cacat Titik :

Cacat yang disebabkan oleh adanya kekosongan/lolosnya atom dari susunannya

Penyebabnya :

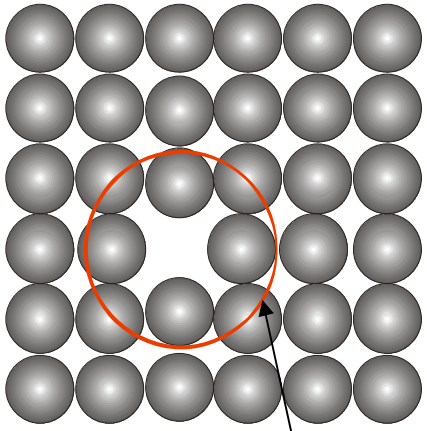
1. Tumpukan atom tidak sempurna selama proses kristalisasi
2. Akibat vibrasi atom pada saat penurunan suhu

Cacat titik dapat berupa:

Vacancy, Divacansy, dan Trivacancy

Vacancy

- Missing atom from an atomic site
- Atoms around the vacancy displaced
- Tensile stress field produced in the vicinity

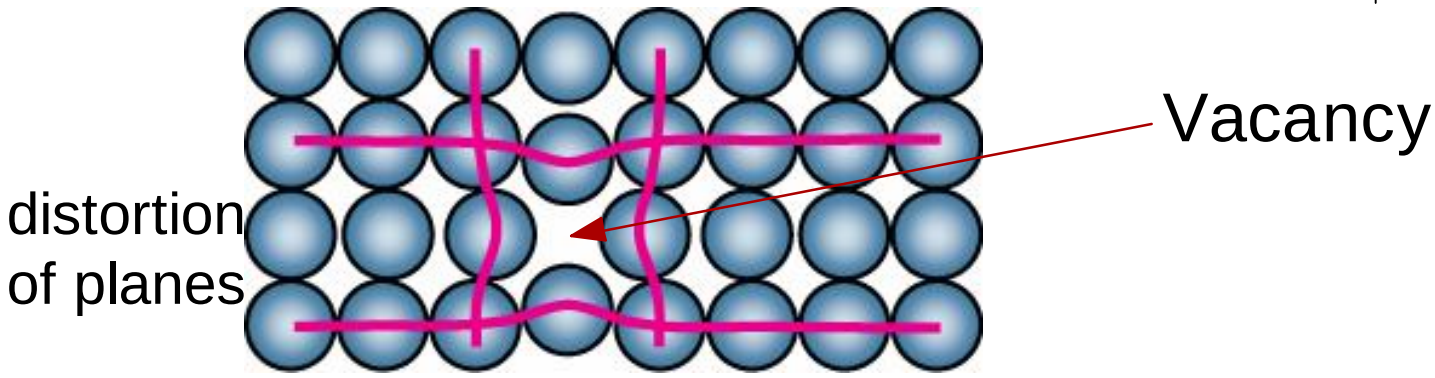


Tensile Stress Fields ?

Point Defects

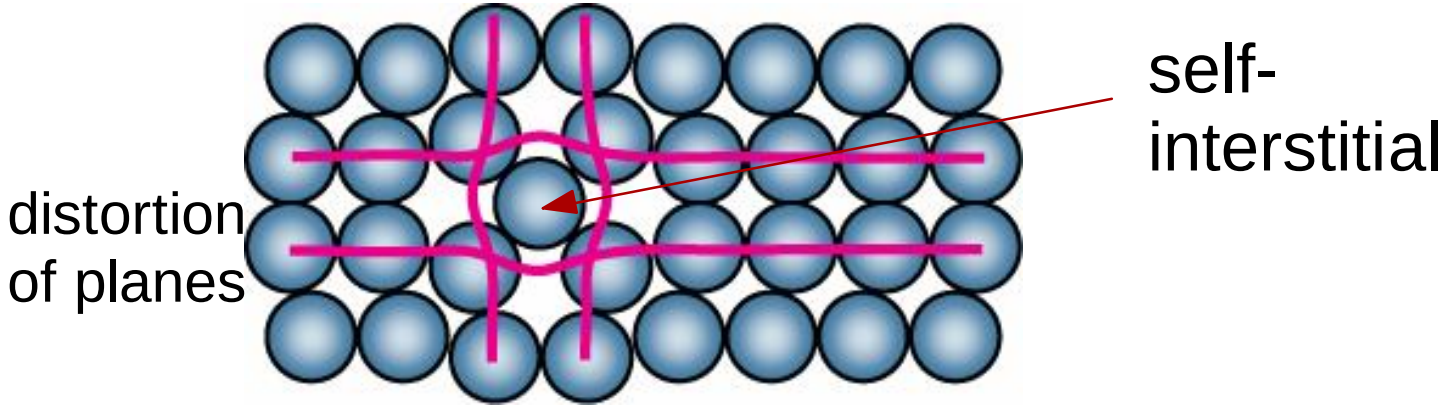
- Vacancies:

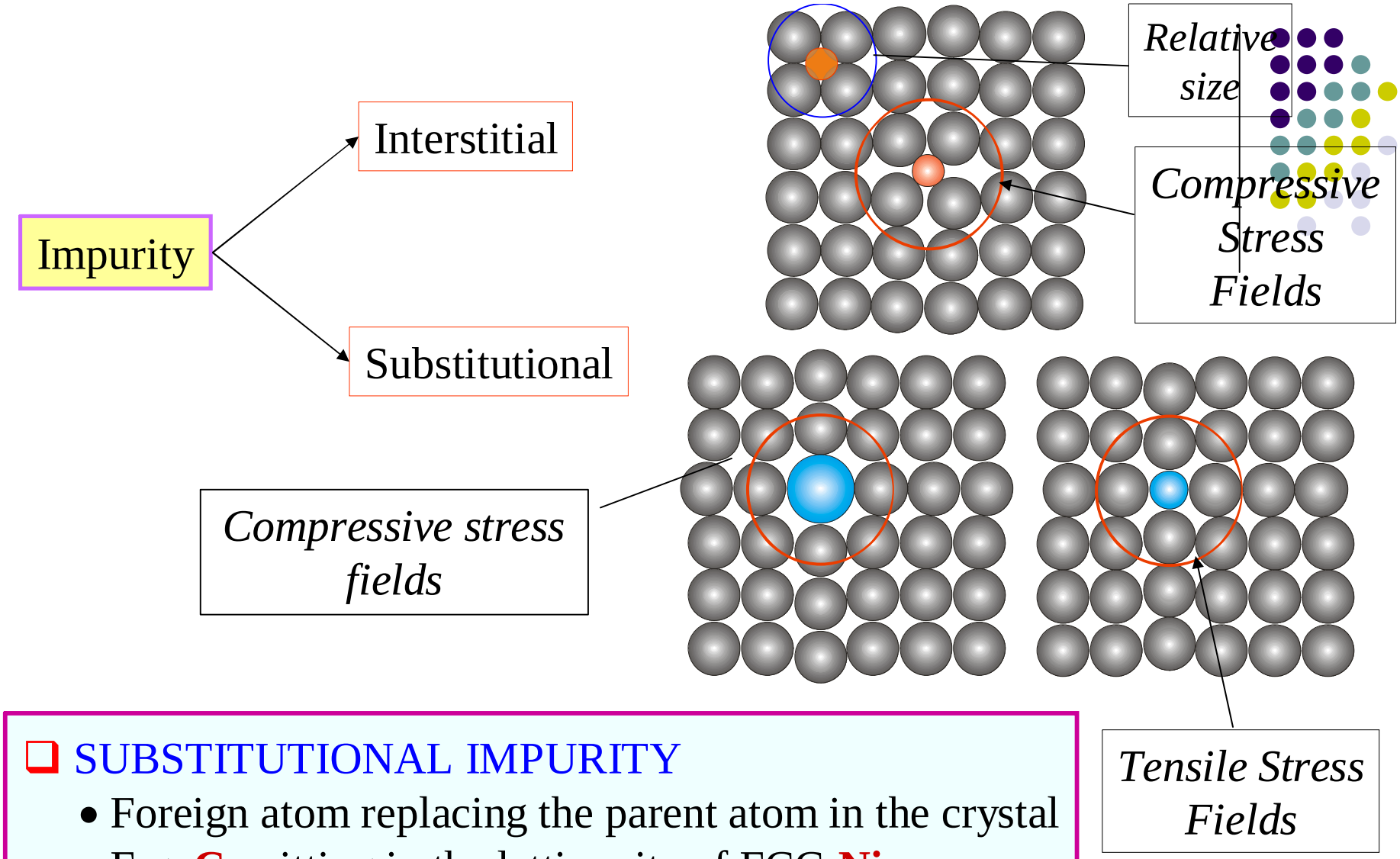
  -vacant atomic sites in a structure.



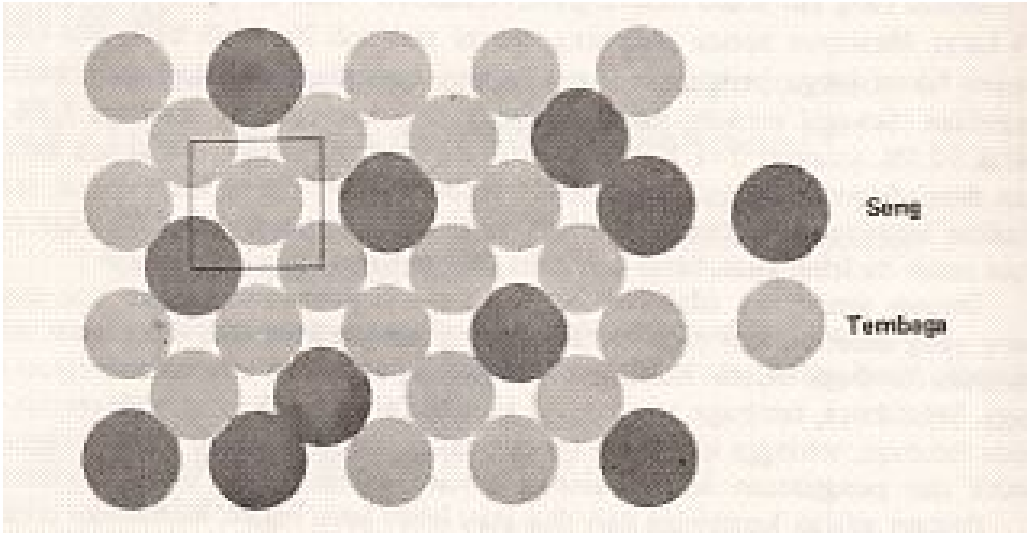
- Self-Interstitials:

  -"extra" atoms positioned between atomic sites.

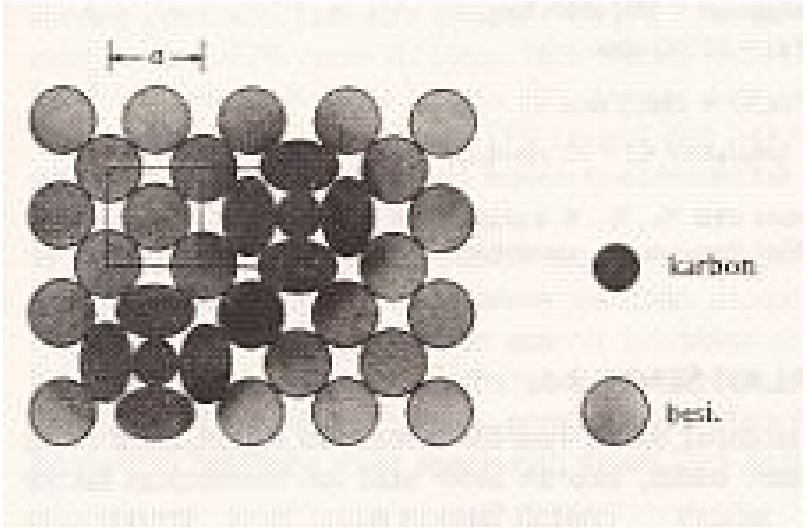




- SUBSTITUTIONAL IMPURITY
  - Foreign atom replacing the parent atom in the crystal
  - E.g. **Cu** sitting in the lattice site of FCC-**Ni**
- INTERSTITIAL IMPURITY
  - Foreign atom sitting in the void of a crystal
  - E.g. **C** sitting in the octahedral void in HT FCC-**Fe**



Larutan padat subsitusi



Larutan padat interstisi

Extrinsic defects (due to impurities)

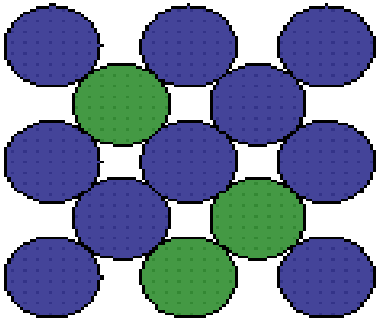
Impurities or ***dopants*** in a solid are any atom(s) of a type that do not belong in the perfect crystal structure (see 'extrinsic semiconductors')

The host crystal with impurities is called a ***solid solution***

Substitutional solid solutions

Impurity atoms occupy the same sites of the **host atoms**

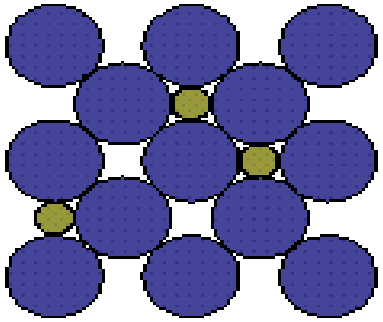
Impurities "substitute" for the host atoms



Interstitial solid solutions

Impurity atoms occupy interstices in the **host crystal** structure

Impurities usually have a small size compared to the host atoms

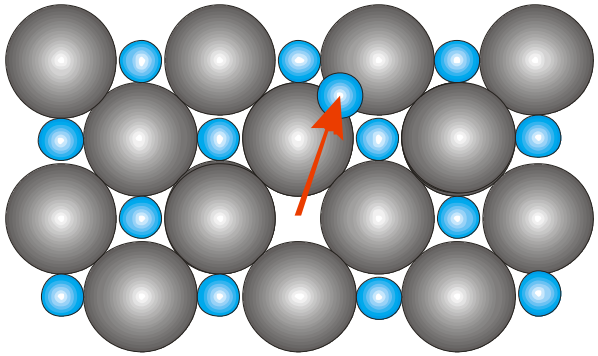


Ionic Crystals

- Overall electrical neutrality has to be maintained

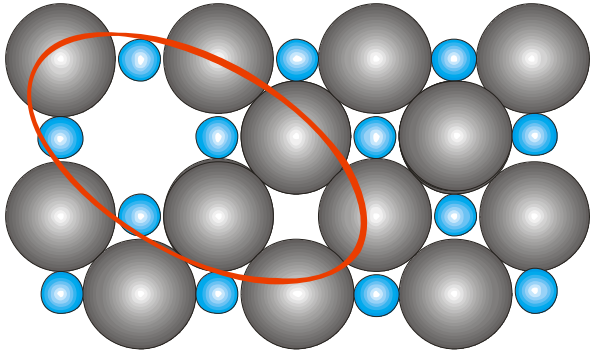
Frenkel defect

- Cation (being smaller get displaced to interstitial voids
- E.g. AgI, CaF_2

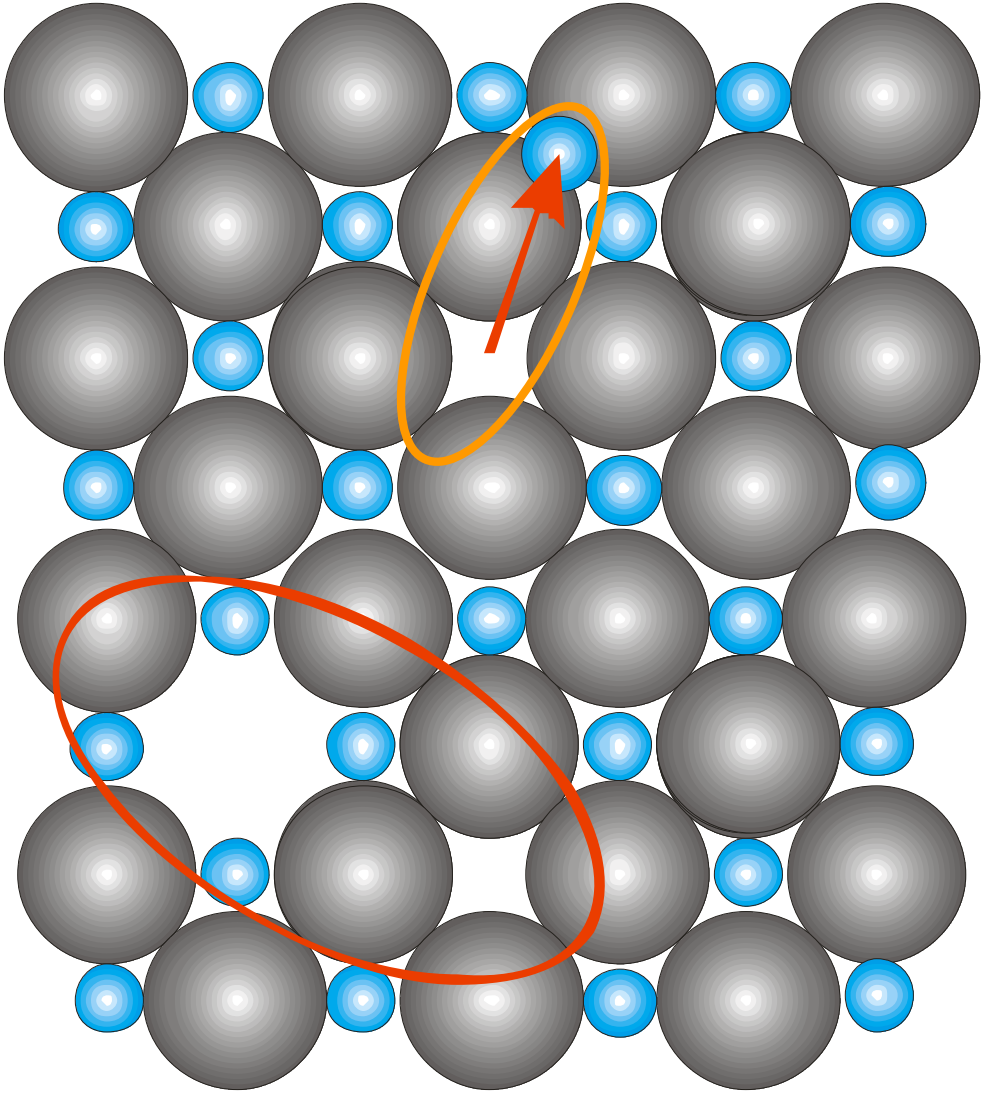


Schottky defect

- Pair of anion and cation vacancies
- E.g. Alkali halides



Defects in ionic solids



Frenkel defect

Cation vacancy
+
cation interstitial

Schottky defect

Cation vacancy
+
anion vacancy