~~Stoichiometric~~ - crystal defect

Imperfection from - ideal crystal structure

Stoichiometric → Point Defects (or) Common Defects

missing / Displacement / Extra

Non stoichiometric → Less Common Defects

- metal Excess
- metal Deficient

Cause

- imperfect packing during Crystalization
- Thermal vibrations at high T

- Schottky
- Frenkel

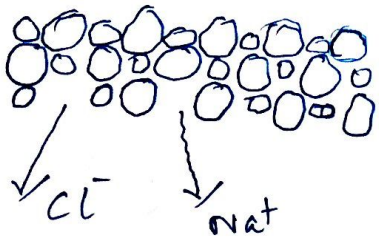
Schottky

Lattice points - Unoccupied - Vacant

CHARGE - Neutral

Ionic crystal — +ve -ve do not differ much in size

Na^+ Cl^-



Under e^- field

- ionic mobility
- Diffusion in solids.

Nat

Cl^- goes missing.

Frenkel

- ion occupies an interstitial position

Ex: AgBr

Ag^+ Br^- Ag^+ Br^- Ag^+ Br^-

Br^- Ag^+ Br^- Ag^+ Br^- Ag^+

Ag^+ Br^- (Agf) Br^- Ag^+ Br^-

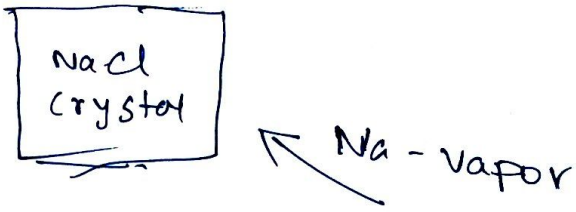
interstitial space rather than its own appropriate site

CHARGE - Remains Neutral

OCCUR — ⊖ve ions much larger than ⊕ve ion

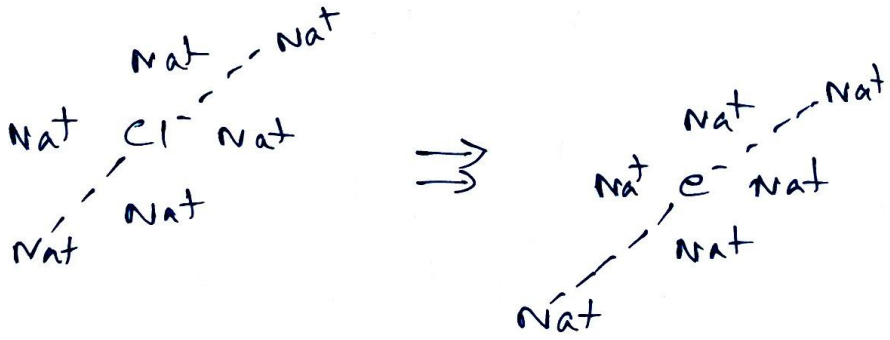
Non-stoichiometric – less common Defect

Metal Excess

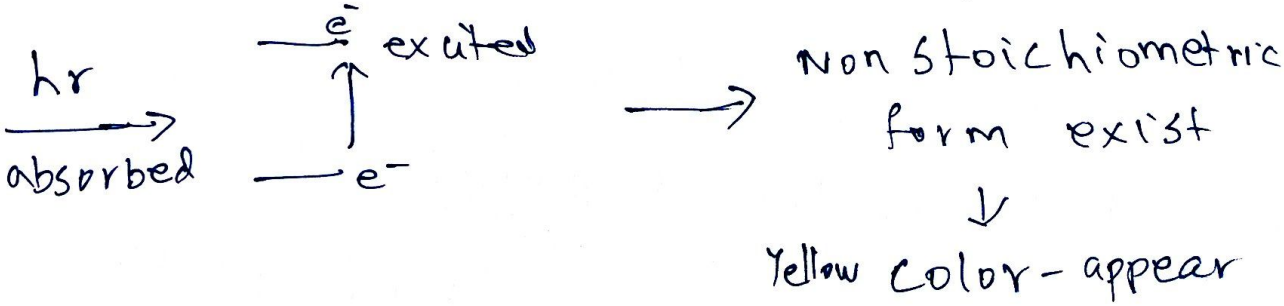


Na - metal gets doped

$$Na \longrightarrow Na^+ + e^- \quad \left[\begin{array}{l}\text{Crystal Energy} \\ \text{crystal stability}\end{array}\right]$$



e^- - Shared with 6 Na^+ - Delocalised



e^- - site → Color Centre / F-Centre

iii)

KCl → non-stoichiometric
magenta color

Metal Deficiency

(+)ve metal ion missing

charge balanced

Fe^{2+} O^{2-}

Fe^{2+} O^{2-} Fe^{2+} O^{2-} Fe^{2+} O^{2-}

O^{2-} Fe^{2+} O^{2-} Fe^{2+} O^{2-} Fe^{2+}

Fe^{2+} O^{2-} ⋱ O^{2-} Fe^{2+} O^{2-}

O^{2-} Fe^{3+} O^{2-} Fe^{3+} O^{2-} Fe^{2+}

vacant - created

Holes — lowers density / crystal Energy

more stable.