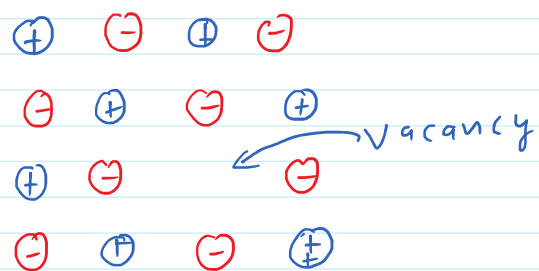


b) Impurity defects

If molten NaCl containing a little amount of SrCl_2 is crystallised, some of the sites of Na^+ ions are occupied by Sr^{2+} . Each Sr^{2+} replaces two Na^+ ions in order to maintain electrical neutrality. It occupies the site of one ion and the other site remains vacant. The cationic vacancies thus produced are equal in number to that of Sr^{2+} ions. Another similar example is the solid solution of CaCl_2 and AgCl.



c) Non - Stoichiometric defects

These disturb the stoichiometry of the crystalline substance. These defects are of two types:

- i) metal excess defect
- ii) metal deficiency defect

i) Metal excess defect

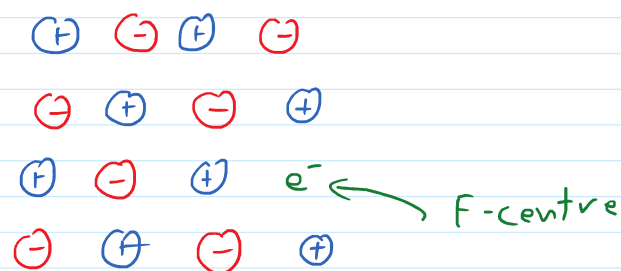
It is of following two types:

Metal excess defect due to anionic vacancies

Alkali halides like NaCl and KCl show this type of defect. When crystals of NaCl are heated in an atmosphere of sodium vapour, the sodium atoms are deposited on the surface of the

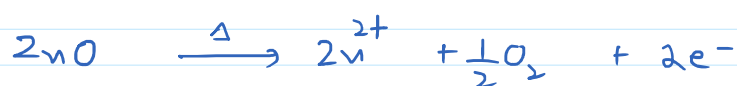
crystal. The Cl^- ions diffuse to the surface of the crystal and combine with Na atoms to give NaCl. This happens by loss of electron by sodium atoms to form Na^+ ions. The released electrons diffuse into the crystal and occupy anionic sites. As a result the crystal now has an excess of sodium. The anionic sites occupied by unpaired electrons are called F-centres (from the German word Farbenzenter for colour centre). They impart yellow colour to the crystals of NaCl. The colour results by excitation of these electrons when they absorb energy from the visible light falling on the crystals.

Similarly excess of lithium makes LiCl crystals pink and excess of potassium makes KCl crystals violet (or lilac)

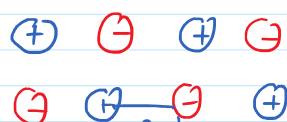


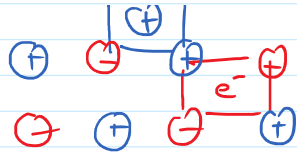
Metal excess defect due to the presence of extra cation at interstitial sites.

Zinc oxide is white in colour at room temperature. On heating it loses oxygen and turns yellow.



Now there is excess of zinc in the crystal and its formula becomes $2\text{Zn}_{1+x}\text{O}$. The Zn^{2+} ions move to interstitial site and the electrons to neighbouring interstitial site.





(ii) Metal deficiency defect

There are many solids which are difficult to prepare in the stoichiometric composition and contain less amount of the metal as compared to the stoichiometric proportion. A typical example of this type is FeO which is mostly found with a composition of $\text{Fe}_{0.95}\text{O}$. It may actually range from $\text{Fe}_{0.93}\text{O}$ to $\text{Fe}_{0.96}\text{O}$.

In crystals of FeO some Fe^{2+} cations are missing and the loss of positive charge is made up by the presence of required number of Fe^{3+} ions.

