

Schottky Defects

Basics

Historically, point defects in crystals were first considered in ionic crystals, not in the much simpler metal crystals. The reason was that some known properties of ionic crystals (e.g. their conduction mechanism by ion migration at high temperatures) could be understood for the first time in terms of point defects, while no special properties of metals (in the twenties) were in desperate need of an explanation.

- Since point defects in ionic crystals are charged, they only can come in pairs to maintain charge neutrality.

- **Schottky defects** then are differently charged pairs of vacancies, i.e. missing Na^+ and Cl^- ions in the **NaCl** crystal (the other principally possible pairing of point defects is described by [Frenkel defects](#)). Schottky defects are dealt with in [chapter 2.1.3](#).

- Since the number of atoms has to stay constant, no matter how many Schottky defects are present, the surplus atoms must be thought of as sitting on the surface - the crystal expands (measurably) when Schottky defects are formed!

Researchers with a chemical or ceramics background tend to classify all point defects in the category "Schottky" or "Frenkel".

- In this classification system, the simple (uncharged) vacancy in metals would be a Schottky defect.

- However, it is not always useful to force all possible point defect assemblies in the narrow corset of "Schottky" or "Frenkel". The general situation of arbitrary numbers of several different point defects will be dealt with in [chapter 2.2](#)