4.3. Specialities

Special Methods for Ionic Crystals

- In ionic crystals, experimental investigations must follow different routes.
  - The ∆l/l - ∆a/a method will not work *by definition* for Frenkel defects, where the concentrations of vacancies and interstitials are identical and the volume change zero.
  - It might work for Schottky defects and mixed defects. In the latter case, however, it will not be possible to obtain information for the individual point defect types involved because the measurement only gives integral numbers.
  - Quenching is difficult if not impossible, because ionic crystals are usually bad heat conductors; this will limit the quenching speed to useless values. In addition, ionic crystals tend to be brittle and they usually fracture upon quenching.
  - Positrons will also be trapped by the negatively charged ions, the technique is not applicable.
  - And last but not least: it is quite unlikely that what you find are *equilibrium* numbers anyway, because point defects in ionic crystals are so sensitive to deviations from stochiometry and so on.
- Fortunately, *there are methods specific for ionic and oxide crystals*; most prominent is the measurement of the ionic conductivity which is often mediated by point defects and therefore can be used to gather information about point defects.
  - Spectroscopic methods (ionic crystal are often transparent) may be applied, too.

Other Methods

- Since most properties of crystals are structure sensitive, many more methods exist that give some information about point defects. In what follows we give a list of some tools (which might be elaborated upon in due time):
  - **Deep level transient spectroscopy** (***DLTS***). This is a standard method for the investigation of impurity atoms in semiconductors.
  - **Electron spin resonance** (***ESR***)
  - **Infra red spectroscopy** (**IR** spectroscopy); especially in the form of **Fourier-transform IR-spectroscopy** (**FTIR**). The method of choice to investigate **O** and **C** in **Si**.