

4.3. Specialities

Special Methods for Ionic Crystals

- ▶ In ionic crystals, experimental investigations must follow different routes.
- The $\Delta l/l - \Delta a/a$ 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 stoichiometry 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 crystals 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**.