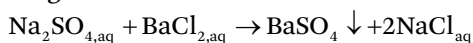


6.4.3 Reaction Crystallization, Precipitation and Drowning-out Crystallization

There are numerous processes, which comprise of a reaction step in direct combination with a crystallization step, see Table 6.1. In such processes the reaction time may be the determining step.

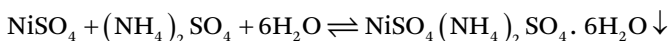
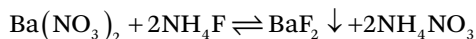
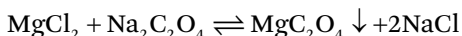
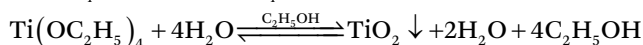
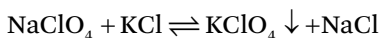
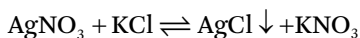
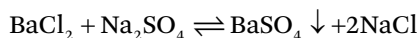
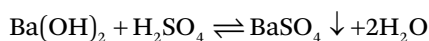
Nevertheless, there are many cases, where the reaction time is not pivotal, because of a rather high reaction rate. This is in particular true for ionic reactions. In this case, and if further on the product of this reaction is sparingly soluble, then the crystallizing substance is said to precipitate. Reaction crystallization and precipitation imply a chemical reaction between two well soluble educts producing the crystallizing substance *in situ*. If its solubility is low, then it will be highly supersaturated and “precipitate” rapidly at high nucleation rate and low particle size. An example is precipitation of BaSO₄ from aqueous Na₂SO₄- and BaCl₂-solution, where the BaSO₄-particles are obtained in the nanometer range.³⁹



A rather similar process for producing a crystalline product at high yield is achieved when adding an anti-solvent, for instance an alcohol, to the (aqueous) solution containing the dissolved substance. The anti-solvent reduces the solubility of this dissolved substance and “drowning-out” of this substance takes place. An example for drowning-out crystallization is the crystallization of sodium sulphate using methanol as the drowning-out agent.⁴⁰

Table 6.1 Examples of reaction crystallization processes.¹⁹

Homogeneous reaction



Heterogeneous reaction

