the enantiomers of asparagine monohydrate, we will essentially present results exploiting two coupled continuously operated fluidized bed crystallizers (FBC).

12.5.1 Resolution of DL-Threonine

L-Threonine belongs to the proteinogenic amino acids. It contains an uncharged polar side chain and is one of the nine essential amino acids that must be provided by proper nutrition, since humans and most other mammals are not able to synthesize them.[73] For this reason, it is often added to human food and animal feed as a dietary supplement and to improve the nutritional value.[74–76]

Because threonine contains two chiral centers, four stereoisomers occur, forming two isomeric pairs, namely L-threonine and D-threonine as well as L-*allo*-threonine and D-*allo*-threonine. The L-/D-threonine pair (L-/D-Thr) (Figure 12.13) was used in our crystallization studies.

12.5.1.1 Solubility Data for the DL-Threonine System

The threonine enantiomers form a racemic conglomerate, which makes the system a suitable candidate for PC based enantioseparation. The enantiomers D- and L-Thr were well characterized regarding their solubility limits in water.[77–79] Figure 12.14 presents solubility data determined in our group for the D-/L-Thr/water system for different temperatures in a ternary phase diagram. It is given in a three-dimensional representation using a triangular prism with the system components forming the apexes of the equilateral triangle of the prism's base and the temperature on the axis perpendicular to this triangle. The solubility isotherms depicted represent the ternary phase diagram of the system at the respective temperature as shown and discussed in Section 12.2.

12.5.1.2 Metastable Zone Width and Crystallization Kinetics

For this system, there are various data sets available regarding the metastable zone widths.[62,80] Furthermore, results of induction time measurements for primary nucleation were reported.[62] The results shown in Figure 12.15 indicate that for this system there is an attractive, sufficiently broad metastable

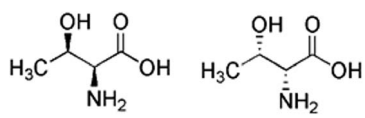

Figure 12.13 Structures of L-(2*S*,3*R*)-(−)-threonine and D-(2*R*,3*S*)-(+)-threonine (L-Thr and D-Thr).