



Figure 14.4 Typical phase diagram for a ternary eutectic system. Reproduced from ref. 15 with permission from Professor Stephen A. Nelson.

Further cooling of the solution below this temperature causes the crystallization of the second salt (B), thus resulting in the simultaneous crystallization of all three components. As the two salts and ice crystallize out, the liquid composition remains invariant until all the liquid solution has turned into the three solids.

The situation is complex in higher order systems. In this case the concentrations of non-crystallizing species increase and phase diagrams describing such systems become complicated. However, a point will be reached where all the various salts in solution will crystallize out at the eutectic composition and temperature of the specific multicomponent system. The removal of water in EFC, through ice crystallization, also concentrates salts whose solubilities are weak functions of temperature, such as CaCO_3 and CaSO_4 . These salts will therefore eventually precipitate out and this makes predicting the crystallizing salts, nucleation temperatures and the sequence of crystallization non-trivial.

14.2 Thermodynamic Modelling of EFC for Saline Streams

In order to deal with the complexity of many of these brines, accurate predictions using thermodynamic modelling software are an essential tool for process design. It is important to select the appropriate thermodynamic