

The Phase Diagram Studies on the 2-Amino-2-methyl-1, 3-propanediol(AMPL) and tris(hydroxymethyl)aminomethane(TRIS) Binary System

A temperature-composition equilibrium phase diagram of the 2-Amino-2-methyl-1, 3-propanediol(AMPL) and tris(hydroxymethyl)aminomethane(TRIS) binary system is developed. The component organic crystalline materials undergo solid-solid phase transitions and this property is used in the storage of thermal energy. The low temperature crystal structure of pure AMPL is monoclinic, and that of pure TRIS is orthorhombic. The low temperature phases are designated as α and β and the high temperature phases as γ and γ^1 respectively. The phase diagram of AMPL-TRIS was constructed using X-ray diffraction and differential scanning calorimetric (DSC) data. It was found that below ~ 75 °C, there is virtually no solubility of AMPL in TRIS or vice versa. The AMPL rich α phase transforms to an AMPL rich γ phase at ~ 75 °C. Between ~ 75 °C and 108 °C a wide $\beta+\gamma$ phase region is observed. The maximum solubility of TRIS in AMPL is 11% TRIS at 73 °C and that of AMPL in TRIS is 34% AMPL at ~ 125 °C. The phase diagram exhibits two eutectoidal transformations at 73 °C ($\gamma \rightarrow \alpha+\beta$) and at 108 °C ($\gamma^1 \rightarrow \beta+\gamma$) respectively. The phase diagram also exhibits a peritectic transformation at 128 °C ($L+\gamma^1 \rightarrow \gamma$). A two phase region with $\gamma + \gamma^1$ plastic phases rich in TRIS and AMPL is also observed between 108 °C and 128 °C. Lattice expansions have also been performed on AMPL detailing the transformation from monoclinic to cubic cell.