

Plane Front Directional Solidification Experiments for Thermochemical Databases

ANDREA LOEFFLER

Institute of Materials Science and Technology, Friedrich-Schiller-Universität Jena, Germany

Abstract

Plane front directional solidification experiments were carried out using a modified Bridgman set-up. By applying suitable experimental parameters, solidification conditions are obtained which are essentially the Scheil conditions.

From the concentration distributions of the alloying elements in the solidified samples, tie lines along the solidification path are determined. Both the resulting concentration distribution and the phase composition along the sample are directly comparable to the results of Scheil simulation calculations and can thus be used to evaluate and subsequently improve thermochemical databases for multicomponent systems.

Additionally, the presented method allows a selective preparation of bulk phases including incongruently melting intermetallic phases. As an example microstructures of a quaternary alloy in the system Al-Cu-Mg-Si system are shown.

Composition and peritectic temperature for the quaternary phase (Q-phase) are determined from a sample prepared with the presented method. With the newly found data an improved dataset for the phase was obtained.