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Determination of the reaction scheme in ternary systems.
Strategies to reduce the experimetal data required

To describe any ternary system for which the binary boundary systems are established, the ternary phases occurring and their stability with respect to composition and temperature needs to be known.

The original approach to determine experimentally one (or more) isothermal sections plus several vertical sections always was seen most reliable, but very time consuming and thus tedious and expensive. And with the number of ternary phases increasing, the experimental effort required to obtain a complete reaction scheme (Scheil diagram) increases beyond proportion.

CALPHAD type modeling is considered a suitable substitute for much of the experiments once the phases occurring and their (free) energy of formation are determined by experiment or from ab initio calculation. Though this method is not much less time consuming, the results suffer from lack of confidence unless the reaction scheme obtained is experimentally verified.

As an alternative we employ a purely experiment based strategy with reduced need for experimental data. For establishing the reaction scheme in complex systems it takes advantage of the Gibbs phase rule and other constraints. The presentation will give several examples, how to obtain descriptions of ternary metallic systems over the entire composition and temperature range from modest sets of experimental data.