

## **CALPHAD modeling - Fundamentals and applications**

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Over the last decades the thermodynamics of innumerable multi-component systems have been assessed using the CALPHAD-approach. and thermodynamic model parameters have been included in thermodynamic databases that are still growing.

Soon after the CALPHAD-approach had been well-established for conventional thermodynamic assessments, its extension towards more sophisticated problems was ambitiously aspired. Among these are the thermodynamic modeling of oxygen and cationic nonstoichiometries in oxides, magnetic transitions, and ordering phenomena. Nowadays even the thermodynamic description of metastable phases can be realized using results of first principles calculations.

Linking thermodynamic databases with mobility databases and nucleation theory, predictions on complex precipitation processes in alloys can be done that are firmly based on physical foundations.

The presentation will lead from the fundamentals of the CALPHAD-approach via examples of sophisticated thermodynamic modeling to applications in the fields of solid oxide fuel cell research and early precipitations in Aluminium alloys.