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THE THIRD LAW OF THERMODYNAMICS: PHASE EQUILIBRIA AND PHASE DIAGRAMS AT LOW TEMPERATURES

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ABSTRACT

Great progress has been made over the recent decades in the application of computational thermodynamics (Calphad) and theoretical methodologies (CVM) including so-called first principles approaches to modeling thermodynamic properties and the calculation of phase diagrams of materials. The aim of this paper is to call attention to considerations of the THIRD LAW OF THERMODYNAMICS when evaluating these results when applied to low temperature phase equilibria. In this effort we call attention to the essential content of the modern version of this third principle of thermodynamics using an historical and pedagogical approach. An appreciation of the constraints of the THIRD LAW is shown to be valuable in projecting possible low temperature phase fields and boundaries and predicting thermodynamically consistent phase diagram configurations as $T \rightarrow 0K$. The ideas of Simon regarding aspects or subsystems are shown to be of paramount importance in assessing the thermodynamic properties of materials at low temperatures.

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