

<<相图边界理论及其应用>>

图书基本信息

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前言

The phase diagram is one of the most extensively used disciplines in the Applied Sciences. They are relevant to different areas both in science and engineering, as well as to the various branches of the national economy. In many scientific and technical specialties, such as physics, chemistry, geology, materials science and technology, chemical engineering, etc, it is easy to find its application that strongly shows the importance of phase diagram in the science and technology today. In the early stages of development, phase diagrams were mainly obtained from experimental measurements. With the increasing number of the system components as well as the severe demands placed on experimental materials requiring corrosion-resistant, heat-resistant, etc, the experimental methods were no longer able to meet these requirements, especially with respect to generating multi-component phase diagrams. The theoretical calculation of phase diagram has now become the principal method for obtaining the desired phase diagrams. This route has been especially favored by the rapid advance of research and development in computer science and technology that induced the “art” of phase diagram calculation to a new level. Under these circumstances, the continuing research on the theory of phase diagrams has recently and naturally become the topic of great and lasting interest, to both applied scientists and engineers alike.

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内容概要

The Boundary Theory of Phase Diagrams and Its Application Rules for Phase Diagram Construction with Phase Regions and Their Boundaries presents a novel theory of phase diagrams. Thoroughly revised on the basis of the Chinese edition and rigorously reviewed, this book inspects the general feature and structure of phase diagrams, and reveals that there exist actually two categories of boundaries. This innovative boundary theory has solved many difficulties in understanding phase diagrams, and also finds its application in constructing multi-component phase diagrams or in calculating high-pressure phase diagrams. Researchers and engineers as well as graduate students in the areas of chemistry, metallurgy and materials science will benefit from this book. Prof. Muyu Zhao was the recipient of the 1998 Prize for Progress in Science and Technology (for his work on the boundary theory of phase diagrams) awarded by the National Commission of Education, China, and many other prizes.

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章节摘录

插图 : Chapter 1 The Phase Rule, Its Deduction and Application 1.1 Why do We Discuss the Phase Rule at First The Gibbs phase rule is now a long established principle of Chemistry, very well known by all physical chemists and materials scientists. So, why do we still need to write a chapter to discuss this classic, fundamental law of Chemical science, at the outset of this treatise ?

Textbooks, as published for the explanation of physical chemistry and the use of phase diagrams, usually present only a simple method for the "deduction" of the phase rule. However, the original "rule" as deduced by Gibbs himself, is both strict and well thought-out, indeed students can learn much from his method. The Gibbs-Roozebooms method, though simple, is, nevertheless, full of wisdom. The deduction of the phase rule under the circumstance, involving particular chemical reactions, by application of the mathematic method of Gibbs free energy minimization, is today, only presented in a few monographs. By means of this method however, both the phase rule, and the law of mass action used for the chemical equilibrium, are successfully deduced. This is indeed a very interesting circumstance. When applying the phase rule, an important and difficult problem to treat is the determination of the number of independent components involved. Generally, ordinary Physical Chemistry texts only present Jouguet's method for the deduction of this number and do not discuss either the strengths and or the shortcomings, of this method. Here, we present another useful approach, i.e. that of the Brinkley's method and these two methods will be shortly compared in detail. The application of the phase rule is generally not a very easy task, so here we will also address some brief remarks to the resolution of this problem. Usually, we apply the phase rule and then discuss the differences between the phase rule predictions and our theory, as set out in detail in Chapter 2. Therefore, at first, a special introductory chapter is now provided, being devoted to a discussion of the phase rule.

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