

# Equilibrium Thermodynamics In Petrology

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this book presents the fundamental principles of thermodynamics for geosciences based on the author's own courses over a number of years many examples help to understand how mineralogical problems can be solved by applying thermodynamic principles

today large numbers of geoscientists apply thermodynamic theory to solutions of a variety of problems in earth and planetary sciences for most problems in chemistry the application of thermodynamics is direct and rewarding geoscientists however deal with complex inorganic and organic substances the complexities in the nature of mineralogical substances arise due to their involved crystal structure and multicomponental character as a result thermochemical solutions of many geological planetological problems should be attempted only with a clear understanding of the crystal chemical and thermochemical character of each mineral the subject of physical geochemistry deals with the elucidation and application of physico chemical principles to geosciences thermodynamics of mineral phases and crystalline solutions form an integral part of it developments in mineralogical thermodynamics in recent years have been very encouraging but do not easily reach many geoscientists interested mainly in applications this series is to provide geoscientists and planetary scientists with current information on the developments in thermodynamics of mineral systems and also provide the active researcher in this rapidly developing field with a forum through which he can popularize the important conclusions of his work in the first several volumes we plan to publish original contributions with an abundant supply of background material for the uninitiated reader and thoughtful reviews from a number of researchers on mineralogical thermodynamics on the application of thermochemistry to planetary phase equilibria including

meteorites and on kinetics of geochemical reactions

this textbook and reference outlines the fundamental principles of thermodynamics emphasizing applications in geochemistry the work is distinguished by its comprehensive balanced coverage and its rigorous presentation the authors bring years of teaching experience to the work and have attempted to particularly address those areas where other texts on the subject have provided inadequate coverage a thorough review of the necessary mathematics is presented early on both as a refresher for those with a background in university calculus and for the benefit of those coming to the subject for the first time the text is written for students in advanced undergraduate or graduate level geochemistry as well as for all researchers in this field

thermodynamic treatment of mineral equilibria a topic central to mineralogical thermodynamics can be traced back to the turn of the century when j h van t hoff and his associates pioneered in applying thermodynamics to the mineral assemblages observed in the stassfurt salt deposit although other renowned researchers joined forces to develop the subject h e boeke even tried to popularize it by giving an overview of the early developments in his *grundlagen der physikalisch chemischen petrographie* berlin 1915 it remained on the whole an esoteric subject for the majority of the contemporary geological community seen that way mineralogical thermodynamics came of age during the last four decades and evolved very rapidly into a mainstream discipline of geochemistry it has contributed enormously to our understanding of the phase equilibria of mineral systems and has helped put mineralogy and petrology on a firm quantitative basis in the wake of these developments academic curricula now require the students of geology to take a course in basic thermodynamics traditionally offered by the departments of chemistry building on that foundation a supplementary course is generally offered to familiarize the students with diverse mineralogical applications of thermodynamics this book draws from the author's experience in giving such a course and has been tailored to cater to those who have had a previous exposure to the basic concepts of chemical thermodynamics

cd rom contains many animations that deal with three dimensional concepts brief text pages for 104 of the most common minerals diagrams illustrations etc

provides a general introduction to mineralogy through a study of basic concept principles and techniques of the discipline and also through focused analysis of specific minerals explains the relationship between chemical composition internal structure and physical properties of crystalline matter

volume 8 of reviews in mineralogy deals with both descriptions of the kinetics of geochemical processes the phenomenological and the atomistic the former relies on macroscopic variables e g temperature or concentrations to describe the rates of

volcanoes are unquestionably one of the most spectacular and awe inspiring features of the physical world our paradoxical fascination with them stems from their majestic beauty and powerful sometimes deadly destructiveness notwithstanding the tremendous advances in volcanology since ancient times some of the mystery surrounding volcanic eruptions remains today the encyclopedia of volcanoes summarizes our present knowledge of volcanoes it provides a comprehensive source of information on the causes of volcanic eruptions and both the destructive and beneficial effects the early chapters focus on the science of volcanism melting of source rocks ascent of magma eruption processes extraterrestrial volcanism etc later chapters discuss human interface with volcanoes including the history of volcanology geothermal energy resources interaction with the oceans and atmosphere health aspects of volcanism mitigation of volcanic disasters post eruption ecology and the impact of eruptions on organismal biodiversity provides the only comprehensive reference work to cover all aspects of volcanology written by nearly 100 world experts in volcanology explores an integrated transition from the physical process of eruptions through hazards and risk to the social face of volcanism with an emphasis on how volcanoes have influenced and shaped society presents hundreds of color photographs maps charts and illustrations making this an aesthetically appealing reference glossary of 3 000 key terms with definitions of all key vocabulary items in the field is included

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