

Solution Of Thermodynamics Gaskell

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Materials Thermodynamics Y. Austin Chang 2010-01-26 A timely, applications-driven text in thermodynamics *Materials Thermodynamics* provides both students and professionals with the in-depth explanation they need to prepare for the real-world application of thermodynamic tools. Based upon an actual graduate course taught by the authors, this class-tested text covers the subject with a broader, more industry-oriented lens than can be found in any other resource available. This modern approach: Reflects changes rapidly occurring in society at large—from the impact of computers on the teaching of thermodynamics in materials science and engineering university programs to the use of approximations of higher order than the usual Bragg-Williams in solution-phase modeling Makes students aware of the practical problems in using thermodynamics Emphasizes that the calculation of the position of phase and chemical equilibrium in complex systems, even when properly defined, is not easy Relegates concepts like equilibrium constants, activity coefficients, free energy functions, and Gibbs-Duhem integrations to a relatively minor role Includes problems and exercises, as well as a solutions manual This authoritative text is designed for students and professionals in materials science and engineering, particularly those in physical metallurgy, metallic materials, alloy design and processing, corrosion, oxidation, coatings, and high-temperature alloys.

Introduction to Metallurgical Thermodynamics David R. Gaskell 1981

Engineering and Chemical Thermodynamics Milo D. Koretsky 2012-12-17 Chemical engineers face the challenge of learning the difficult concept and application of entropy and the 2nd Law of Thermodynamics. By following a visual approach and offering qualitative discussions of the role of molecular interactions, Koretsky helps them understand and visualize thermodynamics. Highlighted examples show how the material is applied in the real world. Expanded coverage includes biological content and examples, the Equation of State approach for both liquid and vapor phases in VLE, and the practical side of the 2nd Law. Engineers will then be able to use this resource as the basis for more advanced concepts.

Basic Engineering Circuit Analysis J. David Irwin 2006-05-05

Advances in Physical Geochemistry Surendra K. Saxena 2012-12-06 The second volume of this series consists of three parts. Part I focuses on the research on intracrystalline reactions. This work, which began nearly two decades ago, is critically reviewed by Ghose and Ganguly in Chapter 1. Besides the review, the authors include some of their previously unpublished work to demonstrate how future research could aid in obtaining data on thermodynamics of solid solutions and in understanding the cooling history of igneous and metamorphic rocks. The latter is also the theme adopted by Kretz in the second chapter, which examines the redistribution of Fe and Mg in coexisting silicates during cooling. Chapter 3 contains new data on Fe-Mg distribution in clinopyroxenes. Dal Negro and his co-authors have selected a series of clinopyroxenes from volcanic rocks and present site occupancy data on several clinopyroxenes of intermediate compositions. The data set has not been published before and is the first of its kind. Part II of this book begins with a chapter on melts by Gaskell, who explores the relationship between density and structure of silicate melts. This is followed by the synthesis of data generated in the U.S.S.R. by Shmulovich and his co-authors on fluids. Blencoe, Merkel and Seil present a thorough analysis of the phase equilibrium data on feldspars coexisting with fluids in the third chapter in this part.

Structure of Materials Marc De Graef 2012-11-15 This highly readable, popular textbook for upper undergraduates and graduates comprehensively covers the fundamentals of crystallography and symmetry, applying these concepts to a large range of materials. New to this edition are more streamlined coverage of crystallography, additional coverage of magnetic point group symmetry and updated material on extraterrestrial minerals and rocks. New exercises at the end of chapters,

plus over 500 additional exercises available online, allow students to check their understanding of key concepts and put into practice what they have learnt. Over 400 illustrations within the text help students visualise crystal structures and more abstract mathematical objects, supporting more difficult topics like point group symmetries. Historical and biographical sections add colour and interest by giving an insight into those who have contributed significantly to the field. Supplementary online material includes password-protected solutions, over 100 crystal structure data files, and Powerpoints of figures from the book.

Materials Engineering Susan Trolier-McKinstry 2018 An easy-to-read textbook linking together bond strength and the arrangement of atoms in space with the properties that they control.

Fundamentals of Electrochemical Corrosion Ele Eugene Stansbury 2000-01-01 Covering the essential aspects of the corrosion behavior of metals in aqueous environments, this book is designed with the flexibility needed for use in courses for upper-level undergraduate and graduate students, for concentrated courses in industry, for individual study, and as a reference book.

Thermodynamics Arthur Shavit 2008-12-09 There are many thermodynamics texts on the market, yet most provide a presentation that is at a level too high for those new to the field. This second edition of *Thermodynamics* continues to provide an accessible introduction to thermodynamics, which maintains an appropriate rigor to prepare newcomers for subsequent, more advanced topics. The book presents a logical methodology for solving problems in the context of conservation laws and property tables or equations. The authors elucidate the terms around which thermodynamics has historically developed, such as work, heat, temperature, energy, and entropy. Using a pedagogical approach that builds from basic principles to laws and eventually corollaries of the laws, the text enables students to think in clear and correct thermodynamic terms as well as solve real engineering problems. For those just beginning their studies in the field, *Thermodynamics, Second Edition* provides the core fundamentals in a rigorous, accurate, and accessible presentation.

Introduction to Metallurgical Thermodynamics David R. Gaskell 1981

Introduction to the Thermodynamics of Materials David R. Gaskell 2016

"For more than thirty years, this textbook has been the definitive introduction to the thermodynamic principles of materials and their multitude of applications. New to this edition is a detailed discussion of acetylene combustion and a numerical explanation for the expansion of ideal gases, as well as additional worked examples covering a wide variety of applied thermodynamics concepts ... Students can conduct thermodynamic calculations, generate equation parameters from tabular data, calculate reaction parameters, and perform equilibrium calculations involving non-ideal solutions. This textbook is ideal for advanced undergraduates and first year graduate students and as a reference for professionals in metallurgy, metallurgical engineering, ceramics, and materials science."--Page 4 of cover.

Advances in Combustion Synthesis and Technology Mehmet Bugdayci

2022-03-21 This reference is an accessible update on combustion synthesis and the chemical technology for synthesizing composite materials. Nine chapters offer an overview of the subject with recent references, giving the reader an informed perspective. The book starts with an introduction to thermodynamic models used in combustion synthesis. Subsequent chapters explain the application of combustion synthesis to manufacture different materials such as nanostructured non-ferrous alloys, ceramic powders, functionally graded materials, boron carbide-based superhard materials, shape memory alloys, biomaterials, high-entropy alloys and rare earth phosphates. The range of topics makes this book a useful guide for students, scientists and industrial professionals in the field of chemical engineering, metallurgy and materials science.

Thermodynamics of Solids Richard Arthur Swalin 1970

Chemical Thermodynamics of Materials C. H. P. Lupis 1993
An Introduction to Transport Phenomena In Materials Engineering, 2nd edition David Gaskell 2012-08-24 This classic text on fluid flow, heat transfer, and mass transport has been brought up to date in this second edition. The author has added a chapter on "Boiling and Condensation" that expands and rounds out the book's comprehensive coverage on transport phenomena. These new topics are particularly important to current research in renewable energy resources involving technologies such as windmills and solar panels. The book provides you and other materials science and engineering students and professionals with a clear yet thorough introduction to these important concepts. It balances the explanation of the fundamentals governing fluid flow and the transport of heat and mass with common applications of these fundamentals to specific systems existing in materials engineering. You will benefit from:

- The use of familiar examples such as air and water to introduce the influences of properties and geometry on fluid flow.
- An organization with sections dealing separately with fluid flow, heat transfer, and mass transport. This sequential structure allows the development of heat transport concepts to employ analogies of heat flow with fluid flow and the development of mass transport concepts to employ analogies with heat transport.
- Ample high-quality graphs and figures throughout.
- Key points presented in chapter summaries.
- End of chapter exercises and solutions to selected problems.
- An all new and improved comprehensive index.

Transmission Electron Microscopy and Diffractometry of Materials

Brent Fultz 2012-10-14 This book explains concepts of transmission electron microscopy (TEM) and x-ray diffractometry (XRD) that are important for the characterization of materials. The fourth edition adds important new techniques of TEM such as electron tomography, nanobeam diffraction, and geometric phase analysis. A new chapter on neutron scattering completes the trio of x-ray, electron and neutron diffraction. All chapters were updated and revised for clarity. The book explains the fundamentals of how waves and wavefunctions interact with atoms in solids, and the similarities and differences of using x-rays, electrons, or neutrons for diffraction measurements. Diffraction effects of crystalline order, defects, and disorder in materials are explained in detail. Both practical and theoretical issues are covered. The book can be used in an introductory-level or advanced-level course, since sections are identified by difficulty. Each chapter includes a set of problems to illustrate principles, and the extensive Appendix includes laboratory exercises.

Introduction to the Thermodynamics of Materials, Fifth Edition

David R. Gaskell 2008-03-13 This classic textbook is the definitive introduction to the thermodynamic behavior of materials systems. Written as a basic text for advanced undergraduates and first year graduate students in metallurgy, metallurgical engineering, ceramics, or materials science, it presents the underlying thermodynamic principles of materials and their plethora of applications. The book is also of proven interest to working professionals in need of a reference or refresher course.

Transport Phenomena in Materials Processing David R. Poirier 2016-12-06 This text provides a teachable and readable approach to transport phenomena (momentum, heat, and mass transport) by providing numerous examples and applications, which are particularly important to metallurgical, ceramic, and materials engineers. Because the authors feel that it is important for students and practicing engineers to visualize the physical situations, they have attempted to lead the reader through the development and solution of the relevant differential equations by applying the familiar principles of conservation to numerous situations and by including many worked examples in each chapter. The book is organized in a manner characteristic of other texts in transport phenomena. Section I deals with the properties and mechanics of fluid motion; Section II with thermal properties and heat transfer; and Section III with diffusion and mass transfer. The authors depart from tradition by building on a presumed understanding of the relationships between the structure and properties of matter, particularly in the chapters devoted to the transport properties (viscosity, thermal conductivity, and the diffusion coefficients). In addition, generous portions of the text, numerous examples, and many problems at the ends of the chapters apply transport phenomena to materials processing.

Problems in Metallurgical Thermodynamics and Kinetics G. S. Upadhyaya 2013-10-22 Problems in Metallurgical Thermodynamics and Kinetics provides an illustration of the calculations encountered in the study of metallurgical thermodynamics and kinetics, focusing on theoretical concepts and practical applications. The chapters of this book provide comprehensive account of the theories, including basic and

applied numerical examples with solutions. Unsolved numerical examples drawn from a wide range of metallurgical processes are also provided at the end of each chapter. The topics discussed include the three laws of thermodynamics; Clausius-Clapeyron equation; fugacity, activity, and equilibrium constant; thermodynamics of electrochemical cells; and kinetics. This book is beneficial to undergraduate and postgraduate students in universities, polytechnics, and technical colleges.

Introduction to the Thermodynamics of Materials David R. Gaskell 2017-08-15 Maintaining the substance that made Introduction to the Thermodynamic of Materials a perennial best seller for decades, this Sixth Edition is updated to reflect the broadening field of materials science and engineering. The new edition is reorganized into three major sections to align the book for practical coursework, with the first (Thermodynamic Principles) and second (Phase Equilibria) sections aimed at use in a one semester undergraduate course. The third section (Reactions and Transformations) can be used in other courses of the curriculum that deal with oxidation, energy, and phase transformations. The book is updated to include the role of work terms other than PV work (e.g., magnetic work) along with their attendant aspects of entropy, Maxwell equations, and the role of such applied fields on phase diagrams. There is also an increased emphasis on the thermodynamics of phase transformations and the Sixth Edition features an entirely new chapter 15 that links specific thermodynamic applications to the study of phase transformations. The book also features more than 50 new end of chapter problems and more than 50 new figures.

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Kinetics of Materials Robert W. Balluffi 2005-12-16 A classroom-tested textbook providing a fundamental understanding of basic kinetic processes in materials. This textbook, reflecting the hands-on teaching experience of its three authors, evolved from Massachusetts Institute of Technology's first-year graduate curriculum in the Department of Materials Science and Engineering. It discusses key topics collectively representing the basic kinetic processes that cause changes in the size, shape, composition, and atomistic structure of materials. Readers gain a deeper understanding of these kinetic processes and of the properties and applications of materials. Topics are introduced in a logical order, enabling students to develop a solid foundation before advancing to more sophisticated topics. Kinetics of Materials begins with diffusion, offering a description of the elementary manner in which atoms and molecules move around in solids and liquids. Next, the more complex motion of dislocations and interfaces is addressed. Finally, still more complex kinetic phenomena, such as morphological evolution and phase transformations, are treated. Throughout the textbook, readers are instilled with an appreciation of the subject's analytic foundations and, in many cases, the approximations commonly used in the field. The authors offer many extensive derivations of important results to help illuminate their origins. While the principal focus is on kinetic phenomena in crystalline materials, select phenomena in noncrystalline materials are also discussed. In many cases, the principles involved apply to all materials. Exercises with accompanying solutions are provided throughout Kinetics of Materials, enabling readers to put their newfound knowledge into practice. In addition, bibliographies are offered with each chapter, helping readers to investigate specialized topics in greater detail. Several appendices presenting important background material are also included. With its unique range of topics, progressive structure, and extensive exercises, this classroom-tested textbook provides an enriching learning experience for first-year graduate students.

Chemical Thermodynamics W.J. Rankin 2019-11-11 This book develops

the theory of chemical thermodynamics from first principles, demonstrates its relevance across scientific and engineering disciplines, and shows how thermodynamics can be used as a practical tool for understanding natural phenomena and developing and improving technologies and products. Concepts such as internal energy, enthalpy, entropy, and Gibbs energy are explained using ideas and experiences familiar to students, and realistic examples are given so the usefulness and pervasiveness of thermodynamics becomes apparent. The worked examples illustrate key ideas and demonstrate important types of calculations, and the problems at the end of chapters are designed to reinforce important concepts and show the broad range of applications. Most can be solved using digitized data from open access databases and a spreadsheet. Answers are provided for the numerical problems. A particular theme of the book is the calculation of the equilibrium composition of systems, both reactive and non-reactive, and this includes the principles of Gibbs energy minimization. The overall approach leads to the intelligent use of thermodynamic software packages but, while these are discussed and their use demonstrated, they are not the focus of the book, the aim being to provide the necessary foundations. Another unique aspect is the inclusion of three applications chapters: heat and energy aspects of processing; the thermodynamics of metal production and recycling; and applications of electrochemistry. This book is aimed primarily at students of chemistry, chemical engineering, applied science, materials science, and metallurgy, though it will be also useful for students undertaking courses in geology and environmental science. A solutions manual is available for instructors.

Thermodynamics of Materials David V. Ragone 1995 "In response to the growing economic and technological importance of polymers, ceramics, and semi-conductors, many materials science and engineering as they apply to all the classes of materials."--Back cover.

Physical Chemistry of Magmas Leonid L. Perchuk 2013-04-09 Physical Chemistry of Magmas investigates the properties, structure, and phase relationships of silicate melts with invited contributions from an international team of experts. Data and some rules for estimating the properties and structures of melts, as well as the implications of the physical chemistry of silicate liquids to igneous petrology are presented. The second section then focuses on phase relationships, with particular attention on the application of experimental and theoretical petrology to modeling the origin of certain magmas.

Physical Properties of Crystals J. F. Nye 1985 First published in 1957, this classic study has been reissued in a paperback version that includes an additional chapter bringing the material up to date. The author formulates the physical properties of crystals systematically in tensor notation, presenting tensor properties in terms of their common mathematical basis and the thermodynamic relations between them. The mathematical groundwork is laid in a discussion of tensors of the first and second ranks. Tensors of higher ranks and matrix methods are then introduced as natural developments of the theory. A similar pattern is followed in discussing thermodynamic and optical aspects.

Introduction to the Thermodynamics of Materials, Fifth Edition David R. Gaskell 2008-03-13 This classic textbook is the definitive introduction to the thermodynamic behavior of materials systems. Written as a basic text for advanced undergraduates and first year graduate students in metallurgy, metallurgical engineering, ceramics, or materials science, it presents the underlying thermodynamic principles of materials and their plethora of applications. The book is also of proven interest to working professionals in need of a reference or refresher course.

An Introduction to Transport Phenomena in Materials Engineering David R. Gaskell 1992 This introduction to transport phenomena in materials engineering balances an explanation of the fundamentals governing fluid flow and the transport of heat and mass with their common applications to specific systems in materials engineering. It introduces the influences of properties and geometry on fluid flow using familiar fluids such as air and water. Covers topics such as engineering units and pressure in static fluids; momentum transport and laminar flow of Newtonian fluids; equations of continuity and conservation of momentum and fluid flow past submerged objects; turbulent flow; mechanical energy balance and its application to fluid flow; transport of heat by conduction; transport of heat by convection; transient heat flow; heat transport by thermal radiation; mass transport in the solid state by diffusion; mass transport in fluids. Includes extensive appendices.

Metallurgical Thermodynamics Kinetics and Numericals Dutta S.K. & Lele A.B. 2017-11 This book is written specially for the students of B.E./B.Tech. of Metallurgical and Materials Engineering. It also serves the needs of allied scientific disciplines at the undergraduate, graduate level

and practising professional engineers

Introduction to the Thermodynamics of Materials, Fifth Edition David R. Gaskell 2003-02-07 "The CD contains data and descriptive material for making detailed thermodynamic calculations involving materials processing"--Preface.

Phase Diagrams and Thermodynamic Modeling of Solutions Arthur D. Pelton 2018-09-19 Phase Diagrams and Thermodynamic Modeling of Solutions provides readers with an understanding of thermodynamics and phase equilibria that is required to make full and efficient use of these tools. The book systematically discusses phase diagrams of all types, the thermodynamics behind them, their calculations from thermodynamic databases, and the structural models of solutions used in the development of these databases. Featuring examples from a wide range of systems including metals, salts, ceramics, refractories, and concentrated aqueous solutions, Phase Diagrams and Thermodynamic Modeling of Solutions is a vital resource for researchers and developers in materials science, metallurgy, combustion and energy, corrosion engineering, environmental engineering, geology, glass technology, nuclear engineering, and other fields of inorganic chemical and materials science and engineering. Additionally, experts involved in developing thermodynamic databases will find a comprehensive reference text of current solution models. Presents a rigorous and complete development of thermodynamics for readers who already have a basic understanding of chemical thermodynamics Provides an in-depth understanding of phase equilibria Includes information that can be used as a text for graduate courses on thermodynamics and phase diagrams, or on solution modeling Covers several types of phase diagrams (paraequilibrium, solidus projections, first-melting projections, Scheil diagrams, enthalpy diagrams), and more

Thermodynamics of Minerals and Melts R.C. Newton 2012-12-06 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 multicomponential 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.

Physical Metallurgy Gregory N. Haidemenopoulos 2018-02-07 Physical metallurgy is one of the main fields of metallurgical science dealing with the development of the microstructure of metals in order to achieve desirable properties required in technological applications. Physical Metallurgy: Principles and Design focuses on the processing-structure-properties triangle as it applies to metals and alloys. It introduces the fundamental principles of physical metallurgy and the design methodologies for alloys and processing. The first part of the book discusses the structure and change of structure through phase transformations. The latter part of the book deals with plastic deformation, strengthening mechanisms, and mechanical properties as they relate to structure. The book also includes a chapter on physical metallurgy of steels and concludes by discussing the computational tools, involving computational thermodynamics and kinetics, to perform alloy and process design.

TEXTBOOK OF MATERIALS AND METALLURGICAL

THERMODYNAMICS AHINDRA GHOSH 2002-01-01 Metallurgical Thermodynamics, as well as its modified version, Thermodynamics of Materials, forms a core course in metallurgical and materials engineering, constituting one of the principal foundations in these disciplines. Designed

as an undergraduate textbook, this concise and systematically organized text deals primarily with the thermodynamics of systems involving physico-chemical processes and chemical reactions, such as calculations of enthalpy, entropy and free energy changes of processes; thermodynamic properties of solutions; chemical and phase equilibria; and thermodynamics of surfaces, interfaces and defects. The major emphasis is on high-temperature systems and processes involving metals and inorganic compounds. The many worked examples, diagrams, and tables that illustrate the concepts discussed, and chapter-end problems that stimulate self-study should enable the students to study the subject with enhanced interest.

Thermodynamics in Materials Science Robert DeHoff 2006-03-13

Thermodynamics in Materials Science, Second Edition is a clear presentation of how thermodynamic data is used to predict the behavior of a wide range of materials, a crucial component in the decision-making process for many materials science and engineering applications. This primary textbook accentuates the integration of principles, strategies, a

Thermitic Thermodynamics Anthony Peter Gordon Shaw 2020-05-13

Thermites, which are generally considered to be reactive mixtures of powdered metals and metal oxides, are an important subset of energetic materials. The underlying thermodynamic properties of a given mixture dictate whether it may undergo a self-sustaining reaction, liberating heat in the process. Thermodynamic information in the existing scientific literature regarding thermitic combinations is scattered and incomplete.

Currently, a comprehensive overview of this nature would be of great use to those working in the areas of pyrotechnics, pyrometallurgy, high-temperature chemistry, and materials science. Thermitic

Thermodynamics solves this problem by describing the results of calculations on over 800 combinations of metal, metalloid, and metal oxide reactants. Other features include: A first-of-its-kind adiabatic survey of binary thermitic reactions Provides an overview of key trends in exothermic metal-metal oxide reactivity Describes the role of non-oxide product formation in thermitic systems Explains how to interpret the results of thermochemical calculations effectively An invaluable resource, this book provides an accessible introduction for students and is also an enduring guide for professionals.

Methods for Phase Diagram Determination Ji-Cheng Zhao 2011-05-05

Phase diagrams are "maps" materials scientists often use to design new materials. They define what compounds and solutions are formed and their respective compositions and amounts when several elements are mixed together under a certain temperature and pressure. This

monograph is the most comprehensive reference book on experimental methods for phase diagram determination. It covers a wide range of methods that have been used to determine phase diagrams of metals, ceramics, slags, and hydrides. * Extensive discussion on methodologies of experimental measurements and data assessments * Written by experts around the world, covering both traditional and combinatorial methodologies * A must-read for experimental measurements of phase diagrams

Introduction to Materials Science and Engineering Elliot P. Douglas

2013-01-23 \int For students taking the Materials Science course . This book is also suitable for professionals seeking a guided inquiry approach to materials science. \int This unique book is designed to serve as an active learning tool that uses carefully selected information and guided inquiry questions. Guided inquiry helps readers reach true understanding of concepts as they develop greater ownership over the material presented.

First, background information or data is presented. Then, concept invention questions lead the students to construct their own understanding of the fundamental concepts represented. Finally, application questions provide the reader with practice in solving problems using the concepts that they have derived from their own valid conclusions.

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MasteringEngineering with Pearson eText -- Access Card -- Introduction to Materials Science \int

An Introduction to Thermodynamics and Statistical Mechanics Keith Stowe 2007-05-10 This introductory textbook for standard undergraduate courses in thermodynamics has been completely rewritten to explore a greater number of topics, more clearly and concisely. Starting with an overview of important quantum behaviours, the book teaches students how to calculate probabilities in order to provide a firm foundation for later chapters. It introduces the ideas of classical thermodynamics and explores them both in general and as they are applied to specific processes and interactions. The remainder of the book deals with statistical mechanics. Each topic ends with a boxed summary of ideas and results, and every chapter contains numerous homework problems, covering a broad range of difficulties. Answers are given to odd-numbered problems, and solutions to even-numbered problems are available to instructors at www.cambridge.org/9781107694927.

Topics in Metallurgical Thermodynamics Owen Francis Devereux 1983