

# Online Library Solution Of Dehoff Thermodynamics In Materials Read Pdf Free

**Thermodynamics in Materials Science Outlines and Highlights for Thermodynamics in Materials Science by Robert T Dehoff, Isbn Solutions Manual for Thermodynamics in Materials Science, Second Edition Thermodynamics in Materials Science Studyguide for Thermodynamics in Materials Science by Dehoff, Robert Introduction to the Thermodynamics of Materials, Fifth Edition Structure of Materials Physical Foundations of Materials Science Sintering of Advanced Materials Biological Thermodynamics Thermodynamics Kept Simple - A Molecular Approach Phase Transitions in Materials Mechanical Behavior of Materials Kinetics of Materials Imperfections in Crystalline Solids Materials Characterization Structure and Bonding in Crystalline Materials Thermodynamic in Materials Science Ceramic Materials Kinetics in Materials Science and Engineering Grain Boundary Migration in Metals Crystals and Crystal Structures Understanding Materials Science Thermal Analysis and Thermodynamic Properties of Solids Molecular Driving Forces Soft Condensed Matter Materials Kinetics Thermodynamic Equilibrium and Stability of Materials Physical Ceramics Mass Transfer and Separation Processes Clinical Engineering Introduction to the Physics and Chemistry of Materials Materials Thermodynamics Thermodynamics of Surfaces and Interfaces Chemical Thermodynamics of Materials Beyond Equilibrium Thermodynamics Thermodynamics of Non-Equilibrium Processes for Chemists with a Particular Application to Catalysis Introduction to the Thermodynamics of Materials Problems in Metallurgical Thermodynamics and Kinetics Diffusion in Solids**

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. A comprehensive introduction, examining both macroscopic and microscopic aspects of the subject, the book applies the theory of thermodynamics to a broad range of materials; from metals, ceramics and other inorganic materials to geological materials. Focusing on materials rather than the underlying mathematical concepts of the subject, this book will be ideal for the non-specialist requiring an introduction to the energetics and stability of materials. Macroscopic thermodynamic properties are linked to the underlying microscopic nature of the materials and trends in important properties are discussed. A unique approach covering both macroscopic and microscopic aspects of the subject Authors have worldwide reputations in this area Fills a gap in the market by featuring a wide range of real up-to-date examples and covering a large amount of materials Sintering is a method for manufacturing components from ceramic or metal powders by heating the powder until the particles adhere to form the component required. The resulting products are characterised by an enhanced density and strength, and are used in a wide range of industries. Sintering of advanced materials: fundamentals and processes reviews important developments in this technology and its applications Part one discusses the fundamentals of sintering with chapters on topics such as the thermodynamics of sintering, kinetics and mechanisms of densification, the kinetics of microstructural change and liquid phase sintering. Part two reviews advanced sintering processes including atmospheric sintering, vacuum sintering, microwave sintering, field/current assisted sintering and photonic sintering. Finally, Part three covers sintering of aluminium, titanium and their alloys, refractory metals, ultrahard materials, thin films, ultrafine and nanosized particles for advanced materials. With its distinguished editor and international team of contributors, Sintering of advanced materials: fundamentals and processes reviews the latest advances in sintering and is a standard reference for researchers and engineers involved in the processing of ceramics, powder metallurgy, net-shape manufacturing and those using advanced materials in such sectors as electronics, automotive and aerospace engineering. Explores the thermodynamics of sintering including sinter bonding and densification Chapters review a variety of sintering methods including atmosphere, vacuum, liquid phase and microwave sintering Discusses sintering of a variety of materials featuring refractory metals, super hard materials and functionally graded materials Beyond Equilibrium Thermodynamics fills a niche in the market by providing a comprehensive introduction to a new, emerging topic in the field. The importance of non-equilibrium thermodynamics is addressed in order to fully understand how a system works, whether it is in a biological system like the brain or a system that develops plastic. In order to fully grasp the subject, the book clearly explains the physical concepts and mathematics involved, as well as presenting problems and solutions; over 200 exercises and answers are included. Engineers, scientists, and applied mathematicians can all use the book to address their problems in modelling, calculating, and understanding dynamic responses of materials. Materials Kinetics: Transport and Rate Phenomena provides readers with a clear understanding of how physical-chemical principles are applied to fundamental kinetic processes. The book integrates advanced concepts with foundational knowledge and cutting-edge computational approaches, demonstrating how diffusion, morphological evolution, viscosity, relaxation and other kinetic phenomena can be applied to practical materials design problems across all classes of materials. The book starts with an overview of thermodynamics, discussing equilibrium, entropy, and irreversible processes. Subsequent chapters focus on analytical and numerical solutions of the diffusion equation, covering Fick's laws, multicomponent diffusion, numerical solutions, atomic models, and diffusion in crystals, polymers, glasses, and polycrystalline materials. Dislocation and interfacial motion, kinetics of phase separation, viscosity, and advanced nucleation theories are examined next, followed by detailed analyses of glass transition and relaxation behavior. The book concludes with a series of chapters covering molecular dynamics, energy landscapes, broken ergodicity, chemical reaction kinetics, thermal and electrical conductivities, Monte Carlo simulation techniques, and master equations. Covers the full breadth of materials kinetics, including organic and inorganic materials, solids and liquids, theory and experiments, macroscopic and microscopic interpretations, and analytical and computational approaches Demonstrates how diffusion, viscosity microstructural evolution, relaxation, and other kinetic phenomena can be leveraged in the practical design of new materials Provides a seamless connection between thermodynamics and kinetics Includes practical exercises that reinforce key concepts at the end of each chapter Thermal Analysis and Thermodynamic Properties of Solids, Second Edition covers foundational principles and recent updates in the field, presenting an authoritative overview of theoretical knowledge and practical applications across several fields. Since the first edition of this book was published, large developments have occurred in the theoretical understanding of—and subsequent ability to assess and apply—principles of thermal analysis. Drawing on the knowledge of its expert author, this second edition provides fascinating insight for both new and experienced students, researchers, and industry professionals whose work is influenced or impacted by thermo analysis principles and tools. Part 1 provides a detailed introduction and guide to theoretical aspects of thermal analysis and the related impact of thermodynamics. Key terminology and concepts, the fundamentals of thermophysical examinations, thermostatics, equilibrium background, thermotics, reaction kinetics and models, thermokinetics and the exploitation of fractals are all discussed. Part 2 then goes on to discuss practical applications of this theoretical information to topics such as crystallization kinetics and glass states, thermodynamics in superconductor models, and climate change. Includes fully updated as well as new chapters on kinetic phase diagrams, thermokinetics in DTA experiments, and crystallization kinetics Discusses the influence of key derivatives such as thermostatics, thermodynamics, thermotics, and thermokinetics Helps readers understand and describe reaction kinetics in solids, both in terms of simplified descriptions of the reaction mechanism models and averaged descriptions using fractals Molecular Driving Forces, Second Edition E-book is an introductory statistical thermodynamics text that describes the principles and forces that drive chemical and biological processes. It demonstrates how the complex behaviors of molecules can result from a few simple physical processes, and how simple models provide surprisingly accurate insights into the workings of the molecular world. Widely adopted in its First Edition, Molecular Driving Forces is regarded by teachers and students as an accessible textbook that illuminates underlying principles and concepts. The Second Edition includes two brand new chapters: (1) "Microscopic Dynamics" introduces single molecule experiments; and (2) "Molecular Machines" considers how nanoscale machines and engines work. "The Logic of Thermodynamics" has been expanded to its own chapter and now covers heat, work, processes, pathways, and cycles. New practical applications, examples, and end-of-chapter questions are integrated throughout the revised and updated text, exploring topics in biology, environmental and energy science, and nanotechnology. Written in a clear and reader-friendly style, the book provides an excellent introduction to the subject for novices while remaining a valuable resource for experts. 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 Never HIGHLIGHT a Book Again Virtually all testable terms, concepts, persons, places, and events are included. Cram101 Textbook Outlines gives all of the outlines, highlights, notes for your textbook with optional online practice tests. Only Cram101 Outlines are Textbook Specific. Cram101 is NOT the Textbook. Accompanys: 9780521673761 This is a textbook on thermodynamics of materials for junior/senior undergraduate students and first-year graduate students as well as a reference book for researchers who would like to refresh their understanding of thermodynamics. The textbook employs a plain language to explain the thermodynamic concepts and quantities. It embraces the mathematical beauty and rigor of Gibbs thermodynamics through the fundamental equation of thermodynamics from which all thermodynamic properties of a material can be derived. However, a reader with basic first-year undergraduate calculus skills will be able to get through the book without difficulty. One unique feature of this textbook is the descriptions of the step-by-step procedures for computing all the thermodynamic properties from the fundamental equation of thermodynamics and all the thermodynamic energies from a set of common, experimentally measurable thermodynamic properties, supplemented with ample numerical examples. Another unique feature of this textbook is its emphasis on the concept of chemical potential and its applications to phase equilibria in single component systems and binary solutions, chemical reaction equilibria, and lattice and electronic defects in crystals. The concept of chemical potential is introduced at the very beginning of the book together with temperature and pressure. It avoids or minimizes the use of terms such as molar Gibbs free energy, partial molar Gibbs free energy, or Gibbs potential because molar Gibbs free energy or partial molar Gibbs free energy is precisely the chemical potential of a material or a component. It is the chemical potential that determines the stability of chemical species, compounds, and phases and their tendency to chemically react to form new species, transform to new physical state, and migrate from one spatial location to another. Therefore, it is the chemical potential differences or gradients that drive essentially all materials processes of interest. A reader after finishing reading the book is expected to not only achieve a high-level fundamental understanding of thermodynamics but also acquire the analytical skills of applying thermodynamics to determining materials equilibrium and driving forces for materials processes. One of the motivating questions in materials research today is, how can elements be combined to produce a solid with specified properties? This book is intended to acquaint the reader with established principles of crystallography and cohesive forces that are needed to address the fundamental relationship between the composition, structure and bonding. Starting with an introduction to periodic trends, the book discusses crystal structures and the various primary and secondary bonding types, and finishes by describing a number of models for predicting phase stability and structure. Containing a large number of worked examples, exercises, and detailed descriptions of numerous crystal structures, this book is primarily intended as an advanced undergraduate or graduate level textbook for students of materials science. It will also be useful to scientists and engineers who work with solid materials. Ceramic Materials: Science and Engineering is an up-to-date treatment of ceramic science, engineering, and applications in a single, integrated text. Building on a foundation of crystal structures, phase equilibria, defects and the mechanical properties of ceramic materials, students are shown how these materials are processed for a broad diversity of applications in today's society. Concepts such as how and why ions move, how ceramics interact with light and magnetic fields, and how they respond to temperature changes are discussed in the context of their applications. References to the art and history of ceramics are included throughout the text. The text concludes with discussions of ceramics in biology and medicine, ceramics as gemstones and the role of ceramics in the interplay between industry and the environment. Extensively illustrated, the text also includes questions for the student and recommendations for additional reading. KEY FEATURES: Combines the treatment of bioceramics, furnaces, glass, optics, pores, gemstones, and point defects in a single text Provides abundant examples and illustrations relating theory to practical applications Suitable for advanced undergraduate and graduate teaching and as a reference for researchers in materials science Written by established and successful teachers and authors with experience in both research and industry 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. A clear, concise and rigorous textbook covering phase transitions in the context of advances in electronic structure and statistical mechanics. In this vivid and comprehensible introduction to materials science, the author expands the modern concepts of metal physics to formulate basic theory applicable to other engineering materials, such as ceramics and polymers. Written for engineering students and working engineers with little previous knowledge of solid-state physics, this textbook enables the reader to study more specialized and fundamental literature of materials science. Dozens of illustrative photographs, many of them transmission electron microscopy images, plus line drawings, aid developing a firm appreciation of this complex topic. Hard-to-grasp terms such as "textures" are lucidly explained - not only the phenomenon itself, but also its consequences for the material properties. This excellent book makes materials science more transparent. This text offers an introduction to the properties and behaviour of soft matter. It begins with a treatment of the underlying principles, then discusses how the properties of certain substances and systems are treated within this framework. This inter-disciplinary guide to the thermodynamics of living organisms has been thoroughly revised and updated to provide a uniquely integrated overview of the subject. Retaining its highly readable style, it will serve as an introduction to the study of energy transformation in the life sciences and particularly as an accessible means for biology, biochemistry and bioengineering undergraduate students to acquaint themselves with the physical dimension of their subject. The emphasis throughout the text is on understanding basic concepts and developing problem-solving skills. The mathematical difficulty increases gradually by chapter, but no calculus is required. Topics covered include energy and its transformation, the First Law of Thermodynamics, Gibbs free energy, statistical thermodynamics, binding equilibria and reaction kinetics. Each chapter comprises numerous illustrative examples taken from different areas of biochemistry, as well as a broad range of exercises and references for further study. A volume in the Principles and Applications in Engineering series, Clinical Engineering focuses on managing the deployment of medical technology and integrating it appropriately with desired clinical practices. It provides a description of the wide range of responsibilities clinical engineers encounter, describes technology management and assessment This introduction for engineers examines not only the physical properties of materials, but also their history, uses, development, and some of the implications of resource depletion and materials substitutions. An accessible textbook providing students with a working knowledge of the properties of defects in crystals, in a step-by-step tutorial style. Thermodynamics of Non-Equilibrium Processes for Chemists with a Particular Application to Catalysis consists of materials adapted from lectures on the thermodynamics of nonequilibrium processes that have been taught at the Department of Natural Sciences of Novosibirsk State University since 1995. The thermodynamics of nonequilibrium processes traditionally required students to have a strong background in physics. However, the materials featured in this volume allow anyone with knowledge in classical thermodynamics of equilibrium processes and traditional chemical kinetics to understand the subject. Topics discussed include systems in the thermodynamics of irreversible processes; thermodynamics of systems that are close to and far from equilibrium; thermodynamics of catalysts; the application of nonequilibrium thermodynamics to material science; and the relationship between entropy and information. This book will be helpful for research into complex chemical transformations, particularly catalytic transformations. Applies simple approaches of non-equilibrium thermodynamics to analyzing properties of chemically reactive systems Covers systems far from equilibrium, allowing the consideration of most chemically reactive systems of a chemical or biological nature This approach resolves many complicated problems in the teaching of chemical kinetics This book covers state-of-the-art techniques commonly used in modern materials characterization. Two important aspects of characterization, materials structures and chemical analysis, are included. Widely used techniques, such as metallography (light microscopy), X-ray diffraction, transmission and scanning electron microscopy, are described. In addition, the book introduces advanced techniques, including scanning probe microscopy. The second half of the book accordingly presents techniques such as X-ray energy dispersive spectroscopy (commonly equipped in the scanning electron microscope), fluorescence X-ray spectroscopy, and popular surface analysis techniques (XPS and SIMS). Finally, vibrational spectroscopy (FTIR and Raman) and thermal analysis are also covered. Never HIGHLIGHT a Book Again! Virtually all of the testable terms, concepts, persons, places, and events from the textbook are included. Cram101 Just the FACTS101 studyguides give all of the outlines, highlights, notes, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanys: 9780849340659 . A classroom-tested textbook providing a fundamental understandingof basic kinetic processes in materials This textbook, reflecting the hands-on teaching experience of itsthree authors, evolved from Massachusetts Institute of Technology'sfirst-year graduate curriculum in the Department of MaterialsScience and Engineering. It discusses key topics collectivelyrepresenting the basic kinetic

processes that cause changes in the size, shape, composition, and atomic 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. Publisher Description Thermodynamics Kept Simple - A Molecular Approach: What is the Driving Force in the World of Molecules? offers a truly unique way of teaching and thinking about basic thermodynamics that helps students overcome common conceptual problems. For example, the book explains the concept of entropy from the perspective of probabilities of various molecular configurations. 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. An accessible yet rigorous discussion, featuring case studies and study problems to illustrate and reinforce key concepts. Designed to provide students with the core understanding necessary to pursue the subject of ceramics as it now exists and to be prepared for any surprises likely to emerge. Key concepts are developed in a sequence which builds on firm foundations, using the material learned so that its significance is continuously reinforced. The nature of defects which intrudes upon the perfect geometry of ideal crystal structures, migration of matter and charge, chemical and phase equilibria are among the subjects discussed. 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. Discusses the Structure and Properties of Materials and How These Materials Are Used in Diverse Applications Building on undergraduate students' backgrounds in mathematics, science, and engineering, Introduction to the Physics and Chemistry of Materials provides the foundation needed for more advanced work in materials science. Ideal for a two-semester course, the text focuses on chemical bonding, crystal structure, mechanical properties, phase transformations, and materials processing for the first semester. The material for the second semester covers thermal, electronic, photonic, optical, and magnetic properties of materials. Requiring no prior experience in modern physics and quantum mechanics, the book introduces quantum concepts and wave mechanics through a simple derivation of the Schrödinger equation, the electron-in-a-box problem, and the wave functions of the hydrogen atom. The author also presents a historical perspective on the development of the materials science field. He discusses the Bose-Einstein, Maxwell-Boltzmann, Planck, and Fermi-Dirac distribution functions, before moving on to the various properties and applications of materials. With detailed derivations of important equations, this applications-oriented text examines the structure and properties of materials, such as heavy metal glasses and superconductors. It also explores recent developments in organics electronics, polymer light-emitting diodes, superconductivity, and more. Mass transfer along with separation processes is an area that is often quite challenging to master, as most volumes currently available complicate the learning by teaching mass transfer linked with heat transfer, rather than focusing on more relevant techniques. With this thoroughly updated second edition, Mass Transfer and Separation Processes: Principles and Applications presents a highly thoughtful and instructive introduction to this sophisticated material by teaching mass transfer and separation processes as unique though related entities. In an ever increasing effort to demystify the subject, with this edition, the author— Avoids more complex separation processes Places a greater emphasis on the art of simplifying assumptions Conveys a greater sense of scale with the inclusion of numerous photos of actual installations Makes the math only as complicated as necessary while reviewing fundamental principles that may have been forgotten The book explores essential principles and reinforces the concepts with classical and contemporary illustrations drawn from the engineering, environmental, and biological sciences. The theories of heat conduction and transfer are utilized not so much to draw analogies but rather to make fruitful use of existing solutions not seen in other texts on the subject. Both an introductory resource and a reference, this important text serves environmental, biomedical, and engineering professionals, as well as anyone wishing to gain a grasp on this subject and its increasing relevance across a number of fields. It fills a void in traditional chemical engineering literature by providing access to the principles and working practices that allow mass transfer theory to be applied to separation processes. "A pedagogical gem.... Professor Readey replaces 'black-box' explanations with detailed, insightful derivations. A wealth of practical application examples and exercise problems complement the exhaustive coverage of kinetics for all material classes." —Prof. Rainer Hebert, University of Connecticut "Prof. Readey gives a grand tour of the kinetics of materials suitable for experimentalists and modellers.... In an easy-to-read and entertaining style, this book leads the reader to fundamental, model-based understanding of kinetic processes critical to development, fabrication and application of commercially-important soft (polymers, biomaterials), hard (ceramics, metals) and composite materials. It is a must-have for anyone who really wants to understand how to make materials and how they will behave in service." --Prof. Bill Lee, Imperial College London, Fellow of the Royal Academy of Engineering "A much needed text filling the gap between an introductory course in materials science and advanced materials-specific kinetics courses. Ideal for the undergraduate interested in an in-depth study of kinetics in materials." —Prof. Mark E. Eberhart, Colorado School of Mines This book provides an in-depth introduction to the most important kinetic concepts in materials science, engineering, and processing. All types of materials are addressed, including metals, ceramics, polymers, electronic materials, biomaterials, and composites. The expert author with decades of teaching and practical experience gives a lively and accessible overview, explaining the principles that determine how long it takes to change material properties and make new and better materials. The chapters cover a broad range of topics extending from the heat treatment of steels, the processing of silicon integrated microchips, and the production of cement, to the movement of drugs through the human body. The author explicitly avoids "black box" equations, providing derivations with clear explanations. This book offers a modern treatment of diffusion in solids, covering such core topics as the transport of mass through the lattice of a crystalline solid. Part I of the book develops basic concepts in diffusion field theory and illustrates them with several applications, while Part II focuses on key solid-state principles needed to apply diffusion theory to real materials. Crystals and Crystal Structures is an introductory text for students and others who need to understand the subject without necessarily becoming crystallographers. Using the book will enable students to read scientific papers and articles describing a crystal structure or use crystallographic databases with confidence and understanding. Reflecting the interdisciplinary nature of the subject the book includes a variety of applications as diverse as the relationship between physical properties and symmetry, and molecular and protein crystallography. As well as covering the basics the book contains an introduction to areas of crystallography, such as modulated structures and quasicrystals, and protein crystallography, which are the subject of important and active research. A non-mathematical introduction to the key elements of the subject Contains numerous applications across a variety of disciplines Includes a range of problems and exercises Clear, direct writing style "...the book contains a wealth of information and it fulfills its purpose of providing an interesting and broad introduction to the terpenes." CHEMISTRY WORLD, February 2007 "The CD contains data and descriptive material for making detailed thermodynamic calculations involving materials processing" --Preface. A major goal of materials science is to create new engineering materials and optimize their cost and performance. Understanding how adjacent materials behave at their borders is an essential part of this process. Grain boundaries are the longest-known crystal defects, but although they were discovered in the mid-eighteenth century, until quite recently, we did not understand them very well. Even now, scientists are still searching for the best ways to comprehensively characterize a material's microstructure—and accurately predict its evolution and behavior. Fills the gap between the physics of grain boundary motion and its engineering practicality Like the popular first edition, Grain Boundary Migration in Metals: Thermodynamics, Kinetics, Applications, Second Edition focuses extensively on the thermodynamics, kinetics, and applications involved with individual grain boundary migration in metals. However, this new volume adds a decade's worth of new developments in research and methods. It offers an up-to-date overview of current knowledge of the grain boundary migration process, and it details how migration influences microstructural evolution, including the recrystallization process and the creation of new materials. The authors rely on well-defined geometry and crystallography to address key topics such as grain growth, textures, and the properties and behavior of grain boundaries, particularly the nonlinear interaction of boundary elements. This invaluable second edition: Covers the latest techniques and computer simulations used in the study of single-grain boundary motion and grain boundary systems with junctions Provides the latest experimental data of grain boundary free volume measurements and offers the first measurements of grain boundary junction line tension Includes new problems with solutions As a solid foundation on which you can build your understanding of the migration phenomenon, this book should be required reading for researchers in areas such as interface physics and materials science of microstructure evolution and property control. It will also be vastly useful to any professional engaged in metals production and/or the heat treatment of metals and alloys.

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