

Introduction To Material And Energy Balances Ebook

Introduction to Material and Energy Balances John Wiley & Sons Incorporated

Energy Materials: A Short Introduction to Functional Materials for Energy Conversion and Storage provides readers with an accessible overview of the functional materials currently employed or investigated for energy provision, conversion, and storage. Rather than exploring the physical and chemical basics of energy conversion and storage, this book focuses on the various materials used in this field with simple explanations of their design principles, specific functionality, and quantitative figures of merit. It is suited for advanced undergraduate and graduate students studying energy and energy materials in physics, material science, engineering, and chemistry courses, as well as scientists starting their research in the field of functional materials for energy applications.

Key Features: Provides an accessible introduction to complex subjects in simple terms with pedagogical features to enhance learning
Contains the latest developments in this exciting and growing area
Discusses examples from modern high-impact research and applications

Includes details of the fundamental phenomenological theories of solar cells, Li ion/ Li-air/Li-S batteries, fuel cells and their energy storage mechanisms. Discusses properties of various energy materials in addition to their device operation and evaluation. Includes details of the fundamental phenomenological theories of solar cells, Li ion/ Li-air/Li-S batteries, fuel cells and their energy storage mechanisms Discusses properties of various energy materials in addition to their device operation and evaluation

Materials for Supercapacitor Applications provides a snapshot of the present status of this rapidly growing field. It covers motivations, innovations, ongoing breakthroughs in research and development, innovative materials, impacts, and perspectives, as well as the challenges and technical barriers to identifying an ideal material for practical applications. This comprehensive reference by electro-chemists explains concepts in materials selection and their unique applications based on their electro-chemical properties. Chemists, chemical and electrical engineers, material scientists, and research scholars and students interested in energy will benefit from this overview of many important reference points in understanding the materials used in supercapacitors. Provides an overview of the formulation for new materials and how to characterize them for supercapacitor applications Describes all

the information on the available materials for supercapacitor applications
Outlines potential material characterization methods Discusses perspectives
and future directions of the field

An Introduction to Aspects of Thermodynamics and Kinetics Relevant to
Materials Science

Introduction to Energy

An Introduction to Materials Engineering and Science for Chemical and
Materials Engineers

Polymer Materials for Energy and Electronic Applications

Introduction to Materials Science

This book, from noted materials selection authority Mike Ashby, provides a structure and framework for analyzing sustainable development and the role of materials in it. The aim is to introduce ways of exploring sustainable development to readers in a way that avoids simplistic interpretations and approaches complexity in a systematic way. There is no completely "right" answer to questions of sustainable development – instead, there is a thoughtful, well-researched response that recognizes concerns of stakeholders, the conflicting priorities and the economic, legal and social aspects of a technology as well as its environmental legacy. The intent is not to offer solutions to sustainability challenges but rather to improve the quality of discussion and enable informed, balanced debate. Winner of a 2016 Most Promising New Textbook Award from the Textbook and Academic Authors Association Describes sustainable

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development in increasingly detailed progression, from a broad overview to specific tools and methods Six chapter length case studies on such topics as biopolymers, electric cars, bamboo, and lighting vividly illustrate the sustainable development process from a materials perspective Business and economic aspects are covered in chapters on corporate sustainability and the "circular materials economy" Support for course use includes online solutions manual and image bank

This textbook introduces the reader to the elementary chemistry on which materials science depends by discussing the different classes of materials and their applications. It shows the reader how different types of materials are produced, why they possess specific properties, and how they are used in technology. Each chapter contains study questions to enable discussions and consolidation of the acquired knowledge. The new edition of this textbook is completely revised and updated to reflect the significant expansion of the field of materials chemistry over the last years, covering now also topics such as graphene, nanotubes, light emitting diodes, extreme photolithography, biomedical materials, and metal organic frameworks. From the reviews of the first edition: "This book is not only informative and comprehensive for a novice reader, but also a valuable resource for a scientist and/or an industrialist for new and novel challenges." (Materials and Manufacturing Process, June 2009) "Allcock provides a clear path by first describing basic chemical principles, then distinguishing between the various major materials groups, and finally enriching the student by offering a variety of special examples." (CHOICE, April 2009) "Proceeding logically from the basics to materials in advanced technology, it covers the fundamentals of materials chemistry, including principles of materials synthesis and materials characterization methods." (Internationale

Fachzeitschrift Metall, January 2009)

Many modern energy systems are reliant on the production, transportation, storage, and use of gaseous hydrogen. The safety, durability, performance and economic operation of these systems is challenged by operating-cycle dependent degradation by hydrogen of otherwise high performance materials. This important two-volume work provides a comprehensive and authoritative overview of the latest research into managing hydrogen embrittlement in energy technologies. Volume 1 is divided into three parts, the first of which provides an overview of the hydrogen embrittlement problem in specific technologies including petrochemical refining, automotive hydrogen tanks, nuclear waste disposal and power systems, and H₂ storage and distribution facilities. Part two then examines modern methods of characterization and analysis of hydrogen damage and part three focuses on the hydrogen degradation of various alloy classes With its distinguished editors and international team of expert contributors, Volume 1 of Gaseous hydrogen embrittlement of materials in energy technologies is an invaluable reference tool for engineers, designers, materials scientists, and solid mechanicians working with safety-critical components fabricated from high performance materials required to operate in severe environments based on hydrogen. Impacted technologies include aerospace, petrochemical refining, gas transmission, power generation and transportation. Summarises the wealth of recent research on understanding and dealing with the safety, durability, performance and economic operation of using gaseous hydrogen at high pressure Reviews how hydrogen embrittlement affects particular sectors such as the petrochemicals, automotive and nuclear industries Discusses how hydrogen embrittlement can be characterised and its effects on particular alloy classes

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Energy and Society: An Introduction, Second Edition provides readers with a detailed introduction to energy sources and energy utilization. This book presents an overview of alternative energy issues and technologies, discusses the pros and cons of various energy sources, and explores their impacts on society and the environment. What's New in the Second Edition: This second edition offers simple updates, as well as completely rewritten material, regarding the last decade in areas including global climate change, oil prices, renewable and alternative fuels, and diversion of civil nuclear energy programs into nuclear weapons proliferation. It covers the development of energy technology from the time of early humans through antiquity, medieval times, and the Industrial Revolution. It also addresses the development of nuclear energy, energy supply and demand, geopolitics of energy, and the various environmental issues associated with energy use. Keeps mathematics to a minimum, making the book usable for a variety of academic majors Includes up-to-date coverage of all new energy sources Traces the development and utilization of energy throughout history *Energy and Society: An Introduction, Second Edition* can benefit undergraduate students taking a survey course in engineering, as well as professionals in the energy supply, energy planning, or environmental industry.

Applied Environmental Materials Science for Sustainability

Introduction to Materials Science and Engineering

Mechanisms, Modelling and Future Developments

Introduction to Materials for Advanced Energy Systems

This book is based on a set of notes developed over many years for an introductory course taught to seniors and entering graduate students in materials science. An Introduction to

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Aspects of Thermodynamics and Kinetics Relevant to Materials Science is about the application of thermodynamics and kinetics to solve problems within Materials Science. Emphasis is to provide a physical understanding of the phenomenon under discussion, with the mathematics presented as a guide. The problems are used to provide practice in quantitative application of principles, and also to give examples of applications of the general subject matter to problems having current interest and to emphasize the important physical concepts. End of chapter problems are included, as are references, and bibliography to reinforce the text. This book provides students with the theory and mathematics to understand the important physical understanding of phenomena. Based on a set of notes developed over many years for an introductory course taught to seniors and entering graduate students in materials science Provides students with the theory and mathematics to understand the important physical understanding of phenomena Includes end of chapter problems, references, and bibliography to reinforce the text

Rev. ed. of: Handbook on material and energy balance calculations in metallurgical processes. 1979.

This first of its kind text enables today's students to understand current and future energy challenges, to acquire skills for selecting and using materials and manufacturing processes in the design of energy systems, and to develop a cross-functional approach to materials, mechanics, electronics and processes of energy production. While taking economic and regulatory aspects into account, this textbook provides a comprehensive introduction to the

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range of materials used for advanced energy systems, including fossil, nuclear, solar, bio, wind, geothermal, ocean and hydropower, hydrogen, and nuclear, as well as thermal energy storage and electrochemical storage in fuel cells. A separate chapter is devoted to emerging energy harvesting systems. Integrated coverage includes the application of scientific and engineering principles to materials that enable different types of energy systems. Properties, performance, modeling, fabrication, characterization and application of structural, functional and hybrid materials are described for each energy system. Readers will appreciate the complex relationships among materials selection, optimizing design, and component operating conditions in each energy system. Research and development trends of novel emerging materials for future hybrid energy systems are also considered. Each chapter is basically a self-contained unit, easily enabling instructors to adapt the book for coursework. This textbook is suitable for students in science and engineering who seek to obtain a comprehensive understanding of different energy processes, and how materials enable energy harvesting, conversion, and storage. In setting forth the latest advances and new frontiers of research, the text also serves as a comprehensive reference on energy materials for experienced materials scientists, engineers, and physicists. Includes pedagogical features such as in-depth side bars, worked-out and end-of-chapter exercises, and many references to further reading Provides comprehensive coverage of materials-based solutions for major and emerging energy systems Brings together diverse subject matter by integrating theory with engaging insights Offers a comprehensive review of the currently existing energy production and consumption

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technologies Offering unique perspectives from one social and one natural scientist and combining them with the view of an industry expert, this book covers definitions and ways of quantifying energy and sustainability, and examines today's energy production and consumption technologies?paying particular attention to the environmental, historic, and regulatory aspects of each introduced energy technology. It also deals with alternative and future energy technologies, as well as examples of sustainable approaches to everyday issues of transportation, urban planning, and home construction. Introduction to Energy and Sustainability starts with a section on introductory concepts and covers such things as the history of our relationship with energy; defining and quantifying both energy and sustainability; flows and conversions of energy and matter; and the laws of thermodynamics energy production today. It examines how energy is produced and consumed in our modern world?and looks at what types of energy exist and how we use it. The book also discusses the future of energy and how we will provide and utilize our current and forthcoming sources of power as our world changes. -Balances the treatment of hard science and engineering concepts of energy and sustainability with a thorough discussion of their socioeconomic and geopolitical implications -Offers a unique perspective of one social and one natural scientist, combined with the view of an industry expert -Filled with chapters that feature practice questions and solutions -Relevant to students in energy fields and environmentalists Introduction to Energy and Sustainability is an ideal text for post-graduate level students of energy fields. It will also greatly benefit environmentalists, engineers, power engineers, and chemists in industry.

Resources, Technology, and Society

Advanced Thermoelectric Materials for Energy Harvesting Applications

The Material Basis of Energy Transitions

Materials for Supercapacitor Applications

An Introduction, Second Edition

A thorough introduction to balance equation concepts. Geared for the course offered to chemical engineering majors in their sophomore year. Develops a framework for the analysis of flowsheet problem information with extensive use of degree-of-freedom analysis. Presents systematic approaches for manual and computer-aided solution of full scale balance problems. Provides a detailed development of the structure, properties, and interrelationships of species and element balances based on the algebraic view of reaction-stoichiometry and the rate of reaction concept.

Global demand for low cost, efficient and sustainable energy production is ever increasing. Driven by recent discoveries and innovation in the science and technology of materials, applications based on functional materials are becoming increasingly important. Functional materials for sustainable energy applications provides an essential guide to the development and application of these materials in sustainable energy production. Part one reviews functional materials for solar power, including silicon-based, thin-film, and dye sensitized photovoltaic solar cells, thermophotovoltaic device modelling and photoelectrochemical cells. Part

two focuses on functional materials for hydrogen production and storage. Functional materials for fuel cells are then explored in part three where developments in membranes, catalysts and membrane electrode assemblies for polymer electrolyte and direct methanol fuel cells are discussed, alongside electrolytes and ion conductors, novel cathodes, anodes, thin films and proton conductors for solid oxide fuel cells. Part four considers functional materials for demand reduction and energy storage, before the book concludes in part five with an investigation into computer simulation studies of functional materials. With its distinguished editors and international team of expert contributors, Functional materials for sustainable energy applications is an indispensable tool for anyone involved in the research, development, manufacture and application of materials for sustainable energy production, including materials engineers, scientists and academics in the rapidly developing, interdisciplinary field of sustainable energy. An essential guide to the development and application of functional materials in sustainable energy production Reviews functional materials for solar power Focuses on functional materials for hydrogen production and storage, fuel cells, demand reduction and energy storage

The growing presence of biomass and waste has caused significant changes to the environment. With the ubiquity of these materials, there is an increasing need for proper disposal and reuse of these resources. Applied Environmental Materials Science for Sustainability is a key resource on the latest advancements in environmental materials, including the utilization of biomass and waste for

advanced materials. Highlighting innovative studies on renewable resources, green technology, and chemical modification, this book is an ideal reference source for academics, researchers, professionals, and graduate students in the field of environmental and materials sciences and technologies.

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

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organics electronics, polymer light-emitting diodes, superconductivity, and more.
Handbook on Material and Energy Balance Calculations in Material Processing,
Includes CD-ROM

Introduction to the Thermodynamics of Materials, Fifth Edition

Energy Law: An Introduction

Advanced Materials Science and Engineering of Carbon

Introduction to Energy and Sustainability

This long awaited second edition of a popular textbook has a simple and direct approach to the diversity and complexity of food processing. It explains the principles of operations and illustrates them by individual processes. The new edition has been enlarged to include sections on freezing, drying, psychrometry, and a completely new section on mechanical refrigeration. All the units have been converted to SI measure. Each chapter contains unworked examples to help the student gain a grasp of the subject, and although primarily intended for the student food technologist or process engineer, this book will also be useful to technical workers in the food industry

This Text Provides A Balanced And Current Treatment Of The Full Spectrum Of Engineering Materials, Covering All The Physical Properties, Applications And Relevant Properties Associated With The Subject. It

Explores All The Major Categories Of Materials While Offering Detailed Examinations Of A Wide Range Of New Materials With High-Tech Applications.

An Introduction to Materials Engineering and Science for Chemical and Materials Engineers provides a solid background in materials engineering and science for chemical and materials engineering students. This book: Organizes topics on two levels; by engineering subject area and by materials class. Incorporates instructional objectives, active-learning principles, design-oriented problems, and web-based information and visualization to provide a unique educational experience for the student. Provides a foundation for understanding the structure and properties of materials such as ceramics/glass, polymers, composites, bio-materials, as well as metals and alloys. Takes an integrated approach to the subject, rather than a "metals first" approach.

A great resource for beginner students and professionals alike Introduction to Energy, Renewable Energy and Electrical Engineering: Essentials for Engineering Science (STEM) Professionals and Students brings together the fundamentals of Carnot's laws of thermodynamics, Coulomb's law, electric circuit theory, and semiconductor technology. The book is the

perfect introduction to energy-related fields for undergraduates and non-electrical engineering students and professionals with knowledge of Calculus III. Its unique combination of foundational concepts and advanced applications delivered with focused examples serves to leave the reader with a practical and comprehensive overview of the subject. The book includes: A combination of analytical and software solutions in order to relate aspects of electric circuits at an accessible level A thorough description of compensation of flux weakening (CFW) applied to inverter-fed, variable-speed drives not seen anywhere else in the literature Numerous application examples of solutions using PSPICE, Mathematica, and finite difference/finite element solutions such as detailed magnetic flux distributions Manufacturing of electric energy in power systems with integrated renewable energy sources where three-phase inverter supply energy to interconnected, smart power systems Connecting the energy-related technology and application discussions with urgent issues of energy conservation and renewable energy—such as photovoltaics and ground-water heat pump resulting in a zero-emissions dwelling—Introduction to Energy, Renewable Energy, and Electrical Engineering crafts a truly modern and relevant approach to its subject

matter.

Material and Energy Balances, Class Notes, 1981 TAPPI Annual Meeting Seminar, March 5-6 1981

Materials and Sustainable Development

Introduction to Material and Energy Balances

**Fundamentals of Materials for Energy and Environmental Sustainability
Energy and Society**

Written in clear, concise language and designed for an introductory applied energy course, Applied Energy: An Introduction discusses energy applications in small-medium enterprises, solar energy, hydro and wind energy, nuclear energy, hybrid energy, and energy sustainability issues. Focusing on renewable energy technologies, energy conversion, and conservation and the energy industry, the author lists the key aspects of applied energy and related studies, taking a question-based approach to the material that is useful for both undergraduate students and postgraduates who want a broad overview of energy conversion. The author carefully designed the text to motivate students and give them the foundation they need to place the concepts presented into a real-world context. He begins with an introduction to the basics and the definitions used throughout the book. From there, he covers the energy industry and energy applications; energy sources, supply, and demand; and energy

management, policy, plans, and analysis. Building on this, the author elucidates various energy saving technologies and energy storage methods, explores the pros and cons of fossil fuels and alternative energy sources, and examines the various types of applications of alternative energies. The book concludes with chapters on hybrid energy technology, hybrid energy schemes, other energy conversion methods, and applied energy issues. The book takes advantage of practical and application-based learning, presenting the information in various forms such as essential notes followed by practical projects, assignments, and objective and practical questions. In each chapter, a small section introduces some elements of applied energy design and innovation, linking knowledge with applied energy design and practice. The comprehensive coverage gives students the skills not only to master the concepts in the course, but also apply them to future work in this area.

Many modern energy systems are reliant on the production, transportation, storage, and use of gaseous hydrogen. The safety, durability, performance and economic operation of these systems is challenged by operating-cycle dependent degradation by hydrogen of otherwise high performance materials. This important two-volume work provides a comprehensive and authoritative overview of the latest research into managing hydrogen embrittlement in energy technologies. Volume 2 is divided into three parts, part one looks at the mechanisms of

hydrogen interactions with metals including chapters on the adsorption and trap-sensitive diffusion of hydrogen and its impact on deformation and fracture processes. Part two investigates modern methods of modelling hydrogen damage so as to predict material-cracking properties. The book ends with suggested future directions in science and engineering to manage the hydrogen embrittlement of high-performance metals in energy systems. With its distinguished editors and international team of expert contributors, Volume 2 of Gaseous hydrogen embrittlement of materials in energy technologies is an invaluable reference tool for engineers, designers, materials scientists, and solid mechanics working with safety-critical components fabricated from high performance materials required to operate in severe environments based on hydrogen. Impacted technologies include aerospace, petrochemical refining, gas transmission, power generation and transportation. Summarises the wealth of recent research on understanding and dealing with the safety, durability, performance and economic operation of using gaseous hydrogen at high pressure Chapters review mechanisms of hydrogen embrittlement including absorption, diffusion and trapping of hydrogen in metals Analyses ways of modelling hydrogen-induced damage and assessing service life Given the potential disruption of climate change, understanding energy issues and technologies is more important than ever if societies are to

make informed choices on policy. Now in its third edition, Introduction to Energy explores the crucial issues connected to modern energy technology and its uses. Fully updated to respond to the substantial developments in the energy sector, the book expands on the relationships of energy use and climate change; of energy availability and the alleviation of world poverty; and of energy consumption and the sustainability of the lifestyles of people in the industrialized world. Directed at a broad readership, it assumes no prior technical expertise and avoids complex mathematical formulations, continuing to provide a standard for introductory energy courses. It is also a useful supplementary text for programs in public policy, business law and resource economics.

Polymer Materials for Energy and Electronic Applications is among the first books to systematically describe the recent developments in polymer materials and their electronic applications. It covers the synthesis, structures, and properties of polymers, along with their composites. In addition, the book introduces, and describes, four main kinds of electronic devices based on polymers, including energy harvesting devices, energy storage devices, light-emitting devices, and electrically driving sensors. Stretchable and wearable electronics based on polymers are a particular focus and main achievement of the book that concludes with the future developments and challenges of electronic polymers and

devices. Provides a basic understanding on the structure and morphology of polymers and their electronic properties and applications Highlights the current applications of conducting polymers on energy harvesting and storage Introduces the emerging flexible and stretchable electronic devices Adds a new family of fiber-shaped electronic devices

Energy Materials

Unit Operations in Food Processing

A Short Introduction to Functional Materials for Energy Conversion and Storage

Introduction to the Physics and Chemistry of Materials

Essentials for Engineering Science (STEM) Professionals and Students

Advanced Thermoelectric Materials for Energy Harvesting Applications is a research-intensive textbook covering the fundamentals of thermoelectricity and the process of converting energy into electrical energy. It covers the design, implementation, and performance of and advanced thermoelectric materials. Chapters examine such topics as organic/inorganic thermoelectric materials, performance and behaviors of thermoelectric devices, and energy harvesting applications of thermoelectric devices.

This book introduces the principles of electrochemistry with a special emphasis on materials science. This book is clearly organized around the main topic areas comprising electrolytes, electrodes, development of the potential differences in combining electrolytes with electrodes, the electrochemical double layer, mass transport, and charge transfer, making the subject

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matter more accessible. In the second part, several important areas for materials science are described in more detail. These chapters bridge the gap between the introductory text and the more specialized literature. They feature the electrodeposition of metals and alloys, the electrochemistry of oxides and semiconductors, intrinsically conducting polymers, and applications of nanotechnology with an emphasis on the codeposition of nanoparticles. This book provides a good introduction into electrochemistry for the graduate student. For the research student as well as for the advanced reader there is sufficient information on the basic problems in the chapters. The book is suitable for students and researchers in chemistry, physics, engineering, as well as materials science. - Introduction into electrochemistry - Metal and alloy electrodeposition - Oxides and semiconductors, corrosion - Intrinsically conducting polymers - Codeposition of nanoparticles, multilayers

"Updated to reflect the many societal and technological changes in the field since publication of the first edition, Introduction to Materials Science and Engineering, Second Edition offers an interdisciplinary view, emphasizing the importance of materials to engineering applications and builds the basis needed to select, modify, and create materials to meet specific criteria. Written for advanced undergraduate students and readers interested in introductory materials science and engineering concepts, this concise textbook provides a strong foundation in materials and its applications. The textbook offers a solutions manual and PowerPoint lecture slides for adopting professors"--

Introduction to Materials Chemistry will appeal to advanced undergraduates and graduate students.

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students in chemistry, materials science, and chemical engineering by leading them step by step from the elementary chemistry on which materials science depends, through a discussion of different classes of materials, and ending with a description of how materials are used in modern devices and general technology.

Introduction to Energy and Climate

Gaseous Hydrogen Embrittlement of Materials in Energy Technologies

An Introduction

Applied Energy

Functional Materials for Sustainable Energy Applications

The purpose of this textbook is to provide a well-rounded working knowledge of both climate change and environmental sustainability for a wide range of students. Students will learn core concepts and methods to analyze energy and environmental impacts; will understand what is changing the earth's climate, and what that means for life on earth now and in the future. They will also have a firm understanding of what energy is and how it can be used. This text intends to develop working knowledge of these topics, with both technical and social implications. Students will find in one volume the integration and careful treatment of climate, energy, and sustainability.

The Material Basis of Energy Transitions explores the intersection between critical raw material provision and the energy system.

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Chapters draw on examples and case studies involving energy technologies (e.g., electric power, transport) and raw material provision (e.g., mining, recycling), and consider these in their regional and global contexts. The book critically discusses issues such as the notion of criticality in the context of a circular economy, approaches for estimating the need for raw materials, certification schemes for raw materials, the role of consumers, and the impact of renewable energy development on resource conflicts. Each chapter deals with a specific issue that characterizes the interdependency between critical raw materials and renewable energies by examining case studies from a particular conceptual perspective. The book is a resource for students and researchers from the social sciences, natural sciences, and engineering, as well as interdisciplinary scholars interested in the field of renewable energies, the circular economy, recycling, transport, and mining. The book is also of interest to policymakers in the fields of renewable energy, recycling, and mining, professionals from the energy and resource industries, as well as energy experts and consultants looking for an interdisciplinary assessment of critical materials. Provides a comprehensive overview of key issues related to the nexus between renewable energy and critical raw materials Explores interdisciplinary perspectives from the natural sciences, engineering, and social

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sciences Discusses critical strategies to address the nexus from a practitioner's perspective

How will we meet rising energy demands? What are our options? Are there viable long-term solutions for the future? Learn the fundamental physical, chemical and materials science at the heart of:

Renewable/non-renewable energy sources • Future transportation systems

• Energy efficiency • Energy storage Whether you are a student taking an energy course or a newcomer to the field, this textbook will help you understand critical relationships between the environment, energy and sustainability. Leading experts provide comprehensive coverage of each topic, bringing together diverse subject matter by integrating theory with engaging insights. Each chapter includes helpful features to aid understanding, including a historical overview to provide context, suggested further reading and questions for discussion. Every subject is beautifully illustrated and brought to life with full color images and color-coded sections for easy browsing, making this a complete educational package. Fundamentals of Materials for Energy and Environmental Sustainability will enable today's scientists and educate future generations.

Carbon materials are exceptionally diverse in their preparation, structure, texture, and applications. In Advanced Materials Science and Engineering of Carbon, noted carbon scientist Michio Inagaki and

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his coauthors cover the most recent advances in carbon materials, including new techniques and processes, carbon materials synthesis, and up-to-date descriptions of current carbon-based materials, trends and applications. Beginning with the synthesis and preparation of nanocarbons, carbon nanotubes, and graphenes, the book then reviews recently developed carbonization techniques, such as templating, electrospinning, foaming, stress graphitization, and the formation of glass-like carbon. The last third of the book is devoted to applications, featuring coverage of carbon materials for energy storage, electrochemical capacitors, lithium-ion rechargeable batteries, and adsorptive storage of hydrogen and methane for environmental protection, photocatalysis, spilled oil recovery, and nuclear applications of isotropic high-density graphite. A progression from synthesis through modern carbonization techniques to applications gives you a thorough understanding of carbon materials. Covers a wide range of precursor materials, preparation techniques, and characteristics to inspire your own development of carbonization techniques, carbon materials and applications. Applications-oriented chapters include timely content on hot topics such as the engineering of carbon nanofibers and carbon materials for various energy-related applications.

Eco-informed Material Choice

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Materials Science In Construction: An Introduction

Introduction to Energy, Renewable Energy and Electrical Engineering

Introduction to Materials Science for Engineers

Introduction to Process Engineering Calculation

Materials Science in Construction explains the science behind the properties and behaviour of construction's most fundamental materials (metals, cement and concrete, polymers, timber, bricks and blocks, glass and plaster). In particular, the critical factors affecting in situ materials are examined, such as deterioration and the behaviour and durability of materials under performance. An accessible, easy-to-follow approach makes this book ideal for all diploma and undergraduate students on construction-related courses taking a module in construction materials.

Addressing the growing global concern for sustainable engineering, *Materials and the Environment, 2e* is the only book devoted exclusively to the environmental aspects of materials. It explains the ways in which we depend on and use materials and the consequences these have, and it introduces methods for thinking about and designing with materials within the context of minimizing environmental impact. Along with its noted in-depth coverage of material consumption, the material life-cycle, selection strategies, and legislative aspects, the second edition includes new case studies, important new chapters on *Materials for Low Carbon Power and Material Efficiency*, all illustrated by in-text examples and expanded exercises. This book is intended for instructors and students as well as materials engineers and product designers who need to consider the environmental implications of materials in their designs. Introduces methods and tools for thinking about

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and designing with materials within the context of their role in products and the environmental consequences Contains numerous case studies showing how the methods discussed in the book can be applied to real-world situations Includes full-color data sheets for 40 of the most widely used materials, featuring such environmentally relevant information as their annual production and reserves, embodied energy and process energies, carbon footprints, and recycling data New to this edition: New chapter of Case Studies of Eco-audits illustrating the rapid audit method New chapter on Materials for Low Carbon Power examines the consequences for materials supply of a major shift from fossil-fuel based power to power from renewables New chapter exploring Material Efficiency, or design and management for manufacture to provide the services we need with the least production of materials Recent news-clips from the world press that help place materials issues into a broader context. are incorporated into all chapters End-of-chapter exercises have been greatly expanded The datasheets of Chapter 15 have been updated and expanded to include natural and man-made fibers

The aim of this short text is simply to introduce a reader to this topic. It is intended for a global audience and rather than being restricted to potential energy law students of a particular country. It is also written for students of other disciplines such as geographers, social scientists and engineers. It should also be engaging to those in a variety of professional practices who want an accessible background to and overview of the subject. The text aims to outline the principles and central logic behind energy law. Therefore, readers from across the world should be able to use it as a guide to thinking about energy law in their own countries. A variety of examples from many different countries are included in the text and while

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examples and comparisons are mainly from the EU and US, they represent good examples of more advanced and innovative energy law. For those readers who seek further or more in-depth knowledge, this text will only serve as an introduction. However, a key focus of the book is to direct the reader where they to look for further information and within the book there are suggested extra readings, the key recommended journals to read and other sources of information based on institutions who publish further material in this area. The aim of the Energy Law: An Introduction is to introduce new readers to the developing area of energy law. The hope is that it provides an introduction to the legal challenges faced in the energy sector and the potential contribution of energy law to delivering a better world for future generations.

Introduction to Process Calculations Stoichiometry

Developing a Sustainable Environment

Fundamentals to Applications

The Problem, its Characterisation and Effects on Particular Alloy Classes

Introduction to Materials Chemistry