

Stoichiometry Bhatt Thakore Solution

Significant advances have occurred in the theory of non-stoichiometry problems and fundamentally new and wide-ranging applications have been developed, helping to better identify relevant issues. The contributions in this volume bring together the experience of specialists from different disciplines (materials scientists, physicists, chemists and device people) confronted with non-stoichiometry problems. The 40 papers, including 9 invited papers, give an advanced scenario of this wide interdisciplinary area, which is highly important in its diverse aspects of theory, implementation and applications. This work will be of interest not only to universities and laboratories engaged in studies and research in this field, but also to organizations and industrial centres concerned with implementations and applications. The diversity of the topics, as well as the extraordinary tempo in which Non-stoichiometry in Semiconductors has progressed in recent years attest to the permanent vitality of this field of research and development.

"This book approaches the subject of material and energy balances from two directions. First, it emphasizes the fundamental principles of the conservation of mass and energy, and the consequences of these two principles. Second it applies the techniques of computational chemistry to materials processing, and introduces new software developed by the author especially for material and heat balances. The third edition reflects the changes in the professional engineer's practice in the last 30 years, reflecting the dramatic shift away from metallurgical engineering and the extractive industry towards materials engineering. A large and growing number of recent graduates are employed in such fields as semiconductor processing, environmental engineering, and the production and processing of advanced and exotic materials for aerospace, electronic and structural applications. The advance in computing power and software for the desktop computer has significantly changed the way engineers make computations, and the biggest change comes from the computational approach used to solve problems. The spreadsheet program Excel is used extensively throughout the text as the main computational "engine" for solving material and energy balance equations, and for statistical analysis of data. The use of Excel and the introduction of the add-in programs enables the study of a range of variables on critical process parameters, and emphasis is placed on multi-device flowsheets with recycle, bypass, and purge streams whose material and heat balance equations were previously too complicated to solve by the normally-used hand calculator. The Excel-based program FlowBal helps the user set up material and heat balance equations for processes with multiple streams and units"--

Designed as an undergraduate-level textbook in Chemical Engineering, this student-friendly, thoroughly class-room tested book, now in its second edition, continues to provide an in-depth analysis of chemical engineering thermodynamics. The book has been so organized that it gives comprehensive coverage of basic concepts and applications of the laws of thermodynamics in the initial chapters, while the later chapters focus at length on important areas of study falling under the realm of chemical thermodynamics. The reader is thus introduced to a thorough analysis of the fundamental laws of thermodynamics as well as their applications to practical situations. This is followed by a detailed discussion on relationships among thermodynamic properties and an exhaustive treatment on the thermodynamic properties of solutions. The role of phase equilibrium thermodynamics in design, analysis, and operation of chemical separation methods is also deftly dealt with. Finally, the chemical reaction equilibria are skillfully explained. Besides numerous illustrations, the book contains over 200 worked examples, over 400 exercise problems (all with answers) and several objective-type questions, which enable students to gain an in-depth understanding of the concepts and theory discussed. The book will also be a useful text for students pursuing courses in chemical engineering-related branches such as polymer engineering, petroleum engineering, and safety and environmental engineering. New to This Edition • More Example Problems and Exercise Questions in each chapter • Updated section on Vapour–Liquid Equilibrium in Chapter 8 to highlight the significance of equations of state approach • GATE Questions up to 2012 with answers

Current Developments in Biotechnology and Bioengineering: Crop Modification, Nutrition, and Food Production provides extensive coverage of new developments, state-of-the-art technologies, and potential future trends, presenting data-based scientific knowledge on agribiotechnology and describing world agriculture and the role biotechnology can play in ensuring food security over the next fifty years. The book discusses the effects of climate change in agriculture and the resultant emergence of new crops, including drought tolerant and more nutritious plants. In addition, the book discusses insect and virus resistance in plants and outlines plant metabolic engineering for agriculture, genetically engineered plants, and microbial diseases. Highlights recent developments in agriculture due to biotechnology Relates the effect of climate change in agriculture to the development of new crops Describes the application of metabolic engineering in the development of new genetically modified plants

Chemical Engineering Practice
Process Equipment Design

Introduction to Engineering Design
Past, Present and Future

Introduction to Engineering Design is a completely novel text covering the basic elements of engineering design for structural integrity. Some of the most important concepts that students must grasp are those relating to 'design thinking' and reasoning, and not just those that relate to simple theoretical and analytical approaches. This is what will enable them to get to grips with *practical* design problems, and the starting point is thinking about problems in a 'deconstructionist' sense. By analysing design problems as sophisticated systems made up of simpler constituents, and evolving a solution from known experience of such building blocks, it is possible to develop an approach that will enable the student to tackle even completely alien design scenarios with confidence. The other essential aspect of the design process – the concept of failure, and its avoidance – is also examined in

detail, and the importance not only of contemplating expected failure conditions at the design stage but also checking those conditions as they apply to the completed design is stressed. These facets in combination offer a systematic method of considering the design process and one that will undoubtedly find favour with many students, teaching staff and practising engineers alike. This book effectively links the latest scientific advances to current technological applications of polymers, mainly focusing on biodegradable polymers obtained from biomass. The individual chapters were written by academic and industry researchers alike, introducing readers to topics that have received little attention in the literature to date. Key topics covered include polymers used in various areas such as food packaging, pharmaceuticals, energy production and the cosmetics industry, as well as the treatment of aqueous effluents.

Stoichiometry Tata McGraw-Hill Education Stoichiometry STOICHIOMETRY AND PROCESS CALCULATIONS PHI Learning Pvt. Ltd.

An extensive update of the classic reference on organic reactions in water Published almost a decade ago, the first edition has served as the guide for research in this burgeoning field. Due to the cost, safety, efficiency, and environmental friendliness of water as a solvent, there are many new applications in industry and academic laboratories. More than forty percent of this extensively updated second edition covers new reactions. For ease of reference, it is organized by functional groups. A core reference, *Comprehensive Organic Reactions in Aqueous Media, Second Edition*: * Provides the most comprehensive coverage of aqueous organic reactions available * Covers the basic principles and theory and progresses to applications * Includes alkanes, alkenes, aromatics, electrophilic substitutions, carbonyls, alpha, beta-unsaturated carbonyls, carbon-nitrogen bonds, organic halides, pericyclic reactions, photochemical reactions, click chemistry, and multi-step syntheses? * Provides examples of applications in industry This is the premier reference for chemists and chemical engineers in industry or research, as well as for students in advanced-level courses.

PRINCIPLES OF MASS TRANSFER AND SEPERATION PROCESSES

Fluid Mechanics, Heat Transfer, and Mass Transfer

Non-Stoichiometry in Semiconductors

Biochemical Engineering

Conceptual Design of Chemical Processes

This text explains the concepts behind process design. It uses a case study approach, guiding readers through realistic design problems, and referring back to these cases at the end of each chapter. Throughout, the author uses shortcut techniques that allow engineers to obtain the whole focus for a design in a very short period (generally less than two days).

This broad-based book covers the three major areas of Chemical Engineering. Most of the books in the market involve one of the individual areas, namely, Fluid Mechanics, Heat Transfer or Mass Transfer, rather than all the three. This book presents this material in a single source. This avoids the user having to refer to a number of books to obtain information. Most published books covering all the three areas in a single source emphasize theory rather than practical issues. This book is written with emphasis on practice with brief theoretical concepts in the form of questions and answers, not adopting stereo-typed question-answer approach practiced in certain books in the market, bridging the two areas of theory and practice with respect to the core areas of chemical engineering. Most parts of the book are easily understandable by those who are not experts in the field. Fluid Mechanics chapters include basics on non-Newtonian systems which, for instance find importance in polymer and food processing, flow through piping, flow measurement, pumps, mixing technology and fluidization and two phase flow. For example it covers types of pumps and valves, membranes and areas of their use, different equipment commonly used in chemical industry and their merits and drawbacks. Heat Transfer chapters cover the basics involved in conduction, convection and radiation, with emphasis on insulation, heat exchangers, evaporators, condensers, reboilers and fired heaters. Design methods, performance, operational issues and maintenance problems are highlighted. Topics such as heat pipes, heat pumps, heat tracing, steam traps, refrigeration, cooling of electronic devices, NOx control find place in the book. Mass transfer chapters cover basics such as diffusion, theories, analogies, mass transfer coefficients and mass transfer with chemical reaction, equipment such as tray and packed columns, column internals including structural packings, design, operational and installation issues, drums and separators are discussed in good detail. Absorption, distillation, extraction and leaching with applications and design methods, including emerging practices involving Divided Wall and Petluk column arrangements, multicomponent separations, supercritical solvent extraction find place in the book.

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.

This book elaborates on drug delivery targeting via intracellular delivery, specifically through the Receptor Mediated Endocytosis (RME) approach, due to the involvement of cellular receptors in various grave diseases. Targeted delivery relies on two basic approaches, passive and active targeting. While passive targeting approaches have shown great promise, the improved selectivity achieved with active targeting approaches has resulted in significantly higher efficacy. Interestingly there are numerous strategies for active targeting, many of which are already highlighted in , Targeted Drug Delivery: Concepts and Applications. Nevertheless an exciting and practical strategy for active targeting, which could enable high intracellular delivery, is through exploitation of RME. Cells in the body express receptors to enable various physiological and biochemical processes. As a result, many of these receptors are overexpressed in pathological conditions, or newer receptors expressed due to defective cellular functioning. RME is based on exploitation of such receptors to achieve intracellular delivery. While targeted delivery can have manifold applications, in this book we focus on two major and challenging therapeutic areas; i) Cancer and ii) Infectious Diseases. Targeted Intracellular Drug Delivery by Receptor Medicated Endocytosis discusses the major receptors that are useful for targeted delivery for these afflictions. A major section of this book is dedicated to details regarding their occurrence and location, the recognition domain of the receptor, structure activity relationship of substrate /ligand for selective binding, ligands explored, antagonists for ligand binding and relevance of these aspects for therapy of cancer and infectious diseases. These facets are elucidated with the help of specific examples from academic research and also emphasize commercial products, wherever relevant. In vitro cellular models relied on for assessing receptor mediated cellular targeting and in vivo models depicting clinical efficacy are focused on in a separate section. Finally, we briefly discuss the regulatory and toxicity issues that may be associated specifically with the RME approach of intracellular drug delivery.

Crop Modification, Nutrition, and Food Production

Mass Transfer

Industrial Applications of Renewable Biomass Products

Basic Principles and Calculations in Chemical Engineering

Fundamentals and Biomedical Applications

With an ever-increasing human population, the demand placed upon the agriculture sector to supply more food is one of the greatest challenges for the agrarian community. In order to meet this challenge, environmentally unfriendly agrochemicals have played a key role in the green revolution and are even today commonly recommended to circumvent nutrient deficiencies of the soils. The use of agrochemicals is, though, a major factor for improvement of plant production; it causes a profound deteriorating effect on soil health (soil fertility) and in turn negatively affects the productivity and sustainability of crops. Concern over disturbance to the microbial diversity and consequently soil fertility (as these microbes are involved in biogeochemical processes), as well as economic constraints, have prompted fundamental and applied research to look for new agro-biotechnologies that can ensure competitive yields by providing sufficiently not only essential nutrients to the plants but also help to protect the health of soils by mitigating the toxic effects of certain pollutants. In this regard, the role of naturally abundant yet functionally fully unexplored microorganisms such as biofertilizers assume a special significance in the context of supplementing plant nutrients, cost and environmental impact under both conventional practices and derelict environments. Therefore, current developments in sustainability involve a rational exploitation of soil microbial communities and the use of inexpensive, though less bioavailable, sources of plant nutrients, which may be made available to plants by microbially-mediated processes.

Ammonia Fuel Cells covers all aspects of ammonia fuel cell technologies and their applications, including their theoretical analysis, modeling studies and experimental investigations. The book analyzes the role of integrated ammonia fuel cell systems within various renewable energy resources and existing energy systems. Covers the types of ammonia fuel cells that have been developed over history Features explanations of the underlying fundamentals and principles of ammonia fuel cells, along with methods to assess the performance of different types of cell Includes case studies considering different applications of ammonia fuel cells and their significance in the future of clean energy

This textbook is designed for undergraduate courses in chemical engineering and related disciplines such as biotechnology, polymer technology, petrochemical engineering, electrochemical engineering, environmental engineering, safety engineering and industrial chemistry. The chief objective of this text is to prepare students to make analysis of chemical processes through calculations and also to develop in them systematic problem-solving skills. The students are introduced not only to the application of law of combining proportions to chemical reactions (as the word 'stoichiometry' implies) but also to formulating and solving material and energy balances in processes with and without chemical reactions. The book presents the fundamentals of chemical engineering operations and processes in an accessible style to help the students gain a thorough understanding of chemical process calculations. It also covers in detail the background materials such as units and conversions, dimensional analysis and dimensionless groups, property estimation, P-V-T behaviour of fluids, vapour pressure and phase equilibrium relationships, humidity and saturation. With the help of examples, the book explains the construction and use of reference-substance plots, equilibrium diagrams, psychrometric charts, steam tables and enthalpy composition diagrams. It also elaborates on thermophysics and thermochemistry to acquaint the students with the thermodynamic principles of energy balance calculations. Key Features :

- SI units are used throughout the book.
- Presents a thorough introduction to basic chemical engineering principles.
- Provides many worked-out examples and exercise problems with answers.
- Objective type questions included at the end of the book serve as useful review material and also assist the students in preparing for competitive examinations such as GATE.

Since the beginning of human civilization, plants have been our true companions. Plants contribute not only to our existence but also serve us through discovery, design and the treatment of

various diseases where there is no satisfactory cure in modern medicine. This has focused Natural Product Chemists to unravel plants therapeutic potential in the light of modern analytical and pharmacological understandings. Presence of multiple active phytochemicals in medicinal plants offers exciting opportunity for the development of novel therapeutics, providing scientific justification for their use in traditional medicines. Non-food plants have been recognized as biofactories for the production of eco-friendly value added materials including agricultural, food products, enzymes, nutraceuticals etc. They have also been widely explored for personal care, industrial products and sources of energy generation. The proven efficacy of botanicals has been appreciated by the scientific community and strengthened plant-human relationship. The synergism in the Phytoproducts, the result of the interaction of two or more moieties, is not simply additive but multiplicative. Recent acceptance of the Food and Drug Administration (US) for herbal-medicine based preparation has renewed interest in Natural Product Research. The year 2011 is declared as the International Year of Chemistry (IYC 2011) by the United Nations Assembly. On this occasion, the present conference CPHEE 2011 aims to offer chemists from diverse areas to come to a common platform to share the knowledge and unveil the chemistry and magic potentials of phytoproducts for the mankind.

Chemical Process Principles Charts

Stoichiometry

CHEMICAL PROCESS CALCULATIONS

Chemical Principles of Synthetic Fibre Dyeing

An Introductory Textbook

This book introduces the fundamental principles of the mass transfer phenomenon and its diverse applications in process industry. It covers the full spectrum of techniques for chemical extraction. Beginning with molecular diffusion in gases, liquids and solids within a single phase, the mechanism of inter-phase mass transfer is explained with the help of several theoretical operations are explained comprehensively in two distinct ways—stage-wise contact and continuous differential contact. The primary design requirements of gas-liquid equipment are provided. A detailed discussion on all individual gas-liquid, liquid-liquid, solid-gas, and solid-liquid separation processes. The students are also exposed to the underlying principles of these separation processes. The book is replete with real applications of separation processes and equipment. Problems are worked out in each chapter. Besides, problems with answers, multiple choice questions with answers are given at the end of each chapter. The text is intended for a course on mass transfer, transport and separation processes prescribed for the undergraduate students of chemical engineering.

Best-selling introductory chemical engineering book - now updated with far more coverage of biotech, nanotech, and green engineering Thoroughly covers material balances, gases, and heat balances. Contains new biotech and bioengineering problems throughout.

Industrial Biotechnology offers a comprehensive overview of biochemical processes, technologies, and practical applications of industrial biotechnology. The work comprises of chapters on medium preparation, inoculum preparation using industrial strain and upstream processing, various fermentation processes, and physico-chemical separation processes for the purification and packaging. Analyzes problems within biochemical processes Discusses stoichiometry of bioprocesses Covers upstream and downstream processing Offers a wealth of case studies on production processes, including those in development of food products, vaccines and medicines, single cell proteins, amino acids, cheese, biodiesel, biopesticides, and more This book is intended for students, industrial practitioners, and researchers in biotechnology, food engineering, chemical engineering, and environmental engineering.

The Book Highlights The Nature And Features Of Indian Society And The Changes That Has Taken Place In Various Social Institutions During Different Historical Phases.This Is Comprehensive And Covers Subjects Widely Prescribed In The Syllabi Of Various Indian Universities At The Under-Graduate And Post-Graduate Levels In Sociology. The Topics Covered Include Indian Society And Culture, Indian Society And Social Institutions, Social Change In India And Indian Social Institutions, Contemporary Indian Society And Culture.While The Subject Has Been Treated In An Analytical Style With Central, Side And Running Headings, Integral And Holistic View Has Been Adopted, In Matters Having Different Opinions. The Language Is Easy And Free Of Technicalities As Far As Possible. At The End Of Each Chapter, Questions Of University Examinations Have Been Given To Help The Students For Preparing Well For The Examination. This Ideal Textbook Will Prove Most Useful To The Students, Teachers, Policymakers And Common Readers.

STOICHIOMETRY AND PROCESS CALCULATIONS

NASA Glenn Coefficients for Calculating Thermodynamic Properties of Individual Species

Introduction to Process Calculations Stoichiometry

Green Biosynthesis of Nanoparticles

A TEXTBOOK OF CHEMICAL ENGINEERING THERMODYNAMICS

There are physical and chemical methods of synthesis of nanomaterials. But due to the damage caused by these methods to the environment there is a pressing need of green nanotechnology, which is a clean and eco-friendly technology for the development of nanomaterials. The present book includes green synthesis of nanoparticles by algae, diatoms and plants. The mechanism behind the synthesis of nanoparticles will also be discussed. The book would be a valuable resource for students, researchers and teachers of biology, chemistry, chemical technology, nanotechnology, microbial technology and those who are interested in green nanotechnology.

This introductory text discusses the essential concepts of three fundamental transport processes, namely, momentum transfer, heat transfer, and mass transfer. Apart from chemical engineering, transport processes play an increasingly important role today in the fields of biotechnology, nanotechnology and microelectronics. The book covers the basic laws of momentum, heat and mass transfer. All the three transport processes are explained using two approaches—first by flux expressions

and second by shell balances. These concepts are applied to formulate the physical problems of momentum, heat and mass transfer. Simple physical processes from the chemical engineering field are selected to understand the mechanism of these transfer operations. Though these problems are solved for unidirectional flow and laminar flow conditions only, turbulent flow conditions are also discussed. Boundary conditions and Prandtl mixing models for turbulent flow conditions are explained as well. The unsteady-state conditions for momentum, heat and mass transfer have also been highlighted with the help of simple cases. Finally, the approach of analogy has also been adopted in the book to understand these three molecular transport processes. Different analogies such as Reynolds, Prandtl, von Kármán and Chilton-Colburn are discussed in detail. This book is designed for the undergraduate students of chemical engineering and covers the syllabi on Transport Phenomena as currently prescribed in most institutes and universities.

Synthetic fibres are widely used for many applications, with their colour being of major commercial importance. This extensively referenced book provides a comprehensive account of the physical chemistry of the dyeing of synthetic fibres and microfibres.

Written by a highly regarded author with industrial and academic experience, this new edition of an established bestselling book provides practical guidance for students, researchers, and those in chemical engineering. The book includes a new section on sustainable energy, with sections on carbon capture and sequestration, as a result of increasing environmental awareness; and a companion website that includes problems, worked solutions, and Excel spreadsheets to enable students to carry out complex calculations.

Nanomaterials in Biofuels Research

The Chemical Biology of Long Noncoding RNAs

Targeted Intracellular Drug Delivery by Receptor Mediated Endocytosis

Handbook on Material and Energy Balance Calculations in Material Processing, Includes CD-ROM

Mechanisms and Applications

This book offers a comprehensive and detailed overview of various aspects of long non-coding RNAs. It discusses their emerging significance in molecular medicine, ranging from human cancers to cardiovascular and metabolic diseases. Transcriptomic studies have demonstrated that the majority of genomes found in complex organisms are expressed in highly dynamic and cell-specific patterns, producing huge numbers of intergenic, antisense and intronic long non-protein-coding RNAs (lncRNAs). Thousands of lncRNAs have been identified, and unlike mRNA, they have no protein-coding capacity. A large repertoire of ncRNAs, actively transcribed from the mammalian genome, control diverse cellular processes, both in terms of development and diseases, through a variety of gene regulatory mechanisms. lncRNAs have emerged as a new paradigm in epigenetic regulation of the genome. Given its scope, the book will be of particular interest to molecular, chemical, cell and developmental biologists, as well as specialists in translational medicine involved in disease-oriented research. It also offers a valuable resource for in silico experts seeking a deeper understanding of lncRNA expression and function through computational analysis of the NGS data.

Multifunctional Systems for Combined Delivery, Biosensing, and Diagnostics explores how multifunctional nanocarriers are being used in combined delivery and diagnostics in contemporary medicine. Particular attention is given to efforts to i) reduce the side effects of therapeutic agents, ii) increase the pharmacological effect, and iii) improve aqueous solubility and chemical stability of different therapeutic agents. The chapters focus on applications of nanostructured materials and nanocarriers, highlighting how these can be used effectively in both diagnosis and delivery. This applied focus makes the book an important reference source for those wanting to learn more about how specific nanomaterials and nanotechnology systems can help to solve drug delivery and diagnostics problems. This book is a valuable resource for materials scientists, bioengineers, and medical researchers who are looking for an applications-oriented guide on how nanotechnology and nanomaterials can be used effectively throughout the medical treatment process, from diagnosis to treatment. Explores the benefits of using a variety of nanomaterials as drug delivery agents Explains how nanocarriers can reduce the side effects of therapeutic agents Provides an analysis of the pros and cons of using specific nanocarriers to solve particular diagnosis and delivery problems

Keeping the importance of basic tools of process calculations—material balance and energy balance—in mind, the text prepares the students to formulate material and energy balance theory on chemical process systems. It also demonstrates how to solve the main process-related problems that crop up in chemical engineering practice. The chapters are organized in a way that enables the students to acquire an in-depth understanding of the subject. The emphasis is given to the units and conversions, basic concepts of calculations, material balance with/without chemical reactions, and combustion of fuels and energy balances. Apart from

numerous illustrations, the book contains numerous solved problems and exercises which bridge the gap between theoretical learning and practical implementation. All the numerical problems are solved with block diagrams to reinforce the understanding of the concepts. Primarily intended as a text for the undergraduate students of chemical engineering, it will also be useful for other allied branches of chemical engineering such as polymer science and engineering and petroleum engineering. **KEY FEATURES** • Methods of calculation for stoichiometric proportions with practical examples from the Industry • Simplified method of solving numerical problems under material balance with and without chemical reactions • Conversions of chemical engineering equations from one unit to another • Solution of fuel and combustion, and energy balance problems using tabular column

This textbook is targetted to undergraduate students in chemical engineering, chemical technology, and biochemical engineering for courses in mass transfer, separation processes, transport processes, and unit operations. The principles of mass transfer, both diffusional and convective have been comprehensively discussed. The application of these principles to separation processes is explained. The more common separation processes used in the chemical industries are individually described in separate chapters. The book also provides a good understanding of the construction, the operating principles, and the selection criteria of separation equipment. Recent developments in equipment have been included as far as possible. The procedure of equipment design and sizing has been illustrated by simple examples. An overview of different applications and aspects of membrane separation has also been provided. 'Humidification and water cooling', necessary in every process industry, is also described. Finally, elementary principles of 'unsteady state diffusion' and mass transfer accompanied by a chemical reaction are covered. **SALIENT FEATURES** : • A balanced coverage of theoretical principles and applications. • Important recent developments in mass transfer equipment and practice are included. • A large number of solved problems of varying levels of complexities showing the applications of the theory are included. • Many end-chapter exercises. • Chapter-wise multiple choice questions. • An Instructors manual for the teachers.

Multifunctional Systems for Combined Delivery, Biosensing and Diagnostics

Introduction to Material and Energy Balances

Microbial Strategies for Crop Improvement

Process Calculations

Chemical Engineering Thermodynamics

This book offers present-day retrospectives and future perspectives on 'phytobiont' studies in the context of phyto-micro restitution, filling some of the information gaps in this promising research field. It discusses several ecosystem restitution strategies using dissimilar groups of microbes alone or in association with plants, as well as advances in metagenomics technology for studying in situ micro and macro communities in contaminated soil. It addresses topics such as the status quo, and the perspectives of microbial researchers and scientists, foresters, students, environmentalists, agriculturists and professional engineers. The rising pollution levels caused by xenobiotics is one of the biggest problems of our times, and as such the book comprehensively elaborates the latest research in this field and describes how the issue can be tackled using micro-organisms. With detailed diagrams and illustrations, the book is a valuable resource for experts and novices in the field of microbial bioremediation, phyto-bioremediation and environmental microbiology

A complete overview and considerations in process equipment design Handling and storage of large quantities of materials is crucial to the chemical engineering of a wide variety of products. Process Equipment Design explores in great detail the design and construction of the containers - or vessels - required to perform any given task within this field. The book provides an introduction to the factors that influence the design of vessels and the various types of vessels, which are typically classified according to their geometry. The text then delves into design and other considerations for the construction of each type of vessel, providing in the process a complete overview of process equipment design.

Rhizobia are bacteria which inhabit the roots of plants in the pea family and "fix" atmospheric nitrogen for plant growth. They are thus of enormous economic importance internationally and the subject of intense research interest. Handbook for Rhizobia is a monumental book of practical methods for working with these bacteria and their plant hosts. Topics include the general microbiological properties of rhizobia and their identification, their potential as symbionts, methods for inoculating rhizobia onto plants, and molecular genetics methods for Rhizobium in the laboratory. The book will be invaluable to Rhizobium scientists, soil microbiologists, field and laboratory researchers at agricultural research centers, agronomists, and crop scientists.

This reference text brings together comprehensive reviews of the latest research in the field of bionanomaterials, with a focus on fundamentals and biomedical

applications. Detailed coverage of the classification, properties and synthesis of bionanomaterials is provided to enhance readers' understanding. The book combines new ideas to uplift the advancement of bionanomaterials in biomedical research and provides a valuable reference for researchers and advanced students in the fields of biomaterials, bionanotechnology and bioengineering. The major applications covered include nanobiosensing, nanomedicine, diagnostics, therapeutics, tissue engineering and green bionanotechnology. The properties and applications of synthetic bionanomaterials and molecularly-imprinted polymer-based bionanomaterials are also included.

Bionanomaterials

Chemistry of Phytopotentials: Health, Energy and Environmental Perspectives

Principles and Operations

Ammonia Fuel Cells

Comprehensive Organic Reactions in Aqueous Media

All engineering disciplines have been developed from the basic sciences. Science gives us the information on the reasoning behind new product development, whereas engineering is the application of science to manufacture the product at the commercial level. Biological processes involve various biomolecules, which come from living sources. It is now possible to manipulate DNA to get the desired changes in biochemical processes. This book provides students the knowledge that will enable them to contribute in various professional fields, including bioprocess development, modeling and simulation, and environmental engineering. It includes the analysis of different upstream and downstream processes. The chapters are organized in broad engineering subdisciplines, such as mass and energy balances, reaction theory using both chemical and enzymatic reactions, microbial cell growth kinetics, transport phenomena, different control systems used in the fermentation industry, and case studies of some industrial fermentation processes. Each chapter begins with a fundamental explanation for general readers and ends with in-depth scientific details suitable for expert readers. The book also includes the solutions to about 100 problems.

As renewable energy sources, biofuels have tremendous potential to replace fossil fuels in future energy scenarios, offering green alternative energy sources. However, though such fuels could mean a significant reduction in environmental pollution, they are still far from practical implementation due to their high production costs and technical issues. Consequently, efforts are being made around the globe to achieve the cost-effective production of biofuels. In this context, the use of nanomaterials to improve biofuels production efficiency is a vital, emerging area. Nanomaterials are attracting attention due to their versatile physicochemical properties and may improve the production process for various biofuels by acting as catalysts. However, this area is still in its infancy. To improve the practical viability of the biofuels production process, it is essential to focus on the specific type of nanomaterial used, its synthesis, and its specific effects on the process parameters. This book explores the potential advantages and feasibility of various aspects of nanomaterials with regard to improving the current biofuels production process, making it a valuable resource for a broad readership.

MOMENTUM, HEAT AND MASS

Methods in Legume-Rhizobium Technology

INTRODUCTION TO TRANSPORT PHENOMENA

Handbook for Rhizobia

Indian Society, Institutions and Change