

Bioseparations Science And Engineering

Describing the role of engineering in medicine today, this comprehensive volume covers a wide range of the most important topics in this burgeoning field. Supported with over 145 illustrations, the book discusses bioelectrical systems, mechanical analysis of biological tissues and organs, biomaterial selection, compartmental modeling, and biomedical instrumentation. Moreover, you find a thorough treatment of the concept of using living cells in various therapeutics and diagnostics. Structured as a complete text for students with some engineering background, the book also makes a valuable reference for professionals new to the bioengineering field. This authoritative textbook features numerous exercises and problems in each chapter to help ensure a solid understanding of the material.

A growing awareness of the contributions that functional foods, bioactive compounds, and nutraceuticals make to health is creating a tremendous market for these products. In order for manufacturers to match this demand with stable, high volume production while maintaining defined and reliable composition, they must have ready access to the very latest information. *Centrifugal Separations in Biotechnology, Second Edition*, is the only book on the market devoted to centrifugal separation in biotechnology. Key topics covered include a full introduction to centrifugation, sedimentation and separation; detailed coverage of centrifuge types, including batch and semi-batch centrifuges, disk-stack and tubular decanter centrifuges; methods for increasing solids concentration; laboratory and pilot testing of centrifuges; selection and sizing centrifuges; scale-up of equipment, performance prediction and analysis of test results using numerical simulation. *Centrifugal Separations in Biotechnology, Second Edition*, provides guidance on troubleshooting and optimizing centrifuges, and then goes on to explore the commercial applications of centrifuges in biotechnology. It gives detailed process information and data to assist in the development of particular processes from existing systems. It is of value to professionals in the chemical, bioprocess, and biotech sectors, and all those concerned with bioseparation, bioprocessing, unit-operations and process engineering. Provides a comprehensive guide to centrifuges, their optimal development, and their operation in the biotechnology industry Updated throughout based on developments in industrial applications and advances in our understanding of centrifugal separations in biotechnology Discusses applications for the separation of proteins, DNA, mitochondria, ribosomes, lysosomes and other cellular elements Includes new sections on use of optimal polymer dosage in waste treatment, new centrifuge designs for applications in algae processing, biopharma, and more

This welcome new edition discusses bioprocess engineering from the perspective of biology students. It includes a great deal of new material and has been extensively revised and expanded. These updates strengthen the book and maintain its position as the book of choice for senior undergraduates and graduates seeking to move from biochemistry/microbiology/molecular biology to bioprocess engineering. All chapters thoroughly revised for current developments, with over 200 pgs of new material, including significant new content in: Metabolic Engineering, Sustainable Bioprocessing, Membrane Filtration, Turbulence and Impeller Design, Downstream Processing, Oxygen Transfer Systems Over 150 new problems and worked examples More than 100 new illustrations

The *Comprehensive Introduction to Standard and Advanced Separation for Every Chemical Engineer Separation Process Engineering, Second Edition* helps readers thoroughly master both standard equilibrium staged separations and the latest new processes. The author explains key separation process with exceptional clarity, realistic examples, and end-of-chapter simulation exercises using Aspen Plus. The book starts by reviewing core concepts, such as equilibrium and unit operations; then introduces a step-by-step process for solving separation problems. Next, it introduces each leading processes, including advanced processes such as membrane separation, adsorption, and chromatography. For each process, the author presents essential principles, techniques, and equations, as well as detailed examples. *Separation Process Engineering* is the new, thoroughly updated edition of the author's previous book, *Equilibrium Staged Separations*. Enhancements include improved organization, extensive new coverage, and more than 75% new homework problems, all tested in the author's Purdue University classes. Coverage includes Detailed problems with real data, organized in a common format for easier understanding Modular simulation exercises that support courses taught with simulators without creating confusion in courses that do not use them Extensive new coverage of membrane separations, including gas permeation, reverse osmosis, ultrafiltration, pervaporation, and key applications A detailed introduction to adsorption, chromatography and ion exchange: everything students need to understand advanced work in these areas Discussions of standard equilibrium stage processes, including flash distillation, continuous column distillation, batch distillation, absorption, stripping, and extraction

Designed for undergraduates, graduate students, and industry practitioners, *Bioseparations Science and Engineering* fills a critical need in the field of bioseparations. Current, comprehensive, and concise, it covers bioseparations unit operations in unprecedented depth. In each of the chapters, the authors use a consistent method of explaining unit operations, starting with a qualitative description noting the significance and general application of the unit operation. They then illustrate the scientific application of the operation, develop the required mathematical theory, and finally, describe

With the advent of modern tools of molecular biology and genetic engineering and new skills in metabolic engineering and synthetic biology, fermentation technology for industrial applications has developed enormously in recent years. Reflecting these advances, *Fermentation Processes Engineering in the Food Industry* explores the state of the art of

This second edition *Encyclopedia* supplies nearly 350 gold standard articles on the methods, practices, products, and standards influencing the chemical industries. It offers expertly written articles on technologies at the forefront of the field to maximize and enhance the research and production phases of current and emerging chemical manufacturing practices and techniques. This collecting of information is of vital interest to chemical, polymer, electrical, mechanical, and civil engineers, as well as chemists and chemical researchers. A complete reconceptualization of the classic reference series the *Encyclopedia of Chemical Processing and Design*, whose first volume published in 1976, this resource offers extensive A-Z treatment of the subject in five simultaneously published volumes, with comprehensive indexing of all five volumes in the back matter of each tome. It includes material on the design of key unit operations involved with chemical processes; the design, unit operation, and integration of reactors and separation systems; process system peripherals such as pumps, valves, and controllers; analytical techniques and equipment; and pilot plant design and scale-up criteria. This reference contains well-researched sections on automation, equipment, design and simulation, reliability and maintenance,

separations technologies, and energy and environmental issues. Authoritative contributions cover chemical processing equipment, engineered systems, and laboratory apparatus currently utilized in the field. It also presents expert overviews on key engineering science topics in property predictions, measurements and analysis, novel materials and devices, and emerging chemical fields. ALSO AVAILABLE ONLINE This Taylor & Francis encyclopedia is also available through online subscription, offering a variety of extra benefits for both researchers, students, and librarians, including: Citation tracking and alerts Active reference linking Saved searches and marked lists HTML and PDF format options Contact Taylor and Francis for more information or to inquire about subscription options and print/online combination packages. US: (Tel) 1.888.318.2367; (E-mail) e-reference@taylorandfrancis.com International: (Tel) +44 (0) 20 7017 6062; (E-mail) online.sales@tandf.co.uk

The bioseparation engineering of today includes downstream process engineering such as waste water, material and gas treatment. Taking this tendency into account, bioseparation engineers gathered in Japan as a special research group under the main theme of "Recovery and Recycle of Resources to Protect the Global Environment". The scope of this book is based on the conference, and deals not only with recent advances in bioseparation engineering in a narrow sense, but also the environmental engineering which includes waste water treatment and bioremediation. The contributors of this book cover many disciplines such as chemical engineering, analytical chemistry, biochemistry, and microbiology. Bioseparation Engineering will stimulate young engineers and scientists who will develop bioseparation engineering further in the 21st century, and contribute to a world-wide attention to the global environment

This practical book presents the modeling of dynamic biological engineering processes in a readily comprehensible manner, using the unique combination of simplified fundamental theory and direct hands-on computer simulation. The mathematics is kept to a minimum, and yet the 60 examples illustrate almost every aspect of biological engineering science, with each one described in detail, including the model equations. The programs are written in the modern user-friendly simulation language Berkeley Madonna, which can be run on both Windows PC and Power-Macintosh computers. Madonna solves models comprising many ordinary differential equations using very simple programming, including arrays. It is so powerful that the model parameters may be defined as "sliders", which allow the effect of their change on the model behavior to be seen almost immediately. Data may be included for curve fitting, and sensitivity or multiple runs may be performed. The results can be viewed simultaneously on multiple-graph windows or by using overlays. The examples can be varied to fit any real situation, and the suggested exercises provide practical guidance. The extensive teaching experience of the authors is reflected in this well-balanced presentation, which is suitable for the teacher, student, biochemist or the engineer.

This book is a short introduction to the engineering principles of harnessing the vast potential of microorganisms, and animal and plant cells in making biochemical products. It was written for scientists who have no background in engineering, and for engineers with minimal background in biology. The overall subject dealt with is process. But the coverage goes beyond the process of biomanufacturing in the bioreactor, and extends to the factory of cell's biosynthetic machinery. Starting with an overview of biotechnology and organism, engineers are eased into biochemical reactions and life scientists are exposed to the technology of production using cells. Subsequent chapters allow engineers to be acquainted with biochemical pathways, while life scientist learn about stoichiometric and kinetic principles of reactions and cell growth. This leads to the coverage of reactors, oxygen transfer and scale up. Following three chapters on biomanufacturing of current and future importance, i.e. cell culture, stem cells and synthetic biology, the topic switches to product purification, first with a conceptual coverage of operations used in bioseparation, and then a more detailed analysis to provide a conceptual understanding of chromatography, the modern workhorse of bioseparation. Drawing on principles from engineering and life sciences, this book is for practitioners in biotechnology and bioengineering. The author has used the book for a course for advanced students in both engineering and life sciences. To this end, problems are provided at the end of each chapter.

The chemical industry is changing, going beyond commodity chemicals to a palette of higher value added products. This groundbreaking book, now revised and expanded, documents this change and shows how to meet the challenges implied. Presenting a four-step design process - needs, ideas, selection, manufacture - the authors supply readers with a simple design template that can be applied to a wide variety of products. Four new chapters on commodities, devices, molecules/drugs and microstructures show how this template can be applied to products including oxygen for emphysema patients, pharmaceuticals like taxol, dietary supplements like lutein, and beverages which are more satisfying. For different groups of products the authors supply both strategies for design and summaries of relevant science. Economic analysis is expanded, emphasizing the importance of speed-to-market, selling ideas to investors and an expectation of limited time in the market. Extra examples, homework problems and a solutions manual are available.

This book presents the most up-to-date technologies for the transformation of biomass into valuable fuels, chemicals, materials, and products. It provides comprehensive coverage of the characterization and fractionation of various types of biomass and details the many challenges that are currently encountered during this process. Divided into two sections, this book discusses timely topics such as the characterization of biomass feedstock, pretreatment and fractionation of biomass, and describes the process for conversion of biomass to value-added commodities. The authors bring biomass transformational strategies that are yet to be explored to the forefront, making this innovative book useful for graduate students and researchers in academia, government, and industry.

Other unique features include basic information about bioproducts and engineering analysis and a chapter with bioseparations laboratory exercises. Bioseparations Science and

Engineering is ideal for students and professionals alike."--BOOK JACKET.

Providing chemical engineering undergraduate and graduate students with a basic understanding of how separation of a mixture of molecules, macromolecules or particles is achieved, this textbook is a comprehensive introduction to the engineering science of separation. • Students learn how to apply their knowledge to determine the separation achieved in a given device or process • Real-world examples are taken from biotechnology, chemical, food, petrochemical, pharmaceutical and pollution control industries • Worked examples, elementary separator designs and chapter-end problems are provided, giving students a practical understanding of separation. The textbook systematically develops different separation processes by considering the forces causing the separation and how this separation is influenced by the patterns of bulk flow in the separation device. Readers will be able to take this knowledge and apply it to their own future studies and research in separation and purification. Online resources include solutions to the exercises and guidance for computer simulations.

Preceded by: Bioseparations science and engineering / Roger G. Harrison ... [et al.]. c2003.

This timely book is a compilation of edited articles by distinguished international scientists discussing global warming, its causes as well as present and future solutions. Social and economic growth at global level is measured in terms of GDP, which requires energy inputs generally based on fossil fuel resources. These, however, are major contributors to increasing levels of CO₂, causing 15 tonnes of green house gas emissions per capita. Renewable sources of energy offer an alternative to fossil fuels, and would help reduce this to the 2 tonnes of greenhouse gas emissions per capita per annum needed to achieve sustainable growth. As such, the book discusses the next-generation of biofuels and all related aspects, based on the editors' significant investigations on biofuels over the last 30 years. It also presents the latest research findings from research work carried out by contemporary researchers. Presenting global biofuel perspectives, it examines various issues related to sustainable development of biofuels in the contexts of agriculture, forestry, industry and economic growth. It covers the 1st to 4th generation biofuels, as well as the status of biofuel resources and their potential in carbon neutral economy. Offering a comprehensive, state-of-art overview of current and future biofuels at local and global levels, this book appeals to administrators, policy makers, universities and research institutions.

For the Graduate and Post Graduate students of different universities in Microbiology and Biotechnology. This book is immensely helpful to under Graduate and Post Graduate students of Microbiology, Biotechnology and Allied Sciences. The chapters are well conversed with Industrial Aspects in the production of Microbiology Inoculments in the field of Agriculture Biovalorisation of Wastes to Renewable Chemicals and Biofuels addresses advanced technologies for converting waste to biofuels and value-added products. Biovalorisation has several advantages over conventional bioremediation processes as it helps reduce the costs of bioprocesses. Examples are provided of several successfully commercialized technologies, giving insight into developing, potential processes for biovalorisation of different wastes. Different bioprocess strategies are discussed for valorising the wastes coming from the leather industry, olive oil industry, pulp and paper, winery, textile, and food industries, as well as aquaculture. A section on biorefinery for hydrocarbons and emerging contaminants is included to cover concepts on biodesulfurization of petroleum wastes, leaching of heavy metals from E - waste, and bioelectrochemical processes for CO₂. Chapters on algal biorefinery are also included to focus on the technologies for conversion of CO₂ sequestration and wastewater utilization. Biovalorisation of Wastes to Renewable Chemicals and Biofuels can be used as course material for graduate students in chemical engineering, chemistry, and biotechnology, and as a reference for industrial professionals and researchers who want to gain a basic understanding on the subject. Covers a wide range of topics, from the conversion of wastes to organic acids, biofuels, biopolymers and industrially relevant products Bridges the gap between academics and industry Written in a lucid and self-explanatory style Includes activities/quiz/critical questions

Bioseparations engineering deals with the scientific and engineering principles involved in large-scale separation and purification of biological products. It is a key component of most chemical engineering/biotechnology/bioprocess engineering programmes. This book discusses the underlying principles of bioseparations engineering written from the perspective of an undergraduate course. It covers membrane based bioseparations in much more detail than some of the other books on bioseparations engineering. Based largely on the lecture notes the author developed to teach the course, this book is especially suitable for use as an undergraduate level textbook, as most other textbooks are targeted at graduate students.

Focusing on current and future uses of microbes as production organisms, this practice-oriented textbook complements traditional texts on microbiology and biotechnology. The editors have brought together leading researchers and professionals from the entire field of industrial microbiology and together they adopt a modern approach to a well-known subject. Following a brief introduction to the technology of microbial processes, the twelve most important application areas for microbial technology are described, from crude bulk chemicals to such highly refined biomolecules as enzymes and antibodies, to the use of microbes in the leaching of minerals and for the treatment of municipal and industrial waste. In line with their application-oriented topic, the authors focus on the "translation" of basic research into industrial processes and cite numerous successful examples. The result is a first-hand account of the state of the industry and the future potential for microbes in industrial processes. Interested students of biotechnology, bioengineering, microbiology and related disciplines will find this a highly useful and much consulted companion, while instructors can use the case studies and examples to add value to their teaching.

It is generally recognized that the commercial success of biotechnology products is highly dependent on the successful development and application of high-powered separation and purification methods. In this practical and authoritative handbook, the separation of proteins, nucleic acids, and oligonucleotides from biological matrices is covered from analytical to process scales. Also included in a chapter on the separation of monoclonal antibodies, which have found numerous uses as therapeutic and diagnostic agents. Analytical techniques include an interesting montage of chromatographic methods, capillary electrophoresis, isoelectric focusing, and mass spectrometry. Among separation and purification methods, liquid-liquid distribution, displacement chromatography, expanded bed adsorption, membrane chromatography, and simulated moving bed chromatography are covered at length. Regulatory and economic considerations are addressed, as are plant and process equipment and engineering process control. A chapter on future developments highlights the application of DNA chip arrays as well as

and their application for protein production, spinning of fibres from protein solutions and structure/function relationships in spider silk. The second part of the book provides a review of the application of biomimetics to a range of textile applications, including the design of clothing and self cleaning textiles. Written by a distinguished team of international authors, *Biologically inspired textiles* is a valuable reference for textile technologists, fibre scientists, textile manufacturers and others in academia. Discusses the principles, production and properties of biomimetics Reviews the application of biomimetics to a range of textile disciplines Chapters explore recombinant DNA technologies, spinning of fibres and structure/function relationships in spider silk

The field of industrial microbiology involves a thorough knowledge of the microbial physiology behind the processes in the large-scale, profit-oriented production of microbe-related goods which are the subject of the field. In recent times a paradigm shift has occurred, and a molecular understanding of the various processes by which plants, animals and microorganisms are manipulated is now central to industrial microbiology. Thus the various applications of industrial microbiology are covered broadly, with emphasis on the physiological and genomic principles behind these applications. Relevance of the new elements such as bioinformatics, genomics, proteomics, site-directed mutation and metabolic engineering, which have necessitated the paradigm shift in industrial microbiology are discussed.

'Product Engineering' provides theories and case studies in product engineering - the design of new, useful products with desired properties.

Designed for undergraduates, graduate students, and industry practitioners, *Bioseparations Science and Engineering* fills a critical need in the field of bioseparations. Current, comprehensive, and concise, it covers bioseparations unit operations in unprecedented depth. In each of the chapters, the authors use a consistent method of explaining unit operations, starting with a qualitative description noting the significance and general application of the unit operation. They then illustrate the scientific application of the operation, develop the required mathematical theory, and finally, describe the applications of the theory in engineering practice, with an emphasis on design and scaleup. Unique to this text is a chapter dedicated to bioseparations process design and economics, in which a process simulator, SuperPro Designer® is used to analyze and evaluate the production of three important biological products. New to this second edition are updated discussions of moment analysis, computer simulation, membrane chromatography, and evaporation, among others, as well as revised problem sets. Unique features include basic information about bioproducts and engineering analysis and a chapter with bioseparations laboratory exercises. *Bioseparations Science and Engineering* is ideal for students and professionals working in or studying bioseparations, and is the premier text in the field.

Downstream bioprocesses have a significant role to play in the creation of a sustainable biobased economy, enabling the creation of new products and systems from the more sustainable bioprocessing of natural products. *Liquid Biphasic System: Fundamentals and Applications in Bioseparation Technology* explores in detail the fundamental processes and applications of this new separation system, aiding in the understanding of the basic principles of the technique and offering constructive criticisms of the latest findings.

Including coverage of the background, principles, mechanisms, and applications, *Liquid Biphasic System* addresses how to adapt the technology for the purification of useful compounds with greater cost efficiency and greener processing. It is essential reading for bioprocess engineers, biochemical engineers, biosystem engineers, chemists, and microbiologists working in the fields of bioprocessing. Researchers, scientists, and engineers concerned with the selection and evaluation of alternative bioseparation processes will find the book particularly useful. Provides information and examples of advanced separations in a single source Includes detailed descriptions of novel bioseparation systems Covers the latest technologies related to advanced liquid-liquid separation and their applications in various industries

The use of biotechnology in chemical synthesis offers up numerous advantages to the engineer in the process industries, but it also presents a number of fundamental challenges and difficulties which impinge directly on separation process requirements. The use of biochemical separations has grown significantly during the past decade, and is especially used in process industries such as healthcare and food processing. However it is becoming increasingly more important in areas such as recycling and waste-water treatment and as industry shifts towards cleaner processes biochemical separations will continue to grow. The two main objectives of this book are to focus on the application of existing separation process techniques to the recovery and purification of biologically derived products and to examine the state of knowledge of new techniques which have future potential. Within these objectives the complexities and breadth of problems associated with biological separations are discussed, specific engineering techniques are featured and their adaptation to biochemical separations are highlighted.

This systematically organized and well-balanced book compresses within the covers of a single volume the theoretical principles and techniques involved in bio-separations, also called downstream processing. These techniques are derived from a range of subjects, for example, physical chemistry, analytical chemistry, bio-chemistry, biological science and chemical engineering. Organized in its 15 chapters, the text covers in the first few chapters topics related to chemical engineering unit operations such as filtration, centrifugation, adsorption, extraction and membrane separation as applied to bioseparations. The use of chromatography as practiced at laboratory as well as industrial scale operation and related techniques such as gel filtration, affinity and pseudoaffinity chromatography, ion-exchange chromatography, electrophoresis and related methods have been discussed. The important applications of these techniques have also been highlighted.

Unlike extensive major reference works or handbooks, *Chemical Engineering: Trends and Developments* provides readers with a ready-reference to latest techniques in selected areas of chemical engineering where research is and will be focused in the future. These areas are: bioseparations; particle science and design; nanotechnology; and reaction engineering. The aim of the book is to provide academic and R&D researchers with an overview of the main areas of technical development and how these techniques can be applied. Each chapter focuses on a technique, plus a selection of applications or examples of where the technique could be applied.

This book provides the first and only comprehensive description and detailed summary of the genetics, structure, function, mechanisms of action, evolution and engineering of homing endonucleases and inteins. These two unique protein superfamilies, which are tied together through their frequent fusion and coevolution, have generated considerable

excitement for their fundamental, structural, and functional properties, their evolution as parasitic elements, and their widespread applications as gene targeting agents and as instruments for the generation of modified proteins and novel protein combinations.

This book presents the latest achievements of separation science and technology. It highlights the application of separation with regard to problems of current interest, such as the protection of the environment and the development of emerging technology, including chemical engineering, biotechnology, renewable energy sources and recycling of materials.

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