Membrane Separation Processes By Kaushik Nath

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Algal Technologies for Wastewater Treatment and Resource Recovery - Raul Muñoz 2019-07-26
Over 80% of globally produced wastewater receives little or no treatment before it is disposed into the environment. Therefore, it is urgent to develop new wastewater treatment technologies that are sustainable in the broad sense of the word, i.e. not only produce high quality effluents, but also minimise energy expenses, recover energy and nutrients, and apply technology that is appropriate in relation to the availability of skilled personnel. This book compiles the main outcomes of recent efforts to improve the design of waste stabilisation ponds, and confirms the superior performance of high rate algal ponds as a result of process intensification. Anaerobic digestion devoted to biogas production continues to be the preferred strategy for the energy valorisation of the algal biomass, co-digestion with multiple high C/N ratio substrates gathering significant attention over the past years. The potential of algal biomass as a biosorbent for heavy metal removal (Cu, Ni, F) maintains its share in the research field of water bioremediation, while research on nutrient removal has focused on providing new insights on the mechanism of nitrogen and phosphorus removal from wastewater in algal–bacterial systems. Finally, it is worth noticing that breakthroughs in complementary fields of research such as nanotechnology or lighting technology are gradually being implemented in algal biotechnology, with new products such as nanoparticles for water disinfection or photobioreactors illuminated by low intensity LED panels. In Focus – a book series that showcases the latest accomplishments in water research. Each book focuses on a specialist area with papers from top experts in the field. It aims to be a vehicle for in-depth understanding and inspire further conversations in the sector.
Prospects of Renewable Bioprocessing in Future Energy Systems - Ali Asghar Rastegari 2019-04-03
This book discusses various renewable energy resources and technologies. Topics covered include recent advances in photobioreactor design; microalgal biomass harvesting, drying, and processing; and technological advances and optimised production systems as prerequisites for achieving a positive energy balance. It highlights alternative resources that can be used to replace fossil fuels, such as algal biofuels, biodiesel, bioethanol, and biohydrogen. Further, it reviews microbial technologies, discusses an immobilization method, and highlights the efficiency of enzymes as a key factor in biofuel production. In closing, the book outlines future research directions to increase oil yields in microalgae, which could create new opportunities for lipid-based biofuels, and provides an outlook on the future of global biofuel production. Given its scope, the book will appeal to all researchers and engineers working in the renewable energy sector.
Advances in Interdisciplinary Engineering - Mukul Kumar 2020-08-14
This book presents select proceedings of the International Conference on Future Learning Aspects of Mechanical Engineering (FLAME 2018). The book discusses interdisciplinary areas such as automobile engineering, mechatronics, applied and structural mechanics, bio-mechanics, biomedical instrumentation, ergonomics, biodynamic modeling, nuclear engineering, agriculture engineering, and farm machineries. The contents of the book will benefit both researchers and professionals.
Membrane Technology - Sundergopal Sridhar 2018-09-03
Contributed by multiple experts, the book covers the scientific and engineering aspects of membrane processes and systems. It aims to cover basic concepts of novel membrane processes including membrane bioreactors, microbial fuel cell, forward osmosis, electro-dialysis and membrane contactors. Maintains a pragmatic approach involving design, operation and cost analysis of pilot plants as well as scaled-up counterparts
Emerging Eco-friendly Green Technologies for Wastewater Treatment - Ram Naresh Bharagava 2020-03-04
As we know, rapid industrialization is a serious concern in the context of a healthy environment and public health due to the generation of huge volumes of toxic wastewater. Although various physico-chemical and biological approaches are available for the treatment of this wastewater, many of them are not effective. Now, there a number of emerging ecofriendly, cost-effective approaches utilizing microorganisms (bacterial/fungi/algae), green plants or their enzymes, and constructed wetland treatment systems in the treatment of wastewaters containing pollutants such as endocrine disrupting chemicals, toxic metals, pesticides, dyes, petroleum hydrocarbons and phenolic compounds. This book provides a much-needed, comprehensive overview of the various types of wastewater and their ecotoxicological effects on the environment, humans, animals and plants as well as various emerging and eco-friendly approaches for their treatment. It provides insights into the ecological problems and challenges in the treatment and management of wastewaters generated by various sources.
Environmental Nanotechnology Volume 5 - Nandita Dasgupta 2022-08-19
This book presents comprehensive reviews on the latest developments of nanotechnologies to detect and remove pollutants in water, air and food. Polymer nanocomposites, nanoparticles from microbes and the application of nanotechnologies for desalination and agriculture are also discussed. Pollution of water and air by contaminants and diseases is a major health issue leading globally to millions of deaths yearly according to the World Health Organization. Such issue requires advanced methods to clean environmental media.
Next Generation Materials and Processing Technologies - Swarup Bag 2021
This book presents the select proceedings of Conference on Research and Developments in Material Processing, Modelling and Characterization (RDMPMC 2020). It highlights the new technologies developed in the generation of rational materials for various applications with tailored properties. It covers fundamental research in emerging materials which includes biomaterials, composites, ceramics, functionally graded materials, energy materials, thin film materials, nanomaterials, nuclear materials, intermetallic, high strength materials, structural materials, super alloys, shape memory alloys and thermally enhanced materials. It includes the numerical modeling and computer simulation to investigate the properties and structure of materials. Few of the most relevant manufacturing techniques highlighted in this book are welding, coating, additive manufacturing, laser-based manufacturing, advanced machining processes, casting, forming and micro and nanoscale manufacturing processes. Given its contents, this book is beneficial to students, researchers and industry professionals. .
Current Developments in Biotechnology and Bioengineering - Ashok Pandey 2016-09-17
Current Developments in Biotechnology and Bioengineering: Production, Isolation and Purification of Industrial Products provides extensive coverage of new developments, state-of-the-art technologies, and potential future trends, focusing on industrial biotechnology and bioengineering practices for the production of industrial products, such as enzymes, organic acids, biopolymers, and biosurfactants, and the processes for isolating and purifying them from a production medium. During the last few years, the tools of molecular biology and genetic and metabolic engineering have rendered tremendous improvements in the production of industrial products by fermentation. Structured by industrial product classifications, this book provides an overview of the current practice, status, and future potential for the production of these agents, along with reviews of the industrial scenario relating to their production. Provides information on industrial bioprocesses for the production of microbial products by fermentation Includes separation and purification processes of fermentation products Presents economic

and feasibility assessments of the various processes and their scaling up Links biotechnology and bioengineering for industrial process development

Swift Heavy Ions for Materials Engineering and Nanostructuring - Devesh Kumar Avasthi 2011-05-24

Ion beams have been used for decades for characterizing and analyzing materials. Now energetic ion beams are providing ways to modify the materials in unprecedented ways. This book highlights the emergence of high-energy swift heavy ions as a tool for tailoring the properties of materials with nanoscale structures. Swift heavy ions interact with materials by exciting/ionizing electrons without directly moving the atoms. This opens a new horizon towards the 'so-called' soft engineering. The book discusses the ion beam technology emerging from the non-equilibrium conditions and emphasizes the power of controlled irradiation to tailor the properties of various types of materials for specific needs.

Mass Transfer - N. Anantharaman 2017-06

Mixed Matrix Membranes - Clara Casado-Coterillo 2019-12-16

Mixed matrix membranes (MMMs) have attracted a large amount of interest in research laboratories worldwide in recent decades, motivated by the gap between a growing interest in developing novel mixed matrix membranes by various research groups and the lack of large-scale implementation. This Special Issue contains six publications dealing with the current opportunities and challenges of mixed matrix membranes development and applications to solve environmental and health challenges of the society of 21st century.

Membrane Distillation Process - Alessandra Criscuoli 2021-09-10

The book deals with the latest research on membrane distillation. New membrane and module designs, low-temperature applications, integration with other membrane units and pilot scale investigations are presented and discussed.

Mineral Tolerance of Animals - National Research Council 2006-01-22

Excess minerals in the diet and water of animals can have an adverse effect on animal health, consumers, and the environment. Preventing unsafe mineral exposure is a fundamental part of animal nutrition and management. At the request of the Food and Drug Administration, the National Academies convened a committee to make recommendations on animal tolerances and toxic dietary levels, updating a 1980 report on mineral tolerance in domestic animals. Based on a review of current scientific data and information, the report sets a "maximum tolerable level" (MTL) for each mineral as it applies to the diets of farm animals, poultry, and fish. The report includes an analysis of the effects of toxic levels in animal diets, and it identifies elements that pose potential human health concerns. The report recommends research that includes a better characterization of animal exposure to minerals through feedstuffs; a better understanding of the relationship between mineral concentrations in feed and water and the levels in consumer products such as meat, milk, and eggs; and more research on the maximum tolerable level of minerals for aquatic and companion animals.

Membrane Technologies and Applications - Kaustubha Mohanty 2011-12-19

Membrane technologies play an increasingly important role in unit operations for resource recovery, pollution prevention, and energy production, as well as environmental monitoring and quality control. They are also key component technologies of fuel cells and bioseparation applications. Membrane Technologies and Applications provides essential data and background information on various dimensions of membrane technologies, with a major focus on their practical application. Membranes of inorganic materials offer cost-effective solutions for simple to complex separation problems. This book is designed for anyone interested in water and wastewater treatment, membrane suppliers, as well as students and academics studying the field.

Plant Microbiomes for Sustainable Agriculture - Ajar Nath Yadav 2020-03-06

This book encompasses the current knowledge of plant microbiomes and their potential biotechnological application for plant growth, crop yield and soil health for sustainable agriculture. The plant microbiomes (rhizospheric, endophytic and epiphytic) play an important role in plant growth, development, and soil health. Plant and rhizospheric soil are a valuable natural resource harbouring hotspots of microbes, and it plays critical roles in the maintenance of global nutrient balance and ecosystem function. The diverse group of microbes is key components of soil–plant systems, where they are engaged in an intense network of interactions in the rhizosphere/endophytic/phyllospheric. The rhizospheric microbial diversity present in rhizospheric zones has a sufficient amount of nutrients release by plant root systems in form of root exudates for growth, development and activities of microbes. The endophytic microbes are referred to those microorganisms, which colonize in the interior of the plant parts, viz root, stem or seeds without causing any harmful effect on host plant. Endophytic microbes enter in host plants mainly through wounds, naturally occurring as a result of plant growth, or through root hairs and at epidermal conjunctions. Endophytes may be transmitted either vertically (directly from parent to offspring) or horizontally (among individuals). The phyllosphere is a common niche for synergism between microbes and plant. The leaf surface has been termed as phyllosphere and zone of leaves inhabited by microorganisms as phyllosphere. The plant part, especially leaves, is exposed to dust and air currents resulting in the establishments of typical flora on their surface aided by the cuticles, waxes and appendages, which help in the anchorage of microorganisms. The phyllospheric microbes may survive or proliferate on leaves depending on extent of influences of material in leaf diffuseness or exudates. The leaf diffuseness contains the principal nutrients factors (amino acids, glucose, fructose and sucrose), and such specialized habitats may provide niche for nitrogen fixation and secretions of substances capable of promoting the growth of plants. The microbes associated with plant as rhizospheric, endophytic and epiphytic with plant growth promoting (PGP) attributes have emerged as an important and promising tool for sustainable agriculture. PGP microbes promote plant growth directly or indirectly, either by releasing plant growth regulators; solubilization of phosphorus, potassium and zinc; biological nitrogen fixation or by producing siderophore, ammonia, HCN and other secondary metabolites which are antagonistic against pathogenic microbes. The PGP microbes belong to different phylum of archaea (Euryarchaeota); bacteria (Acidobacteria, Actinobacteria, Bacteroidetes, Deinococcus-Thermus, Firmicutes and Proteobacteria) and fungi (Ascomycota and Basidiomycota), which include different genera namely Achromobacter, Arthrobacter, Aspergillus, Azospirillum, Azotobacter, Bacillus, Beijerinckia, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Gluconoacetobacter, Haloarcula, Herbaspirillum, Methylobacterium, Paenibacillus, Pantoea, Penicillium, Piriformospora, Planomonospora, Pseudomonas, Rhizobium, Serratia and Streptomyces. These PGP microbes could be used as biofertilizers/bioinoculants at place of chemical fertilizers for sustainable agriculture. The aim of “Plant Microbiomes for Sustainable Agriculture” is to provide the current developments in the understanding of microbial diversity associated with plant systems in the form of rhizospheric, endophytic and epiphytic. The book is useful to scientist, research and students related to microbiology, biotechnology, agriculture, molecular biology, environmental biology and related subjects.

Energy and Environment Nowadays - Luis G. Torres 2014-01-01

Presently, energy and the environment are closely related issues throughout the world. The indiscriminate use of fossil fuels has resulted in adverse effects on the environment (i.e, excessive production of greenhouse gases, pollution of underground and superficial waters, soil contamination). The international reserves of crude oil are declining, and some pessimistic references refer to an important detriment in the annual oil availability for 2050. Because of these facts, the necessity to develop novel sources of energy, especially fuels from sustainable sources, is mandatory. Such alternative sources of energy (i.e. wind, solar, biomass, hydraulic) are potential renewable sources capable of changing the paradigm of productive activities around the world. In many cases, the energy production processes include resources commonly available or even the use of materials that are considered waste (i.e., wastewaters, agriculture residues, urban solid wastes). Despite all the desirable characteristics involved, the processes included in the generation of renewable energy may not only positively impact the environment, but may also cause harm on surrounding areas. However, to our knowledge, relatively few works have been published carrying out this type of environmental cost-benefit analysis.

Seed Proteins - Peter R. Shewry 2012-12-06

Seeds provide more than half of the world's intake of dietary protein and energy and thus are of immense economic, cultural and nutritional importance. Proteins can account for up to 40% of the dry weight of various types of seeds, thereby making a large contribution to the nutritional quality and processing properties of seeds. It is, therefore, not surprising that seed proteins were among the first plant components to be systematically studied, some 250 years ago, and have been a major

focus of research over the past 100 years. The properties and behaviour of seed proteins pervade modem life in numerous ways. For example, legume and cereal proteins are used'in the production of a wide range of meat-free foods; the process of bread-making is dep~ndent on the physical chemical properties of wheat seed proteins; and in developed, as well as developing, countries, nutritional deficiencies among vegetarian diets are avoided through balancing legume and cereal seeds as sources of dietary proteins. Understanding seed proteins, in order to improve their composition and properties and to increase their concentrations, will thus continue to be an important research objective for the future. The present volume represents the culmination of a long-discussed plan of the editors, to bring together the best international authorities in order to compile a definitive monograph on biological, biochemical, molecular and genetic aspects of seed proteins.

Membrane Separations Technology - E.J. Hoffman 2003-05-12

The petroleum, natural gas, and the chemical & petrochemical process industries, variously require the separation of mixtures -- whether of raw feedstream materials, reactants, intermediates, or products -- as comprising gases, liquids, or solutions. Membrane separations add another weapon to the arsenal of separation methods, including the upgrading of subquality natural gas reserves. This book furnishes the necessary derivations and calculations for numerically predicting the separations that can be obtained, based on the known respective membrane permeabilities of the pure components. A verstile text, Membrane Separations Technology is suitable both as a reference and a textbook for the practicing process engineer, the researcher, and chemical & petrochemical engineering faculty and students. Has cutting-edge scientific methods for liquifying and transporting natural gas Written for the engineer in the field, for easy access to important information Also contains problems and solutions for the student and professor in chemical engineering departments

Membrane Characterization - Nidal Hilal 2017-02-18

Membrane Characterization provides a valuable source of information on how membranes are characterized, an extremely limited field that is confined to only brief descriptions in various technical papers available online. For the first time, readers will be able to understand the importance of membrane characterization, the techniques required, and the fundamental theory behind them. This book focuses on characterization techniques that are normally used for membranes prepared from polymeric, ceramic, and composite materials. Features specific details on many membrane characterization techniques for various membrane materials of industrial and academic interest Contains examples of international best practice techniques for the evaluation of several membrane parameters, including pore size, charge, and fouling Discusses various membrane models more suitable to a specific application Provides examples of ab initio calculations for the design, optimization, and scale-up of processes based on characterization data

Algae for Biofuels and Energy - Michael A. Borowitzka 2012-12-11

Microalgae are one of the most studied potential sources of biofuels and bioenergy. This book covers the key steps in the production of renewable biofuels from microalgae - strain selection, culture systems, inorganic carbon utilisation, lipid metabolism and quality, hydrogen production, genetic engineering, biomass harvesting, extraction. Greenhouse gas and techno-economic modelling are reviewed as is the 100 year history of microalgae as sources of biofuels and of commercial-scale microalgae culture. A summary of relevant basic standard methods used in the study of microalgae culture is provided. The book is intended for the expert and those starting work in the field.

Membrane Separation Principles and Applications - Ahmad Fauzi Ismail 2018-09-07

Membrane Separation Principles and Applications: From Material Selection to Mechanisms and Industrial Uses, the latest volume in the Handbooks in Separation Science series, is the first single resource to explore all aspects of this rapidly growing area of study. Membrane technology is now accepted as one of the most effective tools for separation and purification, primarily due to its simple operation. The result has been a proliferation of studies on this topic; however, the relationships between fundamental knowledge and applications are rarely discussed. This book acts as a guideline for those who are interested in exploring membranes at a more progressive level. Covering methods of pressure driving force, partial pressure driving force, concentration driving force, electrical potential driving force, hybrid processes, and more, this volume is more complete than any other known resource on membrane separations. Covers membrane material selection, membrane fabrication, membrane characterization, separation mechanisms and applications in each chapter Authored by contributors who are internationally recognized as experts in their respective fields Organized by the driving force behind each type of membrane separation—a unique approach that more clearly links fundamental principles with their dominant applications

Postharvest Handling - Robert L. Shewfelt 2012-12-02

Postharvest Handling: A Systems Approach introduces a new concept in the handling of fresh fruits and vegetable. Traditional treatments have been either physiologically based with an emphasis on biological tissue or technologically based with an emphasis on storage and handling. This book integrates all processes from production practices through consumer consumption with an emphasis on understanding market forces and providing fresh product that meets consumer expectations. Postharvest physiologists and technologists across the disciplines of agricultural economics, agricultural engineering, food science and horticulture along with handlers of minially-processed products within the fresh produce fruit and vegetable processing industries will find this to be an invaluable source of information. Uses a systems approach that provides a unique perspective on the handling of fresh fruits and vegetables Designed with the applied perspective to complement the more basic perspectives provided in other treatments Provides the integrated, interdisciplinary perspective needed in research to improve the quality of fresh and minimally processed products Emphasizes that the design of handling systems should be market-driven rather than concentrating on narrow specifics

Nanopesticides - Leonardo F. Fraceto 2020-07-06

This book explores the development of nanopesticides and tests of their biological activity against target organisms. It also covers the effects of nanopesticides in the aquatic and terrestrial environments, along with related subjects including fate, behaviour, mechanisms of action and toxicity. Moreover, the book discusses the potential risks of nanopesticides for non-target organisms, as well as regulatory issues and future perspectives.

Bioactive Compounds in Phytomedicine - Iraj Rasooli 2012-01-18

There are significant concerns regarding the potential side effects from the chronic use of conventional drugs such as corticosteroids, especially in children. Herbal therapy is less expensive, more readily available, and increasingly becoming common practice all over the world. Such practices have both their benefits and risks. However, herbal self-therapy might have serious health consequences due to incorrect self-diagnosis, inappropriate choice of herbal remedy or adulterated herbal product. In addition, absence of clinical trials and other traditional safety mechanisms before medicines are introduced to the wider market results in questionable safe dosage ranges which may produce adverse and unexpected outcomes. Therefore, the use of herbal remedies requires sufficient knowledge about the efficacy, safety and proper use of such products. Hence, it is necessary to have baseline data regarding the use of herbal remedies and to educate future health professionals about various aspects of herbal remedies.

Proceedings of the International Conference on Paradigms of Computing, Communication and Data Sciences - Mayank Dave 2021-02-19

This book presents best selected papers presented at the International Conference on Paradigms of Computing, Communication and Data Sciences (PCCDS 2020), organized by National Institute of Technology, Kurukshetra, India, during 1–3 May 2020. It discusses high-quality and cutting-edge research in the areas of advanced computing, communications and data science techniques. The book is a collection of latest research articles in computation algorithm, communication and data sciences, intertwined with each other for efficiency.

Cryogenic Systems - Randall F. Barron 1985

This introduction to the principles of low-temperature engineering emphasizes the design and analysis of cryogenic systems. The new edition includes fresh material on superconductivity, liquid natural gas technology, rectification system design, refrigerators, and instrumentation. SI units are now used throughout the book. Unlike the previous edition, which was designed primarily as a college text, the new edition is written to serve as a professional reference as well, and is particularly useful for mechanical and chemical engineers involved in the design of cryogenic systems. Senior-level and graduate students interested in the fundamentals of cryogenic engineering will find this volume indispensable.

Protein Self-Assembly - Jennifer J. McManus 2019

This volume explores experimental and computational approaches to measuring the most widely studied protein assemblies, including

condensed liquid phases, aggregates, and crystals. The chapters in this book are organized into three parts: Part One looks at the techniques used to measure protein-protein interactions and equilibrium protein phases in dilute and concentrated protein solutions; Part Two describes methods to measure kinetics of aggregation and to characterize the assembled state; and Part Three details several different computational approaches that are currently used to help researchers understand protein self-assembly. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Thorough and cutting-edge, Protein Self-Assembly: Methods and Protocols is a valuable resource for researchers who are interested in learning more about this developing field.

C4.5 - J. Ross Quinlan 1993

This book is a complete guide to the C4.5 system as implemented in C for the UNIX environment. It contains a comprehensive guide to the system's use, the source code (about 8,800 lines), and implementation notes.

Membrane Processes - S. Sridhar 2018-12-18

A reference for engineers, scientists, and academics who want to be abreast of the latest industrial separation/treatment technique, this new volume aims at providing a holistic vision on the potential of advanced membrane processes for solving challenging separation problems in industrial applications. Separation processes are challenging steps in any process industry for isolation of products and recycling of reactants. Membrane technology has shown immense potential in separation of liquid and gaseous mixtures, effluent treatment, drinking water purification and solvent recovery. It has found endless popularity and wide acceptance for its small footprint, higher selectivity, scalability, energy saving capability and inherent ease of integration into other unit operations. There are many situations where the target component cannot be separated by distillation, liquid extraction, and evaporation. The different membrane processes such as pervaporation, vapor permeation and membrane distillation could be used for solving such industrial bottlenecks. This book covers the entire array of fundamental aspects, membrane synthesis and applications in the chemical process industries (CPI). It also includes various applications of pervaporation, vapor permeation and membrane distillation in industrially and socially relevant problems including separation of azeotropic mixtures, close-boiling compounds, organic–organic mixtures, effluent treatment along with brackish and seawater desalination, and many others. These processes can also be applied for extraction of small quantities of value-added compounds such as flavors and fragrances and selective removal of hazardous impurities, viz., volatile organic compounds (VOCs) such as vinyl chloride, benzene, ethyl benzene and toluene from industrial effluents. Including case studies, this is a must-have for any process or chemical engineer working in the industry today. Also valuable as a learning tool, students and professors in chemical engineering, chemistry, and process engineering will benefit greatly from the groundbreaking new processes and technologies described in the volume.

Gaussian Processes for Machine Learning - Carl Edward Rasmussen 2005-11-23

A comprehensive and self-contained introduction to Gaussian processes, which provide a principled, practical, probabilistic approach to learning in kernel machines. Gaussian processes (GPs) provide a principled, practical, probabilistic approach to learning in kernel machines. GPs have received increased attention in the machine-learning community over the past decade, and this book provides a long-needed systematic and unified treatment of theoretical and practical aspects of GPs in machine learning. The treatment is comprehensive and self-contained, targeted at researchers and students in machine learning and applied statistics. The book deals with the supervised-learning problem for both regression and classification, and includes detailed algorithms. A wide variety of covariance (kernel) functions are presented and their properties discussed. Model selection is discussed both from a Bayesian and a classical perspective. Many connections to other well-known techniques from machine learning and statistics are discussed, including support-vector machines, neural networks, splines, regularization networks, relevance vector machines and others. Theoretical issues including learning curves and the PAC-Bayesian framework are treated, and several approximation methods for learning with large datasets are discussed. The book contains illustrative examples and exercises, and code and datasets are available on the Web. Appendixes provide mathematical background and a discussion of Gaussian Markov processes.

Basic Principles of Membrane Technology - Marcel Mulder 2012-12-06

III . 2 Preparation of synthetic membranes 72 III . 3 Phase inversion membranes 75 III. 3. 1 Preparation by evaporation 76 III . 3. 2 Precipitation. from the vapour phase 76 III . 3. 3 Precipitation by controlled evaporation 76 Thermal precipitation 76 III . 3. 4 III . 3. 5 Immersion precipitation 77 Preparation techniques for immersion precipitation 77 III . 4 Flat membranes 77 III . 4. 1 78 III . 4. 2 Tubular membranes 81 III . 5 Preparation techniques for composite membranes 82 III. 5. 1 Interfacial polymerisation Dip-coating 83 III . 5. 2 III . 5. 3 Plasma polymerisation 86 III . 5. 4 Modification of homogeneous dense membranes 87 III . 6 Phase separation in polymer systems 89 III . 6. 1 Introduction 89 III . 6. 1. 1 Thermodynamics 89 III . 6. 2 Demixing processes 99 III . 6. 2. 1 Binary mixtures 99 III . 6. 2. 2 Ternary systems 102 III . 6. 3 Crystallisation 104 III . 6. 4 Gelation 106 III . 6. 5 Vitrification 108 III . 6. 6 Thermal precipitation 109 III . 6. 7 Immersion precipitation 110 III . 6. 8 Diffusional aspects 114 III . 6. 9 Mechanism of membrane formation 117 III. 7 Influence of various parameters on membrane morphology 123 III. 7. 1 Choice of solvent-nonsolvent system 123 III . 7. 2 Choice of the polymer 129 III . 7. 3 Polymer concentration 130 III . 7. 4 Composition of the coagulation bath 132 III . 7. 5 Composition of the casting solution 133 III . 7.

Modeling in Membranes and Membrane-Based Processes - Anirban Roy 2020-04-07

The book Modeling in Membranes and Membrane-Based Processes is based on the idea of developing a reference which will cover most relevant and “state-of-the-art” approaches in membrane modeling. This book explores almost every major aspect of modeling and the techniques applied in membrane separation studies and applications. This includes first principle-based models, thermodynamics models, computational fluid dynamics simulations, molecular dynamics simulations, and artificial intelligence-based modeling for membrane separation processes. These models have been discussed in light of various applications ranging from desalination to gas separation. In addition, this breakthrough new volume covers the fundamentals of polymer membrane pore formation mechanisms, covering not only a wide range of modeling techniques, but also has various facets of membrane-based applications. Thus, this book can be an excellent source for a holistic perspective on membranes in general, as well as a comprehensive and valuable reference work. Whether a veteran engineer in the field or lab or a student in chemical or process engineering, this latest volume in the “Advances in Membrane Processes” is a must-have, along with the first book in the series, Membrane Processes, also available from Wiley-Scrivener.

Industrial Membrane Separation Technology - K. Scott 2012-12-06

Membrane science and technology is an expanding field and has become a prominent part of many activities within the process industries. It is relatively easy to identify the success stories of membranes such as desali nation and microfiltration and to refer to others as developing areas. This, however, does not do justice to the wide field of separations in which membranes are used. No other 'single' process offers the same potential and versatility as that of membranes. The word separation classically conjures up a model of removing one component or species from a second component, for example a mass transfer process such as distillation. In the field of synthetic membranes, the terminology 'separation' is used in a wider context. A range of separations of the chemical/mass transfer type have developed around the use of membranes including distillation, extraction, absorption, adsorption and stripping, as well as separations of the physical type such as filtration. Synthetic membranes are an integral part of devices for analysis, energy generation and reactors (cells) in the electrochemical industry.

MEMBRANE SEPARATION PROCESSES - KAUSHIK NATH 2017-01-01

This concise and systematically organized text, now in its second edition, gives a clear insight into various membrane separation processes. It covers the fundamentals as well as the recent developments of different processes along with their industrial applications and the products. It includes the basic principles, operating parameters, membrane hardware, flux equation, transport mechanism, and applications of membrane-based technologies. Membrane separation processes are largely rate-controlled separations which require rate analysis for complete understanding. Moreover, a higher level of mathematical

analysis, along with the understanding of mass transfer, is also required. These are amply treated in different chapters of the book to make the students comprehend the membrane separation principles with ease. This textbook is primarily designed for undergraduate students of chemical engineering, biochemical engineering and biotechnology for the course in membrane separation processes. Besides, the book will also be useful to process engineers and researchers. KEY FEATURES • Provides sufficient number of examples of industrial applications related to chemical, metallurgical, biochemical and food processing industries. • Focuses on important biomedical applications of membrane-based technologies such as blood oxygenator, controlled drug delivery, plasmapheresis, and bioartificial organs. • Includes chapter-end short questions and problems to test students' comprehension of the subject. NEW TO THIS EDITION • A new section on membrane cleaning is included. Membrane fabrication methods are supplemented with additional information (Chapter 2). • Additional information on silt density index, forward osmosis and sea water desalination (Chapter 3). • Physicochemical parameters affecting nanofiltration, determination of various resistances using resistance in series model and few more industrial applications with additional short questions (Chapter 4). • Membrane cross-linking methods used in pervaporation, factors affecting pervaporation and few more applications (Chapter 9). • Membrane distillation, membrane reactor with different modules, types of membranes and reactions for membrane reactor (Chapter 13).

Urban Ecology, Water Quality and Climate Change - Arup K. Sarma 2018-03-14

This unique book brings together high-quality research contributions on ecological aspects of urbanization, water quality concerns in an urban environment, and climate change issues with a strong Indian focus under one umbrella. It includes several case studies that discuss urban water management, particularly highlighting the quality aspects. Urbanization is an ecological disturbance that the modern world accepts as essential in the absence of a better alternative that could provide an equal level of comfort. The prohibitive costs of eco-friendly production technologies are forcing the developing world to generate industrial waste that is detrimental to the environment. At the same time, the availability of adequate fresh water is another challenge for our climate-change impacted world. The scientific community is, therefore, searching for ways towards ecologically sustainable urban development. Discussing all these issues, this book offers a useful guide for academicians, researchers, practicing engineers, and managers dealing with diverse water-related problems in urban areas.

The United Nations world water development report 2019 - WWAP 2019-03-19

Access to water and sanitation is internationally recognized human right. Yet more than t wo billion people lack even the most basic of services. The latest United Nations World Water Development Report, Leaving No One Behind, explores the symptoms of exclusion and investigates ways to overcome inequalities.

Immobilization Strategies - Anuj Tripathi 2020-10-28

This book delves into the field of immobilizing biologically active and non-active molecules. It discusses the designing strategy of immobilization and the current state-of-the-art applications for advancing biomedical, agricultural, environmental and industrial practices. It focuses on aspects ranging from fundamental principles to current technological advances at multi-scale levels (macro, micro, and nano) which are suitable for cell, enzyme, and nano-catalyst based applications. Written by experts from across the globe, the contents deal with illustrated examples of molecular and cellular interactions with materials/scaffolds and discussions on factors that can affect the functionality and yield of the process. With its discussions on material science, design of delivery vehicles, separation science, additive manufacturing, agriculture and environmental science, this book will be a useful reference for researchers across multiple disciplines.

BIOSPERATIONS - B. SIVASANKAR 2005-01-01

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.

Microbial Metatranscriptomics Belowground - Manoj Nath 2021-06-02

The book emphasizes role of functional microbes in soil to improve fertility and plant health in agro-ecosystem. In this compendium main emphasis is on occurrence and distribution of microbial communities, In situ active microbial quorum in rhizosphere, metratranscriptomics for microflora- and fauna, and fnctional diversity in rhizosphere. The book also highlights the importance of PGPRs in rhizosphere, root endotrophic microbes, functional niche under biotic stress, functional niche under abiotic stress, functional root derived signals, as well as functional microbe derived signals. Approaches deployed in metatranscriptomics, and molecular Tools used in rhizosphere are also discussed in detail. The book presents content is useful for students, academicians, researchers working on soil rhizosphere and as a policy document on sustenance of agriculture.

Handbook of Nanofibers - Ahmed Barhoum 2019-09-10

This Handbook covers all aspects related to Nanofibers, from the experimental set-up for their fabrication to their potential industrial applications. It describes several kinds of nanostructured fibers such as metal oxides, natural polymers, synthetic polymers and hybrid inorganic-polymers or carbon-based materials. The first part of the Handbook covers the fundamental aspects, experimental setup, synthesis, properties and physico-chemical characterization of nanofibers. Specifically, this part details the history of nanofibers, different techniques to design nanofibers, self-assembly in nanofibers, critical parameters of synthesis, fiber alignment, modeling and simulation, types and classifications of nanofibers, and signature physical and chemical properties (i.e. mechanical, electrical, optical and magnetic), toxicity and regulations, bulk and surface functionalization and other treatments to allow them to a practical use. Characterization methods are also deeply discussed here. The second part of the Handbook deals with global markets and technologies and emerging applications of nanofibers, such as in energy production and storage, aerospace, automotive, sensors, smart textile design, energy conversion, tissue engineering, medical implants, pharmacy and cosmetics. Attention is given to the future of research in these areas in order to improve and spread the applications of nanofibers and their commercialization.