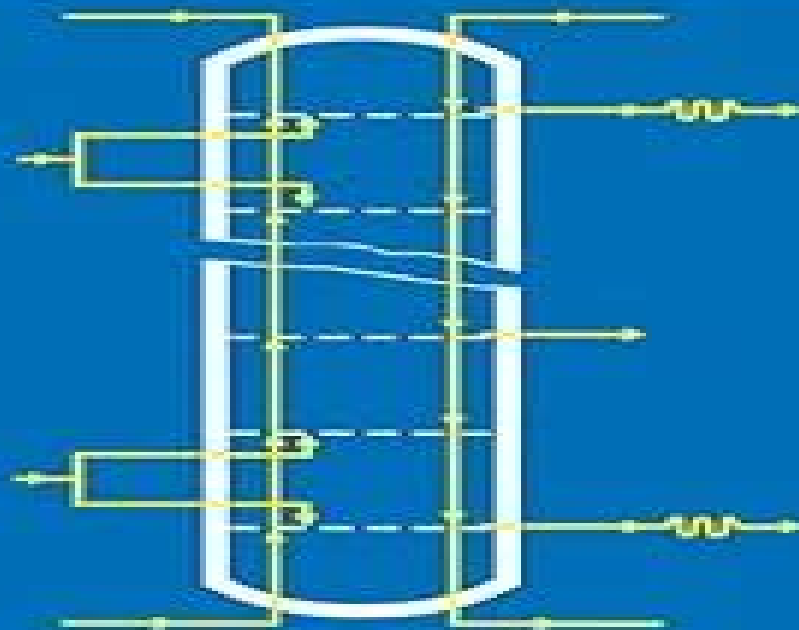


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Thermal Separation Processes

Principles and Design



Thermal Separation Processes Principles And Design

Philip E. Nelson



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Thermal Separation Processes Klaus Sattler,Hans Jacob Feindt,2008-07-11 This much needed book presents a clear and very practice oriented overview of thermal separation processes An extensive introduction elucidates the physical and physicochemical fundamentals of different unit operations used to separate homogenous mixtures This is followed by a concise text with numerous explanatory figures and tables referring to process and design flowsheets basic engineering and examples of separation process applications Very helpful guidance in the form of process descriptions calculation models and operation data is presented in an easy to understand manner thereby assisting the practicing engineer in the choosing and evaluation of separation processes and facilitating the modeling and design of innovative equipment A comprehensive reference list provides further opportunity for the following up of special separation problems Chemical and mechanical engineers chemists physicists and biotechnologists in research and development plant design and environmental protection as well as students in chemical engineering and natural sciences will find this all embracing reference guide of tremendous value and practical use Thermal Separation Technology Alfons Mersmann,Matthias Kind,Johann Stichlmair,2011-07-28

Thermal Separation Technology is a key discipline for many industries and lays the engineering foundations for the sustainable and economic production of high quality materials This book provides fundamental knowledge on this field and may be used both in university teaching and in industrial research and development Furthermore it is intended to support professional engineers in their daily efforts to improve plant efficiency and reliability Previous German editions of this book have gained widespread recognition This first English edition will now make its content available to the international community of students and professionals In the first chapters of the book the fundamentals of thermodynamics heat and mass transfer and multiphase flow are addressed Further chapters examine in depth the different unit operations distillation and absorption extraction evaporation and condensation crystallization adsorption and chromatography and drying while the closing chapter provides valuable guidelines for a conceptual process development **Industrial Separation Processes**

André B. de Haan,H. Burak Eral,Boelo Schuur,2020-07-06 Separation processes on an industrial scale account for well over half of the capital and operating costs in the chemical industry Knowledge of these processes is key for every student of chemical or process engineering This book is ideally suited to university teaching thanks to its wealth of exercises and solutions The second edition boasts an even greater number of applied examples and case studies as well as references for further reading **Process Design for Cryogenics** Alexander Alekseev,2024-10-14

Up to date overview of the method for producing the main industrial gases This book covers process design for cryogenic processes like air separation natural gas liquefaction and hydrogen and helium liquefaction It offers an overview of the basics of cryogenics and information on process design for modern industrial plants Throughout the book helps readers visualize the theories of thermodynamics related to cryogenics in practice A central concept in the book is the connection between the theoretical world of process

design and the real limitations given by available hardware components and systems Sample topics covered in Process Design for Cryogenics include Cryogenic gases like nitrogen oxygen argon neon hydrogen helium and methane Thermodynamics Typical cryogenic refrigeration processes including the classic Joule Thomson process the contemporary mixed gas Joule Thomson process and expander based processes like Brayton and Claude cycles Helium and hydrogen liquefaction and air separation Process Design for Cryogenics is a comprehensive must have resource for engineers and scientists working in academia and industry on cryogenic processes

Process Intensification Mirko Skiborowski, Andrzej Górak, 2022-06-06 Process intensification aims for increasing efficiency and sustainability of biochemical production processes This book presents strategies for the intensification of fluid separation processes such as reactive distillation reactive absorption and membrane assisted separations The authors discuss theoretical fundamentals model development methods for synthesis and the design as well as scale up and industrial process applications

Sustainable Separation Engineering Gyorgy Szekely, Dan Zhao, 2022-04-04 Sustainable Separation Engineering Explore an insightful collection of resources exploring conventional and emerging materials and techniques for separations In Sustainable Separation Engineering Materials Techniques and Process Development a team of distinguished chemical engineers delivers a comprehensive discussion of the latest trends in sustainable separation engineering Designed to facilitate understanding and knowledge transfer between materials scientists and chemical engineers the book is beneficial for scientists practitioners technologists and industrial managers Written from a sustainability perspective the status and need for more emphasis on sustainable separations in the chemical engineering curriculum is highlighted The accomplished editors have included contributions that explore a variety of conventional and emerging materials and techniques for efficient separations as well as the prospects for the use of artificial intelligence in separation science and technology Case studies round out the included material discussing a broad range of separation applications like battery recycling carbon sequestration and biofuel production This edited volume also provides Thorough introductions to green materials for sustainable separations as well as advanced materials for sustainable oil and water separation Comprehensive explorations of the recycling of lithium batteries and ionic liquids for sustainable separation processes Practical discussions of carbon sequestration the recycling of polymer materials and AI for the development of separation materials and processes In depth examinations of membranes for sustainable separations green extraction processes and adsorption processes for sustainable separations Perfect for academic and industrial researchers interested in the green and sustainable aspects of separation science Sustainable Separation Engineering Materials Techniques and Process Development is an indispensable resource for chemical engineers materials scientists polymer scientists and renewable energy professionals

Reactive and Membrane-Assisted Separations Philip Lutze, Andrzej Górak, 2016-07-28 Process intensification aims for increasing efficiency and sustainability of biochemical production processes This book presents strategies for improving fluid separation such as reactive distillation

reactive absorption and membrane assisted separations The authors discuss computer simulation model development methodological approaches for synthesis and the design and scale up of final industrial processes **Separation Process Principles** J. D. Seader, Ernest J. Henley, D. Keith Roper, 2016-01-20 Separation Process Principles with Applications Using Process Simulator 4th Edition is the most comprehensive and up to date treatment of the major separation operations in the chemical industry The 4th edition focuses on using process simulators to design separation processes and prepares readers for professional practice Completely rewritten to enhance clarity this fourth edition provides engineers with a strong understanding of the field With the help of an additional co author the text presents new information on bioseparations throughout the chapters A new chapter on mechanical separations covers settling filtration and centrifugation including mechanical separations in biotechnology and cell lysis Boxes help highlight fundamental equations Numerous new examples and exercises are integrated throughout as well *Environmental Engineering* Vesna Tomašić, Bruno Zelić, 2018-10-08

Environmental Engineering provides a profound introduction to Ecology Chemistry Microbiology Geology and Hydrology engineering The authors explain transport phenomena air pollution control waste water management and soil treatment to address the issue of energy preservation production asset and control of waste from human and animal activities Modeling of environmental processes and risk assessment conclude the interdisciplinary approach **Principles of Aseptic**

Processing and Packaging Philip E. Nelson, 2010 In aseptic processing food is stored at ambient temperatures in sterilized containers free of spoilage organisms and pathogens The results of this food technology come in all shapes and sizes from the consumer packages of milk on the shelves of the supermarket to the huge containers full of orange juice transported around the world by cargo ships Over the last couple of decades aseptic bulk storage and distribution has revolutionized the global food trade For example more than 90 percent of the approximately 24 million tons of fresh tomatoes harvested globally each year are aseptically processed and packaged for year round remanufacture into various food products The technology has also been applied to bring potable water and emergency food aid to survivors of the 2004 tsunami in Southeast Asia and the victims of Hurricane Katrina in 2005 as well as to other crisis situations worldwide The construction of new aseptic facilities continues around the world and an up to date understanding of the technology is essential for a new generation of food scientists and engineers alike The contributors to this important textbook discuss all aspects of aseptic processing and packaging focusing on the areas that most influence the success or failure of the process Fully updated this new edition covers all areas of chemistry microbiology engineering packaging and regulations as they relate to aseptic processing Ion

Exchange and Solvent Extraction Yitzhak Marcus, Arup K. SenGupta, 2004-07-23 Volume 17 in the Ion Exchange and Solvent Extraction series represents the vanguard of research on solvent extraction It covers the principles of electrolyte extraction and other subjects of increasing interest to the field This volume begins with pharmaceutical applications of supercritical fluid solvents particularly supercritical carbon dioxide It also contains chapters on liquid ion exchangers and relevant

experiment protocols SCF applications in drug formulation and pollution reduction exploiting SCF as reaction media applications of metal bis dicarbollide in analytical chemistry and radioactive waste treatment and synergistic extraction of metal ions Volume 17 discusses the ion exchange isothermal supersaturation technique metal separation via pH induced parametric pumping modeling of ion exchange kinetics for ultrapure water and the engineering of activated carbons and carbonaceous materials for removal of metal ions and organic micropollutants in water Volume 17 cover topics that include supercritical fluid applications applications of metal bis dicarbollide and synergistic extraction of metal ions *Separation Process Engineering* Phillip C. Wankat, 2022-10-24 The Definitive Learner Friendly Guide to Chemical Engineering Separations Extensively Updated Including a New Chapter on Melt Crystallization Efficient separation processes are crucial to addressing many societal problems from developing new medicines to improving energy efficiency and reducing emissions Separation Process Engineering Fifth Edition is the most comprehensive accessible guide to modern separation processes and the fundamentals of mass transfer In this completely updated edition Phillip C Wankat teaches each key concept through detailed realistic examples using actual data with up to date simulation practice spreadsheet based exercises and references Wankat thoroughly covers each separation process including flash column and batch distillation exact calculations and shortcut methods for multicomponent distillation staged and packed column design absorption stripping and more His extensive discussions of mass transfer and diffusion enable faculty to teach separations and mass transfer in a single course And detailed material on liquid liquid extraction adsorption chromatography and ion exchange prepares students for advanced work New and updated content includes melt crystallization steam distillation residue curve analysis batch washing the Shanks system for percolation leaching eutectic systems forward osmosis microfiltration and hybrid separations A full chapter discusses economics and energy conservation including updated equipment costs Over 300 new and updated homework problems are presented all extensively tested in undergraduate courses at Purdue University New chapter on melt crystallization solid liquid phase equilibrium suspension static and falling film layer approaches and 34 questions and problems New binary VLE equations and updated content on simultaneous solutions New coverage of safety and fire hazards New material on steam distillation simple multi component batch distillation and residue curve analysis Expanded discussion of tray efficiencies packed column design and energy reduction in distillation New coverage of two hybrid extraction with distillation and the Kremser equation in fractional extraction Added sections on deicing with eutectic systems eutectic freeze concentration and scale up New sections on forward osmosis and microfiltration Expanded advanced content on adsorption and ion exchange including updated instructions for eight detailed Aspen Chromatography labs Discussion of membrane separations including gas permeation reverse osmosis ultrafiltration pervaporation and applications Thirteen up to date Aspen Plus process simulation labs adaptable to any simulator This guide reflects an up to date understanding of how modern students learn designed organized and written to be exceptionally clear and easy to use It presents detailed

examples in a clear standard format using real data to solve actual engineering problems preparing students for their future careers

Chemical Engineering and Chemical Process Technology - Volume IV Ryszard Pohorecki, John Bridgwater, M. Molzahn, Rafiqul Gani and Crispulo Gallegos, 2010-11-30 Chemical Engineering and Chemical Process Technology is a theme component of Encyclopedia of Chemical Sciences Engineering and Technology Resources in the global Encyclopedia of Life Support Systems EOLSS which is an integrated compendium of twenty Encyclopedias Chemical engineering is a branch of engineering dealing with processes in which materials undergo changes in their physical or chemical state These changes may concern size energy content composition and or other application properties Chemical engineering deals with many processes belonging to chemical industry or related industries petrochemical metallurgical food pharmaceutical fine chemicals coatings and colors renewable raw materials biotechnological etc and finds application in manufacturing of such products as acids alkalis salts fuels fertilizers crop protection agents ceramics glass paper colors dyestuffs plastics cosmetics vitamins and many others It also plays significant role in environmental protection biotechnology nanotechnology energy production and sustainable economical development The Theme on Chemical Engineering and Chemical Process Technology deals in five volumes and covers several topics such as Fundamentals of Chemical Engineering Unit Operations Fluids Unit Operations Solids Chemical Reaction Engineering Process Development Modeling Optimization and Control Process Management The Future of Chemical Engineering Chemical Engineering Education Main Products which are then expanded into multiple subtopics each as a chapter These five volumes are aimed at the following five major target audiences University and College students Educators Professional practitioners Research personnel and Policy analysts managers and decision makers and NGOs

Azeotropic Data Jürgen Gmehling, 1994-07-13 Separation processes are a multi billion dollar business In the United States alone there are more than 40 000 distillation columns which require approximately 7 0 % of the total US energy consumption for operation Azeotropic data and zeotropic information are essential for the optimal design and synthesis of distillation processes The book highlights the best way to separate azeotropic systems using hybrid or specialized distillation processes such as pressure swing azeotropic or extractive distillation This extensive two volume compilation covers nearly all data currently available for binary and higher systems This knowledge is the key for the successful separation of these azeotropic systems The reader will be inspired by the sheer volume of data for more than 18800 systems involving approximately 1700 compounds These data are carefully evaluated documented and arranged according to molecular formula for easy access The best thermal separation conditions for industry and environmental protection can be achieved through this practical source In addition to chemical engineers and physical chemists scientists active in process engineering and environmental protection and will find themselves fully equipped to deal with any separation task

Natural Product Extraction 2nd edn Mauricio A. Rostagno, Juliana M. Prado, 2022-07-20 Natural Product Extraction presents an updated review of the more environmentally benign techniques available for the extraction of

natural products **Natural Product Extraction** Mauricio A Rostagno,Juliana M Prado,2015-10-09 Natural products are sought after by the food pharmaceutical and cosmetics industries and research continues into their potential for new applications Extraction of natural products in an economic and environmentally friendly way is of high importance to all industries involved This book presents a holistic and in depth view of the techniques available for extracting natural products with modern and more environmentally benign methods such as ultrasound and supercritical fluids discussed alongside conventional methods Examples and case studies are presented along with the decision making process needed to determine the most appropriate method Where appropriate scale up and process integration is discussed Relevant to researchers in academia and industry and students aiming for either career path Natural Product Extraction presents a handy digest of the current trends and latest developments in the field with concepts of Green Chemistry in mind **Fundamentals and Operations in Food Process Engineering** Susanta Kumar Das, Madhusweta Das,2019-03-08 Fundamentals and Operations in Food Process Engineering deals with the basic engineering principles and transport processes applied to food processing followed by specific unit operations with a large number of worked out examples and problems for practice in each chapter The book is divided into four sections fundamentals in food process engineering mechanical operations in food processing thermal operations in food processing and mass transfer operations in food processing The book is designed for students pursuing courses on food science and food technology including a broader section of scientific personnel in the food processing and related industries Advances in Distillation Retrofit Nguyen Van Duc Long, Moonyong Lee,2017-09-18 This book describes the current state of the art in the retrofit of existing distillation processes using advanced distillation techniques Highlighting concept and practical application rather than theory it emphasizes the use of advanced process integration and intensification techniques such as multi effect distillation heat pump assisted distillation thermally coupled distillation dividing wall column reactive distillation and innovative hybrid systems As a thermal separation method distillation is one of the most important and widely used technologies in the chemical process industry While it has many advantages one major drawback is its large energy requirement which can significantly influence overall plant profitability The increasing cost of energy has forced industry to reduce its energy requirement but simultaneously there has been a need to increase capacity and output due to heightened demand To accomplish this the retrofit of distillation processes to increase efficiency and output has become a crucial issue This book describes the use of advanced process integration and process intensification techniques to carry out effective distillation retrofit Written by leading researchers in distillation process process integration process intensification and process retrofit the book presents a comprehensive review of contemporary advanced distillation techniques which can be employed in grass root systems and retrofit It is a valuable source of information for undergraduate and postgraduate students of chemical engineering practicing process designers and chemical engineers *Modern Drying Technology, Volume 4* Evangelos Tsotsas, Arun S. Mujumdar,2011-12-19 This five volume series

provides a comprehensive overview of all important aspects of modern drying technology concentrating on the transfer of cutting edge research results to industrial use Volume 4 deals with the reduction of energy demand in various drying processes and areas highlighting the following topics Energy analysis of dryers efficient solid liquid separation techniques osmotic dehydration heat pump assisted drying zeolite usage solar drying drying and heat treatment for solid wood and other biomass sources and sludge thermal processing Process Engineering Renewal 1 Éric Schaer, Jean-Claude André, 2020-06-16 Process engineering emerged at the beginning of the 20th Century and has become an essential scientific discipline for the matter and energy processing industries Its success is incontrovertible with the exponential increase in techniques and innovations Rapid advances in new technologies such as artificial intelligence as well as current societal needs sustainable development climate change renewable energy the environment are developments that must be taken into account in industrial renewal Process Engineering Renewal 1 the first volume of three focuses on training demonstrating the need for innovation in order for the field to have a framework that is sustainable in a highly changeable world

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