

## Random Packing Sulzer

This is the first book dedicated to the entire field of integrated chemical processes, covering process design, analysis, operation and control of these processes. Both the editors and authors are internationally recognized experts from different fields in industry and academia, and their contributions describe all aspects of intelligent integrations of chemical reactions and physical unit operations such as heat exchange, separational operations and mechanical unit operations. As a unique feature, the book also introduces new concepts for treating different integration concepts on a generalized basis. Of great value to a broad audience of researchers and engineers from industry and academia.

Process Technology provides a general overview about chemical and biochemical process technology. It focuses on the structure and development of production processes, main technological operations and the important aspects of process economics. The theoretical foundations in each chapter are supplemented by case studies and examples in a clear and instructive manner to illustrate the practical aspects. The author highlights operating principles, reasons for application and available industrial equipment of technological operations. Aim is to facilitate those without a process technology background in multi-disciplinary cooperation with (bio-) chemical engineers by providing an overview of this exciting field. The textbook is

organized into seven distinct parts: Structure of the chemical industry and (bio-) chemical processes (Bio-) Chemical reaction engineering Molecular separations (distillation, extraction, absorption, adsorption) Mechanical separations (filtration, sedimentation, membranes) Particle and final product manufacturing Development, scale-up, design and safety of processes Major industrial process descriptions This book covers a wide range of food and oleochemical applications of palm and coconut oils. The presentations were part of the World Conference on Palm and Coconut Oils for the 21st Century held in Bali and reflect the changes in the oleochemical industry during the past decade.

The first German edition of the book "Fluid dynamics of packed columns with modern random and structured packings for gas/liquid systems" was published in 1991. It sold out within a few years. Added to this were numerous enquiries, in particular within the industry, prompting me to publish a second, extended edition. A packed column remains the core element of any diffusional separation process. This underlines the need for basic design principles for packed columns, which enhance the design process by making it more accurate and reliable. The SBD (suspended bed of droplets) model introduced in the first German edition of the book was well received by the experts and is now used by a large number of companies in the industry, as it offers improved reliability in the fluid dynamic design of packed columns. For the purpose of facilitating the design process, the SBD model was integrated into the simulation

programme ChemCAD. The software programme FDPACK, which is available for Windows, has certainly contributed to the widespread use of the SBD model. The programme is very user-friendly and the calculation results are presented in tabular as well as graphic form, showing food load, pressure drop and hold-up diagrams in the entire operating range.

Absorption-Based Post-Combustion Capture of Carbon Dioxide provides a comprehensive and authoritative review of the use of absorbents for post-combustion capture of carbon dioxide. As fossil fuel-based power generation technologies are likely to remain key in the future, at least in the short- and medium-term, carbon capture and storage will be a critical greenhouse gas reduction technique. Post-combustion capture involves the removal of carbon dioxide from flue gases after fuel combustion, meaning that carbon dioxide can then be compressed and cooled to form a safely transportable liquid that can be stored underground. Provides researchers in academia and industry with an authoritative overview of the amine-based methods for carbon dioxide capture from flue gases and related processes Editors and contributors are well known experts in the field Presents the first book on this specific topic

This textbook provides a comprehensive introduction to chemical process engineering, linking the fundamental theory and concepts to the industrial day-to-day practice. It bridges the gap between chemical sciences and the practical chemical industry. It enables the reader to integrate fundamental knowledge of the basic disciplines, to

understand the most important chemical processes, and to apply this knowledge to the practice in the industry.

Distillation: Operation and Applications—winner of the 2015 PROSE Award in Chemistry & Physics from the Association of American Publishers—is a single source of authoritative information on all aspects of the theory and practice of modern distillation, suitable for advanced students and professionals working in a laboratory, industrial plants, or a managerial capacity. It addresses the most important and current research on industrial distillation, including all steps in process design (feasibility study, modeling, and experimental validation), together with operation and control aspects.

This volume features an extra focus on distillation applications. Winner of the 2015 PROSE Award in Chemistry & Physics from the Association of American Publishers  
Practical information on the newest development written by recognized experts  
Coverage of a huge range of laboratory and industrial distillation approaches  
Extensive references for each chapter facilitates further study

Explore and review novel techniques for intensifying transport and reaction in liquid-liquid and related systems with this essential toolkit. Topics include discussion of the principles of process intensification, the nexus between process intensification and sustainable engineering, and the fundamentals of liquid-liquid contacting, from an expert with over forty-five years' experience in the field. Providing promising directions for investment and for new research in process intensification, in addition to a unique

review of the fundamentals of the topic, this book is the perfect guide for senior undergraduate students, graduate students, developers, and research staff in chemical engineering and biochemical engineering.

Guiding readers through all steps of the complex process, this book covers the most diverse aspects of chemicals production, including those not or insufficiently covered in natural science courses. These comprise economic feasibility, patenting and licensing, demands on the location and the problem of waste disposal. Throughout, the author does not rely on simple references to other literature but instead reiterates many facts and places them in context, as well as succinctly explaining formulas, thus removing the need to look up items in secondary reference works. As such, the book is suitable for both newcomers as well as those already working in the field. Those working in R&D as well as plant managers will learn how to avoid pitfalls, resulting in higher safety. A common basis and indispensable ready reference for engineers and chemists.

This book highlights key recent developments in air conditioning technologies for cooling and dehumidification with the specific objectives to improve energy efficiency and to minimize environmental impact. Today, air conditioning, comprising cooling and dehumidification, is a necessity in commercial and residential buildings and even in many industrial processes. This book provides key update on recent developments in air conditioning systems, cooling cycles and innovative cooling/dehumidification technologies. Key technologies related to cooling include heat-driven absorption and

adsorption cooling and water-based dew point evaporative cooling. Technologies connected with dehumidification involve new generations of adsorbent–desiccant dehumidifiers, liquid-based desiccants and membranes that sieve out water vapor from air. Losses in cooling cycles and thermo-economic analysis for a sustainable economy are also judiciously documented.

This five-volume series covers the entire range of technologies used in the petroleum refining industry. The books are intended for students and for the engineers and technicians who operate in refineries. This volume is devoted to the main equipment used in a refinery or a petrochemical complex, classified by technology. The basic principles for design and sizing are presented for each type of equipment. The details of practical implementation are also discussed with a view to maximum efficiency. Equipment selection criteria are provided for specific applications. Lastly, emphasis is placed on the major trends in equipment development. Contents: I. Separation technologies. 1. Gas-liquid contactors for distillation: plate columns. 2. Gas-liquid contactors for distillation: packed columns. 3. Solvent extraction equipment. 4. Techniques for physical separation of phases. II. Heat transfer technologies. 5. Process furnaces. 6. Heat exchangers. III. Reaction technologies. 7. Chemical reactor technology. IV. Mechanical operations. 8. Pumps, compressors, turbines and ejectors. 9. Agitation and mixing techniques. V. Control and optimization techniques. 10. Control and Monitoring. 11. Rational use of energy. References. Index.

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. Each engineering task is described and illustrated with a sample document taken from

a real project. --

This book offers a comprehensive sketch of the tools used in material research and the rich and diverse stories of how those tools came to be. We aim to give readers a sense of what tools materials researchers required in the late 20th century, and how those tools were developed and became accessible. The book is in a sense a collective biography of the components of what the philosopher of science, Ian Hacking, calls the 'instrumentarium' of materials research. Readers should gain an appreciation of the work materials researchers put into developing and using such tools, and of the tremendous variety of such tools. They should also gain some insight into the material (and hence financial) prerequisites for materials research. Materials research requires funding for the availability and maintenance of its tools; and the category of tools encompasses a broad range of substances, apparatus, institutions, and infrastructure.

Handbook of Separation Process Technology John Wiley & Sons

The aim of the biennial series of symposia on Fusion Technology organized by the European Fusion Laboratories, is the exchange of information on the design, construction and operation of fusion experiments and on the technology being developed for the next-step devices and fusion reactors. The coverage of the volume includes the technological aspects of fusion reactors in relation to new developments, thus forming a guideline for the definition of future work. These

proceedings comprise three volumes and contain both the invited lectures and contributed papers presented at the symposium, which was attended by 569 participants from around the globe. The 343 papers, including 12 invited papers, characterise the increasing interest of industry in the fusion programme, giving a broad and current overview on the progress and trends fusion technology is experiencing now, as well as indicating the future for fusion devices.

Distillation Principles and Practice Second Edition covers all the main aspects of distillation including the thermodynamics of vapor/liquid equilibrium, the principles of distillation, the synthesis of distillation processes, the design of the equipment, and the control of process operation. Most textbooks deal in detail with the principles and laws of distilling binary mixtures. When it comes to multi-component mixtures, they refer to computer software nowadays available. One of the special features of the second edition is a clear and easy understandable presentation of the principles and laws of ternary distillation. The right understanding of ternary distillation is the link to a better understanding of multi-component distillation. Ternary distillation is the basis for a conceptual process design, for separating azeotropic mixtures by using an entrainer, and for reactive distillation, which is a rapidly developing field of distillation. Another special feature of the book is the design of distillation equipment, i.e. tray columns and

packed columns. In practice, empirical know-how is preferably used in many companies, often in form of empirical equations, which are not even dimensionally correct. The objective of the proposed book is the derivation of the relevant equations for column design based on first principles. The field of column design is permanently developing with respect to the type of equipment used and the know-how of two-phase flow and interfacial mass transfer. This five-volume series covers the entire range of technologies used in the petroleum refining industry. The books are intended for students and for the engineers and technicians who operate in refineries. In addition to the detailed description of the conventional separation processes used in refining, this volume devotes ample space to discussing future developments. These include enhancements to existing technologies and the introduction of new technologies and separation processes that are as yet seldom implemented in the industry.

Contents: 1. Basics of separation operations. 2. Thermodynamics: phase equilibria. 3. Mass transfer and efficiency of separation operations. 4. Distillation, absorption and stripping. 5. Distillation, absorption and stripping in the petroleum industry. 6. Liquid-liquid extraction. 7. Solvent extraction in the oil industry. 8. Crystallization. 9. Crystallization in the oil industry: solvent dewaxing. 10. Adsorption. 11. Adsorption in the oil and gas industry. 12. Membrane separation.

References. Index.

Annotation A handbook for chemical and process engineers who need a solution to their practical on-the-job problems. It solves process design problems quickly, accurately and safely, with hundreds of techniques, shortcuts and calculations. This textbook is targeted to undergraduate students in chemical engineering, chemical technology, and biochemical engineering for courses in mass transfer, separation processes, transport processes, and unit operations. The principles of mass transfer, both diffusional and convective have been comprehensively discussed. The application of these principles to separation processes is explained. The more common separation processes used in the chemical industries are individually described in separate chapters. The book also provides a good understanding of the construction, the operating principles, and the selection criteria of separation equipment. Recent developments in equipment have been included as far as possible. The procedure of equipment design and sizing has been illustrated by simple examples. An overview of different applications and aspects of membrane separation has also been provided. 'Humidification and water cooling', necessary in every process industry, is also described. Finally, elementary principles of 'unsteady state diffusion' and mass transfer accompanied by a chemical reaction are covered. SALIENT FEATURES

- A balanced coverage of theoretical principles and applications.
- Important recent developments in mass transfer equipment and practice are included.
- A large number of solved problems of varying levels of complexities showing the applications of the theory are included.
- Many end-chapter exercises.
- Chapter-wise multiple choice questions.
- An Instructors manual for the teachers.

Distillation: Equipment and Processes—winner of the 2015 PROSE Award in Chemistry & Physics from the Association of American Publishers—is a single source of authoritative information on all aspects of the theory and practice of modern distillation, suitable for advanced students and professionals working in a laboratory, industrial plants, or a managerial capacity. It addresses the most important and current research on industrial distillation, including all steps in process design (feasibility study, modeling, and experimental validation), together with operation and control aspects. This volume features an extra focus on distillation equipment and processes. Winner of the 2015 PROSE Award in Chemistry & Physics from the Association of American Publishers Practical information on the newest development written by recognized experts Coverage of a huge range of laboratory and industrial distillation approaches Extensive references for each chapter facilitates further study

Taking greater advantage of powerful computing capabilities over the last several

years, the development of fundamental information and new models has led to major advances in nearly every aspect of chemical engineering. Albright's Chemical Engineering Handbook represents a reliable source of updated methods, applications, and fundamental concepts that will continue to play a significant role in driving new research and improving plant design and operations. Well-rounded, concise, and practical by design, this handbook collects valuable insight from an exceptional diversity of leaders in their respective specialties. Each chapter provides a clear review of basic information, case examples, and references to additional, more in-depth information. They explain essential principles, calculations, and issues relating to topics including reaction engineering, process control and design, waste disposal, and electrochemical and biochemical engineering. The final chapters cover aspects of patents and intellectual property, practical communication, and ethical considerations that are most relevant to engineers. From fundamentals to plant operations, Albright's Chemical Engineering Handbook offers a thorough, yet succinct guide to day-to-day methods and calculations used in chemical engineering applications. This handbook will serve the needs of practicing professionals as well as students preparing to enter the field.

Emerging Technologies and Biological Systems for Biogas Upgrading

systematically summarizes the fundamental principles and the state-of-the-art of biogas cleaning and upgrading technologies, with special emphasis on biological processes for carbon dioxide (CO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), siloxane, and hydrocarbon removal. After analyzing the global scenario of biogas production, upgrading and utilization, this book discusses the integration of methanation processes to power-to-gas systems for methane (CH<sub>4</sub>) production and physiochemical upgrading technologies, such as chemical absorption, water scrubbing, pressure swing adsorption and the use of membranes. It then explores more recent and sustainable upgrading technologies, such as photosynthetic processes using algae, hydrogen-mediated microbial techniques, electrochemical, bioelectrochemical, and cryogenic approaches. H<sub>2</sub>S removal with biofilters is also covered, as well as removal of siloxanes through polymerization, peroxidation, biological degradation and gas-liquid absorption. The authors also thoroughly consider issues of mass transfer limitation in biomethanation from waste gas, biogas upgrading and life cycle assessment of upgrading technologies, techno-economic aspects, challenges for upscaling, and future trends. Providing specific information on biogas upgrading technology, and focusing on the most recent developments, *Emerging Technologies and Biological Systems for Biogas Upgrading* is a unique resource for researchers,

engineers, and graduate students in the field of biogas production and utilization, including waste-to-energy and power-to-gas. It is also useful for entrepreneurs, consultants, and decision-makers in governmental agencies in the fields of sustainable energy, environmental protection, greenhouse gas emissions and climate change, and strategic planning. Explores all major technologies for biogas upgrading through physiochemical, biological, and electrochemical processes Discusses CO<sub>2</sub>, H<sub>2</sub>S, and siloxane removal techniques Provides a systematical approach to discuss technologies, including challenges to gas–liquid mass transfer, life cycle assessment, technoeconomic implications, upscaling and systems integration

This book highlights recent findings in industrial, manufacturing and mechanical engineering, and provides an overview of the state of the art in these fields, mainly in Russia and Eastern Europe. A broad range of topics and issues in modern engineering are discussed, including the dynamics of machines and working processes, friction, wear and lubrication in machines, surface transport and technological machines, manufacturing engineering of industrial facilities, materials engineering, metallurgy, control systems and their industrial applications, industrial mechatronics, automation and robotics. The book gathers selected papers presented at the 5th International Conference on Industrial

Engineering (ICIE), held in Sochi, Russia in March 2019. The authors are experts in various fields of engineering, and all papers have been carefully reviewed. Given its scope, the book will be of interest to a wide readership, including mechanical and production engineers, lecturers in engineering disciplines, and engineering graduates.

Tritium Technologies for Thermonuclear Fusion Reactors summarizes the most recent research and practice in tritium technologies for the processing of hydrogen isotopes in fuel cycles. Authors Dr. Perevezentsev and Professor Rozenkevich combine their wealth of first-hand experience to present this comprehensive guide which promotes the best radiation protection practices and a more sustainable way to produce power in a thermonuclear reactor plant. Applicable to both magnetic and inertial confinements of plasma, this book covers tritium processing systems, tritium recovery from the plasma chamber, and various safety systems devoted to lessening the impact on the public and environment. The readers are also led through various modeling techniques, such as the separation of hydrogen isotopes, and the detritiation of liquid and gaseous streams in dynamic and steady state operation modes. This book is a practical guide which includes various case studies and examples which will help solidify the reader's learning. It combines the latest research of tritium

technologies with applications for fusion nuclear reactors, and includes solutions and directions for the resolution of various common challenges faced. Engineers, researchers, and students of tritium technologies, fusion energy, and nuclear power generation will gain a detailed and integrated understanding of how tritium can be used within a nuclear setting, for cleaner and more efficient power generation. Guides the reader through problem solving via step-by-step processes and models Includes case studies and examples throughout, from two of the most recognized experts in the field with firsthand knowledge of the subject Presents a comprehensive, practical reference on the tritium fuel cycle for fusion reactors

The rising trend towards the operation of packed towers in separation processes was initiated after the energy crisis in the seventies. This book is the first of its kind which treats all the important theoretical and practical aspects for the calculation, design and operation of these packed towers. The main applications of packed towers are in the separation of gas-liquid or vapour-liquid systems. This book considers all features of packed towers for industrial separation plants that can be used in process and environmental technology. It includes a comprehensive treatment of packed-bed technology and the advantages of packed towers, such as the application of improved methods for energy saving

purposes, environmental protection measures and the revamping of existing plants, are clearly outlined. The methods presented are based on sound physical and mathematical modelling, the validity of which have been confirmed by numerous experimental investigations performed in laboratories and pilot plants and then scaled up to meet practical, industrial requirements.

Surveys the selection, design, and operation of most of the industrially important separation processes. Discusses the underlying principles on which the processes are based, and provides illustrative examples of the use of the processes in a modern context. Features thorough treatment of newer separation processes based on membranes, adsorption, chromatography, ion exchange, and chemical complexation. Includes a review of historically important separation processes such as distillation, absorption, extraction, leaching, and crystallization and considers these techniques in light of recent developments affecting them.

Packed bed columns are largely employed for absorption, desorption, rectification and direct heat transfer processes in chemical and food industry, environmental protection and also processes in thermal power stations like water purification, flue gas heat utilization and SO<sub>2</sub> removal. These Separation processes, are estimated to account for 40%-70% of capital and operating costs in process industry. Packed bed columns are widely employed in this area. Their

usage also for direct heat transfer between gas and liquid, enlarge their importance. They are the best apparatuses, from thermodynamical point of view, for mass and heat transfer processes between gas and liquid phase. Their wide spreading is due to low capital investments and operating costs. Since 1995 there has not been published a specialised book in this area, and this is a period of quick development of packed columns. Packed Bed Columns reflects the state of this field including the author's experience on creating and investigating of new packings, column internals and industrial columns. Considers the theories of mass transfer processes and shows how they help the construction of highly effective packings Complete information about the performance characteristics of different modern types of highly effective packings Considers the models for calculation and areas of their application

Separation of Isotopes of Biogenic Elements provides a detailed overview of this area of research covering all aspects from the value of isotope effects to their practical use (equilibrium single-stage isotope effect - kinetics and mass transfer – multiplication of the single-stage isotope separation factor - technological peculiarity of processes) with the purpose of extraction from the natural mixture of the enriched and highly concentrated isotopes. In contrast to traditional books on the theory of isotope separation, the theoretical part of the book describes

separation in two-phase processes in counter-flow columns. The experimental part of the book presents systematic analysis of specialists in the field of isotope separation in counter-flow columns. This book will be of interest to scientists, engineers and technical workers engaged in isotope separation processes and isotope application in nuclear physics, medicine, agro-chemistry, biology and other areas. This book may also be used in teaching theory and practical aspects in courses on physical chemistry and Isotope separation of light elements by physicochemical methods. \* summarises current state of isotope research, especially biogenic elements \* covering all aspects from the value of isotope effects to their practical use \* of interest to scientists, engineers and technical workers engaged in isotope separation processes and isotope application

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

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CO<sub>2</sub> capture and geological storage (CCS) is now recognised as being one of the pathways that can be implemented to reduce CO<sub>2</sub> emissions and fight against global warming. But where, how and at what price can CO<sub>2</sub> be captured? This book attempts to provide the answers to these questions, reviewing the state of the art of the technologies required. It presents the three main pathways considered in which the CO<sub>2</sub> capture technologies are expected to be implemented, respectively: the post-combustion pathway, in which the CO<sub>2</sub> contained in industrial flue gases is extracted; the oxy-combustion pathway, in which combustion is performed in oxygen to obtain flue gases with high CO<sub>2</sub> concentration; and lastly the pre-combustion pathway, in which carbon is extracted from the initial fuel to generate hydrogen, whose combustion will produce only water vapour. The book introduces, for each pathway, the technologies currently available and those under development. It is intended for everyone wanting to gain a better understanding of the mechanisms implemented in CO<sub>2</sub> capture operations, as well as the technological and economic challenges to be met to ensure that the costs generated by these

operations are no longer an obstacle to their worldwide generalisation. Contents:

1. Why capture and store CO<sub>2</sub>? Global warming. How to reduce CO<sub>2</sub> emissions. Main links of the CCS chain.
2. Where capture CO<sub>2</sub>? CO<sub>2</sub> fixed emission sources worldwide. Fixed sources in France. CO<sub>2</sub> capture potential in France.
3. Post-Combustion CO<sub>2</sub> capture. Principles and stakes. Characteristics of post-combustion flue gases. Separation techniques potentially suitable for post-combustion CO<sub>2</sub> capture. Technologies under development for post-combustion CO<sub>2</sub> Capture. CO<sub>2</sub> conditioning. Conclusion.
4. Oxy-combustion CO<sub>2</sub> capture. Principles and stakes. Oxy-combustion. Chemical looping combustion. CO<sub>2</sub> conditioning. Demonstrations.
5. Pre-combustion CO<sub>2</sub> capture. Principles and stakes. Syngas production. Water-gas shift reaction. CO<sub>2</sub> extraction. CO<sub>2</sub> conditioning. Hydrogen combustion. Integrated power production processes with pre-combustion CO<sub>2</sub> capture.
6. Capture and store CO<sub>2</sub>: at what cost? Calculation bases. CO<sub>2</sub> capture costs. CO<sub>2</sub> transport costs. CO<sub>2</sub> storage costs. Trend in the cost of the CCS chain - Power production. Variability of CCS chain costs. Application to existing installations. Conclusion. Appendix.

Supplying nearly 350 expertly-written articles on technologies that can maximize and enhance the research and production phases of current and emerging chemical manufacturing practices and techniques, this second edition provides

gold standard articles on the methods, practices, products, and standards recently influencing the chemical industries. New material includes: design of key unit operations involved with chemical processes; design, unit operation, and integration of reactors and separation systems; process system peripherals such as pumps, valves, and controllers; analytical techniques and equipment; current industry practices; and pilot plant design and scale-up criteria.

This book gives a practical account of the modern theory of calculation of absorbers for binary and multicomponent physical absorption and absorption with simultaneous chemical reaction. The book consists of two parts: the theory of absorption and the calculation of absorbers. Part I covers basic knowledge on diffusion and the theory of mass transfer in binary and multicomponent systems. Significant stress is laid on diffusion theory because this forms the basis for the absorption process. In the next chapters the fundamentals of simultaneous mass transfer and chemical reaction, the theory of the desorption of gases from liquids and the formulation of differential mass balances are discussed. Part II is devoted to the calculation of absorbers and the classification of absorbers. The chapters present calculation methods for the basic types of absorber with a detailed analysis of the calculation methods for packed, plate and bubble columns. The authors illustrate the presented material with a large number of examples,

starting with simple ones for binary systems and ending with column calculation for multicomponent systems.

This advanced textbook covering the fundamentals and industry applications of process intensification (PI) discusses both the theoretical and conceptual basis of the discipline. Since interdisciplinarity is a key feature of PI, the material contained in the book reaches far beyond the classical area of chemical engineering. Developments in other relevant disciplines, such as chemistry, catalysis, energy technology, applied physics, electronics and materials science, are extensively described and discussed, while maintaining a chemical engineering perspective. Divided into three major parts, the first introduces the PI principles in detail and illustrates them using practical examples. The second part is entirely devoted to fundamental approaches of PI in four domains: spatial, thermodynamic, functional and temporal. The third and final part explores the methodology for applying fundamental PI approaches in practice. As well as detailing technologies, the book focuses on safety, energy and environmental issues, giving guidance on how to incorporate PI in plant design and operation -- safely, efficiently and effectively.

Offering indispensable insight from experts in the field, *Fundamentals of Natural Gas Processing, Second Edition* provides an introduction to the gas industry and

the processes required to convert wellhead gas into valuable natural gas and hydrocarbon liquids products. The authors compile information from the literature, meeting proceedings, and the

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