

Modeling And Simulation For Reactive Distillation Process

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Process Analysis and Simulation in Chemical Engineering - Iván Darío Gil Chaves 2015-11-27
This book offers a comprehensive coverage of process simulation and flowsheeting, useful for undergraduate students of Chemical Engineering and Process Engineering as theoretical and practical support in Process Design, Process Simulation, Process Engineering, Plant Design, and Process Control courses. The main concepts related to process simulation and application tools are presented and discussed in the framework of typical problems found in engineering design. The topics presented in the chapters are organized in an inductive way, starting from the more simplistic simulations up to some complex problems.

Reactive Distillation Design and Control - William L. Luyben 2009-03-30
After an overview of the fundamentals, limitations, and scope of reactive distillation, this book uses rigorous models for steady-state design and dynamic analysis of different types of reactive distillation columns and quantitatively compares the economics of reactive distillation columns with conventional multi-unit processes. It goes beyond traditional steady-state design that primarily considers the capital investment and energy costs when analyzing the control structure and the dynamic robustness of disturbances, and discusses how to maximize the economic and environmental benefits of reactive distillation technology.

The ChemSep Book - Harry A. Kooijman 2000

Chemical Engineering Process Simulation -

Dominic C.Y. Foo 2022-09-29
Chemical Engineering Process Simulation, Second Edition guides users through chemical processes and unit operations using the main simulation software used in the industrial sector. The book helps predict the characteristics of a process using mathematical models and computer-aided process simulation tools, as well as how to model and simulate process performance before detailed process design takes place. Content coverage includes steady-state and dynamic simulation, process design, control and optimization. In addition, readers will learn about the simulation of natural gas, biochemical, wastewater treatment and batch processes. Provides an updated and expanded new edition that contains 60-70% new content
Guides readers through chemical processes and unit operations using the primary simulation software used in the industrial sector Covers the fundamentals of process simulation, theory and advanced applications Includes case studies of various difficulty levels for practice and for applying developed skills Features step-by-step guides to using UniSim Design, SuperPro Designer, Symmetry, Aspen HYSYS and Aspen Plus for process simulation novices

Process Design, Integration, and Intensification - Mahmoud El-Halwagi 2019-05-27

With the growing emphasis on enhancing the sustainability and efficiency of industrial plants, process integration and intensification are gaining additional interest throughout the chemical engineering community. Some of the hallmarks of process integration and

intensification include a holistic perspective in design, and the enhancement of material and energy intensity. The techniques are applicable for individual unit operations, multiple units, a whole industrial facility, or even a cluster of industrial plants. This book aims to cover recent advances in the development and application of process integration and intensification. Specific applications are reported for hydraulic fracturing, palm oil milling processes, desalination, reactive distillation, reaction network, adsorption processes, herbal medicine extraction, as well as process control.

CHEMICAL PROCESS MODELLING AND COMPUTER SIMULATION - AMIYA K. JANA
2011-11-05

This comprehensive and thoroughly revised text, now in its second edition, continues to present the fundamental concepts of how mathematical models of chemical processes are constructed and demonstrate their applications to the simulation of two of the very important chemical engineering systems: the chemical reactors and distillation systems. The book provides an integrated treatment of process description, mathematical modelling and dynamic simulation of realistic problems, using the robust process model approach and its simulation with efficient numerical techniques. Theoretical background materials on activity coefficient models, equation of state models, reaction kinetics, and numerical solution techniques—needed for the development of mathematical models—are also addressed in the book. The topics of discussion related to tanks, heat exchangers, chemical reactors (both continuous and batch), biochemical reactors (continuous and fed-batch), distillation columns (continuous and batch), equilibrium flash vaporizer, and refinery debutanizer column contain several worked-out examples and case studies to teach students how chemical processes can be measured and monitored using computer programming. The new edition includes two more chapters—Reactive Distillation Column and Vaporizing Exchangers—which will further strengthen the text. This book is designed for senior level undergraduate and first-year postgraduate level courses in “Chemical Process Modelling and Simulation”. The book will also be useful for students of petrochemical

engineering, biotechnology, and biochemical engineering. It can serve as a guide for research scientists and practising engineers as well.

Fourth International Conference on Foundations of Computer-Aided Process Design - Lorenz T. Biegler 1995

This work contains edited papers from the Fourth Conference on the Foundations of Computer-aided Process Design.

Process Synthesis and Process Intensification - Ben-Guang Rong 2017-09-25
Process synthesis and process intensification are becoming state-of-the-art scientific fields that provide the methods and tools to improve process technologies in terms of high energy efficiency, low capital investment, low emissions, improved safety, and less hazardous byproducts to achieve sustainable products and processes. The book covers manufacturing processes from both fossil- and biomass-based feedstocks for graduate students.

Integrated Reaction and Separation Operations - Henner Schmidt 2006-07-06
The book gives deep insights into the overall evaluation of integrated processes as well as development of methods for a systematic design and optimisation of integrated reaction and separation processes.. Potentials and the technical as well as economic limitations for process integration have been identified. The book covers several case studies of reactive distillation, reactive extraction, reactive gas-adsorption and chromatographic reactors which have been investigated from the modelling and experimental point of view. Based on validated models process simulation was used to optimize these processes. Following the concept of integrated process design approaches have been developed for model predictive control and process optimisation during production. Another new and very important focus of the book is systematic synthesis of integrated processes. The book presents the latest developments in simulation of integrated processes as well as new methods of process synthesis and process control. It shows also the details of experimental approaches for model validation, determining of model parameters and measurement techniques. The combination of sophisticated modelling, optimisation methods and experimental results has not been published up to now. Therefore on

the book addresses readers from industry as well as academic research.

Process Modelling and Simulation - César de Prada 2019-09-23

Since process models are nowadays ubiquitous in many applications, the challenges and alternatives related to their development, validation, and efficient use have become more apparent. In addition, the massive amounts of both offline and online data available today open the door for new applications and solutions. However, transforming data into useful models and information in the context of the process industry or of bio-systems requires specific approaches and considerations such as new modelling methodologies incorporating the complex, stochastic, hybrid and distributed nature of many processes in particular. The same can be said about the tools and software environments used to describe, code, and solve such models for their further exploitation. Going well beyond mere simulation tools, these advanced tools offer a software suite built around the models, facilitating tasks such as experiment design, parameter estimation, model initialization, validation, analysis, size reduction, discretization, optimization, distributed computation, co-simulation, etc. This Special Issue collects novel developments in these topics in order to address the challenges brought by the use of models in their different facets, and to reflect state of the art developments in methods, tools and industrial applications.

Handbook of MTBE and Other Gasoline Oxygenates - Halim Hamid 2004-03-11

This handbook presents the outlook for future production and consumption of MTBE and other oxygenates worldwide and studies new catalytic systems and modern methods for the synthesis and commercial production of methyl tertiary-butyl ether (MTBE) and related ethers. The scope of this sophisticated guide extends from process chemistry fundamentals a

Advanced Distillation Technologies - Anton A. Kiss 2013-02-26

Distillation has historically been the main method for separating mixtures in the chemical process industry. However, despite the flexibility and widespread use of distillation processes, they still remain extremely energy inefficient. Increased optimization and novel

distillation concepts can deliver substantial benefits, not just in terms of significantly lower energy use, but also in reducing capital investment and improving eco-efficiency. While likely to remain the separation technology of choice for the next few decades, there is no doubt that distillation technologies need to make radical changes in order to meet the demands of the energy-conscious society. *Advanced Distillation Technologies: Design, Control and Applications* gives a deep and broad insight into integrated separations using non-conventional arrangements, including both current and upcoming process intensification technologies. It includes: Key concepts in distillation technology Principles of design, control, sizing and economics of distillation Dividing-wall column (DWC) - design, configurations, optimal operation and energy efficient and advanced control DWC applications in ternary separations, azeotropic, extractive and reactive distillation Heat integrated distillation column (HIDiC) - design, equipment and configurations Heat-pump assisted applications (MVR, TVR, AHP, CHRP, TAHP and others) Cyclic distillation technology - concepts, modeling approach, design and control issues Reactive distillation - fundamentals, equipment, applications, feasibility scheme Results of rigorous simulations in Mathworks Matlab & Simulink, Aspen Plus, Dynamics and Custom Modeler Containing abundant examples and industrial case studies, this is a unique resource that tackles the most advanced distillation technologies - all the way from the conceptual design to practical implementation. The author of *Advanced Distillation Technologies*, Dr. Ir. Anton A. Kiss, has been awarded the Hoogewerff Jongerenprijs 2013. http://www.hoogewerff-fonds.nl/nieuws/26/hoogewerff_jongerenprijs_2013_toegekend_aan_veelzijdige_procestecnoloog Find out more (website in Dutch).../a

Synthesis and Operability Strategies for Computer-Aided Modular Process

Intensification - Efstratios N Pistikopoulos 2022-04-15

Synthesis and Operability Strategies for Computer-Aided Modular Process intensification presents state-of-the-art methodological developments and real-world applications for

computer-aided process modeling, optimization and control, with a particular interest on process intensification systems. Each chapter consists of basic principles, model formulation, solution algorithm, and step-by-step implementation guidance on key procedures. Sections cover an overview on the current status of process intensification technologies, including challenges and opportunities, detail process synthesis, design and optimization, the operation of intensified processes under uncertainty, and the integration of design, operability and control. Advanced operability analysis, inherent safety analysis, and model-based control strategies developed in the community of process systems engineering are also introduced to assess process operational performance at the early design stage. Includes a survey of recent advances in modeling, optimization and control of process intensification systems Presents a modular synthesis approach for process design, integration and material selection in intensified process systems Provides advanced process operability, inherent safety tactics, and model-based control analysis approaches for the evaluation of process operational performance at the conceptual design stage Highlights a systematic framework for multiscale process design intensification integrated with operability and control Includes real-world application examples on intensified reaction and/or separation systems with targeted cost, energy and sustainability improvements

11th International Symposium on Process Systems Engineering - PSE2012 - Iftekhar A Karimi 2012-09-09

While the PSE community continues its focus on understanding, synthesizing, modeling, designing, simulating, analyzing, diagnosing, operating, controlling, managing, and optimizing a host of chemical and related industries using the systems approach, the boundaries of PSE research have expanded considerably over the years. While early PSE research was largely concerned with individual units and plants, the current research spans wide ranges of scales in size (molecules to processing units to plants to global multinational enterprises to global supply chain networks; biological cells to ecological webs) and time (instantaneous molecular interactions to months of plant operation to

years of strategic planning). The changes and challenges brought about by increasing globalization and the the common global issues of energy, sustainability, and environment provide the motivation for the theme of PSE2012: Process Systems Engineering and Decision Support for the Flat World. Each theme includes an invited chapter based on the plenary presentation by an eminent academic or industrial researcher Reports on the state-of-the-art advances in the various fields of process systems engineering Addresses common global problems and the research being done to solve them

Distillation: Equipment and Processes - Andrzej Gorak 2014-06-24

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
26th European Symposium on Computer Aided Process Engineering - 2016-06-17
26th European Symposium on Computer Aided Process Engineering contains the papers presented at the 26th European Society of Computer-Aided Process Engineering (ESCAPE) Event held at Portorož Slovenia, from June 12th to June 15th, 2016. Themes discussed at the conference include Process-product Synthesis, Design and Integration, Modelling, Numerical analysis, Simulation and Optimization, Process Operations and Control and Education in CAPE/PSE. Presents findings and discussions

from the 26th European Society of Computer-Aided Process Engineering (ESCAPE) Event
PROCESS SIMULATION AND CONTROL USING ASPENTM - AMIYA K. JANA 2012-03-17

Solving the model structure with a large equation set becomes a challenging task due to the involvement of several complex processes in an industrial plant. To overcome these challenges, various process flow sheet simulators are used. This book, now in its second edition, continues to discuss the simulation, optimization, dynamics and closed-loop control of a wide variety of chemical processes using the most popular commercial flow sheet simulator ASPENTM. A large variety of chemical units including flash drum, continuous stirred tank reactor, plug flow reactor, petroleum refining column, heat exchanger, absorption tower, reactive distillation, distillation train, and monomer production unit are thoroughly explained. The book acquaints the students with the simulation of large chemical plants with several single process units. With the addition of the new sections, additional information and plenty of illustrations and exercises, this text should prove extremely useful for the students. Designed for the students of chemical engineering at the senior under-graduate and postgraduate level, this book will also be helpful to research scientists and practising engineers as a handy guide to simulation of chemical processes. NEW TO THIS EDITION : Section 1.3 on Stepwise Aspen Plus Simulation of Flash Drums is thoroughly updated (Chapter 1) Section 3.2 on Aspen Plus Simulation of the Binary Distillation Columns is updated, a new section on Simulation of a Reactive Distillation Column is added (Section 3.6), and a new topic on Column Sizing is introduced (Chapter 3) A new section on Aspen Simulation of a Petlyuk Column with Streams Recycling is included (Chapter 4)

European Symposium on Computer Aided Process Engineering - 10 - S. Pierucci
2000-05-10

This book includes papers presented at ESCAPE-10, the 10th European Symposium on Computer Aided Process -Engineering, held in Florence, Italy, 7-10th May, 2000. The scientific program reflected two complementary strategic objectives of the 'Computer Aided Process

Engineering' (CAPE) Working Party: one checked the status of historically consolidated topics by means of their industrial application and their emerging issues, while the other was addressed to opening new windows to the CAPE audience by inviting adjacent Working Parties to co-operate in the creation of the technical program. The former CAPE strategic objective was covered by the topics: Numerical Methods, Process Design and Synthesis, Dynamics & Control, Process Modeling, Simulation and Optimization. The latter CAPE strategic objective derived from the European Federation of Chemical Engineering (EFCE) promotion of scientific activities which autonomously and transversely work across the Working Parties' terms of references. These activities enhance the exchange of the know-how and knowledge acquired by different Working Parties in homologous fields. They also aim to discover complementary facets useful to the dissemination of tools and of novel procedures. As a consequence, the Working Parties 'Environmental Protection', 'Loss Prevention and Safety Promotion' and 'Multiphase Fluid Flow' were invited to assist in the organization of sessions in the area of: A Process Integrated Approach for: Environmental Benefit, Loss Prevention and Safety, Computational Fluid Dynamics. A total of 473 abstracts from all over the world were evaluated by the International Scientific Committee. Out of them 197 have been finally selected for the presentation and reported into this book. Their authors come from thirty different countries. The selection of the papers was carried out by twenty-eight international reviewers. These proceedings will be a major reference document to the scientific and industrial community and will contribute to the progress in Computer Aided Process Engineering.

Process Intensification - Fernando Israel Gómez-Castro 2019-10-21

Intensified processes have found widespread application in the chemical and petrochemical industries. The use of intensified systems allows for a reduction of operating costs and supports the "greening" of chemical processes. However, the design of intensified equipment requires special methodologies. This book describes the fundamentals and applications of these design

methods, making it a valuable resource for use in both industry and academia.

AICHE Symposium Series - American Institute of Chemical Engineers 2000

Chemical Process Design, Simulation and Optimization - Jean-Pierre Corriou 2021-02-19

The book presents a series of articles devoted to modeling, simulation, and optimization of processes, mainly chemical. General methods for process modeling and numerical simulation are described with flowsheeting. Population balances are addressed in detail with application to crystal production; energy saving is frequently optimized, including exergy analysis. The coupling between process simulation and computational fluid dynamics is studied for air classification and bubble columns. Pressure swing adsorption, reactive distillation, and nanofiltration are explained in general and applied to particular processes. The synthesis of carbon dots is solved by the design of experiments method. A safety study addresses the consequences of gas explosion.

Ludwig's Applied Process Design for Chemical and Petrochemical Plants - A. Kayode Coker, PhD 2010-07-19

The Fourth Edition of Applied Process Design for Chemical and Petrochemical Plants Volume 2 builds upon the late Ernest E. Ludwig's classic chemical engineering process design manual. Volume Two focuses on distillation and packed towers, and presents the methods and fundamentals of plant design along with supplemental mechanical and related data, nomographs, data charts and heuristics. The Fourth Edition is significantly expanded and updated, with new topics that ensure readers can analyze problems and find practical design methods and solutions to accomplish their process design objectives. A true application-driven book, providing clarity and easy access to essential process plant data and design information. Covers a complete range of basic day-to-day petrochemical operation topics. Extensively revised with new material on distillation process performance; complex-mixture fractionating, gas processing, dehydration, hydrocarbon absorption and stripping; enhanced distillation types

Reactive Distillation - Kai Sundmacher

2006-08-21

In a reactive distillation column, both the chemical conversion and the distillative separation of the product mixture are carried out simultaneously. Through this integrative strategy, chemical equilibrium limitations can be overcome, higher selectivities can be achieved and heat of reaction can be directly used for distillation. Increased process efficiency and reduction of investments and operational costs are the direct results of this approach. Highly renowned international experts from both industry and academia review the state-of-the-art and the future directions in application, design, analysis and control of Reactive Distillation processes. Part I surveys various industrial applications and covers both established large scale processes as well as new chemical reaction schemes with high future potential. Part II provides the vital details for analysis of reactive phase equilibria, and discusses the importance of chemical reaction kinetics, while Part III focuses on identifying feasible column configurations and designing their internal structure. Analysis and control of the complex dynamic and steady-state behavior of reactive distillation processes are described in Part IV. Reactive Distillation - a very promising alternative to conventional reaction-distillation flow schemes.

Reactive Distillation - Vandana Sakhre 2022-04-19

Neural Networks is an integral part in machine learning and a known tool for controlling nonlinear processes. The area is under rapid development and provides a tool for modelling and controlling of advanced processes. This book provides a comprehensive overview for modelling, simulation, measurement and control strategies for reactive distillations using neural networks.

Distillation Processes - Vilmar Steffen 2022-08-31

Distillation is an important separation technique that has been used for many centuries to exploit the volatility differences between components in a mixture. The distillation process has many variations and applications. This book includes two sections on desalination and reactive distillation. It discusses desalination in the processes of solar and membrane distillation,

with a focus on the reduction of energy costs to obtain potable water. It also discusses reactive distillation, which can be used in some cases to reduce the power duty in the separation process by using the reaction heat directly in the separation. The book includes cases of mathematical modeling, simulation, and optimization of the distillation process.

Promising Techniques for Wastewater Treatment and Water Quality Assessment - Iqbal Ahmed
2021-12-01

This book reviews the primary aspects of wastewater treatment processing techniques and designs, as well as water quality assessment. Chapters address microwave digestive techniques of wastewater treatment, advanced ozone oxidative and photo processes, and reactive distillation for various applications. The book is a useful resource for choosing applicable processing techniques and design parameters.

Reactive and Membrane-Assisted Separations - Philip Lutze
2016-07-28

Process intensification aims for increasing efficiency and sustainability of (bio-)chemical 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.

Plantwide Control - Gade Pandu Rangaiah
2012-01-09

The use of control systems is necessary for safe and optimal operation of industrial processes in the presence of inevitable disturbances and uncertainties. Plant-wide control (PWC) involves the systems and strategies required to control an entire chemical plant consisting of many interacting unit operations. Over the past 30 years, many tools and methodologies have been developed to accommodate increasingly larger and more complex plants. This book provides a state-of-the-art of techniques for the design and evaluation of PWC systems. Various applications taken from chemical, petrochemical, biofuels and mineral processing industries are used to illustrate the use of these approaches. This book contains 20 chapters organized in the following

sections: Overview and Industrial Perspective Tools and Heuristics Methodologies Applications Emerging Topics With contributions from the leading researchers and industrial practitioners on PWC design, this book is key reading for researchers, postgraduate students, and process control engineers interested in PWC.

Reactive Separation for Process Intensification and Sustainability - Carlos Ariel Cardona Alzate
2019-12-20

This book describes, analyses and discusses the main principles, phenomena and design strategies of reactive separation processes with an emphasis on the intensification as a basis of the sustainability. Different reactive separation processes are explained in detail to show the phenomena and with the purpose of understanding when their use allows advantages based on the output results. Case examples are analysed and the perspective of these processes in the future is discussed. The overall sustainability of reactive separation processes in the industry is also explained separately.

Distillation - Vilmar Steffen
2019-12-04

The purpose of this book is to offer readers important topics on the modeling, simulation, and optimization of distillation processes. The book is divided into four main sections: the first section is introduction to the topic, the second presents work related to distillation process modeling, the third deals with the modeling of phase equilibrium, one of the most important steps of distillation process modeling, and the fourth looks at the reactive distillation process, a process that has been applied successfully to a number of applications and has been revealed as a promising strategy for a number of recent challenges.

21st European Symposium on Computer Aided Process Engineering - E. N. Pistikopoulos
2011-07-21

The European Symposium on Computer Aided Process Engineering (ESCAPE) series presents the latest innovations and achievements of leading professionals from the industrial and academic communities. The ESCAPE series serves as a forum for engineers, scientists, researchers, managers and students to present and discuss progress being made in the area of computer aided process engineering (CAPE). European industries large and small are

bringing innovations into our lives, whether in the form of new technologies to address environmental problems, new products to make our homes more comfortable and energy efficient or new therapies to improve the health and well being of European citizens. Moreover, the European Industry needs to undertake research and technological initiatives in response to humanity's "Grand Challenges," described in the declaration of Lund, namely, Global Warming, Tightening Supplies of Energy, Water and Food, Ageing Societies, Public Health, Pandemics and Security. Thus, the Technical Theme of ESCAPE 21 will be "Process Systems Approaches for Addressing Grand Challenges in Energy, Environment, Health, Bioprocessing & Nanotechnologies."

Chemical Process Design and Simulation: Aspen Plus and Aspen Hysys Applications -

Juma Haydary 2019-01-03

A comprehensive and example oriented text for the study of chemical process design and simulation Chemical Process Design and Simulation is an accessible guide that offers information on the most important principles of chemical engineering design and includes illustrative examples of their application that uses simulation software. A comprehensive and practical resource, the text uses both Aspen Plus and Aspen Hysys simulation software. The author describes the basic methodologies for computer aided design and offers a description of the basic steps of process simulation in Aspen Plus and Aspen Hysys. The text reviews the design and simulation of individual simple unit operations that includes a mathematical model of each unit operation such as reactors, separators, and heat exchangers. The author also explores the design of new plants and simulation of existing plants where conventional chemicals and material mixtures with measurable compositions are used. In addition, to aid in comprehension, solutions to examples of real problems are included. The final section covers plant design and simulation of processes using nonconventional components. This important resource: Includes information on the application of both the Aspen Plus and Aspen Hysys software that enables a comparison of the two software systems Combines the basic theoretical principles of chemical process and

design with real-world examples Covers both processes with conventional organic chemicals and processes with more complex materials such as solids, oil blends, polymers and electrolytes Presents examples that are solved using a new version of Aspen software, ASPEN One 9 Written for students and academics in the field of process design, Chemical Process Design and Simulation is a practical and accessible guide to the chemical process design and simulation using proven software.

Practical Distillation Control - W.L. Luyben
2012-12-06

Distillation column control has been the the "Lehigh inquisition" and survived! So it subject of many, many papers over the last has been tested by the fire of both actual half century. Several books have been de review by a hard-nosed plant experience and voted to various aspects of the subject. The group of practically oriented skeptics. technology is quite extensive and diffuse. In selecting the authors and the topics, There are also many conflicting opinions the emphasis has been on keeping the ma about some of the important questions. terial practical and useful, so some subjects We hope that the collection under one that are currently of mathematical and the cover of contributions from many of the oretical interest, but have not been demon leading authorities in the field of distillation strated to have practical importance, have control will help to consolidate, unify, and not been included. clarify some of this vast technology. The The book is divided about half and half contributing authors of this book represent between methodology and specific applica tion examples. Chapters 3 through 14 dis both industrial and academic perspectives, and their cumulative experience in the area cuss techniques and methods that have of distillation control adds up to over 400 proven themselves to be useful tools in at tacking distillation control problems.

Modeling of Process Intensification - Frerich J. Keil 2007-04-09

Combining the knowledge involved in process engineering and process modeling, this is the first book to cover all modeling methods applicable to process intensification. Both the editors and authors are renowned experts from industry and academia in the various fields of

process modeling and integrated chemical processes. Following an introduction to the topic, the book goes on to look at equipment and operational methods, monolithic catalysis, HEX, micro- and reverse flow reactors, catalytic and reactive distillation, the simulated-moving bed and vibration bubble column as well as ultrasound and ultrasonic reactors. A final chapter is devoted to processes under supercritical conditions. In its treatment of hot topics of multidisciplinary interest, this book is of great value to researchers and engineers alike.

Separation and Purification Technologies in Biorefineries - Shri Ramaswamy 2013-02-04

Separation and purification processes play a critical role in biorefineries and their optimal selection, design and operation to maximise product yields and improve overall process efficiency. Separations and purifications are necessary for upstream processes as well as in maximising and improving product recovery in downstream processes. These processes account for a significant fraction of the total capital and operating costs and also are highly energy intensive. Consequently, a better understanding of separation and purification processes, current and possible alternative and novel advanced methods is essential for achieving the overall techno-economic feasibility and commercial success of sustainable biorefineries. This book presents a comprehensive overview focused specifically on the present state, future challenges and opportunities for separation and purification methods and technologies in biorefineries. Topics covered include: Equilibrium Separations: Distillation, liquid-liquid extraction and supercritical fluid extraction. Affinity-Based Separations: Adsorption, ion exchange, and simulated moving bed technologies. Membrane Based Separations: Microfiltration, ultrafiltration and diafiltration, nanofiltration, membrane pervaporation, and membrane distillation. Solid-liquid Separations: Conventional filtration and solid-liquid extraction. Hybrid/Integrated Reaction-Separation Systems: Membrane bioreactors, extractive fermentation, reactive distillation and reactive absorption. For each of these processes, the fundamental principles and design aspects are presented, followed by a detailed discussion

and specific examples of applications in biorefineries. Each chapter also considers the market needs, industrial challenges, future opportunities, and economic importance of the separation and purification methods. The book concludes with a series of detailed case studies including cellulosic bioethanol production, extraction of algae oil from microalgae, and production of biopolymers. Separation and Purification Technologies in Biorefineries is an essential resource for scientists and engineers, as well as researchers and academics working in the broader conventional and emerging bio-based products industry, including biomaterials, biochemicals, biofuels and bioenergy.

Chemical Engineering Process Simulation - Nishanth G. Chemmangattuvalappil 2017-07-13

Chemical Engineering Process Simulation is ideal for students, early career researchers, and practitioners, as it guides you through chemical processes and unit operations using the main simulation softwares that are used in the industrial sector. This book will help you predict the characteristics of a process using mathematical models and computer-aided process simulation tools, as well as model and simulate process performance before detailed process design takes place. Content coverage includes steady and dynamic simulations, the similarities and differences between process simulators, an introduction to operating units, and convergence tips and tricks. You will also learn about the use of simulation for risk studies to enhance process resilience, fault finding in abnormal situations, and for training operators to control the process in difficult situations. This experienced author team combines industry knowledge with effective teaching methods to make an accessible and clear comprehensive guide to process simulation. Ideal for students, early career researchers, and practitioners, as it guides you through chemical processes and unit operations using the main simulation softwares that are used in the industrial sector. Covers the fundamentals of process simulation, theory, and advanced applications Includes case studies of various difficulty levels to practice and apply the developed skills Features step-by-step guides to using Aspen Plus and HYSYS for process simulations available on companion site Helps readers predict the characteristics of a process

using mathematical models and computer-aided process simulation tools

Distillation Design and Control Using Aspen Simulation - William L. Luyben 2006-04-20

A timely treatment of distillation combining steady-state design and dynamic controllability. As the world continues to seek new sources of energy, the distillation process remains one of the most important separation methods in the chemical, petroleum, and energy industries. And as new renewable sources of energy and chemical feedstocks become more universally utilized, the issues of distillation design and control will remain vital to a future sustainable lifestyle. Distillation Design and Control Using Aspen Simulation introduces the current status and future implications of this vital technology from the dual perspectives of steady-state design and dynamics. Where traditional design texts have focused mainly on the steady-state economic aspects of distillation design, William Luyben also addresses such issues as dynamic performance in the face of disturbances. Utilizing the commercial simulators Aspen Plus and Aspen Dynamics, the text guides future and practicing chemical engineers first in the development of optimal steady-state designs of distillation systems, and then in the development of effective control structures. Unique features of the text include: * In-depth coverage of the dynamics of column design to help develop effective control structures for distillation columns * Development of rigorous simulations of single distillation columns and sequences of columns * Coverage of design and control of petroleum fractionators Encompassing nearly four decades of research and practical developments in this dynamic field, the text represents an important reference for both students and experienced engineers faced with distillation problems.

Intensification of Biobased Processes -

Andrzej Gorak 2018-06-18

In recent years bioprocessing has increased in popularity and importance, however, bioprocessing still poses various important techno-economic and environmental challenges, such as product yields, excessive energy consumption for separations in highly watery systems, batch operation or the downstream processing bottlenecks in the production of

biopharmaceutical products. Many of those challenges can be addressed by application of different process intensification technologies discussed in the present book. The first book dedicated entirely to this area, Intensification of Biobased Processes provides a comprehensive overview of modern process intensification technologies used in bioprocessing. The book focusses on four different categories of biobased products: bio-fuels and platform chemicals; cosmeceuticals; food products; and polymers and advanced materials. It will cover various intensification aspects of the processes concerned, including (bio)reactor intensification; intensification of separation, recovery and formulation operations; and process integration. This is an invaluable source of information for researchers and industrialists working in chemical engineering, biotechnology and process engineering.

Reactive Separation Processes - Kulprathipanja 2019-01-15

This book summarizes the available information in six known areas of reactive separation: reaction/distillation, reaction/extraction, reaction/absorption, reaction/adsorption, reaction/membrane, and reaction/crystallization.

Process Intensification Technologies for Green Chemistry - Kamelia Boodhoo 2013-01-03

The successful implementation of greener chemical processes relies not only on the development of more efficient catalysts for synthetic chemistry but also, and as importantly, on the development of reactor and separation technologies which can deliver enhanced processing performance in a safe, cost-effective and energy efficient manner. Process intensification has emerged as a promising field which can effectively tackle the challenges of significant process enhancement, whilst also offering the potential to diminish the environmental impact presented by the chemical industry. Following an introduction to process intensification and the principles of green chemistry, this book presents a number of intensified technologies which have been researched and developed, including case studies to illustrate their application to green chemical processes. Topics covered include: • Intensified reactor technologies: spinning disc reactors,

microreactors, monolith reactors, oscillatory flowreactors, cavitation reactors • Combined reactor/separator systems: membrane reactors, reactive distillation, reactive extraction, reactive absorption • Membrane separations for green chemistry • Industry relevance of process intensification, including economics and environmental impact, opportunities for energy

saving, and practical considerations for industrial implementation. Process Intensification for Green Chemistry is a valuable resource for practising engineers and chemists alike who are interested in applying intensified reactor and/or separator systems in a range of industries to achieve green chemistry principles.