

Separation Process Engineering

Includes Mass Transfer Analysis

FOURTH EDITION



Separation Process Engineering Wankat Solutions

A. Kayode Coker

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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 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 **22nd European Symposium on Computer Aided Process Engineering** David Bogle, 2012-08-03 Computer aided process engineering CAPE plays a key design and operations role in the process industries This conference features presentations by CAPE specialists and addresses strategic planning supply chain issues and the increasingly important area of sustainability audits Experts collectively highlight the need for CAPE practitioners to embrace the three components of sustainable development environmental social and economic progress and the role of systematic and sophisticated CAPE tools in delivering these goals Contributions from the international community of researchers and engineers using computing based methods in process engineering Review of the latest developments in process systems engineering Emphasis on a systems approach in tackling industrial and societal grand challenges Separation of Molecules, Macromolecules and Particles Kamalesh Sirkar, 2014-01-16 A modern separation process textbook written for advanced undergraduate and graduate level courses in chemical engineering <u>Chemical Processes for a Sustainable Future</u> Trevor Letcher, Janet Scott, Darrell Alec Patterson, 2014-12-16 Summarising recent achievements in surface functionalised cells including fabrication characterisation applications and nanotoxicity the chapters in this book cover a range of different systems for altering and enhancing the functionalities of cells using different functional nanomaterials such as polymer nanofilms nanoparticles nanocoated cells and artificial spores The book provides an interdisciplinary approach to the topic with authors from both biological and chemical backgrounds Thermodynamics with Chemical Engineering Applications Elias I. Franses, 2014-08-25 Master the principles of thermodynamics with this comprehensive undergraduate textbook carefully developed to provide students of chemical engineering and chemistry with a deep and intuitive understanding of the practical applications of these fundamental ideas and principles Logical and lucid explanations introduce core thermodynamic concepts in the context of their measurement and experimental origin giving students a thorough understanding of how theoretical concepts apply to practical situations A broad range of real world applications relate key topics to contemporary

issues such as energy efficiency environmental engineering and climate change and further reinforce students understanding of the core material This is a carefully organized highly pedagogical treatment including over 500 open ended study questions for discussion over 150 varied homework problems clear and objective standards for measuring student progress and a password protected solution manual for instructors Handbook of Separation Process Technology Ronald W. Rousseau, 1987-05-13 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 Stevioside Sirshendu De, Sourav Mondal, Suvrajit Banerjee, 2013-11-11 Stevioside is one of the naturally occurring sweeteners belonging to the diterpene glycoside family which can be widely applied in food drinks medicine and consumer chemicals It is a good dietary supplement being non calorific thermally stable non toxic with a sugar like taste profile and suitable for diabetics phenylketonuria patients and the obese It is also non fermentable and exhibits anti carcinogenic antioxidant and anti hyperglycemic properties Stevioside tastes about 300 times sweeter than 0 4% sucrose solution Thus it offers a reasonably rare combination of health benefits and taste benefits making the extraction of stevioside is an area of active research for the food industry as well as academic food scientists With the rapid increase in the popularity of stevioside as a sugar substitute particularly with regard to its associated health benefits there is a need for more efficient and feasible extraction processes for stevioside in the near future This book offers an in depth look at perhaps the major sugar alternative of the future up to date and in line with the latest global legislation regarding its suitability for consumption and its scope for application Ludwig's Applied Process Design for Chemical and Petrochemical **Plants** A. Kayode Coker, 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 **Distillation** Andrzej Gorak, Eva Sorensen, 2014-07-22 Distillation Fundamentals and Principles winner of the 2015 PROSE Award in Chemistry Physics 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 the conceptual design of distillation 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

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