Chemical Reaction Engineering Textbook

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Green Chemical Engineering CRC Press

Focused on the undergraduate audience, Chemical Reaction Engineering provides students with complete coverage of the fundamentals, including in-depth coverage of chemical kinetics. By introducing heterogeneous chemistry early in the book, the text gives students the knowledge they need to solve real chemistry and

industrial problems. An emphasis on problem-solving and numerical techniques ensures students learn and practice the skills they will need later on, whether for industry or graduate work.

Reactor Design for Chemical Engineers Pearson Educación

Intended primarily for undergraduate chemical-engineering students, this book also includes material which bridges the gap between undergraduate and graduate requirements. The introduction contains a listing of the principal types of reactors employed in the chemical industry, with diagrams and examples of their use. There is then a brief exploration of the concepts employed in later sections for modelling and sizing reactors, followed by basic information on stoichiometry and thermodynamics, and the kinetics of homogeneous and catalyzed reactions. Subsequent chapters are devoted to reactor sizing and modelling in some simple situations, and more detailed coverage of the design and operation of the principal reactor types.

An Introduction to Chemical Kinetics John Wiley & Sons

Chemical Reactor Modeling closes the gap between Chemical Reaction Engineering and Fluid Mechanics. The second edition consists of two volumes: Volume 1: Fundamentals. Volume 2: Chemical Engineering Applications In volume 1 most of the fundamental theory is

presented. A few numerical model simulation application examples are given to elucidate the link between theory and applications. In volume 2 the chemical reactor equipment to be modeled are described. Several engineering models are introduced and discussed. A survey of the frequently used numerical methods, algorithms and schemes is provided. A few practical engineering applications of the modeling tools are presented and discussed. The working principles of several experimental techniques employed in order to get data for model validation are outlined. The monograph is based on lectures regularly taught in the fourth and fifth years graduate courses in transport phenomena and chemical reactor modeling and in a post graduate course in modern reactor modeling at the Norwegian University of Science and Technology, Department of Chemical Engineering, Trondheim, Norway. The objective of the book is to present the fundamentals of the single-fluid and multi-fluid models for the analysis of single and multiphase reactive flows in chemical reactors with a chemical reactor engineering rather than mathematical bias. Organized into 13 chapters, it combines theoretical aspects and practical

applications and covers some of the recent research in several areas of chemical reactor engineering. This book contains a survey of the modern literature in the field of chemical reactor modeling.

Chemical Reaction and Reactor Engineering

Prentice Hall

Appropriate for a one-semester undergraduate or first-year graduate course, this text introduces the quantitative treatment of chemical reaction engineering. It covers both homogeneous and heterogeneous reacting systems and examines chemical reaction engineering as well as chemical reactor engineering. Each chapter contains numerous worked-out problems and real-world vignettes involving commercial applications, a feature widely praised by reviewers and teachers. 2003 edition.

The Engineering of Chemical Reactions

Courier Corporation

Chemical Engineering Design, Second Edition, deals with the application of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, this edition has been specifically developed for the U.S. market. It provides the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards. It contains new discussions of conceptual plant

design, flowsheet development, and revamp design; extended coverage of capital cost estimation, process costing, and economics; and new chapters on equipment selection, reactor design, and solids handling processes. A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data, and Excel spreadsheet calculations, plus over 150 Patent References for downloading from the companion website. Extensive instructor resources, including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors. This text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken, plus graduates) and lecturers/tutors, and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). New to this edition: Revised organization into Part I: Process Design, and Part II: Plant Design. The broad themes of Part I are flowsheet development, economic analysis, safety and environmental impact and optimization. Part II contains chapters on equipment design and selection that can be used as

supplements to a lecture course or as essential references for students or practicing engineers working on design projects. New discussion of conceptual plant design, flowsheet development and revamp design Significantly increased coverage of capital cost estimation, process costing and economics New chapters on equipment selection, reactor design and solids handling processes New sections on fermentation, adsorption, membrane separations, ion exchange and chromatography Increased coverage of batch processing, food, pharmaceutical and biological processes All equipment chapters in Part II revised and updated with current information Updated throughout for latest US codes and standards, including API, ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data and Excel spreadsheet calculations plus over 150 Patent References, for downloading from the companion

website Extensive instructor resources: 1170 lecture slides plus fully worked solutions manual available to adopting instructors

Chemical Reaction Engineering Butterworth-Heinemann The Engineering of Chemical Reactions focuses explicitly on developing the skills necessary to design a chemical reactor for any application, including chemical production, materials processing, and environmental modeling.

Elements of Chemical Reaction Engineering CRC Press This book is a progressive presentation of kinetics of the c hemicalreaction s. It provides complete coverage of the domain of chemicalkinetics , which is necessary for the various future users in thefields of Chemistry, Physical Chemistry, Materials Science,Chemical Engineering, Macromolecular Chemistry and Combustion. Itwill help them to understand the most sophisticated knowledge oftheir future job area. Over 15 chapters, this book present the fundamentals of chemicalkinetics, its relations with reaction mechanisms and kineticproperties . Two chapters are then devoted to experimental resultsand how to calculate the kinetic laws in both homogeneous an dheterogeneous systems. The

following two chapters describe the mai napproximation modes to calculate these laws. Three chapters aredevoted to elementary steps with the various classes, theprinciples used to write them and their modeling using the theoryof the activated complex in gas and condensed phases. Threechapters are devoted to the particular areas of chemical reactions,chain reactions, catalysis and the stoichiometric h eterogeneousrea ctions. Finally the non-steady-state processes of combustion andexplosion are treated in the final chapter. *Chemical Reactions and Chemical Reactors* Chemical Reaction Engineering Market_Desc: · Chemical Engineers in Chemical, Nuclear and Biomedical Industries Special Features: · Emphasis is placed throughout on the development of common design strategy for all systems, homogeneous and heterogeneous · This edition features new topics on biochemical systems, reactors with fluidized solids, gas/liquid reactors, and more on non ideal flow · The book explains why certain assumptions are made, why an alternative approach is not used, and to indicate the limitations of the treatment when applied to real situations About The Book: Chemical reaction engineering is concerned with the exploitation of chemical reactions on a commercial scale. Its goal is the successful design and operation of

chemical reactors. This text emphasizes qualitative arguments, simple design methods, graphical procedures, and frequent comparison of capabilities of the major reactor types. Simple ideas are treated first, and are then extended to the more complex.

Chemical Reactor Analysis and Design Springer Science & Business Media

The Omnibook aims to present the main ideas of reactor design in a simple and direct way. it includes key formulas, brief explanations, practice exercises, problems from experience and it skims over the field touching on all sorts of reaction systems. Most important of all it tries to show the reader how to approach the problems of reactor design and what questions to ask. In effect it tries to show that a common strategy threads its way through all reactor problems, a strategy which involves three factors: identifying the flow patter, knowing the kinetics, and developing the proper performance equation. It is this common strategy which is the heart of Chemical Reaction Engineering and identifies it as a distinct field of study.

Bioprocess Engineering CRC Press

The first English edition of this book was published in 2014. This book was originally intended for undergraduate and graduate students and had one major objective: teach

the basic concepts of kinetics and reactor design. The main reason behind the book is the fact that students frequently have great difficulty to explain the basic phenomena that occur in practice. Therefore, basic concepts with examples and many exercises are presented in each topic, instead of specific projects of the industry. The main objective was to provoke students to observe kinetic phenomena and to think about them. Indeed, reactors cannot be designed and operated without knowledge of kinetics. Additionally, the empirical nature of kinetic studies is recognized in the present edition of the book. For this reason, analyses related to how experimental errors affect kinetic studies are performed and illustrated with actual data. Particularly, analytical and numerical solutions are derived to represent the uncertainties of reactant conversions in distinct scenarios and are used to analyze the quality of the obtained parameter estimates. Consequently, new topics that focus on the development of analytical and numerical procedures for more accurate description of experimental errors in reaction systems and of estimates of kinetic parameters have been included in this version of the book. Finally, kinetics requires knowledge that must be complemented and tested in the laboratory. Therefore, practical examples of reactions performed in bench and semi-pilot scales are discussed in the final chapter. This edition of the book has been

organized in two parts. In the first part, a thorough discussion regarding reaction kinetics is presented. In the second part, basic equations are derived and used to represent the performances of batch and continuous ideal reactors, isothermal and non-isothermal reaction systems and homogeneous and heterogeneous reactor vessels, as illustrated with several examples and exercises. This textbook will be of great value to undergraduate and graduate students in chemical engineering as well as to graduate students in and researchers of kinetics and catalysis.

Chemical Reaction Engineering Nirali Prakashan

Filling a longstanding gap for graduate courses in the field, Chemical Reaction Engineering: Beyond the Fundamentals covers basic concepts as well as complexities of chemical reaction engineering, including novel techniques for process intensification. The book is divided into three parts: Fundamentals Revisited, Building on Fundamentals, and Beyon

Essentials of Chemical Reaction Engineering John Wiley & Sons Incorporated

Accompanying DVD-ROM contains many realistic, interactive simulations.

Chemical Reaction Engineering II Courier Corporation

Reaction Kinetics for Chemical Engineers focuses on chemical kinetics, including

homogeneous reactions, nonisothermal systems, flow reactors, heterogeneous processes, granular beds, catalysis, and scale-up methods. The publication first takes a look at fundamentals and homogeneous isothermal reactions. Topics include simple reactions at constant volume or pressure, material balance in complex reactions, homogeneous catalysis, effect of temperature, energy of activation, law of mass action, and classification of reactions. The book also elaborates on adiabatic and programmed reactions, continuous stirred reactors, and homogeneous flow reactions. Topics include nonisothermal flow reactions, semiflow processes, tubular-flow reactors, material balance in flow problems, types of flow processes, rate of heat input, constant heat-transfer coefficient, and nonisothermal conditions. The text ponders on uncatalyzed heterogeneous reactions, fluid-phase reactions catalyzed by solids, and fixed and fluidized beds of particles. The transfer processes in granular masses, fluidization, heat and mass transfer, adsorption rates and equilibria, diffusion and combined mechanisms, diffusive mass transfer, and mass-transfer coefficients in chemical reactions are discussed. The publication is a dependable source of data for chemical engineers and readers wanting to explore chemical kinetics. Reaction Engineering, Catalyst Preparation, and Kinetics John Wiley & Sons Monomers composed of

carbon and hydrogen atoms are the simple building blocks that make up polyolefins - molecules which are extremely useful and which have an extraordinary range of properties and applications. How these monomer molecules are connected in the polymer chain defines the molecular architecture of polyolefins. Written by two world-renowned authors pooling their experience from industry and academia, this book adopts a unique engineering approach using elegant mathematical modeling techniques to relate polymerization conditions, reactor and catalyst type to polyolefin properties. Readers thus learn how to design and optimize polymerization conditions to produce polyolefins with a given microstructure, and how different types of reactors and processes are used to create the different products. Aimed at polymer chemists, plastics technologists, process engineers,the plastics industry, chemical engineers, materials scientists, and company libraries.

Introduction to Chemical Reaction Engineering and Kinetics

Lulu.com

This book presents an authoritative progress report that will remain germane to the topic and prove to be a substantial inspiration to further progress. It is valuable to academic and industrial practitioners of the art and science of chemical reaction and

reactor engineering.

Reaction Kinetics and Reactor Design, Second Edition

Elsevier

The role of the chemical reactor is crucial for the industrial conversion of raw materials into products and numerous factors must be considered when selecting an appropriate and efficient chemical reactor. Chemical Reaction Engineering and Reactor Technology defines the qualitative aspects that affect the selection of an industrial chemical reactor and couples various reactor models to case-specific kinetic expressions for chemical processes. Thoroughly revised and updated, this much-anticipated Second Edition addresses the rapid academic and industrial development of chemical reaction engineering. Offering a systematic development of the chemical reaction engineering concept, this volume explores: essential stoichiometric, kinetic, and thermodynamic terms needed in the analysis of chemical reactors homogeneous and heterogeneous reactors reactor optimization aspects residence time distributions and non-ideal flow conditions in industrial reactors solutions of algebraic and ordinary differential equation systems gas- and liquid-phase diffusion coefficients and

gas-film coefficients correlations for gas-liquid systems solubilities of gases in liquids guidelines for laboratory reactors and the estimation of kinetic parameters The authors pay special attention to the exact formulations and derivations of mass energy balances and their numerical solutions. Richly illustrated and containing exercises and solutions covering a number of processes, from oil refining to the development of specialty and fine chemicals, the text provides a clear understanding of chemical reactor analysis and design.

Chemical Engineering Design CRC Press

Today ' s Definitive, Undergraduate-Level Introduction to Chemical Reaction Engineering Problem-Solving For 30 years, H. Scott Fogler ' s Elements of Chemical Reaction Engineering has been the #1 selling text for courses in chemical reaction engineering worldwide. Now, in Essentials of Chemical Reaction Engineering, Second Edition, Fogler has distilled this classic into a modern, introductory-level guide specifically for undergraduates. This is the ideal resource for today ' s students: learners who demand instantaneous access to information and want to enjoy learning as they deepen their critical thinking and creative problem-solving

skills. Fogler successfully integrates text, visuals, and computer simulations, and links theory to practice through many relevant examples. This updated second edition covers mole balances, conversion and reactor sizing, rate laws and stoichiometry, isothermal reactor design, rate data collecti on/analysis, multiple reactions, reaction mechanisms, pathways, bioreactions and bioreactors, catalysis, catalytic reactors, nonisothermal reactor designs, and more. Its multiple improvements include a new discussion of activation energy, molecular simulation, and stochastic modeling, and a significantly revamped chapter on heat effects in chemical reactors. To promote the transfer of key skills to real-life settings, Fogler presents three styles of problems: Straightforward problems that reinforce the principles of chemical reaction engineering Living Example Problems (LEPs) that allow students to rapidly explore the issues and look for optimal solutions Open-ended problems that encourage students to use inquiry-based learning to practice creative problem-solving skills About the Web Site (umich .edu/~elements/ 5e/index.html) The companion Web site offers extensive enrichment opportunities and additional content,

including Complete PowerPoint slides for lecture notes for chemical reaction engineering classes Links to additional software, including Polymath, MATLAB, Wolfram Mathematica, AspenTech, and COMSOL Multiphysics Interactive learning resources linked to each chapter, including Learning Objectives, Summary Notes, Web Modules, Interactive Computer Games, Computer Simulations and Experiments, Solved Problems, FAQs, and links to LearnChemE Living Example Problems that provide more than 75 interactive simulations, allowing students to explore the examples and ask "what-if" questions Professional Reference Shelf, containing advanced content on reactors, weighted least squares, experimental planning, laboratory reactors, pharmacokinetics, wire gauze reactors, trickle bed reactors, fluidized bed reactors, CVD boat reactors, detailed explanations of key derivations, and more Problem-solving strategies and insights on creative and critical thinking Register your product at informit.com/register for convenient access to downloads, updates, and/or corrections as they become available.

Chemical Reactor

Analysis and Design Fundamentals CRC Press Approximately half of the world production of the petrochemical industry (more than 100 million tonnes) is in the form of polymers, yet it would probably surprise most people to learn how much their lifestyle depends on polymers ranging, as they do, from detergents, kitchenware and electrical appliances to furnishings and a myriad other domestic goods. Still less are they likely to be aware of the extensive part they play in engineering applications for mechanical machine components and advanced high performance aircraft. This versatility derives from the fact that polymeric materials are made up of a range of molecules of varying length, whose properties are related to molecular structure and the proportions of the chains in the mixture. For example, polypropylene is a commodity polymer which is produced in hun dreds of different grades to meet specific market requirements. This depends on the catalyst as well as the operating conditions and reactor design. A major area for growth is in substituting polymers for conventional materials such as ceramics and metals. Not only can they match these materials in terms of mechanical strength and robustness but

they have very good resistance to chemical attack. Polyamides, for example, are widely used for car bumpers and new polymers are being developed for engine manifolds and covers. In 1993 there is, typically, 100 kg of various polymers used in cars and this is continually increasing, giving a net weight reduction and hence better fuel economy.

Essentials of Chemical Reaction Engineering CRC Press

Chemical reaction engineering is concerned with the exploitation of chemical reactions on a commercial scale. It's goal is the successful design and operation of chemical reactors. This text emphasizes qualitative arguments, simple design methods, graphical procedures, and frequent comparison of capabilities of the major reactor types. Simple ideas are treated first, and are then extended to the more complex.

Polymer Reactor Engineering Butterworth-Heinemann

Chemical Reaction EngineeringJohn Wiley & Sons Incorporated