Chemical Reactor Design And Operation 2e

Written by a highly regarded author with industrial and academic

experience, this new edition of an established bestselling book provides practical guidance for students, researchers, and those in chemical engineering. The book includes a new section on sustainable energy, with sections on carbon capture and

sequestration, as a result of increasing environmental awareness; and a companion website that includes problems, worked solutions, and Excel spreadsheets to enable students to carry out complex calculations.

Laurence Belfiore's unique treatment meshes two mainstreamsubject areas in chemical engineering: transport phenomena andchemical reactor design. Expressly intended as an extension ofBird, Stewart, and Lightfoot's classic Transport

Phenomena,and Froment and Bischoff's Chemical Reactor Analysis andDesign, Second Edition, Belfiore's unprecedented textexplores the synthesis of these two disciplines in a manner theupper undergraduate or graduate reader can

readily grasp. Transport Phenomena for Chemical Reactor Designapproaches the design of chemical reactors from microscopic heatand mass transfer principles. It includes simultaneousconsideration of kinetics and heat transfer, both

critical to theperformance of real chemical reactors. Complementary topics intransport phenomena and thermodynamics that provide support forchemical reactor analysis are covered, including: Fluid dynamics in the creeping and

potential flow regimesaround solid spheres and gas bubbles The corresponding mass transfer problems that employ velocityprofiles, derived in the book's fluid dynamics chapter, tocalculate interphase heat and mass

transfer coefficients Heat capacities of ideal gases via statistical thermodynamicsto calculate Prandtl numbers Thermodynamic stability criteria for homogeneous mixtures thatreveal that binary molecular diffusion coefficients must

bepositive In addition to its comprehensive treatment, the text alsocontains 484 problems and ninety-six detailed solutions to assistin the exploration of the subject. Graduate and advancedundergraduate chemical

engineering students, professors, andresearchers will appreciate the vision, innovation, and practicalapplication of Laurence Belfiore's Transport Phenomenafor Chemical Reactor Design. Mathematics in Science and

Engineering, Volume 3: The Optimal Design of Chemical Reactors: A Study in Dynamic Programming covers some of the significant problems of chemical reactor engineering from a unified point of view. This book discusses the

principle of optimality in its general baring on chemical processes. Organized into nine chapters, this volume begins with an overview of the whole range of optimal problems in chemical reactor design. This text then provides the fundamental

equations for reactions and reactors. Other chapters consider the objective function needed to define a realistic optimal problem and explain separately the main types of chemical reactors and their associated problems. This book

discusses as well the three problems with a stochastic element. The final chapter deals with the optimal operation of existing reactors that may be regarded as partial designs in which only some of the variables can be optimally chosen. This book is a

valuable resource for chemical engineers.

Chemical Reactors

Principles, Practice and Economics of Plant and Process Design

Chemical Reactor Analysis and Design

Mathematical Modeling and Applications

Chemical Process Design and Integration

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.

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 Bioprocess Engineering involves the design and development of equipment and processes for the manufacturing of products such as food, feed,

pharmaceuticals, nutraceuticals, chemicals, and polymers and paper from biological materials. It also deals with studying various biotechnological processes. "Bioprocess Kinetics and Systems Engineering" first of its kind contains systematic and comprehensive content on bioprocess kinetics, bioprocess

systems, sustainability and reaction engineering. Dr. Shijie Liu reviews the relevant fundamentals of chemical kinetics- including batch and continuous reactors, biochemistry, microbiology, molecular biology, reaction engineering, and bioprocess systems engineering- introducing key principles that enable

bioprocess engineers to engage in the analysis, optimization, design and consistent control over biological and chemical transformations. The quantitative treatment of bioprocesses is the central theme of this book, while more advanced techniques and applications are covered with some depth. Many

theoretical derivations and simplifications are used to demonstrate how empirical kinetic models are applicable to complicated bioprocess systems. Contains extensive illustrative drawings which make the understanding of the subject easy Contains worked examples of the various process parameters, their significance and

their specific practical use Provides the theory of bioprocess kinetics from simple concepts to complex metabolic pathways Incorporates sustainability concepts into the various bioprocesses
Adsorption, Ion Exchange and Catalysis

Chemical Reactor Analysis and

Applications for the Practicing Engineer
Multiphase Reactive Flows
Chemical Reactor Design and Control

This is the Second Edition of the standard text on chemical reaction engineering, beginning with basic

definitions and fundamental principles and continuing all the way to practical applications, emphasizing real-world aspects of industrial practice. The two main sections cover applied or

engineering kinetics, reactor analysis and design. Includes updated coverage of computer modeling methods and many new worked examples. Most of the examples use real kinetic data from processes of

industrial importance. Reaction Engineering clearly and concisely covers the concepts and models of reaction engineering and then applies them to real-world reactor design. The book

emphasizes that the foundation of reaction engineering requires the use of kinetics and transport knowledge to explain and analyze reactor behaviors. The authors use readily

understandable language to cover the subject, leaving readers with a comprehensive guide on how to understand, analyze, and make decisions related to improving chemical reactions and chemical reactor

design. Worked examples, and over 20 exercises at the end of each chapter, provide opportunities for readers to practice solving problems related to the content covered in the book. Seamlessly

integrates chemical kinetics, reaction engineering, and reactor analysis to provide the foundation for optimizing reactions and reactor design Compares and contrasts three types of ideal reactors, then

applies reaction engineering principles to real reactor design Covers advanced topics, like microreactors, reactive distillation, membrane reactors, and fuel cells, providing the reader with a

broader appreciation of the applications of reaction engineering principles and methods
Reaction Kinetics and the Development and Operation of Catalytic Processes is a

trendsetter. The Keynote Lectures have been authored by top scientists and cover a broad range of topics like fundamental aspects of surface chemistry, in particular dynamics and spillover, the

modeling of reaction mechanisms, with special focus on the importance of transient experimentation and the application of kinetics in reactor design. Fundamental and applied kinetic studies are

well represented. More than half of these deal with transient kinetics, a new trend made possible by recent sophisticated experimental equipment and the awareness that transient experimentation

provides more information and insight into the microphenomena occurring on the catalyst surface than steady state techniques. The trend is not limited to purely kinetic studies since the great

majority of the papers dealing with reactors also focus on transients and even deliberate transient operation. It is to be expected that this trend will continue and amplify as the community becomes more

aware of the predictive potential of fundamental kinetics when combined with detailed realistic modeling of the reactor operation. Computational Flow Modeling for Chemical Reactor

Engineering
Reaction Engineering
Introduction to Chemical Reactor Analysis
The Optimal Design of Chemical Reactors
An Introduction to Chemical

Engineering Kinetics & Reactor Design

Featuring case studies and worked examples that illustrate key concepts in the text, this book contains guidelines for scaleup of laboratory and pilot

plant results, methods to derive the correct reaction order, activation energy, or kinetic model from laboratory tests, and theories, correlations, and practical examples for 2- and 3-phase reaction

A guide to the technical and calculation problems of chemical reactor analysis, scale-up, catalytic and biochemical reactor design Chemical Reactor Design offers a guide to the myriad aspects of reactor design

including the use of numerical methods for solving engineering problems. The author - a noted expert on the topic - explores the use of transfer functions to study residence time distributions, convolution and deconvolution

curves for reactor characterization, forced-unsteady-state-operation, scale-up of chemical reactors, industrial catalysis, design of multiphasic reactors, biochemical reactors design, as well as the

design of multiphase gas-liquid-solid reactors. Chemical Reactor Design contains several examples of calculations and it gives special emphasis on the numerical solutions of differential equations by using the finite

differences approximation, which offers the background information for understanding other more complex methods. The book is designed for the chemical engineering academic community and includes case

studies on mathematical modeling by using of MatLab software. This important book: - Offers an up-to-date insight into the most important developments in the field of chemical, catalytic, and

biochemical reactor engineering - Contains new aspects such as the use of numerical methods for solving engineering problems, transfer functions to study residence time distributions, and more - Includes illustrative case

studies on MatLab approach, with emphasis on numerical solution of differential equations using the finite differences approximation Written for chemical engineers, mechanical engineers, chemists in industry,

complex chemists, bioengineers, and process engineers, Chemical Reactor Design addresses the technical and calculation problems of chemical reactor analysis, scale-up, as well as catalytic and biochemical

reactor design.
This books format follows an applications-oriented text and servesas a training tool for individuals in education and industryinvolved directly, or indirectly, with chemical reactors.

Itaddresses both technical and calculational problems in this field.While this text can be complimented with texts on chemical kineticsand/or reactor design, it also stands alone as a self-teachingaid. The first part

serves as an introduction to the subject titleand contains chapters dealing with history, process variables,basic operations, kinetic principles, and conversion variables. Thesecond part of the book

addresses traditional reactor analysis;chapter topics include batch, CSTRs, tubular flow reactors, plus acomparison of these classes of reactors. Part 3 keys on reactorapplications that include non-ideal reactors:

thermal effects,interpretation of kinetic data, and reactor design. The bookconcludes with other reactor topics; chapter titles includecatalysis, catalytic reactors, other reactions and reactors, andABET-related

topics. An extensive Appendix is also included

A Modern Approach to Chemical Reaction Engineering with Different Case Histories and Exercises

Design, Engineering, Operation

Transport Phenomena for Chemical Reactor Design
Bioprocess Engineering
Elements of chemical reactor design and operation
An innovative approach that helps students move from the

classroom to professional practice This text offers a comprehensive, unified methodology to analyze and design chemical reactors, using a reaction-based design formulation rather than the

common species-based design formulation. The book's acclaimed approach addresses the weaknesses of current pedagogy by giving readers the knowledge and tools needed to address the technical

challenges they will face in practice. Principles of Chemical Reactor Analysis and Design prepares readers to design and operate real chemical reactors and to troubleshoot any technical problems that may

arise. The text's unified methodology is applicable to both single and multiple chemical reactions, to all reactor configurations, and to all forms of rate expression. This text also . . . Describes

reactor operations in terms of dimensionless design equations, generating dimensionless operating curves that depict the progress of individual chemical reactions, the composition of species, and the temperature.

Combines all parameters that affect heat transfer into a single dimensionless number that can be estimated a priori. Accounts for all variations in the heat capacity of the reacting fluid. Develops a complete framework

for economic-based optimization of reactor operations. Problems at the end of each chapter are categorized by their level of difficulty from one to four, giving readers the opportunity to test and develop

their skills. Graduate and advanced undergraduate chemical engineering students will find that this text's unified approach better prepares them for professional practice by teaching them the actual skills

needed to design and analyze chemical reactors.
Chemical Reaction and Reactor Design begins with a discussion of chemical reactions, emphasizing chemical equilibrium and rate of reaction

and proceeds to the theory and practice of heat and mass transfer, and important considerations in the design of chemical reactors. The final section of the book provides detailed case studies from the

chemical industry covering the six chemical processes: naphtha cracking, steam reforming, epoxy resin production, hydro-treating, fluid catalytic cracking and flue gas desulfurization. The comprehensive coverage of

theories of chemical reaction and their application to reactor design provided here will be of value to chemical engineers, industrial chemists and researchers in these fields. This graduate textbook, written

by a former lecturer, addresses industrial chemical reaction topics, focusing on the commercial-scale exploitation of chemical reactions. It introduces students to the concepts behind the successful

design and operation of chemical reactors, with an emphasis on qualitative arguments, simple design methods, graphical procedures, and frequent comparison of capabilities of the major reactor

types. It starts by discussing simple ideas before moving on to more advanced concepts with the support of numerous case studies. Many simple and advanced exercises are present in each chapter and the

detailed MATLAB code for their solution is available to the reader as supplementary material on Springer website. It is written for MSc chemical engineering students and novice researchers working in

industrial laboratories.
The Chemical Reactor from Laboratory to Industrial Plant
Chemical Reaction Engineering
Modeling of Chemical Kinetics and Reactor Design
Chemical Reactions and

Chemical Reactors
New Tools for Industrial Chemical Reactor Operations
"The fourth edition of Elements of Chemical Reaction Engineering is a completely revised version of the book. It

combines authoritative coverage of the principles of chemical reaction engineering with an unsurpassed focus on critical thinking and creative problem solving, employing open-ended questions and stressing the

Socratic method. Clear and organized, it integrates text, visuals, and computer simulations to help readers solve even the most challenging problems through reasoning, rather than by memorizing

equations."--BOOK JACKET.
Chemical Reactor Design and OperationWiley
This comprehensive review, prepared by 24 experts, many of whom are pioneers of the subject, brings together in one

place over 40 years of research in this unique publication. This book will assist R & D specialists, research chemists, chemical engineers or process managers harnessing periodic operations to improve their

process plant performance. Periodic Operation of Reactors covers process fundamentals, research equipment and methods and provides "the state of the art" for the periodic operation of many industrially

important catalytic reactions. Emphasis is on experimental results, modeling and simulation. Combined reaction and separation are dealt with, including simulated moving bed chromatographic, pressure and

temperature swing and circulating bed reactors. Thus, Periodic Operation of Reactors offers readers a single comprehensive source for the broad and diverse new subject. This exciting new publication is

a "must have" for any professional working in chemical process research and development. A comprehensive reference on the fundamentals, development and applications of periodic operation Contributors

and editors include the pioneers of the subject as well as the leading researchers in the field Covers both fundamentals and the state of the art for each operation scenario, and brings all types of periodic operation

together in a single volume Discussion is focused on experimental results rather than theoretical ones; provides a rich source of experimental data, plus process models Accompanying website with

modelling data
Kinetics, Sustainability, and Reactor Design
Elements of Chemical Reaction Engineering
Design of Operations and Environmental Applications

Chemical Reactor Modeling
Chemical Reactor Design
Among the best primers on chemical reactor analysis. Thorough, easy-to-follow guide features simple examples and coherent explanations of stoichiometry, thermochemistry and

chemical equilibrium, basic reactor types, transient rate of reactors and more. Preface. Appendix. Index. 1989 edition.

Chemical Reactor Design and Operation K. R. Westerterp, W. P. M. van Swaaij and A. A. C. M.

Beenackers Chemical Reaction Engineering Laboratories, Twente University of Technology, Enschede, The Netherlands This is a comprehensive handbook on the design and operation of chemical reactors which are vital elements in every

manufacturing process. The book offers an introduction to the modern literature and covers in depth the relevant theory of chemical reactors. The theory is illustrated by numerous worked examples typical to chemical reaction engineering practice in

research, development, design and operation. The examples range from fine chemicals to large scale production and from water purification to metallurgical processes, commencing with simple homogenous model reactors and then moving to the

complicated, multi-phase, heterogeneous reactors met with in reality. All the examples are based on the industrial experience of the authors. Much effort is dedicated to the behaviour of reactors in practice and to the capacity, yield and selectivity of the

reactor. The book is thoroughly indexed and cross-referenced. This edition will be particularly useful to undergraduate and graduate students studying chemical reactors. Contents Fundamentals of chemical reactor calculations Model reactors: single

reactions, isothermal single phase reactor calculations Model reactors: multiple reactions, isothermal single phase reactors Residence time distribution and mixing in continuous flow reactors Influence of micromixing on chemical reactions The role of the

heat effect in model reactors Multi-phase reactors, single reactions Multi-phase reactors, multiple reactions Heat effects in multi-phase reactors The authors: The authors have accumulated a long experience both in fine chemicals and in the petrochemicals

industry, in Europe as well as abroad. Currently they are jointly responsible for the research work in chemical reaction engineering and process development at Twente University. Several new reactor types and new processes have been developed at their

institute and present research interests include gasification, fluidization and gas--liquid reactors, three-phase reactors, high-pressure technology in chemical reaction engineering, thermal behaviour of heterogeneous reactors and computer design and economic

evaluation of reaction units and chemical plants.
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.

Reactor Design for Chemical Engineers
Periodic Operation of Chemical Reactors
Chemical Reactor Design and Operation
Chemical and Catalytic Reaction

Engineering
A Study in Dynamic Programming
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 Beyond the Fundamentals. Part I: Fundamentals Revisited reviews the salient features of an undergraduate course, introducing concepts essential

to reactor design, such as mixing, unsteady-state operations, multiple steady states, and complex reactions. Part II: Building on Fundamentals is devoted to "skill building," particularly in

the area of catalysis and catalytic reactions. It covers chemical thermodynamics, emphasizing the thermodynamics of adsorption and complex reactions; the fundamentals of chemical

kinetics, with special emphasis on microkinetic analysis; and heat and mass transfer effects in catalysis, including transport between phases, transfer across interfaces, and effects of external heat and

mass transfer. It also contains a chapter that provides readers with tools for making accurate kinetic measurements and analyzing the data obtained. Part III: Beyond the Fundamentals

presents material not commonly covered in textbooks, addressing aspects of reactors involving more than one phase. It discusses solid catalyzed fluid-phase reactions in fixed-bed and

fluidized-bed reactors, gas–solid noncatalytic reactions, reactions involving at least one liquid phase (gas–liquid and liquid–liquid), and multiphase reactions. This section also describes

membrane-assisted reactor engineering, combo reactors, homogeneous catalysis, and phase-transfer catalysis. The final chapter provides a perspective on future trends in reaction engineering.

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. Chemical Reactor Design and Control uses process simulators like Matlab®,

Aspen Plus, and Aspen Dynamics to study the design of chemical reactors and their dynamic control. There are numerous books that focus on steady-state reactor design. There are no books that

consider practical control systems for real industrial reactors. This unique reference addresses the simultaneous design and control of chemical reactors. After a discussion of reactor

basics, it: Covers three types of classical reactors: continuous stirred tank (CSTR), batch, and tubular plug flow Emphasizes temperature control and the critical impact of steady-state

design on the dynamics and stability of reactors Covers chemical reactors and control problems in a plantwide environment Incorporates numerous tables and shows step-by-step calculations with

equations Discusses how to use process simulators to address diverse issues and types of operations This is a practical reference for chemical engineering professionals in the process

industries, professionals who work with chemical reactors, and students in undergraduate and graduate reactor design, process control, and plant design courses.

Elementary Chemical Reactor

Analysis
Beyond the Fundamentals
Chemical Engineering Design
Reaction Kinetics and the Development and Operation of Catalytic Processes
Multiphase Chemical Reactors

Reactor Process Design in Sustainable Energy Technology compiles and explains current developments in reactor and process design in sustainable energy technologies, including

optimization and scale-up methodologies and numerical methods. Sustainable energy technologies that require more efficient means of converting and utilizing energy can help provide for burgeoning global energy

demand while reducing anthropogenic carbon dioxide emissions associated with energy production. The book, contributed by an international team of academic and industry experts in the field, brings

numerous reactor design cases to readers based on their valuable experience from lab R&D scale to industry levels. It is the first to emphasize reactor engineering in sustainable energy technology discussing

design. It provides comprehensive tools and information to help engineers and energy professionals learn, design, and specify chemical reactors and processes confidently. Emphasis on

reactor engineering in sustainable energy technology Up-to-date overview of the latest reaction engineering techniques in sustainable energy topics Expert accounts of reactor types,

processing, and optimization
Figures and tables designed to comprehensively present concepts and procedures
Hundreds of citations drawing on many most recent and previously published works on the subject

This book describes how modeling fluid flow in chemical reactors may offer solutions that improve design, operation, and performance of reactors. Chemical reactors are any vessels, tubes, pipes, or

tanks in which chemical reactions take place. Computational Flow Modeling for Chemical Reactor Engineering will show the reactor engineer how to define the specific roles of computational flow modeling,

select appropriate tools, and apply these tools to link reactor hardware to reactor performance. Overall methodology is illustrated with numerous case studies. Industry has invested substantial funds in

computational flow modeling which will pay off only if it can be used to realize significant performance enhancement in chemical reactors. No other single source exists which provides the information contained in

this book.
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 Reactor Design for Process Plants: Principles and techniques

Principles of Chemical Reactor Analysis and Design
Theory, Design, Scale Up
Chemical Reaction and Reactor Design
Reactor and Process Design in Sustainable Energy Technology

Selecting the best type of reactor for any particular chemical reaction, taking into consideration safety, hazard analysis, scale-up, and many other factors is essential to any

industrial problem. An understanding of chemical reaction kinetics and the design of chemical reactors is key to the success of the of the chemist and the chemical

engineer in such an endeavor. This valuable reference volume conveys a basic understanding of chemical reactor design methodologies, incorporating control,

hazard analysis, and other topics not covered in similar texts. In addition to covering fluid mixing, the treatment of wastewater, and chemical reactor modeling, the

author includes sections on safety in chemical reaction and scale-up, two topics that are often neglected or overlooked. As a real-world introduction to the

modeling of chemical kinetics and reactor design, the author includes a case study on ammonia synthesis that is integrated throughout the text. The text also

features an accompanying CD, which contains computer programs developed to solve modeling problems using numerical methods. Students, chemists,

technologists, and chemical engineers will all benefit from this comprehensive volume. Shows readers how to select the best reactor design, hazard analysis,

and safety in design methodology Features computer programs developed to solve modeling problems using numerical methods Designed to give chemical

engineers background for managing chemical reactions, this text examines the behavior of chemical reactions and reactors; conservation equations for reactors;

heterogeneous reactions; fluid-fluid and fluid-solid reaction systems; heterogeneous catalysis and catalytic kinetics; diffusion and heterogeneous catalysis;

and analyses and design of heterogeneous reactors. 1976 edition. Adsorption, Ion Exchange and Catalysis is essentially a mixture of environmental science and

chemical reactor engineering. More specifically, three important heterogeneous processes, namely, adsorption, ion exchange and catalysis, are

analysed, from fundamental kinetics to reactor design with emphasis on their environmental applications. In Chapter 1, the subject of air and water pollution is dealt

with. Data about pollutants and emission sources are given and the treatment methods are shortly presented. In Chapter 2, the very basics and historical development

of adsorption, ion exchange and catalysis are presented as well as their environmental applications. Chapter 3 is devoted to heterogeneous processes and reactor

analysis. All types of reactors are described in depth and reactor modelling, hydraulics and mass/heat transfer phenomena are examined for each type of reactor.

Chapters 4 and 5 are dedicated to adsorption & ion exchange and catalysis, respectively. The basic principles are presented including kinetics, equilibrium,

mass/heat transfer phenomena as well as the analytical solutions of the reactor models presented in Chapter 3. In the sixth chapter, the subject of scale up is

approached. The two Annexes at the end of the book contain physical properties of substances of environmental interest as well as unit conversion tables. Finally, nearly

all the examples contained are based on real experimental data found in literature with environmental interest. Most of the examples consider all aspects of

*operation design – kinetics, hydraulics and mass transfer. * Provides basic knowledge of major environmental problems and connects them to chemical engineering*