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Introduction to Chemical Engineering Kinetics and Reactor Design
Chemical Engineering Kinetics An Introduction to Chemical Engineering Kinetics & Reactor Design
Introduction to Chemical Reaction Engineering and Kinetics
Reaction Kinetics for Chemical Engineers An Introduction to Chemical Engineering Kinetics and Reactor Design
Gas-Phase Thermal Reactions Modeling of Chemical Kinetics and Reactor Design
Kinetics of Chemical Reactions Catalysis and Kinetics: Molecular Level Considerations
Chemical Reaction Engineering Lecture Notes in Chemical Engineering Kinetics and Chemical Reactor Design
A Guide to Chemical Engineering Reactor Design and Kinetics
Chemical Engineering Kinetics Kinetics of Chemical Processes An Introduction to Chemical Kinetics
Bioprocess Engineering Reaction Engineering Chemical Reaction Engineering Green Chemical Engineering
Solutions Manual to Accompany Chemical Engineering Kinetics [by J.M. Smith], Second Edition
Reaction Engineering, Catalyst Preparation, and Kinetics Reaction Kinetics and Reactor Design,
Second Edition Chemical Reaction Engineering Advances in Chemical Engineering Chemical Reactor
Analysis and Design Chemical Reactions and Chemical Reactors Reaction Kinetics Introduction to
Chemical Reactor Analysis, Second Edition Chemical Kinetics and Reactor Design Bioprocess
Engineering Reaction Kinetics for Chemical Engineers Reaction Engineering Principles The Elements
of Chemical Kinetics and Reactor Calculations (a Self-paced Approach) Fundamentals of Chemical
Reactor Engineering Advances in Chemical Engineering Bench Scale Calorimetry in Chemical Reaction
Kinetics Elements of Chemical Reaction Engineering Chemical Engineering Kinetics Adsorption
Analysis: Equilibria And Kinetics (With Cd Containing Computer Matlab Programs)

The book presents in a clear and concise manner the fundamentals of chemical reaction engineering. The structure of the book allows the student to solve reaction engineering problems through reasoning rather than through memorization and recall of numerous equations, restrictions, and conditions under which each equation applies. The fourth edition contains more industrial chemistry with real reactors and real engineering and extends the wide range of applications to which chemical reaction engineering principles can be applied (i.e., cobra bites, medications, ecological engineering) Get Cutting-Edge Coverage of All Chemical Engineering Topics— from Fundamentals to the Latest Computer Applications First published in 1934, Perry's Chemical Engineers' Handbook has equipped generations of engineers and chemists with an expert source of chemical engineering information and data. Now updated to reflect the latest technology and processes of the new millennium, the Eighth Edition of this classic guide provides unsurpassed coverage of every aspect of chemical engineering—from fundamental principles to chemical processes and equipment to new computer applications. Filled with over 700 detailed illustrations, the Eighth Edition of Perry's Chemical Engineering Handbook features: Comprehensive tables and charts for unit conversion A greatly expanded section on physical and chemical data New to this edition: the latest advances in distillation, liquid-liquid extraction, reactor modeling, biological processes, biochemical and membrane separation processes, and chemical plant safety practices with accident case histories Inside This Updated Chemical Engineering Guide - Conversion Factors and Mathematical Symbols • Physical and Chemical Data • Mathematics • Thermodynamics • Heat and Mass Transfer • Fluid and Particle Dynamics Reaction Kinetics • Process Control • Process Economics • Transport and Storage of Fluids • Heat Transfer Equipment • Psychrometry, Evaporative Cooling, and Solids Drying • Distillation • Gas Absorption and Gas-Liquid System Design • Liquid-Liquid Extraction Operations and Equipment • Adsorption and Ion Exchange • Gas-Solid Operations and Equipment • Liquid-Solid Operations and Equipment • Solid-Solid Operations and Equipment • Size Reduction and Size Enlargement • Handling of Bulk Solids and Packaging of Solids and Liquids • Alternative Separation Processes • And Many Other Topics! Solving problems in chemical reaction engineering and kinetics is now easier than ever! As students read through this text, they'll find a comprehensive, introductory treatment of reactors for single-phase and multiphase systems that exposes them to a broad range of reactors and key design features. They'll gain valuable insight on reaction kinetics in relation to chemical reactor design. They will also utilize a special software package that helps them quickly solve systems of algebraic and differential equations, and perform parameter estimation, which gives them more time for analysis. Key Features Thorough coverage is provided on the relevant principles of kinetics in order to develop better designs of chemical reactors. E-Z Solve software, on CD-ROM, is included with the text. By utilizing this

software, students can have more time to focus on the development of design models and on the interpretation of calculated results. The software also facilitates exploration and discussion of realistic, industrial design problems. More than 500 worked examples and end-of-chapter problems are included to help students learn how to apply the theory to solve design problems. A web site, www.wiley.com/college/misssen, provides additional resources including sample files, demonstrations, and a description of the E-Z Solve software. This book serves as an introduction to the subject, giving readers the tools to solve real-world chemical reaction engineering problems. It features a section of fully solved examples as well as end of chapter problems. It includes coverage of catalyst characterization and its impact on kinetics and reactor modeling. Each chapter presents simple ideas and concepts which build towards more complex and realistic cases and situations. Introduces an in-depth kinetics analysis Features well developed sections on the major topics of catalysts, kinetics, reactor design, and modeling Includes a chapter that showcases a fully worked out example detailing a typical problem that is faced when performing laboratory work Offers end of chapter problems and a solutions manual for adopting professors Aimed at advanced chemical engineering undergraduates and graduate students taking chemical reaction engineering courses as well as chemical engineering professionals, this textbook provides the knowledge to tackle real problems within the industry. 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 Primarily aimed at the junior - senior level student in chemical engineering. The cross-fertilization of physico-chemical and mathematical ideas has a long historical tradition. This volume of Advances in Chemical Engineering is almost completely dedicated to a conference on "Mathematics in Chemical Kinetics and Engineering (MaCKiE-2007), which was held in Houston in February 2007, bringing together about 40 mathematicians, chemists, and chemical engineers from 10 countries to discuss the application and development of mathematical tools in their respective fields. * Updates and informs the reader on the latest research findings using original reviews * Written by leading industry experts and scholars * Reviews and analyzes developments in the field This book describes new and efficient calorimetric measurement methods, which can be used to accurately follow the chemical kinetics of liquid phase reaction systems. It describes apparatus and techniques for the precise measuring of the rate of heat liberation in discontinuous and continuous isothermal as well as non-isothermal reactions. The presented methodology can be used to follow the development of chemical reactions online, even in industrial scales. Written by an experienced scientist and practitioner, who can look back on long-standing expert knowledge in chemical engineering, the book contains many practical hints and instructions. The reader will find a sound compact introduction to fundamentals, and comprehensive technical background information and instructions for performing own kinetic experiments. This book is the fusion of scientific background information and long hands-on experience in the practice. This text combines a description of the origin and use of fundamental chemical kinetics through an assessment of realistic reactor problems with an expanded discussion of kinetics and its relation to chemical thermodynamics. It provides exercises, open-ended situations drawing on creative thinking, and worked-out examples. A solutions manual is also available to instructors. Chemical Reaction Engineering: Essentials, Exercises and Examples presents the essentials of kinetics, reactor design and chemical reaction engineering for undergraduate students. Concise and didactic in its approach, it features over 70 resolved examples and many exercises. The work is organized in two parts: in the first part kinetics is presented 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 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. 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 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. 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. Understanding and modeling the kinetics of chemical reactions is crucial to any research and development effort aimed at process optimization and innovation. This volume of *Advances in Chemical Engineering* provides four complementary

points of view. It reflects state-of-the-art developments as well as views on the way to proceed by reporting on the efforts of a representative, sample of research and development groups. A first contribution by W.H. Green Jr. sets the scene. The author advocates a paradigm shift in chemical kinetics from "postdictive" to predictive models. The contribution from the Politecnico di Milano reports on the tremendous experience accumulated over the years in the field of steam cracking, one of the largest scale production processes of the petrochemical industry. The Russian school of chemical kinetics is represented by a chapter on oxidation of alkanes, this contribution addresses more "philosophical" issues. The last chapter gives an indication of the state-of-the-art in an industrial environment.

Provides original reviews Presents leading chemical engineers as authors Reviews state-of-the-art developments A comprehensive introduction to chemical engineering kinetics Providing an introduction to chemical engineering kinetics and describing the empirical approaches that have successfully helped engineers describe reacting systems, An Introduction to Chemical Engineering Kinetics & Reactor Design is an excellent resource for students of chemical engineering. Truly introductory in nature, the text emphasizes those aspects of chemical kinetics and material and energy balances that form the broad foundation for understanding reactor design. For those seeking an introduction to the subject, the book provides a firm and lasting foundation for continuing study and practice. This book covers topics of equilibria and kinetics of adsorption in porous media. Fundamental equilibria and kinetics are dealt with for homogeneous as well as heterogeneous particles. Five chapters of the book deal with equilibria and eight chapters deal with kinetics. Single component as well as multicomponent systems are discussed. In kinetics analysis, we deal with the various mass transport processes and their interactions inside a porous particle. Conventional approaches as well as the new approach using Maxwell-Stefan equations are presented. Various methods to measure diffusivity, such as the Differential Adsorption Bed (DAB), the time lag, the diffusion cell, chromatography, and the batch adsorber methods are also covered by the book. It can be used by lecturers and engineers who wish to carry out research in adsorption. A number of programming codes written in MatLab language are included so that readers can use them directly to better understand the behavior of single and multicomponent adsorption systems. This book is a progressive presentation of kinetics of the chemical reactions. It provides complete coverage of the domain of chemical kinetics, which is necessary for the various future users in the fields of Chemistry, Physical Chemistry, Materials Science, Chemical Engineering, Macromolecular Chemistry and Combustion. It will help them to understand the most sophisticated knowledge of their future job area. Over 15 chapters, this book presents the fundamentals of chemical kinetics, its relations with reaction mechanisms and kinetic properties. Two chapters are then devoted to experimental results and how to calculate the kinetic laws in both homogeneous and heterogeneous systems. The following two chapters describe the main approximation modes to calculate these laws. Three chapters are devoted to elementary steps with the various classes, the principles used to write them and their modeling using the theory of the activated complex in gas and condensed phases. Three chapters are devoted to the particular areas of chemical reactions, chain reactions, catalysis and the stoichiometric heterogeneous reactions. Finally the non-steady-state processes of combustion and explosion are treated in the final chapter. This systematic presentation covers both experimental and theoretical kinetic methods, as well as fundamental and applied. The identification of dominant reaction paths, reaction intermediates and rate-determining steps allows a quantification of the effects of reaction conditions and catalyst properties, providing guidelines for catalyst optimization. In addition, the form in which the equations are presented allows for their straightforward implementation for scale-up and chemical reactor design purposes. Throughout, the methodologies given are illustrated by many examples. Introduction to Chemical Reactor Analysis, Second Edition introduces the basic concepts of chemical reactor analysis and design, an important foundation for understanding chemical reactors, which play a central role in most industrial chemical plants. The scope of the second edition has been significantly enhanced and the content reorganized for improved pedagogical value, containing sufficient material to be used as a text for an undergraduate level two-term course. This edition also contains five new chapters on catalytic reaction engineering. Written so that newcomers to the field can easily progress through the topics, this text provides sufficient knowledge for readers to perform most of the common reaction engineering calculations required for a typical practicing engineer. The authors introduce kinetics, reactor types, and commonly used terms in the first chapter. Subsequent chapters cover a review of chemical engineering thermodynamics, mole balances in ideal reactors for three common reactor types, energy balances in ideal reactors, and chemical reaction kinetics. The text also presents an introduction to nonideal reactors, and explores kinetics and reactors in catalytic systems. The book assumes that readers have some knowledge of thermodynamics, numerical methods, heat transfer, and fluid flow. The authors include an appendix for numerical methods, which are essential to solving most realistic problems in chemical reaction engineering. They also provide numerous worked examples and additional problems in each chapter. Given the significant number of chemical engineers involved in chemical process plant operation at some point in their careers, this book offers essential training for interpreting chemical reactor performance and improving reactor operation. What's New in This Edition: Five new chapters on catalytic reaction engineering, including various catalytic reactions and kinetics, transport processes, and experimental methods Expanded coverage of

adsorption Additional worked problems Reorganized material Advances in Chemical Engineering was established in 1960 and is the definitive serial in the area. It is one of great importance to organic chemists, polymer chemists, and many biological scientists. Written by established authorities in the field, the comprehensive reviews combine descriptive chemistry and mechanistic insight and yield an understanding of how the chemistry drives the properties. This volume covers the topic of catalysis and kinetics and aspects in chemical engineering. Control and optimization of process systems Polyelectrolytes Propane dehydrogenation and selective oxidation of hydrogen Chromium catalysts for ethylene polymerization and oligomerization Computational simulation of rare Earth catalysis The Second Edition features new problems that engage readers in contemporary reactor design Highly praised by instructors, students, and chemical engineers, Introduction to Chemical Engineering Kinetics & Reactor Design has been extensively revised and updated in this Second Edition. The text continues to offer a solid background in chemical reaction kinetics as well as in material and energy balances, preparing readers with the foundation necessary for success in the design of chemical reactors. Moreover, it reflects not only the basic engineering science, but also the mathematical tools used by today's engineers to solve problems associated with the design of chemical reactors. Introduction to Chemical Engineering Kinetics & Reactor Design enables readers to progressively build their knowledge and skills by applying the laws of conservation of mass and energy to increasingly more difficult challenges in reactor design. The first one-third of the text emphasizes general principles of chemical reaction kinetics, setting the stage for the subsequent treatment of reactors intended to carry out homogeneous reactions, heterogeneous catalytic reactions, and biochemical transformations. Topics include: Thermodynamics of chemical reactions Determination of reaction rate expressions Elements of heterogeneous catalysis Basic concepts in reactor design and ideal reactor models Temperature and energy effects in chemical reactors Basic and applied aspects of biochemical transformations and bioreactors About 70% of the problems in this Second Edition are new. These problems, frequently based on articles culled from the research literature, help readers develop a solid understanding of the material. Many of these new problems also offer readers opportunities to use current software applications such as Mathcad and MATLAB®. By enabling readers to progressively build and apply their knowledge, the Second Edition of Introduction to Chemical Engineering Kinetics & Reactor Design remains a premier text for students in chemical engineering and a valuable resource for practicing engineers. While chemical products are useful in their own right—they address the demands and needs of the masses—they also drain our natural resources and generate unwanted pollution. Green Chemical Engineering: An Introduction to Catalysis, Kinetics, and Chemical Processes encourages minimized use of non-renewable natural resources and fosters maximized pollution prevention. This text stresses the importance of developing processes that are environmentally friendly and incorporate the role of green chemistry and reaction engineering in designing these processes. Focused on practical application rather than theory, the book integrates chemical reaction engineering and green chemical engineering, and is divided into two sections. The first half of the book covers the basic principles of chemical reaction engineering and reactor design, while the second half of the book explores topics on green reactors, green catalysis, and green processes. The authors mix in elaborate illustrations along with important developments, practical applications, and recent case studies. They also include numerous exercises, examples, and problems covering the various concepts of reaction engineering addressed in this book, and provide MATLAB® software used for developing computer codes and solving a number of reaction engineering problems. Consisting of six chapters organized into two sections, this text: Covers the basic principles of chemical kinetics and catalysis Gives a brief introduction to classification and the various types of chemical reactors Discusses in detail the differential and integral methods of analysis of rate equations for different types of reactions Presents the development of rate equations for solid catalyzed reactions and enzyme catalyzed biochemical reactions Explains methods for estimation of kinetic parameters from batch reactor data Details topics on homogeneous reactors Includes graphical procedures for the design of multiple reactors Contains topics on heterogeneous reactors including catalytic and non-catalytic reactors Reviews various models for non-catalytic gas–solid and gas–liquid reactions Introduces global rate equations and explicit design equations for a variety of non-catalytic reactors Gives an overview of novel green reactors and the application of CFD technique in the modeling of green reactors Offers detailed discussions of a number of novel reactors Provides a brief introduction to CFD and the application of CFD Highlights the development of a green catalytic process and the application of a green catalyst in the treatment of industrial effluent Comprehensive and thorough in its coverage, Green Chemical Engineering: An Introduction to Catalysis, Kinetics, and Chemical Processes explains the basic concepts of green engineering and reactor design fundamentals, and provides key knowledge for students at technical universities and professionals already working in the industry. 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. **FUNDAMENTALS OF CHEMICAL REACTOR ENGINEERING** A comprehensive introduction to chemical reactor engineering from an industrial perspective In *Fundamentals of Chemical Reactor Engineering: A Multi-Scale Approach*, a distinguished team of academics delivers a thorough introduction to foundational concepts in chemical reactor engineering. It offers readers the tools they need to develop a firm grasp of the kinetics and thermodynamics of reactions, hydrodynamics, transport processes, and heat and mass transfer resistances in a chemical reactor. This textbook describes the interaction of reacting molecules on the molecular scale and uses real-world examples to illustrate the principles of chemical reactor analysis and heterogeneous catalysis at every scale. It includes a strong focus on new approaches to process intensification, the modeling of multifunctional reactors, structured reactor types, and the importance of hydrodynamics and transport processes in a chemical reactor. With end-of-chapter problem sets and multiple open-ended case studies to promote critical thinking, this book also offers supplementary online materials and an included instructor's manual. Readers will also find: A thorough introduction to the rate concept and species conservation equations in reactors, including chemical and flow reactors and the stoichiometric relations between reacting species A comprehensive exploration of reversible reactions and chemical equilibrium, including the thermodynamics of chemical reactions and different forms of the equilibrium constant Practical discussions of chemical kinetics and analysis of batch reactors, including batch reactor data analysis In-depth examinations of ideal flow reactors, CSTR, and plug flow reactor models Ideal for undergraduate and graduate chemical engineering students studying chemical reactor engineering, chemical engineering kinetics, heterogeneous catalysis, and reactor design, *Fundamentals of Chemical Reactor Engineering* is also an indispensable resource for professionals and students in food, environmental, and materials engineering. Chemical reaction engineering is at the core of chemical engineering education. Unfortunately, the subject can be intimidating to students, because it requires a heavy dose of mathematics. These mathematics, unless suitably explained in the context of the physical phenomenon, can confuse rather than enlighten students. Bearing this in mind, *Reaction Engineering Principles* is written primarily from a student's perspective. It is the culmination of the author's more than twenty years of experience teaching chemical reaction engineering. The textbook begins by covering the basic building blocks of the subject—stoichiometry, kinetics, and thermodynamics—ensuring students gain a good grasp of the essential concepts before venturing into the world of reactors. The design and performance evaluation of reactors are conveniently grouped into chapters based on an increasing degree of difficulty. Accordingly, isothermal reactors—batch and ideal flow types—are addressed first, followed by non-isothermal reactor operation, non-ideal flow in reactors, and some special reactor types. For better comprehension, detailed derivations are provided for all important mathematical equations. Narrative of the physical context in which the formulae work adds to the clarity of thought. The use of mathematical formulae is elaborated upon in the form of problem solving steps followed by worked examples. Effects of parameters, changing trends, and comparisons between different situations are presented graphically. Self-practice exercises are included at the end of each chapter. *Bioprocess Engineering: Kinetics, Sustainability, and Reactor Design, Second Edition*, provides a comprehensive resource on bioprocess kinetics, bioprocess systems, sustainability, and reaction engineering. Author Dr. Shijie Liu reviews the relevant fundamentals of chemical kinetics, batch and continuous reactors, biochemistry, microbiology, molecular biology, reaction engineering, and bioprocess systems engineering, also introducing key principles that enable bioprocess engineers to engage in analysis, optimization, and design with consistent control over biological and chemical transformations. The quantitative treatment of bioprocesses is the central theme in this book, with more advanced techniques and applications being covered in depth. This updated edition reflects advances that are transforming the field, ranging from genetic sequencing, to new techniques for producing proteins from recombinant DNA, and from green chemistry, to process stability and sustainability. The book introduces techniques with broad applications, including the conversion of renewable biomass, the production of chemicals, materials, pharmaceuticals, biologics, and commodities, medical applications, such as tissue engineering and gene therapy, and solving critical environmental problems. Includes the mechanistic description of biotransformations and chemical transformations Provides quantitative descriptions of bioprocesses Contains extensive illustrative drawings, which make the understanding of the subject easy Includes bioprocess kinetics and reactor analysis Contains examples of the various process parameters, their significance, and their specific practical use Incorporates sustainability concepts into the various bioprocesses This book is devoted to Gas-Phase Thermal Reactions (GPTRs), and especially combustion reactions, which take place in engines, burners and industrial chemical reactors to produce mechanical or thermal energy to

incinerate pollutants or to manufacture chemical substances, and which play an important part due to the consequences they have on the environment : fires and explosions, tropospheric pollution, greenhouse effect, hole in the stratospheric ozone layer. The design and running of engines, burners, incinerators, industrial reactors, both economical in fuels, raw materials and energy, efficient, safe and clean, as well as the scientific evaluation of the causes and the effects of atmospheric pollutions with a view to taking rational environmental decisions, which necessitate an understanding of the fundamental mechanisms of these reactions and an access to models allowing numerical simulations of the phenomena being studied to be carried out. The analysis of the results of the simulations then allows an optimal solution to be found to the industrial problem or to extrapolate the natural phenomena. Kinetics of Chemical Processes details the concepts associated with the kinetic study of the chemical processes. The book is comprised of 10 chapters that present information relevant to applied research. The text first covers the elementary chemical kinetics of elementary steps, and then proceeds to discussing catalysis. The next chapter tackles simplified kinetics of sequences at the steady state. Chapter 5 deals with coupled sequences in reaction networks, while Chapter 6 talks about autocatalysis and inhibition. The seventh chapter describes the irreducible transport phenomena in chemical kinetics. The next two chapters discuss the correlations in homogenous kinetics and heterogeneous catalysis, respectively. The last chapter covers the analysis of reaction networks. The book will be of great use to students, researchers, and practitioners of scientific disciplines that deal with chemical reaction, particularly chemistry and chemical 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 Engineering Kinetics and Reactor Design is one of the key courses in any academic Chemical Engineering studies, and it is typically offered in the third year of a Chemical Engineering undergraduate program. The main objective of this course is to learn to analyze the performance of chemical reactors, and to design them. This book covers all topics that are taught in an undergraduate course on Chemical Engineering Kinetics and Reactor Design. Starting from the study of chemical kinetics of homogeneous, noncatalytic systems, the book moves on to heterogeneous catalytic kinetics, enzymatic kinetics, and other complex systems. Armed with this knowledge, the student is taught how to describe batch reactors, continuous stirred-tank reactors, and plug-flow reactors. The book is concluded with a chapter on the determination of reaction kinetics from experimental data, and a chapter introducing advanced reactor design. While analytical solutions to reactor problems are discussed whenever they are relevant, the main focus is on numerical reactor models. All models are freely available either as Matlab code, or as an Excel file, on the series website that can be found at <http://www.lecturenotesonline.com>

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