

CHEMICAL ENGINEERING KINETICS

J. M. SMITH

THIRD EDITION



Chemical Engineering Kinetics

Roman Wölfel



Chemical Engineering Kinetics:

An Introduction to Chemical Engineering Kinetics & Reactor Design Charles G. Hill, **Introduction to Chemical Engineering Kinetics and Reactor Design** Charles G. Hill, Thatcher W. Root, 2014-05-27 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

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,2008-10-06 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 *Kinetics of Chemical Reactions* Guy B. Marin, Gregory S. Yablonsky, 2011-08-29 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 **Green Chemical Engineering** S. Suresh, S. Sundaramoorthy, 2014-12-18 This book explores a balance between energy and material applied to chemical reactors with catalysis to achieve a given purpose It includes the fundamentals of chemical reaction engineering and explains reactor design fundamentals The book spans the full range from the fundamentals of kinetics and heterogeneous catalysis via modern experimental and theoretical results of model studies to their equivalent large scale industrial production processes It also includes significant developments with recent research case studies and literature Reaction Kinetics for Chemical Engineers Stanley M. Walas, 1959 Introduction to Chemical Engineering Kinetics and Reactor Design Charles G. Hill, Thatcher W. Root, 2014-04-24 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

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Reaction Kinetics for Chemical Engineers Stanley M. Walas, 2013-10-22 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

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Gas-Phase Thermal Reactions Guy-Marie Côme, 2001-10-31 This book is dedicated to gas phase thermal reactions which take place in engines burners and industrial reactors for the production of mechanical or thermal energy for the incineration of pollutants or for the manufacture of chemicals It also studies their effect on the environment fires explosions tropospheric pollution the greenhouse effect and holes in the ozone layer After a short reminder of the concepts and laws of thermodynamics and of chemical and physical kinetics the book suggests a methodology for the kinetic modelling of these reactions generation and reduction of reaction mechanisms estimation of kinetic data of elementary reactions estimation of the thermodynamic data and transport data of molecules and free radicals and analysis and validation of mechanisms by comparison of calculated results with the experimental results obtained using laboratory reactors The models thus generated carry all the information necessary to allow them to be incorporated into computer programs for the calculation of reactors or of the fluid dynamics of reacting gases Tables of numerical data and a list of computer programs and URLs complete the book

Fundamentals of Chemical Reaction Engineering Mark E. Davis, Robert J. Davis, 2003 Chemistry in the hands of Engineers This mantra initiated and developed largely in the research programs of academic chemical engineers over the

last few decades has now made its way into the core undergraduate curriculum in the form of a new Chemical Reaction Engineering textbook by Cal Tech's Mark E Davis and UVA's Robert J Davis Michael T Klein Rutgers University This book is an introduction to the quantitative treatment of chemical reaction engineering It is appropriate for a one semester undergraduate or first year graduate course The text provides a balanced approach first it covers both homogeneous and heterogeneous reacting systems second it covers both chemical reaction engineering and chemical reactor engineering Here's what reviewers have to say The Davis Davis book really brings out the strong coupling between chemical reactions and reactor design concepts in a pedagogical fashion Michael S Wong Rice University Great use of chemical reactions as teaching examples Michael S Wong Rice University The examples illustrations and vignettes given in the text are very well done and are of either fundamental or practical interest David F Cox Virginia Tech A primary motivation to use this text is the arrangement of the introductory material on kinetics The initial description of reactions and kinetics in Davis Davis appears prior to the introduction of reactor material balances David F Cox Virginia Tech Concise development and discussion of material Michael S Wong Rice University

Modeling of Chemical Kinetics and Reactor Design A. Kayode Coker, 2001-08-14 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 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

An Introduction to Chemical Kinetics Michel Soustelle, 2013-02-07 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

Lecture Notes in Chemical Engineering Kinetics and Chemical Reactor Design Alex De Visscher, 2013-12-12 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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