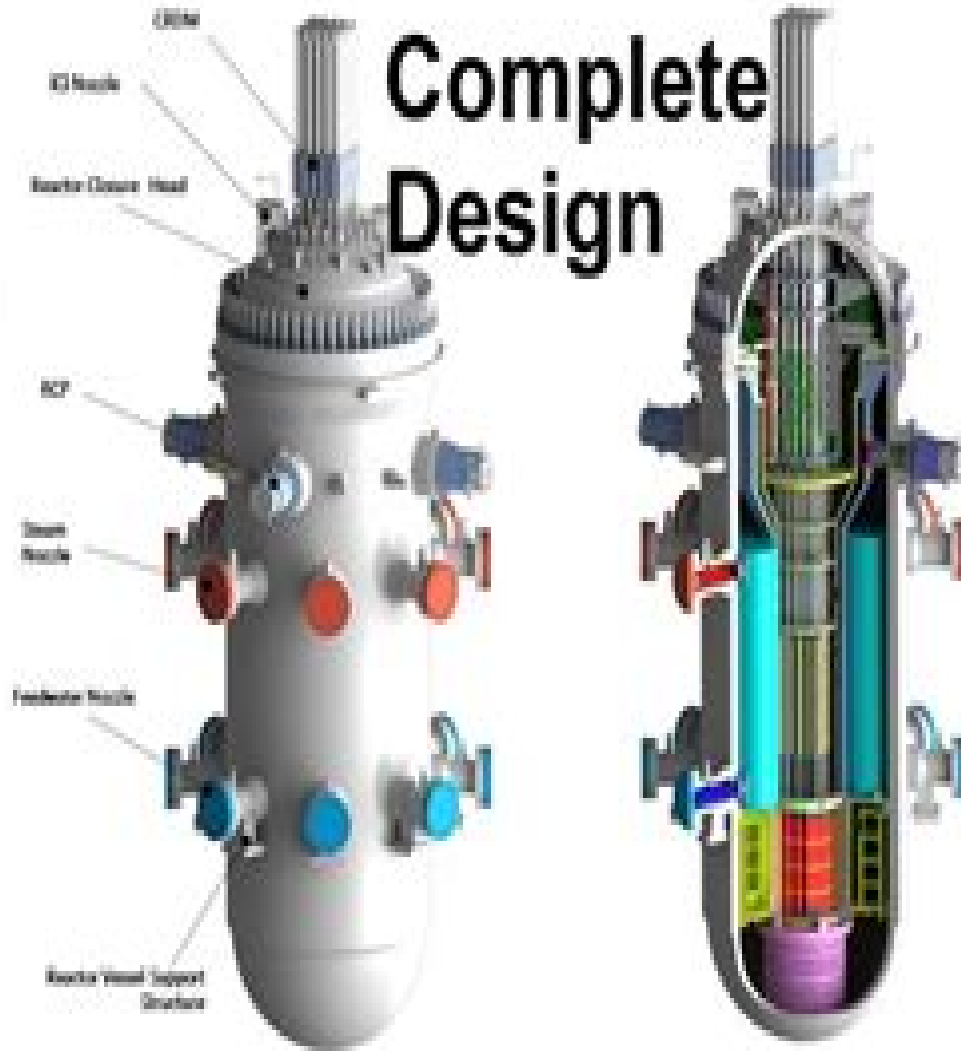


# Chemical Reactors Design



# Chemical Reactor Design

**Peter Harriott**



## **Chemical Reactor Design:**

**Chemical Reactor Design and Operation** K. R. Westerterp, W. P. M. van Swaaij, A. A. C. M. Beenackers, 1984  
*Reactor Design for Chemical Engineers* J. M. Winterbottom, Michael King, 1999-02-05 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

**Handbook of Chemical Reactor Design, Optimization, and Scaleup** Bruce Nauman, 2001-10-21 THE MODERN GUIDE TO CHEMICAL REACTORS In the best professional sourcebook on chemical reactors ever written world class expert Bruce Nauman provides tools information and hands on expertise to make important engineering tasks and decisions easier Clearly and in depth CHEMICAL REACTOR DESIGN OPTIMIZATION AND SCALEUP provides Up to date information to help chemical and process engineers save time money and materials Decision aiding coverage of every aspect of selection design factors and parameters optimization and scaleup A convenient source of explained formulas principles and data Numerous detailed examples Worked mathematical solutions The latest information on reactor design for biochemicals and polymers as well as other newer and standard substances DESIGN AND SPECIFY CHEMICAL REACTORS CONFIDENTLY WITH STATE OF THE ART SKILLS

*An Introduction to Chemical Engineering Kinetics & Reactor Design* Charles G. Hill, **Chemical Reactor Design** Juan A. Conesa, 2019-12-04 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 multiphase 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 Problem Solving in Chemical Reactor Design Juan A. Conesa,2024-12-23 Extensive workbook with more than 200 up to date solved problems on advanced chemical reactors for deeper understanding of chemical reactor design Problem Solving in Chemical Reactor Design provides in depth coverage of more than 200 solved complex reactor design problems extracted from core chemical engineering subject areas The problems in this book cover the design of non ideal catalytic multiphase heterogeneous and biochemical reactors rather than focusing on basic Chemical Reactor Engineering concepts Each complex problem is solved using simple procedures and mathematical tools enabling readers to better understand the correct procedure for solving problems and solve them faster more conveniently and more accurately This book is inspired by more than two decades of the author s teaching experience in chemical reactor engineering Accompanying electronic materials include spreadsheets and easily understandable Matlab programs which can both be downloaded from the Wiley website Some of the topics covered in Problem Solving in Chemical Reactor Design include Optimization operation and complexities of reactor design in the face of non idealities such as mixing issues and residence time distributions Utilization of the tanks in series model dispersion model and intricate combinations of ideal reactors to elucidate the impact on conversion rates Signal processing within the domain of chemical reactor engineering specifically focusing on convolution and deconvolution methodologies Reaction kinetics diffusion dynamics and catalyst efficiency in catalytic reactor design and design of gas catalytic and gas liquid solid catalyst systems in multiphase reactors Problem Solving in Chemical Reactor Design is an excellent learning resource for students and professionals in the fields of chemical engineering pharmaceuticals biotechnology and fine chemistry **Reaction Kinetics and Reactor Design** John B. Butt,2000-01-03 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 als **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.

Chemical Reactor Design and Technology Hugo de Lasa, 2012-12-06 Today's frustrations and anxieties resulting from two energy crises in only one decade show us the problems and fragility of a world built on high energy consumption accustomed to the use of cheap non renewable energy and to the acceptance of existing imbalances between the resources and demands of countries. Despite all these stressing factors our world is still hesitating about the urgency of undertaking new and decisive research that could stabilize our future. Could this trend change in the near future? In our view two different scenarios are possible. A renewed energy tension could take place with an unpredictable timing mostly related to political and economic factors. This could bring again scientists and technologists to a new state of shock and awaken our talents. A second interesting and beneficial scenario could result from the positive influence of a new generation of researchers that with or without immediate crisis acting both in industry and academia will face the challenge of developing technologies and processes to pave the way to a less vulnerable society. Because Chemical Reactor Design and Technology activities are at the heart of these required new technologies, the timeliness of the NATO Advanced Study Institute at the University of Western Ontario, London, was very appropriate.

*Chemical Reactor Design* E. B. Nauman, 1987-02-13 Combines the concepts of chemical kinetics as taught in physical chemistry with those of transport phenomena taught in engineering courses: fluid flow, heat transfer, and mass transfer with heavy emphasis on numerical methods and computation. The reader is taught to use and understand modern computer aided design techniques, CAD with emphasis on design optimization. Includes sections on biochemical engineering, electronic materials processing and multiphase reactions, and provides a chapter on polymer reaction engineering.

**The Optimal Design of Chemical Reactors** Rutherford Aris, 2016-06-03 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 bearing 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

**Electrochemical Reactor Design** David J. Pickett, 1977

**Chemical Reactor Design and Control** William L. Luyben, 2007-07-16 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

*Chemical Reactor Design in Practice* L. M. Rose, 1981-01-01 When this book first appeared in 1981 a reviewer writing in Chemistry in Britain commented I enjoyed reading this book and would recommend it to teachers of the subject The book is now available in paperback at less than half the price of the hardcover edition thus bringing it within the reach of students Intended as an extension to the normal introductory reactor engineering course the text is based on a lecture course in practical reactor design and aims to teach students how to design and specify reactors or to know the advanced techniques by which this is done Reactor design is concerned with many aspects Hence the text touches on a multitude of disciplines statistics economics optimization control and safety as well as those subjects traditionally thought of as reactor design The book includes a set of interactive computer based exercises which enable the student to discover for himself the major characteristics of the various reactor types

CONTENTS Chapter 1 Chemical Kinetics and Reactor Design Principles 2 Modelling of Reactors 3 Reactor Laboratory Studies in Process Development 4 The Planning of Experiments 5 The Pilot Stage 6

Chemical Reactor Analysis and Applications for the Practicing Engineer Louis Theodore, 2012-09-11 This books format follows an applications oriented text and serves as a training tool for individuals in education and industry involved directly or indirectly with chemical reactors It

addresses both technical and calculational problems in this field While this text can be complimented with texts on chemical kinetics and or reactor design it also stands alone as a self teaching aid The first part serves as an introduction to the subject title and contains chapters dealing with history process variables basic operations kinetic principles and conversion variables The second part of the book addresses traditional reactor analysis chapter topics include batch CSTRs tubular flow reactors plus a comparison of these classes of reactors Part 3 keys on reactor applications that include non ideal reactors thermal effects interpretation of kinetic data and reactor design The book concludes with other reactor topics chapter titles include catalysis catalytic reactors other reactions and reactors and ABET related topics An extensive Appendix is also included

*Principles of Chemical Reactor Analysis and Design* Uzi Mann,2009-03-30 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 Hiroo Tominaga,Masakazu Tamaki,1999-01-07 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 Chemical Reactor Design Peter Harriott,2002-11-06 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 Chemical

Reactors Pierre Trambouze, Jean-Paul Euzen, 2004 This in depth revision provides a summary of current knowledge updated based on the most recent literature in the field The reader will find recommendations on the choice of correlations to apply depending on the case and useful references to the original documents on industrial processes This practical user s guide is designed for engineers in industries involved with the problems of chemical transformations and for professors and students of process engineering Whether the reader is working in a design department an engineering firm or an R D department or is managing production plants he will find material here that is directly applicable to the solution of his problems Contents 1 Definitions and fundamental concepts 2 Single phase reactors 3 General characteristics of reactors with two fluid phases 4 Experimental data and correlations for gas liquid reactors 5 Experimental data and correlations for liquid liquid reactors 6 General characteristics of heterogeneous catalytic reactors 7 Reactors employing a fluid phase and a catalytic solid phase fixed bed moving bed fluidized bed 8 Three phase reactors gas liquid and catalytic solid 9 Case studies 10 Multifunctional reactors and future developments General nomenclature Index

Modeling of Chemical Kinetics and Reactor Design A. Kayode Coker, 2001-07-26 This reference conveys a basic understanding of chemical reactor design methodologies that incorporate both control and hazard analysis It demonstrates how to select the best reactor for any particular chemical reaction and how to estimate its size to determine the best operating conditions

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