

Table of contents provided by Syndetics

- **Introduction**
- **Process Development**
- **The Thermodynamics of Chemical Reactions**
- **Problems**
- **Basic Building Blocks of Chemical Reaction Engineering**
- **Introduction to Chemical Reactions**
- **Outline of the Book**
- **Classification and Types of Reactors**
- **Introduction to Rate Function**
- **Reactor Performance Measures**
- **Transport Phenomena in Reactors**
- **Basic Definitions**
- **Summary**
- **Numerical Methods**
- **References**
- **Energy Changes in Systems**
- **Chemical Reaction Equilibrium**
- **References**
- **Mole Balances in Ideal Reactors**
- **General Mole Balance Equation**
- **Perfectly Mixed Batch Reactor**
- **Plug Flow Reactor**
- **Reaction Rate in Terms of Catalyst Mass**
- **Comparison of PFR and CSTR Performance**
- **Multiple Reactions**
- **Multiple-Reactor Systems**
- **Further Thoughts on Defining Conversion**
- **Summary**
- **Problems**
- **Energy Balances in Ideal Reactors**
- **Influence of Temperature on Reactor Operation**
- **General Energy Balance**
- **Batch Reactor**
- **Plug Flow Reactor**
- **Continuous Stirred Tank Reactor**
- **Summary**
- **Problems**
- **References**
- **Chemical Kinetics for Homogeneous Reactions**
- **Reaction Mechanism**
- **Theoretical Analysis of Reaction Rate**
- **Rate Equations for Nonelementary Reactions**
- **Continuous Stirred Tank Reactor**
- **Transient Reactor Operation**

- **General Nature of Rate Functions**
- **Mechanisms and Models**
- **Experimental Methods in Rate Data Collection and Analysis**
- **Summary**
- **Problems**
- **Nonideal Reactor Analysis**
- **Causes of Nonideal Reactor Behavior**
- **Residence Time and Mixing**
- **RTD Function**
- **RTD in Ideal Reactors**
- **Modeling RTD**
- **Mixing in Chemical Reactors**
- **Summary**
- **Problems**
- **References**
- **Introduction to Catalysis**
- **Origins of Catalysis: Historical Perspectives**
- **Definitions and Fundamental Concepts**
- **Thermodynamics**
- **Catalyst Types and Basic Structure**
- **Classification of Vapor-Phase Reactions**
- **Basic Steps in Heterogeneous Catalytic Reactions**
- **Introduction to Catalytic Reactors**
- **Summary**
- **Kinetics of Catalytic Reactions**
- **External Mass and Heat Transfer Effects**
- **The Conservation Equations for Packed Beds**
- **Adsorption**
- **Summary**
- **Rate Expressions for Catalytic Reactions**
- **Reference**
- **Diffusion in Porous Catalysts**
- **Problems**
- **Mechanisms and Models**
- **Transport Processes in Catalysis**
- **Diffusion with Reaction in Porous Catalysts**
- **References**
- **Summary**
- **Analysis of Catalytic Reactors**
- **Problems**
- **Diffusion in Bulk Phase**
- **The Packed-Bed Reactor: Introduction and Overview**
- **One-Dimensional Steady-State Plug Flow Models**
- **One-Dimensional Steady-State Axial Dispersion Models**
- **Two-Dimensional Steady-State Models**
- **Transient Packed-Bed Models**

- **Transport Properties in Packed Beds**
- **Autothermal Operation of Packed Beds**
- **Fluidized-Bed Reactors**
- **Metal Gauze Reactors**
- **The Counter Diffusive Reactor: Radiant Heaters**
- **Monolith Reactors**
- **Reactors for Gas-Liquid-Solid Systems**
- **Summary**
- **Problems**
- **References**
- **Experimental Methods in Catalysis**
- **Kinetic Investigations**
- **Measuring Physical Properties**
- **Electron Microscopy**
- **Surface Science Studies**
- **Summary**
- **Problems**
- **References**
- **Appendix 1 Numerical Methods**
- **Nonlinear Algebraic Equations**
- **Linear Algebraic Equations**
- **Ordinary Differential Equations (IVP)**
- **Numerical Integration**
- **Numerical Differentiation**
- **Partial Differential Equations**
- **Appendix 2 Thermodynamic Data**
- **Appendix 3 Useful Integrals**
- **Appendix 4 Numerical Software**
- **Apolymath**
- **Amatlab**
- **AC.3 COMSOL Multiphysics**
- **Index**