1. Record Nr. UNINA9911001782903321

Autore	Tesser Riccardo
Titolo	The Chemical Reactor from Laboratory to Industrial Plant : A Modern Approach to Chemical Reaction Engineering / / by Riccardo Tesser, Elio Santacesaria
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2025
ISBN	3-031-82502-0
Edizione	[2nd ed. 2025.]
Descrizione fisica	1 online resource (XXIII, 725 p. 506 illus., 208 illus. in color.)
Disciplina	660
Soggetti	Chemistry, Technical Thermodynamics Heat engineering Heat - Transmission Mass transfer Chemistry, Physical and theoretical Reaction mechanisms (Chemistry) Chemical engineering Biotechnology Industrial Chemistry Engineering Thermodynamics, Heat and Mass Transfer Physical Chemistry Reaction Mechanisms Chemical Process Engineering Chemical Bioengineering
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Chapter 1 Introduction to the Study of Chemical Industrial Processes -- Chapter 2 Thermodynamics of Physical and Chemical Transformations -- Chapter 3 The Role of Catalysis in Promoting Chemical Reactions -- Chapter 4 Kinetics of Homogeneous Reactions and Related Mechanisms -- Chapter 5 Kinetics of Heterogeneous Reactions and Related Mechanisms -- Chapter 6 Kinetics of and Transport Phenomena in Gas–Solid Reactors -- Chapter 7 Kinetics and Transport Phenomena in

Multi-phase Reactors -- Chapter 8 Polymerization Reactions and Reactors -- Chapter 9 Bioreactors.

Sommario/riassunto

This second edition presents updated key concepts and exercises in chemical reaction engineering. While retaining the foundational structure of the first edition, this graduate textbook offers 2 new chapters devoted to polymerization reactions and reactors, and to bioreactors, and provides a complete and more suitable overview of the field for students and researchers of Chemical Reaction Engineering Sciences. The Preface of this edition has been rewritten to justify the changes conducted since the first edition. The subsequent chapters introduce 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. These chapters were updated and/or enriched with new exercises, and particular attention was given to the following topics: Chapter 2: Expanded Vapour-Liquid Equilibria (VLE) in multi-component systems with new exercises, including flash separation with reaction. Chapter 3: Deepened surface acidity distribution of heterogeneous catalysts with a new exercise. Chapters 4 & 5: Enlarged exercises with further calculations, plots, and new solved exercises. Chapter 6: Enriched with a new exercise on effectiveness factor calculation, covering mass, heat, and momentum transport laws and their relationship with chemical kinetics. Chapter 7: Added exercise to determine concentration profiles in the liquid film for gas-liquid reactions at different reaction rates. Chapter 8: New chapter on polymers and polymerization reactors, detailing mechanisms and kinetics with solved examples and exercises for various polymerization types. Chapter 9: New chapter on Bioreactors, covering the evolution of kinetic models for fermentation processes, including metabolic and cybernetic models applied to baker yeast and bioethanol production, with examples and solved exercises. The authors conducted a comprehensive revision of all the MATLAB code exercises to ensure they aligned with current learning objectives and described in detail the mathematical strategy adopted, particularly for the more complex problems. With expanded content, practical exercises, and new chapters, this textbook equips students and professionals alike with the knowledge and tools to excel in chemical and industrial engineering.