

1. Record Nr.	UNINA9910132188803321
Autore	Kashid Madhvanand N.
Titolo	Microstructured devices for chemical processing / / Madhvanand N. Kashid, Albert Renken, and Lioubov Kiwi-Minsker
Pubbl/distr/stampa	Weinheim, Germany : , : Wiley-VCH, , 2014 ©2014
ISBN	3-527-68518-9 3-527-68522-7 3-527-68519-7
Descrizione fisica	1 online resource (381 p.)
Disciplina	660.28
Soggetti	Chemical processes - Study and teaching
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Microstructured Devices for Chemical Processing; Contents; Preface; List of Symbols; Chapter 1 Overview of Micro Reaction Engineering; 1.1 Introduction; 1.2 What are Microstructured Devices?; 1.3 Advantages of Microstructured Devices; 1.3.1 Enhancement of Transfer Rates; 1.3.2 Enhanced Process Safety; 1.3.3 Novel Operating Window; 1.3.4 Numbering-Up Instead of Scale-Up; 1.4 Materials and Methods for Fabrication of Microstructured Devices; 1.5 Applications of Microstructured Devices; 1.5.1 Microstructured Reactors as Research Tool; 1.5.2 Industrial/Commercial Applications 1.6 Structure of the Book 1.7 Summary; References; Chapter 2 Basis of Chemical Reactor Design and Engineering; 2.1 Mass and Energy Balance; 2.2 Formal Kinetics of Homogenous Reactions; 2.2.1 Formal Kinetics of Single Homogenous Reactions; 2.2.2 Formal Kinetics of Multiple Homogenous Reactions; 2.2.3 Reaction Mechanism; 2.2.4 Homogenous Catalytic Reactions; 2.3 Ideal Reactors and Their Design Equations; 2.3.1 Performance Parameters; 2.3.2 Batch Wise-Operated Stirred Tank Reactor (BSTR); 2.3.3 Continuous Stirred Tank Reactor (CSTR); 2.3.4 Plug Flow or Ideal Tubular Reactor (PFR) 2.4 Homogenous Catalytic Reactions in Biphasic Systems 2.5 Heterogenous Catalytic Reactions; 2.5.1 Rate Equations for Intrinsic

Surface Reactions; 2.5.1.1 The Langmuir Adsorption Isotherms; 2.5.1.2 Basic Kinetic Models of Catalytic Heterogenous Reactions; 2.5.2 Deactivation of Heterogenous Catalysts; 2.6 Mass and Heat Transfer Effects on Heterogenous Catalytic Reactions; 2.6.1 External Mass and Heat Transfer; 2.6.1.1 Isothermal Pellet; 2.6.2 Internal Mass and Heat Transfer; 2.6.2.1 Isothermal Pellet; 2.6.2.2 Nonisothermal Pellet 2.6.2.3 Combination of External and Internal Transfer Resistances2. 6.2.4 Internal and External Mass Transport in Isothermal Pellets; 2.6.2.5 The Temperature Dependence of the Effective Reaction Rate; 2.6.2.6 External and Internal Temperature Gradient; 2.6.3 Criteria for the Estimation of Transport Effects; 2.7 Summary; 2.8 List of Symbols; References; Chapter 3 Real Reactors and Residence Time Distribution (RTD); 3.1 Nonideal Flow Pattern and Definition of RTD; 3.2 Experimental Determination of RTD in Flow Reactors; 3.2.1 Step Function Stimulus-Response Method 3.2.2 Pulse Function Stimulus-Response Method3.3 RTD in Ideal Homogenous Reactors; 3.3.1 Ideal Plug Flow Reactor; 3.3.2 Ideal Continuously Operated Stirred Tank Reactor (CSTR); 3.3.3 Cascade of Ideal CSTR; 3.4 RTD in Nonideal Homogeneous Reactors; 3.4.1 Laminar Flow Tubular Reactors; 3.4.2 RTD Models for Real Reactors; 3.4.2.1 Tanks in Series Model; 3.4.2.2 Dispersion Model; 3.4.3 Estimation of RTD in Tubular Reactors; 3.5 Influence of RTD on the Reactor Performance; 3.5.1 Performance Estimation Based on Measured RTD; 3.5.2 Performance Estimation Based on RTD Models; 3.5.2.1 Dispersion Model 3.5.2.2 Tanks in Series Model

Sommario/riassunto

Based on courses taught by the authors, this advanced textbook discusses opportunities for achieving larger-scale reactions in a technically controllable, sustainable, cost-effective and safe manner. Adopting a practical approach, it describes how miniaturized devices are used successfully for process intensification, focusing on the engineering aspects of microstructured devices, such as their design and characterization for homogeneous and multiphase reactions. It addresses the conditions under which microstructured devices are beneficial, how they should be designed, and how such devices c