1. Record Nr. UNINA9910877349503321

Autore	Asano Koichi <1926->
Titolo	Mass transfer : from fundamentals to modern industrial applications / / Koichi Asano
Pubbl/distr/stampa	Weinheim, : Wiley-VCH, c2006
ISBN	1-281-08792-0 9786611087920 3-527-60918-0 3-527-60908-3
Descrizione fisica	1 online resource (291 p.)
Disciplina	530.475 660.2832
Soggetti	Mass transfer Transport theory
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 and index.
Nota di contenuto	Mass Transfer; Contents; Preface; 1 Introduction; 1.1 The Beginnings of Mass Transfer; 1.2 Characteristics of Mass Transfer; 1.3 Three Fundamental Laws of Transport Phenomena; 1.3.1 Newton's Law of Viscosity; 1.3.2 Fourier's Law of Heat Conduction; 1.3.3 Fick's Law of Diffusion; 1.4 Summary of Phase Equilibria in Gas-Liquid Systems; References; 2 Diffusion and Mass Transfer; 2.1 Motion of Molecules and Diffusion; 2.1.1 Diffusion Phenomena; 2.1.2 Definition of Diffusional Flux and Reference Velocity of Diffusion [1, 2]; 2.1.3 Binary Diffusion Flux; 2.2 Diffusion Coefficients 2.2.1 Binary Diffusion Coefficients in the Gas Phase2.2.2 Multicomponent Diffusion Coefficients in the Gas Phase; Example 2.1; Solution; 2.3 Rates of Mass Transfer; 2.3.1 Definition of Mass Flux; 2.3.2 Unidirectional Diffusion in Binary Mass Transfer; 2.3.3 Equimolal Counterdiffusion; 2.3.4 Convective Mass Flux for Mass Transfer in a Mixture of Vapors; Example 2.2; Solution; 2.4 Mass Transfer Coefficients; Example 2.3; Solution; 2.5 Overall Mass Transfer Coefficients; References; 3 Governing Equations of Mass Transfer; 3.1 Laminar and Turbulent Flow

3.2 Continuity Equation and Diffusion Equation3.2.1 Continuity Equation; 3.2.2 Diffusion Equation in Terms of Mass Fraction; 3.2.3 Diffusion Equation in Terms of Mole Fraction; 3.3 Equation of Motion and Energy Equation; 3.3.1 The Equation of Motion (Navier-Stokes Equation); 3.3.2 The Energy Equation; 3.3.3 Governing Equations in Cylindrical and Spherical Coordinates; 3.4 Some Approximate Solutions of the Diffusion Equation; 3.4.1 Film Model [6]; 3.4.2 Penetration Model; 3.4.3 Surface Renewal Model; Example 3.1; Solution; 3.5 Physical Interpretation of Some Important Dimensionless Numbers 3.5.1 Reynolds Number3.5.2 Prandtl Number and Schmidt Number; 3.5.3 Nusselt Number; 3.5.4 Sherwood Number; 3.5.5 Dimensionless Numbers Commonly Used in Heat and Mass Transfer; Example 3.2; Solution; 3.6 Dimensional Analysis; 3.6.1 Principle of Similitude and Dimensional Homogeneity; 3.6.2 Finding Dimensionless Numbers and Pi Theorem; References; 4 Mass Transfer in a Laminar Boundary Layer; 4.1 Velocity Boundary Layer; 4.1.1 Boundary Layer Equation; 4.1.2 Similarity Transformation; 4.1.3 Integral Form of the Boundary Layer Equation; 4.1.4 Friction Factor
4.2 Temperature and Concentration Boundary Layers4.2.1 Temperature and Concentration Boundary Layer Equations; 4.2.2 Integral Form of Thermal and Concentration Boundary Layer Equations; Example 4.1; Solution; 4.3 Numerical Solutions of the Boundary Layer Equations; 4.3.1 Quasi-Linearization Method; 4.3.2 Correlation of Heat and Mass Transfer Rates; Example 4.2; Solution; 4.4 Mass and Heat Transfer in Extreme Cases; 4.4.1 Approximate Solutions for Mass Transfer in the Case of Extremely Large Schmidt Numbers
4.4.2 Approximate Solutions for Heat Transfer in the Case of Extremely Small Prandtl Numbers [6]

Sommario/riassunto

This didactic approach to the principles and modeling of mass transfer as it is needed in modern industrial processes is unique in combining a step-by-step introduction to all important fundamentals with the most recent applications. Based upon the renowned author's successful new modeling method as used for the O-18 process, the exemplary exercises included in the text are fact-proven, taken directly from existing chemical plants.Fascinating reading for chemists, graduate students, chemical and process engineers, as well as thermodynamics physicists.