Analysis Transport Phenomena Chemical Engineering

Transport Phenomena in Multiphase FlowsIntroduction to Transport PhenomenaTransport PhenomenaSelected Topics in Transport PhenomenaEnvironmental Transport PhenomenaTransport Phenomena in Micro Process EngineeringTransport PhenomenaTransport PhenomenaAdvanced Transport PhenomenaSelected Topics in transport phenomenaTransport PhenomenaTransport PhenomenaTransport Phenomena FundamentalsTransport Processes in Chemically Reacting Flow SystemsModelling in Transport PhenomenaIntroductory Transport PhenomenaA Modern Course in Transport PhenomenaTransport PhenomenaTransport Phenomena for EngineersTransport Phenomena of Foods and Biological Materials Roberto Mauri William J. Thomson R. Byron Bird American Institute of Chemical Engineers A. Eduardo Saez Norbert Kockmann Robert S. Brodkey Robert S. Brodkey John C. Slattery Robert Byron Bird W. J. Beek Robert S. Brodkey Joel L. Plawsky Daniel E. Rosner Ismail Tosun R. Byron Bird David C. Venerus Larry A. Glasgow Louis Theodore Vassilis Gekas

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this textbook provides a thorough presentation of the phenomena related to the transport of mass momentum and energy it lays all the basic physical principles then for the more advanced readers it offers an in depth treatment with advanced mathematical derivations and ends with some useful applications of the models and equations in specific settings the important idea behind the book is to unify all types of transport phenomena describing them within a common framework in terms of cause and effect respectively represented by the driving force and the flux of the transported quantity the approach and presentation are original in that the book starts with a general description of transport processes providing the macroscopic balance relations of fluid dynamics and heat and mass transfer before diving into the mathematical realm of continuum mechanics to derive the microscopic governing equations at the microscopic level the book is a modular teaching tool and can be used either for an introductory or for an advanced graduate course the last 6 chapters will be of interest to more advanced researchers who might be interested in particular applications in physics mechanical engineering or biomedical engineering all chapters are complemented with exercises that are essential to complete the learning process

professor william j thomson emphasizes the formulation of differential equations to describe physical problems helping readers understand what they are doing and why the solutions are either simple separable linear second order or derivable with a differential equation solver book jacket

the market leading transport phenomena text has been revised authors bird stewart and lightfoot have revised transport phenomena to include deeper and more extensive coverage of heat transfer enlarged discussion of dimensional analysis a new chapter on flow of polymers systematic discussions of convective momentum energy and mass transport and transport in two phase systems if this is your first look at transport phenomena you ll quickly learn that its balanced introduction to the subject of transport phenomena is the foundation of its long standing success about the revised 2nd edition since the appearance of the second edition in 2002 the authors and numerous readers have found a number of errors some major and some minor in the revised 2nd edition the authors have endeavored to correct these errors a new isbn has been assigned to the revised 2nd edition in order to more easily identify the most correct version for bird s corrigenda please click here and see transport phenomena in the books

section

this book offers a detailed yet accessible introduction to transport phenomena it begins by explaining the underlying principles and mechanisms that govern mass transport and continues by tackling practical problems spanning all subdisciplines of environmental science and chemical engineering assuming some knowledge of ordinary differential equations and a familiarity with basic fluid mechanics applications this classroom tested text addresses mass conservation and macroscopic mass balances placing a special emphasis on applications to environmental processes and presenting a mathematical framework for formulating and solving transport phenomena problems

in this book the fundamentals of chemical engineering are presented aiming to applications in micro system technology microfluidics and transport processes within microstructures after a general overview on both disciplines and common areas recent projects are shortly presented the combination of different disciplines gives new opportunities in microfluidic devices and process intensification respectively special features of the book are the state of the art in micro process engineering a detailed treatment of transport phenomena for engineers a design methodology from transport effects to economic considerations a detailed treatment of chemical reaction in continuous flow microstructured reactors an engineering methodology to treat complex processes the book addresses researchers and graduate students in the field of chemical engineering microsystems engineering and chemistry

this book teaches the basic equations of transport phenomena in a unified manner and uses the analogy between heat transfer and mass and momentum to explain the more difficult concepts part i covers the basic concepts in transport phenomena part ii covers applications in greater detail part iii deals with the transport properties the three transport phenomena heat mass and momentum transfer are treated in depth through simultaneous or parallel developments transport properties such as viscosity thermal conductivity and mass diffusion coefficient are introduced in a simple manner early on and then applied throughout the rest of the book advanced discussion is provided separately an entire chapter is devoted to the crucial material of non newtonian phenomena this book covers heat transfer as it pertains to transport phenomena and covers mass transfer as it relates to the analogy with heat and

momentum the book includes a complete treatment of fluid mechanics for ch e s the treatment begins with newton s law and including laminar flow turbulent flow fluid statics boundary layers flow past immersed bodies and basic and advanced design in pipes heat exchanges and agitation vessels this text is the only one to cover modern agitation design and scale up thoroughly the chapter on turbulence covers not only traditional approaches but also includes the most contemporary concepts of the transition and of coherent structures in turbulence the book includes an extensive treatment of fluidization computer programs and numerical methods are integrated throughout the text especially in the example problems

part ii covers applications in greater detail the three transport phenomena heat mass and momentum transfer are treated in depth through simultaneous or parallel developments

the term transport phenomena describes the fundamental processes of momentum energy and mass transfer the author provides a thorough discussion of transport phenomena laying the foundation for understanding a wide variety of operations used by chemical engineers the book is arranged in three parallel parts covering the major topics of momentum energy and mass transfer each part begins with the theory followed by illustrations of the way the theory can be used to obtain fairly complete solutions and concludes with the four most common types of averaging used to obtain approximate solutions a broad range of technologically important examples as well as numerous exercises are provided throughout the text based on the author s extensive teaching experience a suggested lecture outline is also included this book is intended for first year graduate engineering students it will be an equally useful reference for researchers in this field solutions manual available

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the fourth edition of transport phenomena fundamentals continues with its streamlined approach to the subject based on a unified treatment of heat mass and momentum transport using a balance equation approach the new edition includes more worked examples within each chapter and adds confidence building problems at the end of each chapter some numerical solutions are included in an appendix for students to check their comprehension of key concepts additional resources online include exercises that can be practiced using a wide

range of software programs available for simulating engineering problems such as comsol maple fluent aspen mathematica python and matlab lecture notes and past exams this edition incorporates a wider range of problems to expand the utility of the text beyond chemical engineering the text is divided into two parts which can be used for teaching a two term course part i covers the balance equation in the context of diffusive transport momentum energy mass and charge each chapter adds a term to the balance equation highlighting that term s effects on the physical behavior of the system and the underlying mathematical description chapters familiarize students with modeling and developing mathematical expressions based on the analysis of a control volume the derivation of the governing differential equations and the solution to those equations with appropriate boundary conditions part ii builds on the diffusive transport balance equation by introducing convective transport terms focusing on partial rather than ordinary differential equations the text describes paring down the full microscopic equations governing the phenomena to simplify the models and develop engineering solutions and it introduces macroscopic versions of the balance equations for use where the microscopic approach is either too difficult to solve or would yield much more information that is actually required the text discusses the momentum bernoulli energy and species continuity equations including a brief description of how these equations are applied to heat exchangers continuous contactors and chemical reactors the book introduces the three fundamental transport coefficients the friction factor the heat transfer coefficient and the mass transfer coefficient in the context of boundary layer theory laminar flow situations are treated first followed by a discussion of turbulence the final chapter covers the basics of radiative heat transfer including concepts such as blackbodies graybodies radiation shields and enclosures

transport processes in chemically reacting flow systems discusses the role in chemically reacting flow systems of transport processes particularly the transport of momentum energy and chemical species mass in fluids gases and liquids the principles developed and often illustrated here for combustion systems are important not only for the rational design and development of engineering equipment e g chemical reactors heat exchangers mass exchangers but also for scientific research involving coupled transport processes and chemical reaction in flow systems the book begins with an introduction to transport processes in chemically reactive systems separate chapters cover momentum energy and mass transport these chapters

develop state and exploit useful quantitative analogies between these transport phenomena including interrelationships that remain valid even in the presence of homogeneous or heterogeneous chemical reactions a separate chapter covers the use of transport theory in the systematization and generalization of experimental data on chemically reacting systems the principles and methods discussed are then applied to the preliminary design of a heat exchanger for extracting power from the products of combustion in a stationary fossil fuel fired power plant the book has been written in such a way as to be accessible to students and practicing scientists whose background has until now been confined to physical chemistry classical physics and or applied mathematics

modelling in transport phenomena a conceptual approach aims to show students how to translate the inventory rate equation into mathematical terms at both the macroscopic and microscopic levels the emphasis is on obtaining the equation representing a physical phenomenon and its interpretation the book begins with a discussion of basic concepts and their characteristics it then explains the terms appearing in the inventory rate equation including rate of input and rate of output the rate of generation in transport of mass momentum and energy is also described subsequent chapters detail the application of inventory rate equations at the macroscopic and microscopic levels this book is intended as an undergraduate textbook for an introductory transport phenomena course in the junior year it can also be used in unit operations courses in conjunction with standard textbooks although it is written for students majoring in chemical engineering it can also serve as a reference or supplementary text in environmental mechanical petroleum and civil engineering courses

introductory transport phenomena by r byron bird warren e stewart edwin n lightfoot and daniel klingenberg is a new introductory textbook based on the classic bird stewart lightfoot text transport phenomena the authors goal in writing this book reflects topics covered in an undergraduate course some of the rigorous topics suitable for the advanced students have been retained the text covers topics such as the transport of momentum the transport of energy and the transport of chemical species the organization of the material is similar to bird stewart lightfoot but presentation has been thoughtfully revised specifically for undergraduate students encountering these concepts for the first time devoting more space to mathematical derivations and providing fuller explanations of mathematical developments including a

section of the appendix devoted to mathematical topics allows students to comprehend transport phenomena concepts at an undergraduate level

integrating nonequilibrium thermodynamics and kinetic theory this unique text presents a novel approach to the subject of transport phenomena

enables readers to apply transport phenomena principles to solve advanced problems in all areas of engineering and science this book helps readers elevate their understanding of and their ability to apply transport phenomena by introducing a broad range of advanced topics as well as analytical and numerical solution techniques readers gain the ability to solve complex problems generally not addressed in undergraduate level courses including nonlinear multidimensional transport and transient molecular and convective transport scenarios avoiding rote memorization the author emphasizes a dual approach to learning in which physical understanding and problem solving capability are developed simultaneously moreover the author builds both readers interest and knowledge by demonstrating that transport phenomena are pervasive affecting every aspect of life offering historical perspectives to enhance readers understanding of current theory and methods providing numerous examples drawn from a broad range of fields in the physical and life sciences and engineering contextualizing problems in scenarios so that their rationale and significance are clear this text generally avoids the use of commercial software for problem solutions helping readers cultivate a deeper understanding of how solutions are developed references throughout the text promote further study and encourage the student to contemplate additional topics in transport phenomena transport phenomena is written for advanced undergraduates and graduate students in chemical and mechanical engineering upon mastering the principles and techniques presented in this text all readers will be better able to critically evaluate a broad range of physical phenomena processes and systems across many disciplines

transport phenomena of foods and biological materials provides comprehensive coverage of transport phenomena modeling in foods and other biological materials the book is unique in its consideration of models ranging from rigorous mathematical to empirical approaches including phenomenological and semi empirical models it examines cell structure and descriptions of other non traditional models such as those based on irreversible

thermodynamics or those focused on the use of the chemical and electrochemical potential as the driving forces of transport other topics discussed include the source term important for the coupling transport phenomena reaction or other intentional unintentional phenomena and the connections between transport phenomena modeling and design aspects some 100 tables provide useful summaries of the characteristics of each model and provide data about the transport properties of an extensive variety of foods transport phenomena of foods and biological materials will benefit a broad audience of chemists biochemists biotechnologists and other scientists in the academic and industrial realm of foods and biological materials

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