Chemical Reaction Engineering And Reactor Technology

An Introduction to Chemical Engineering Kinetics & Reactor DesignNuclear Reactor EngineeringChemical Reaction Engineering and Reactor TechnologyChemical Reaction Engineering and Reactor Technology, Second EditionNuclear Reactor EngineeringIntroduction to Chemical Engineering Kinetics and Reactor DesignTrickle Bed ReactorsChemical Reactor Analysis and Applications for the Practicing EngineerNuclear reactor engineeringNuclear Reactor EngineeringIntroduction to Chemical Reactor Analysis, Second EditionA Guide to Chemical Engineering Reactor Design and KineticsNuclear Reactor Physics and EngineeringNuclear Reactor Engg., 4e Vol. II : Reactor Systems EngineeringThe Chemical Reactor from Laboratory to Industrial PlantReactor and Process Design in Sustainable Energy TechnologyNuclear Engineering FundamentalsChemical Reaction Engineering and Reactor TechnologyFundamentals of Nuclear EngineeringAn Introduction to the Engineering of Fast Nuclear Reactors Charles G. Hill Samuel Glasstone Tapio O. Salmi Jyri-Pekka Mikkola Samuel Glasstone Charles G. Hill Vivek V. Ranade Louis Theodore Samuel Glasstone (Sesonske, Alexander) Samuel Glasstone R.E. Hayes Gael D. Ulrich John C. Lee Glasstone/sesonske Elio Santacesaria Fan Shi Robert E. Masterson Tapio Salmi Brent J. Lewis Anthony M. Judd

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Nuclear Reactors *Charles G. Hill Samuel Glasstone Tapio O. Salmi Jyri-Pekka Mikkola Samuel Glasstone Charles G. Hill Vivek V. Ranade Louis Theodore Samuel Glasstone (Sesonske, Alexander) Samuel Glasstone R.E. Hayes Gael D. Ulrich John C. Lee Glasstone/sesonske Elio Santacesaria Fan Shi Robert E. Masterson Tapio Salmi Brent J. Lewis Anthony M. Judd*

dr samuel glasstone the senior author of the previous editions of this book was anxious to live until his ninetieth birthday but passed away in 1986 a few months short of this milestone i am grateful for the many years of stimulation received during our association and in preparing this edition have attempted to maintain his approach previous editions of this book were intended to serve as a text for students and a reference for practicing engineers emphasis was given to the broad perspective particularly for topics important to reactor design and oper ation with basic coverage provided in such supporting areas as neutronics thermal hydraulics and materials this the fourth edition was prepared with these same general objectives in mind however during the past three decades the nuclear industry and university educational programs have matured considerably presenting some challenges in meeting the objec tives of this book nuclear power reactors have become much more complex with an ac companying growth in supporting technology university programs now offer separate courses covering such basic topics as reactor physics thermal hydraulics and materials finally the general availability of inexpensive xv xvi preface powerful micro and minicomputers has transformed design and analysis procedures so that sophisticated methods are now commonly used instead of earlier more approximate approaches

the role of the chemical reactor is crucial for the industrial conversion of raw materials into products and numerous factors must be considered when selecting an appropriate and efficient chemical reactor chemical reaction engineering and reactor technology defines the qualitative aspects that affect the selection of an industrial chemical reactor and couples various reactor models to case specific kinetic expressions for chemical processes offering a systematic development of the chemical reaction engineering concept this volume explores essential stoichiometric kinetic and thermodynamic terms needed in the analysis of chemical reactors homogeneous and heterogeneous reactors residence time distributions and non ideal flow conditions in industrial reactors solutions of algebraic and ordinary differential equation systems gas and liquid phase diffusion coefficients and gas film coefficients correlations for gas liquid systems solubilities of gases in liquids guidelines for

laboratory reactors and the estimation of kinetic parameters the authors pay special attention to the exact formulations and derivations of mass energy balances and their numerical solutions richly illustrated and containing exercises and solutions covering a number of processes from oil refining to the development of specialty and fine chemicals the text provides a clear understanding of chemical reactor analysis and design

the role of the chemical reactor is crucial for the industrial conversion of raw materials into products and numerous factors must be considered when selecting an appropriate and efficient chemical reactor chemical reaction engineering and reactor technology defines the qualitative aspects that affect the selection of an industrial chemical reactor and couples various reactor models to case specific kinetic expressions for chemical processes thoroughly revised and updated this much anticipated second edition addresses the rapid academic and industrial development of chemical reaction engineering offering a systematic development of the chemical reaction engineering concept this volume explores essential stoichiometric kinetic and thermodynamic terms needed in the analysis of chemical reactors homogeneous and heterogeneous reactors reactor optimization aspects residence time distributions and non ideal flow conditions in industrial reactors solutions of algebraic and ordinary differential equation systems gas and liquid phase diffusion coefficients and gas film coefficients correlations for gas liquid systems solubilities of gases in liquids guidelines for laboratory reactors and the estimation of kinetic parameters the authors pay special attention to the exact formulations and derivations of mass energy balances and their numerical solutions richly illustrated and containing exercises and solutions covering a number of processes from oil refining to the development of specialty and fine chemicals the text provides a clear understanding of chemical reactor analysis and design

the second edition features new problems that engage readers in contemporary reactor design highly praised by instructors students and chemical engineers introduction to chemical engineering kinetics reactor design has been extensively revised and updated in this second edition the text continues to offer a solid background in chemical reaction kinetics as well as in material and energy balances preparing readers with the foundation necessary for success in the design of chemical reactors moreover it reflects not only the basic engineering science but also the mathematical tools used by today s engineers to solve problems associated with the design of chemical reactors introduction to chemical engineering kinetics reactor

design enables readers to progressively build their knowledge and skills by applying the laws of conservation of mass and energy to increasingly more difficult challenges in reactor design the first one third of the text emphasizes general principles of chemical reaction kinetics setting the stage for the subsequent treatment of reactors intended to carry out homogeneous reactions heterogeneous catalytic reactions and biochemical transformations topics include thermodynamics of chemical reactions determination of reaction rate expressions elements of heterogeneous catalysis basic concepts in reactor design and ideal reactor models temperature and energy effects in chemical reactors basic and applied aspects of biochemical transformations and bioreactors about 70 of the problems in this second edition are new these problems frequently based on articles culled from the research literature help readers develop a solid understanding of the material many of these new problems also offer readers opportunities to use current software applications such as mathcad and matlab by enabling readers to progressively build and apply their knowledge the second edition of introduction to chemical engineering kinetics reactor design remains a premier text for students in chemical engineering and a valuable resource for practicing engineers

this book provides a hybrid methodology for engineering of trickle bed reactors by integrating conventional reaction engineering models with state of the art computational flow models the content may be used in several ways and at various stages in the engineering process it may be used as a basic resource for making appropriate reactor engineering decisions in practice as study material for a course on reactor design operation or optimization of trickle bed reactors or in solving practical reactor engineering problems the authors assume some background knowledge of reactor engineering and numerical techniques facilitates development of high fidelity models for industrial applications facilitates selection and application of appropriate models guides development and application of computational models to trickle beds

this books format follows an applications oriented text and serves as a training tool for individuals in education and industry involved directly or indirectly with chemical reactors it addresses both technical and calculational problems in this field while this text can be complimented with texts on chemical kinetics and or reactor design it also stands alone as a self teaching aid the first part serves as an introduction to the subject title and contains chapters dealing with history process variables basic operations kinetic principles and conversion variables the second part of the book addresses traditional reactor analysis chapter topics include batch cstrs tubular flow reactors plus a comparison of these classes of reactors part 3 keys on reactor

applications that include non ideal reactors thermal effects interpretation of kinetic data and reactor design the book concludes with other reactor topics chapter titles include catalysis catalytic reactors other reactions and reactors and abet related topics an extensive appendix is also included

economic and regulatory pressures have yielded considerable progress in the science and technology of nuclear reactor design this practical reference has been revised and updated to include the latest engineering and operational developments and the likely course of future trends

introduction to chemical reactor analysis second edition introduces the basic concepts of chemical reactor analysis and design an important foundation for understanding chemical reactors which play a central role in most industrial chemical plants the scope of the second edition has been significantly enhanced and the content reorganized for improved pedagogical value containing sufficient material to be used as a text for an undergraduate level two term course this edition also contains five new chapters on catalytic reaction engineering written so that newcomers to the field can easily progress through the topics this text provides sufficient knowledge for readers to perform most of the common reaction engineering calculations required for a typical practicing engineer the authors introduce kinetics reactor types and commonly used terms in the first chapter subsequent chapters cover a review of chemical engineering thermodynamics mole balances in ideal reactors for three common reactor types energy balances in ideal reactors and chemical reaction kinetics the text also presents an introduction to nonideal reactors and explores kinetics and reactors in catalytic systems the book assumes that readers have some knowledge of thermodynamics numerical methods heat transfer and fluid flow the authors include an appendix for numerical methods which are essential to solving most realistic problems in chemical reaction engineering they also provide numerous worked examples and additional problems in each chapter given the significant number of chemical engineers involved in chemical process plant operation at some point in their careers this book offers essential training for interpreting chemical reactor performance and improving reactor operation what s new in this edition five new chapters on catalytic reaction engineering including various catalytic reactions and kinetics transport processes and experimental methods expanded coverage of adsorption additional worked problems reorganized material

essential guide to analyzing nuclear energy systems with focus on reactor physics fuel cycle system dynamics thermal hydraulics and economics nuclear reactor physics and

engineering highlights efforts in utilizing low enrichment uranium fuel as a substitute for carbon based fuels in energy generation and provides an overview of important aspects of nuclear reactor physics utilizing the neutron diffusion equation for major reactor designs and matlab software for system analysis with exercises illustrating key points and design parameters as supplementary material this revised and updated second edition reflects key findings of the 2023 national academy of sciences nas report and discusses physical and engineering characteristics of advanced nuclear reactors especially in the form of small modular reactors that have the potential to provide enhanced safety and economics as well as effective long term management of used nuclear fuel in geological repositories key topics explored in the updated edition of nuclear reactor physics and engineering include impact of the use of high assay low enrichment uranium haleu fuel as a new efficient nuclear fuel advantages resulting from combined uses of light water reactor and sodium cooled fast reactor with fuel reprocessing fundamental nuclear reactor physics nuclear reactor system analysis and lattice physics analysis for reactor cores nuclear fuel cycle analysis nuclear plant simulation and control and management of used nuclear fuel economic analysis of nuclear electricity and thermal hydraulic analysis of nuclear systems with a wealth of all new information detailing the state of the art in the field nuclear reactor physics and engineering is an invaluable reference on the subject for undergraduate and graduate students in nuclear engineering as well as practicing engineers involved with nuclear power plants

this graduate textbook written by a former lecturer addresses industrial chemical reaction topics focusing on the commercial scale exploitation of chemical reactions it introduces 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 it starts by discussing simple ideas before moving on to more advanced concepts with the support of numerous case studies many simple and advanced exercises are present in each chapter and the detailed matlab code for their solution is available to the reader as supplementary material on springer website it is written for msc chemical engineering students and novice researchers working in industrial laboratories

reactor process design in sustainable energy technology compiles and explains current developments in reactor and process design in sustainable energy technologies including optimization and scale up methodologies and numerical

methods sustainable energy technologies that require more efficient means of converting and utilizing energy can help provide for burgeoning global energy demand while reducing anthropogenic carbon dioxide emissions associated with energy production the book contributed by an international team of academic and industry experts in the field brings numerous reactor design cases to readers based on their valuable experience from lab r d scale to industry levels it is the first to emphasize reactor engineering in sustainable energy technology discussing design it provides comprehensive tools and information to help engineers and energy professionals learn design and specify chemical reactors and processes confidently emphasis on reactor engineering in sustainable energy technology up to date overview of the latest reaction engineering techniques in sustainable energy topics expert accounts of reactor types processing and optimization figures and tables designed to comprehensively present concepts and procedureshundreds of citations drawing on many most recent and previously published works on the subject

nuclear engineering fundamentals is the most modern up to date and reader friendly nuclear engineering textbook on the market today it provides a thoroughly modern alternative to classical nuclear engineering textbooks that have not been updated over the last 20 years printed in full color it conveys a sense of awe and wonder to anyone interested in the field of nuclear energy it discusses nuclear reactor design nuclear fuel cycles reactor thermal hydraulics reactor operation reactor safety radiation detection and protection and the interaction of radiation with matter it presents an in depth introduction to the science of nuclear power nuclear energy production the nuclear chain reaction nuclear cross sections radioactivity and radiation transport all major types of reactors are introduced and discussed and the role of internet tools in their analysis and design is explored reactor safety and reactor containment systems are explored as well to convey the evolution of nuclear science and engineering historical figures and their contributions to evolution of the nuclear power industry are explored numerous examples are provided throughout the text and are brought to life through life like portraits photographs and colorful illustrations the text follows a well structured pedagogical approach and provides a wide range of student learning features not available in other textbooks including useful equations numerous worked examples and lists of key web resources as a bonus a complete solutions manual and pdf slides of all figures are available to qualified instructors who adopt the text more than any other fundamentals book in a generation it is student friendly and truly impressive in its design and its scope it can be used for a one semester a two semester or a three semester course in the fundamentals of nuclear

power it can also serve as a great reference book for practicing nuclear scientists and engineers to date it has achieved the highest overall satisfaction of any mainstream nuclear engineering textbook available on the market today

fundamental of nuclear engineering is derived from over 25 years of teaching undergraduate and graduate courses on nuclear engineering the material has been extensively class tested and provides the most comprehensive textbook and reference on the fundamentals of nuclear engineering it includes a broad range of important areas in the nuclear engineering field nuclear and atomic theory nuclear reactor physics design control dynamics safety and thermal hydraulics nuclear fuel engineering and health physics radiation protection it also includes the latest information that is missing in traditional texts such as space radiation the aim of the book is to provide a source for upper level undergraduate and graduate students studying nuclear engineering

an invaluable resource for both graduate level engineering students and practising nuclear engineers who want to expand their knowledge of fast nuclear reactors the reactors of the future this book is a concise yet comprehensive introduction to all aspects of fast reactor engineering it covers topics including neutron physics neutron flux spectra flux distribution doppler and coolant temperature coefficients the performance of ceramic and metal fuels under irradiation structural changes and fission product migration the effects of irradiation and corrosion on structural materials irradiation swelling heat transfer in the reactor core and its effect on core design coolants including sodium and lead bismuth alloy coolant circuits pumps heat exchangers and steam generators and plant control the book includes new discussions on lead alloy and gas coolants metal fuel the use of reactors to consume radioactive waste and accelerator driven subcritical systems

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