

Combustion Science Engineering Book

This comprehensive handbook presents recent research results on combustion theory. Contributors from both industry and academia present the state of knowledge on flame properties. Includes a review of combustion chemistry and measurement techniques; discusses heterogeneous and homogeneous combustion.

Chemical propulsion comprises the science and technology of using chemical reactions of any kind to create thrust and thereby propel a vehicle or object to a desired acceleration and speed. This book focuses on recent advances in the design of very highly efficient, low-pollution-emitting propulsion systems, as well as advances in testing, diagnostics and analysis. It offers unique coverage of Pulse Detonation Engines, which add tremendous power to jet thrust by combining high pressure with ignition of the air/fuel mixture. Readers will learn about the advances in the reduction of jet noise and toxic fuel emissions—something that is being heavily regulated by relevant government agencies. * Lead editor is one of the world's foremost combustion researchers, with contributions from some of the world's leading researchers in combustion engineering * Covers all major areas of chemical propulsion—from combustion measurement, analysis and simulation, to advanced control of combustion processes, to noise and emission control * Includes important information on advanced technologies for reducing jet engine noise and hazardous fuel combustion emissions

This text, by a leading authority in the field, presents a fundamental and factual development of the science and engineering underlying the design of combustion engines and turbines. An extensive illustration program supports the concepts and theories discussed.

Progress in Astronautics and Aeronautics—Volume 15: Heterogeneous Combustion focuses on the processes, reactions, methodologies, and techniques involved in heterogeneous combustion. The selection first offers information on the techniques for the study of combustion of beryllium and aluminum particles, study of quenched aluminum particle combustion, and spectroscopic investigation of metal combustion. Discussions focus on the combustion of metal particles in a hot oxidizing atmosphere, experimental apparatus and procedure, selected examples of residue observations, ignition of beryllium, and photographic study of particle combustion. The text then takes a look at the analytical developments, experimental observations in oxygen atmospheres, and experimental observations in carbon dioxide atmospheres of vapor-phase diffusion flames in the combustion of magnesium and aluminum. The publication ponders on the combustion of elemental boron with fluorine, combustion of pyrolytic boron nitride, characteristics of diborane flames, oxidation of diethyldiborane, and reaction of pentaborane and hydrazine and structure of the adduct. The selection is a dependable reference for readers interested in

heterogeneous combustion.

Industry relies heavily on the combustion process. The already high demand for energy, primarily from combustion, is expected to continue to rapidly increase. Yet, the information is scattered and incomplete, with very little attention paid to the overall combustion system. Designed for practicing engineers, *Heat Transfer in Industrial Combustion*

The utilisation of biomass is increasingly important for low- or zero-carbon power generation. Developments in conventional power plant fuel flexibility allow for both direct biomass combustion and co-firing with fossil fuels, while the integration of advanced technologies facilitates conversion of a wide range of biomass feedstocks into more readily combustible fuel. *Biomass combustion science, technology and engineering* reviews the science and technology of biomass combustion, conversion and utilisation. Part one provides an introduction to biomass supply chains and feedstocks, and outlines the principles of biomass combustion for power generation. Chapters also describe the categorisation and preparation of biomass feedstocks for combustion and gasification. Part two goes on to explore biomass combustion and co-firing, including direct combustion of biomass, biomass co-firing and gasification, fast pyrolysis of biomass for the production of liquids and intermediate pyrolysis technologies. Large-scale biomass combustion and biorefineries are then the focus of part three. Following an overview of large-scale biomass combustion plants, key engineering issues and plant operation are discussed, before the book concludes with a chapter looking at the role of biorefineries in increasing the value of the end-products of biomass conversion. With its distinguished editor and international team of expert contributors, *Biomass combustion science, technology and engineering* provides a clear overview of this important area for all power plant operators, industrial engineers, biomass researchers, process chemists and academics working in this field. *Reviews the science and technology of biomass combustion, conversion and utilisation Provides an introduction to biomass supply chains and feedstocks and outlines the principles of biomass combustion for power generation Describes the categorisation and preparation of biomass feedstocks for combustion and gasification*

Combustion Engineering & Gas Utilisation is a practical guide to sound engineering practice for engineers from industry and commerce responsible for the selection, installation, designing and maintenance of efficient and safe gas fired heating equipment.

This book provides an introduction to understanding combustion, the burning of a substance that produces heat and often light, in microgravity environments-i.e., environments with very low gravity such as outer space. Readers are presented with a compilation of worldwide findings from fifteen years of research and experimental tests in various low-gravity environments, including drop towers, aircraft, and space. *Microgravity Combustion* is unique in that no other book reviews low- gravity combustion research in such a comprehensive manner. It

provides an excellent introduction for those researching in the fields of combustion, aerospace, and fluid and thermal sciences. * An introduction to the progress made in understanding combustion in a microgravity environment * Experimental, theoretical and computational findings of current combustion research * Tutorial concepts, such as scaling analysis * Worldwide microgravity research findings

Fuel Property Estimation and Combustion Process Characterization is a thorough tool book, which provides readers with the most up-to-date, valuable methodologies to efficiently and cost-effectively attain useful properties of all types of fuels and achieve combustion process characterizations for more efficient design and better operation. Through extensive experience in fuels and combustion, Kiang has developed equations and methodologies that can readily obtain reasonable properties for all types of fuels (including wastes and biomass), which enable him to provide guidance for designers and operators in the combustion field, in order to ensure the design, operation, and diagnostics of all types of combustion systems are of the highest quality and run at optimum efficiency. Written for professionals and researchers in the renewable energy, combustion, chemical, and mechanical engineering fields, the information in this book will equip readers with detailed guidance on how to reliably obtain properties of fuels quickly for the design, operation and diagnostics of combustion systems to achieve highly efficient combustion processes. Presents models for quick estimation of fuel properties without going through elaborate, costly and time consuming sampling and laboratory testing Offers methodologies to determine combustion process characteristics for designing and deploying combustion systems Examines the fundamentals of combustion applied to energy systems, including thermodynamics of traditional and alternative fuels combustion Presents a fuel property database for over 1400 fuels Includes descriptive application of big data technology, using dual properties analysis as an example Provides specific technical solutions for combustion, fuels and waste processing

Self-Propagating High-Temperature Synthesis of Materials is a collection of papers that reflects modern trends in self-propagating, high-temperature synthesis (SHS), a process for synthesis of modern materials carried out in the mode of autowave solid-flame combustion. To date, SHS-produced materials have found their application in different branches of modern science and technology, mechanical engineering, ferrous and nonferrous metallurgy, aerospace engineering, chemical industry, electrical engineering, and electronics. This book is useful not only for the SHS community, but also for researchers and engineers who are active in the following related fields of knowledge; theory and practice of combustion, materials science and technology, pure and applied chemistry, and metallurgy.

This book elucidates the concepts and innovative models around prospective developments with respect to combustion science and engineering. Combustion

refers to a series of exothermic redox chemical reactions between fuel and oxidant which results in production of heat, light and energy. Combustion engineering deals with applying the rules of science and engineering in order to form solutions for problems related to combustion and fire, in various fields. Combustion engineering is used in cars, gas ovens, fossil fuel power plants, steam engines, etc. This book includes topics that are of utmost significance and bound provide incredible insights to readers. Different approaches, evaluations, methodologies and advanced studies on this subject have been included in this text. Scientists, engineers, researchers, students and all related to this field will benefit alike from this text.

This graduate-level 2006 text incorporates these advances in a comprehensive treatment of the fundamental principles of combustion physics. The presentation emphasises analytical proficiency and physical insight, with the former achieved through complete, though abbreviated, derivations at different levels of rigor, and the latter through physical interpretations of analytical solutions, experimental observations, and computational simulations. Exercises are mostly derivative in nature in order to further strengthen the student's mastery of the theory.

Implications of the fundamental knowledge gained herein on practical phenomena are discussed whenever appropriate. These distinguishing features provide a solid foundation for an academic program in combustion science and engineering.

Combustion Emissions: Formation, Reaction, and Removal of Trace Metals in Combustion Products presents the latest scientific knowledge on combustion, with a particular focus on the behavior of elements in this high temperature method of energy generation. The book describes methods of control and establishes a solid base of understanding for future research. Encyclopedic in style and consistent in format, each chapter systematically presents a complete analysis of the combustion behavior of each element and guides the reader in resolving specific problems. This includes source levels in fuels and fuel usage, emission and pollutant release into the environment and environmental effects, and more. Societal impacts and environmental concerns are considered throughout, highlighting sustainability aspects across a diverse range of applications, such as within power plants, automobiles and propulsion. Presents the latest research in a very systematic way Includes methods of control and establishes a base of understanding for future research in energy systems Analyzes the individual behavior of 34 elements, considering their chemistry, nature and environmental impacts

Lean Combustion: Technology and Control, Second Edition outlines and explains the latest advances in lean combustion technology and systems. Combustion under sufficiently fuel-lean conditions can have the desirable attributes of high efficiency and low emissions. The book offers readers both the fundamentals and latest developments in how lean burn (broadly defined) can increase fuel economy and decrease emissions, while still achieving desired power output and

performance. This volume brings together research and design of lean combustion systems across the technology spectrum in order to explore the state-of-the-art in lean combustion. Readers will learn about advances in the understanding of ultra-lean fuel mixtures and how new types of burners and approaches to managing heat flow can reduce problems often found with lean combustion (such as slow, difficult ignition and frequent flame extinction). This book offers abundant references and examples of real-world applications. New to this edition are significantly revised chapters on IC engines and stability/oscillations, and new case studies and examples. Written by a team of experts, this contributed reference book aims to teach its reader to maximize efficiency and minimize both economic and environmental costs. Presents a comprehensive collection of lean burn technology across potential applications, allowing readers to compare and contrast similarities and differences Provides an extensive update on IC engines including compression ignition (diesel), spark ignition, and homogeneous charge compression ignition (HCCI) Includes an extensive revision to the Stability/Oscillations chapter Includes use of alternative fuels such as biogas and hydrogen for relevant technologies Covers new developments in lean combustion using high levels of pre-heat and heat recirculating burners, as well as the active control of lean combustion instabilities Bridging the gap between theory and application, this reference demonstrates the operational mechanisms, modeling, and simulation of equipment for the combustion and gasification of solid fuels. Solid Fuels Combustion and Gasification: Modeling, Simulation, and Equipment Operation clearly illustrates procedures to improve and optimize the de

This monograph focuses on the science of combustion, exploring its technological, social, and philosophical aspects. Presented here is a systematic overview of the field, with up-to-date treatments of topics of central importance: diffusion flames, deflagrations, detonations, flammability, and explosions. Special emphasis is given to turbulent combustion so that the many different approaches to this multifaceted subject can be exposed and categorized in a systematic manner. The author offers his projections for future developments, including identification of outstanding research areas. This book is a concise and penetrating overview of the field of combustion history and research, and will be of interest to motivated non-specialists interested in more than a facile exploration of the subject.

Numerical Prediction of Flow, Heat Transfer, Turbulence and Combustion: Selected Works of Professor D. Brian Spalding focuses on the many contributions of Professor Spalding on thermodynamics. This compilation of his works is done to honor the professor on the occasion of his 60th birthday. Relatively, the works contained in this book are selected to highlight the genius of Professor Spalding in this field of interest. The book presents various research on combustion, heat transfer, turbulence, and flows. His thinking on separated flows paved the way for the multi-dimensional modeling of turbulence. Arguments on

the universality of the models of turbulence and the problems that are associated with combustion engineering are clarified. The text notes the importance of combustion science as well as the problems associated with it. Mathematical computations are also presented in determining turbulent flows in different environments, including on curved pipes, curved ducts, and rotating ducts. These calculations are presented to further strengthen the claims of Professor Spalding in this discipline. The book is a great find for those who are interested in studying thermodynamics.

In recent years fire science has made rapid progress due to the increase in research on the subject. This book brings together state-of-the-art contributions on those aspects of fire within the engineering science of combustion. Written by leading experts, the book seeks to identify the role of fire in the spectrum of combustion science. Individual chapters address solid phase combustion, turbulent diffusion flames, and thermal plumes. The text then examines the consequences of fire occurring within an enclosure from ignition, through flashover, on to the fully developed phase. Using zonal and CFD methodologies with consideration for fire chemistry, the text also reviews the latest research in the numerical modelling of enclosure fires. This book will interest all those concerned with fire safety. In particular it will be of value for combustion scientists with an interest in fire and fire protection. Key Features * Presents a state-of-the-art treatise on fire science * Consolidates our current understanding of this very complex problem * Provides a solid foundation to a rapidly developing engineering profession * Includes applications of computer simulation to design and fire investigation

Fundamentals of Combustion Processes is designed as a textbook for an upper-division undergraduate and graduate level combustion course in mechanical engineering. The authors focus on the fundamental theory of combustion and provide a simplified discussion of basic combustion parameters and processes such as thermodynamics, chemical kinetics, ignition, diffusion and pre-mixed flames. The text includes exploration of applications, example exercises, suggested homework problems and videos of laboratory demonstrations

Sir Diarmuid Downs, CBE, FEng, FRS Engineering is about designing and making marketable artefacts. The element of design is what principally distinguishes engineering from science. The engineer is a creator. He brings together knowledge and experience from a variety of sources to serve his ends, producing goods of value to the individual and to the community. An important source of information on which the engineer draws is the work of the scientist or the scientifically minded engineer. The pure scientist is concerned with knowledge for its own sake and receives his greatest satisfaction if his experimental observations fit into an aesthetically satisfying theory. The applied scientist or engineer is also concerned with theory, but as a means to an end. He tries to devise a theory which will encompass the known experimental facts, both because an all embracing theory somehow serves as an extra validation of the

facts and because the theory provides us with new leads to further fruitful experimental investigation. I have laboured these perhaps rather obvious points because they are well exemplified in this present book. The first internal combustion engines, produced just over one hundred years ago, were very simple, the design being based on very limited experimental information. The current engines are extremely complex and, while the basic design of cylinder, piston, connecting rod and crankshaft has changed but little, the overall performance in respect of specific power, fuel economy, pollution, noise and cost has been absolutely transformed.

Coal Combustion Products (CCPs): Their Nature, Utilization and Beneficiation is a valuable resource for engineers and scientists from the coal, cement, concrete, and construction industries seeking an in-depth guide to the characteristics, utilization, beneficiation, and environmental impacts of coal combustion by-products. Researchers in universities working in this area will also find much to expand their knowledge. The book provides a detailed overview of the different waste materials produced during power generation from coal, exploring their nature, beneficiation techniques, applications, and environmental impacts. Strong focus is placed on coal fly ash, bottom ash, and flue gas desulfurization materials, and their employment in cement, concrete, gypsum products, aggregates, road construction, geotechnics, and agriculture, among other products and industries. Part 1 focuses on the nature of coal ashes, with chapters on their origin, generation, and storage, both in ponds and landfill. The coal combustion by-products produced as a result of clean coal technologies are the focus of the final chapter in the section. The next group of chapters in Part 2 considers the utilization of different waste materials, including the key products coal fly ash, bottom ash, and flue gas desulfurization materials. This is followed by a contribution reviewing the latest research into innovative and advanced uses for coal ash. After an introduction to ash quality problems and quality monitoring, Part 3 concentrates on the essential area of by-product beneficiation techniques, in other words how to maximize the quality of materials for the end user. Topics covered include separation methods, thermal processing, and chemical passivation. The final section of the book addresses environmental issues, including the use of coal combustion by-products in green construction materials and the essential health and safety considerations associated with their use. An essential reference on the nature, reactivity, beneficiation, potential and environmental risks of coal-combustion by-products Contains an in-depth review of the origin and geochemistry of coal ash Explores the utilization of coal combustion by-products as supplementary cementitious materials to reduce the anthropomorphic greenhouse gas emissions associated with the use of ordinary Portland cement concrete Describes the essential area of the toxicology of coal combustion by-products

This revised edition of Taylor's classic work on the internal-combustion engine incorporates changes and additions in engine design and control that have been

brought on by the world petroleum crisis, the subsequent emphasis on fuel economy, and the legal restraints on air pollution. The fundamentals and the topical organization, however, remain the same. The analytic rather than merely descriptive treatment of actual engine cycles, the exhaustive studies of air capacity, heat flow, friction, and the effects of cylinder size, and the emphasis on application have been preserved. These are the basic qualities that have made Taylor's work indispensable to more than one generation of engineers and designers of internal-combustion engines, as well as to teachers and graduate students in the fields of power, internal-combustion engineering, and general machine design.

Combustion Science and Engineering CRC Press

Students embarking on their studies in chemical, mechanical, aerospace, energy, and environmental engineering will face continually changing combustion problems, such as pollution control and energy efficiency, throughout their careers. Approaching these challenges requires a deep familiarity with the fundamental theory, mathematics, and physical concepts of combustion. Based on more than two decades of teaching experience, Combustion Science and Engineering lays the necessary groundwork while using an illustrative, hands-on approach. Taking a down-to-earth perspective, the book avoids heavy mathematics in the first seven chapters and in Chapter 17 (pollutants formation and destruction), but considers molecular concepts and delves into engineering details. It begins with an outline of thermodynamics; basics of thermochemistry and chemical equilibrium; descriptions of solid, liquid, and gaseous fuels; chemical kinetics and mass transfer; and applications of theory to practical systems. Beginning in chapter 8, the authors provide a detailed treatment of differential forms of conservation equations; analyses of fuel combustion including jet combustion and boundary layer problems; ignition; flame propagation; interactive and group combustion; pollutant formation and control; and turbulent combustion. In addition, this textbook includes abundant examples, illustrations, and exercises, as well as spreadsheet software in combustion available for download. This software allows students to work out the examples found in the text. Combustion Science and Engineering imparts the skills and foundational knowledge necessary for students to successfully approach and solve new problems.

Exposes a Powerful Material-Making Tool Dedicated to the physical, chemical, and structural transformations that take place during combustion synthesis (CS) of advanced materials, Combustion for Material Synthesis analyzes the nature of solid flame phenomenon and provides readers with undisputed proof that fire is a powerful tool used in making ma

Oxy-fuel Combustion: Fundamentals, Theory and Practice provides a comprehensive review of various aspects of oxy-fuel combustion technology, including its concept, fundamental theory, pilot practice, large-scale feasibility studies and related practical issues, such as the commissioning and operation of

an oxy-fuel combustion plant. Oxy-fuel combustion, as the most practical large-scale carbon capture power generation technology, has attracted significant attention in the past two decades. As significant progress has been achieved in worldwide demonstration and the oxy-combustion concept confirmed by Schwartze Pump, CUIDEN, Callide, Ponferrada and Yingcheng projects in the past five years, this book provides a timely addition for discussion and study. Covers oxy-fuel combustion technology Includes concepts, fundamentals, pilots and large-scale feasibility studies Considers related practical issues, such as the commissioning and operation of an oxy-fuel combustion plant Focuses on theories and methods closely related to engineering practice

A Gallery of Combustion and Fire is the first book to provide a graphical perspective of the extremely visual phenomenon of combustion in full color. It is designed primarily to be used in parallel with, and supplement existing combustion textbooks that are usually in black and white, making it a challenge to visualize such a graphic phenomenon. Each image includes a description of how it was generated, which is detailed enough for the expert but simple enough for the novice. Processes range from small scale academic flames up to full scale industrial flames under a wide range of conditions such as low and normal gravity, atmospheric to high pressures, actual and simulated flames, and controlled and uncontrolled flames. Containing over 500 color images, with over 230 contributors from over 75 organizations, this volume is a valuable asset for experts and novices alike.

Focusing on spectroscopically-based, spatially-precise, laser techniques for temperature and chemical composition measurements in reacting and non-reacting flows, this book makes these powerful and important new tools in combustion research

Fundamentals and Technology of Combustion contains brief descriptions of combustion fundamental processes, followed by an extensive survey of the combustion research technology. It also includes mathematical combustion modeling of the processes covering mainly premixed and diffusion flames, where many chemical and physical processes compete in complex ways, for both laminar and turbulent flows. The combustion chemistry models that validate experimental data for different fuels are sufficiently accurate to allow confident predictions of the flame characteristics. This illustrates a unique bridge between combustion fundamentals and combustion technology, which provides a valuable technical reference for many engineers and scientists. Moreover, the book gives the reader sufficient background of basic engineering sciences such as chemistry, thermodynamics, heat transfer and fluid mechanics. The combustion research and mathematical models fit between small-scale laboratory burner flames, and large-scale industrial boilers, furnaces and combustion chambers. The materials have been collected from previous relevant research and some selected papers of the authors and co-workers, which have been presented mainly in different refereed journals, international conferences and symposia,

thus providing a comprehensive collection. Furthermore, the book includes some of the many recent general correlations for the characteristics of laminar, turbulent, premixed and diffusion flames in an easily usable form. The authors believe that further progress in optimizing combustion performance and reducing polluting emissions can only be treated through understanding of combustion chemistry.

This book is an introductory text on fundamental aspects of combustion including thermodynamics, heat and mass transfer and chemical kinetics which are used to systematically derive the basic concepts of combustion. Apart from the fundamental aspects, many of the emerging topics in the field like microscale combustion, combustion dynamics, oxy-fuel combustion and combustion diagnostics are also covered in the book. This would help the beginners in the subject to get initiated to the state of the art topics. Key Features: Coverage of the essential aspects of combustion engineering suitable for both beginners and practicing professionals Topics like entropy generation, microscale combustion, combustion diagnostics, second law-based analysis exclusive to the title Balanced treatment of thermodynamics, transport phenomena and chemical kinetics Discussion on state of the art techniques in combustion diagnostics Illustrates combustion of gaseous, liquid and solid fuels along with emission of pollutants and greenhouse gases

Combustion Engineering, Second Edition maintains the same goal as the original: to present the fundamentals of combustion science with application to today's energy challenges. Using combustion applications to reinforce the fundamentals of combustion science, this text provides a uniquely accessible introduction to combustion for undergraduate students, first-year graduate students, and professionals in the workplace. Combustion is a critical issue impacting energy utilization, sustainability, and climate change. The challenge is to design safe and efficient combustion systems for many types of fuels in a way that protects the environment and enables sustainable lifestyles. Emphasizing the use of combustion fundamentals in the engineering and design of combustion systems, this text provides detailed coverage of gaseous, liquid and solid fuel combustion, including focused coverage of biomass combustion, which will be invaluable to new entrants to the field. Eight chapters address the fundamentals of combustion, including fuels, thermodynamics, chemical kinetics, flames, detonations, sprays, and solid fuel combustion mechanisms. Eight additional chapters apply these fundamentals to furnaces, spark ignition and diesel engines, gas turbines, and suspension burning, fixed bed combustion, and fluidized bed combustion of solid fuels. Presenting a renewed emphasis on fundamentals and updated applications to illustrate the latest trends relevant to combustion engineering, the authors provide a number of pedagogic features, including: Numerous tables with practical data and formulae that link combustion fundamentals to engineering practice Concise presentation of mathematical methods with qualitative descriptions of their use Coverage of alternative and

renewable fuel topics throughout the text Extensive example problems, chapter-end problems, and references These features and the overall fundamentals-to-practice nature of this book make it an ideal resource for undergraduate, first level graduate, or professional training classes. Students and practitioners will find that it is an excellent introduction to meeting the crucial challenge of engineering sustainable combustion systems in a cost-effective manner. A solutions manual and additional teaching resources are available with qualifying course adoption.

Design, construct and utilize fuel systems using this comprehensive reference work. Combustion Engineering Issues for Solid Fuel Systems combines modeling, policy/regulation and fuel properties with cutting edge breakthroughs in solid fuel combustion for electricity generation and industrial applications. This book moves beyond theory to provide readers with real-life experiences and tips for addressing the various technical, operational and regulatory issues that are associated with the use of fuels. With the latest information on CFD modeling and emission control technologies, Combustion Engineering Issues for Solid Fuel Systems is the book practicing engineers as well as managers and policy makers have been waiting for. Provides the latest information on CFD modeling and emission control technologies Comprehensive coverage of combustion systems and fuel types Addresses policy and regulatory concerns at a technical level Tackles various technical and operational issues

Now in its fourth edition, Introduction to Internal Combustion Engines remains the indispensable text to guide you through automotive or mechanical engineering, both at university and beyond. Thoroughly updated, clear, comprehensive and well-illustrated, with a wealth of worked examples and problems, its combination of theory and applied practice is sure to help you understand internal combustion engines, from thermodynamics and combustion to fluid mechanics and materials science. Introduction to Internal Combustion Engines: - Is ideal for students who are following specialist options in internal combustion engines, and also for students at earlier stages in their courses - especially with regard to laboratory work - Will be useful to practising engineers for an overview of the subject, or when they are working on particular aspects of internal combustion engines that are new to them - Is fully updated including new material on direct injection spark engines, supercharging and renewable fuels - Offers a wealth of worked examples and end-of-chapter questions to test your knowledge - Has a solutions manual available online for lecturers at www.palgrave.com/engineering/stone

Combustion Ash and Residue Management assists owners and operators of Coal-fired and Resource Recovery Power Plants. By applying the principles and reviewing the case studies examples described within this book, accidents and upsets can be avoided and regulatory permitting can be achieved – reducing costs. This unique book is an essential reference for anybody responsible for disposal or utilization of combustion residues. It reflects over 30 years of engineering practice, applying the principles of concrete chemistry and civil engineering/soil mechanics as confirmed by field data. Dr. Richard Goodwin assesses the composition and environmental impact of

combustion residues, and provides not only best practices for safe disposal, but also a blueprint for effective reuse, including applications like structural fill, grout, and capping material. Case studies and cost information for ash disposal options are included, in addition to the lessons learned by high-profile failures, such as the TVA Kingston fossil plant coal fly ash slurry spill in 2008. It also applies engineering principles to discuss how to avoid future upsets, including better operator training and monitoring methods. A comprehensive update to reflect changes in legislation and practice, including new material on the safe disposal or beneficial use of coal ash A straightforward engineering approach, providing practical guidance and field data Written by an established expert in the field

This book presents basic information about combustion, mostly in the form of examples. It is a textbook for a one-semester or one-quarter course for juniors or seniors in mechanical, aerospace, chemical, or civil engineering.

Combustion and Mass Transfer: A Textbook with Multiple-Choice Exercises for Engineering Students is a 20-chapter lecture text that covers various aspects of combustion and mass transfer. Each of the 20 chapters is provided with a set partly analytical and multiple-choice tutorial exercises, designed to assist the student to understand the material of the lectures. The opening chapters deal with the importance of combustion and mass transfer processes. The succeeding chapters survey the concepts and principles of droplet vaporization, droplet combustion, liquid-propellant rocket, and laminar and turbulent jet. These topics are followed by discussions of laminar and turbulent diffusion flame, kinetically-influenced phenomena, chemical kinetics, and spontaneous ignition. The remaining chapters consider the basic concepts of stirred reactor, flame stabilization, laminar flame propagation, spark ignition, and coal-particle combustion. This book is intended for undergraduate mechanical engineering students.

Throughout its previous four editions, Combustion has made a very complex subject both enjoyable and understandable to its student readers and a pleasure for instructors to teach. With its clearly articulated physical and chemical processes of flame combustion and smooth, logical transitions to engineering applications, this new edition continues that tradition. Greatly expanded end-of-chapter problem sets and new areas of combustion engineering applications make it even easier for students to grasp the significance of combustion to a wide range of engineering practice, from transportation to energy generation to environmental impacts. Combustion engineering is the study of rapid energy and mass transfer usually through the common physical phenomena of flame oxidation. It covers the physics and chemistry of this process and the engineering applications—including power generation in internal combustion automobile engines and gas turbine engines. Renewed concerns about energy efficiency and fuel costs, along with continued concerns over toxic and particulate emissions, make this a crucial area of engineering. New chapter on new combustion concepts and technologies, including discussion on nanotechnology as related to combustion, as well as microgravity combustion, microcombustion, and catalytic combustion—all interrelated and discussed by considering scaling issues (e.g., length and time scales) New information on sensitivity analysis of reaction mechanisms and generation and application of reduced mechanisms Expanded coverage of turbulent reactive flows to better illustrate real-world applications Important new sections on stabilization of diffusion flames—for the

first time, the concept of triple flames will be introduced and discussed in the context of diffusion flame stabilization

Gas Phase Combustion

This book contains a collection of papers prepared by leading experts on selected areas of particular importance to researchers in combustion science. The editors have gathered writings on fundamental physical and chemical aspects of combustion, including combustion chemistry, soot formation, and condensed phase and turbulent combustion intended to be a source of current understanding on the topics covered. The materials were originally presented as part of a Colloquium on Combustion held in honor of Professor Irvin Glassman.

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