Combustion Science Engineering Book | 7738491f33dec0aacf1eac850cd53d66

Combustion Fundamentals of FireUnderground Coal Gasification and CombustionMicrogravity CombustionCombustion Science and EngineeringCombustion TheoryCombustion Science and EngineeringCombustion Engineering, Second EditionFundamentals of Combustion ProcessesNumerical Prediction of Flow, Heat Transfer, Turbulence and CombustionAdvanced Combustion ScienceThe Mathematical Theory of Combustion and ExplosionsCombustion Processes in PropulsionCombustion of Pulverised Coal in a Mixture of Oxygen and Recycled Flue GasIntroduction To CombustionCombustion Engineering, Second EditionFuel Property Estimation and Combustion Process CharacterizationOxy-fuel CombustionFundamental Aspects of CombustionCombustion PhysicsCombustion EngineeringPhysical and Chemical Aspects of CombustionBiomass Combustion Science, Technology and EngineeringSelf-Propagating High-Temperature Synthesis of MaterialsApplied CombustionCombustionCombustion and Mass TransferFundamentals of Combustion EngineeringFossil Fuel CombustionInternal Combustion Engineering: Science & TechnologyCombustionComputational Fluid Dynamics in Fire EngineeringAdvanced Thermodynamics for EngineersCombustion Engineering Issues for Solid Fuel SystemsInternal Combustion Engine FundamentalsCombustion Engineering and Gas UtilisationCombustion EmissionsLean CombustionCombustion Ash Residue ManagementLaser Diagnostics for Combustion Temperature and SpeciesCombustion Thermodynamics and Dynamics

The second edition of this practical text offers a broad introduction to the engineering principles of chemical energy conversion. Eugene L. Keating, Ph.D., P.E., a recognized authority within academia, government, and industry, examines combustion science and technology using fundamental principles. Thermochemical engineering data and design formulations of basic performance relationships appear in dual SI and English engineering dimensions and units, helping you save time and avoid conversion errors. New in the Second Edition Streamlined organization that progressively develops fundamental concepts Extended section on fuel cells New section on the nitrogen-oxygen reaction system Additional coverage of environmental aspects of specific combustion characteristics New chapter on thermal destruction Furnishing examples that demonstrate a proper engineering analysis as well as important concepts relevant to the nature of combustion devices, Applied Combustion, Second Edition explores the ideal oxidation-reaction equation, fuel heat release rates, chemical equilibrium, incomplete combustion, chemical kinetics, and detonation, thermal explosion, and basic flame theories. The book treats the features of chemical energy resources and presents a thermochemical overview of current and potential solid, liquid, and gaseous natural and synthetic fuel resources. It also describes the fuel-engine interface characteristics of important external and internal combustion heat engines in terms of fuel compatibility, consumption rates, pollution characteristics, emission controls, and energy conversion efficiencies.Combustion of Pulverised Coal in a Mixture of Oxygen and Recycled Flue Gas focuses on a niche technology, combustion of coal in an oxygen rich environment, which is one approach to obtaining ‘clean coal,’ by making it easier to capture carbon that is released in the combustion process. Toporov’s book breaks ground on covering the key fundamentals of oxycoal technologies, which have not yet been covered in this depth. Combustion of Pulverised Coal in a Mixture of Oxygen and Recycled Flue Gas summarizes the main results from a pioneering work on experimental and numerical investigations of oxyfuel technologies. It provides the theoretical background of the process, the problems to be faced, and the technical solutions that were achieved during these investigations. Summarizes results from investigations of oxyfuel technologies performed at Aachen University, Germany Provides theoretical background, as well as the primary problems of these technologies and how they can be solvedCombustion 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 impactsThe 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. Largescale 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 gasificationCombustion Theory delves deeper into the science of combustion than most other texts and gives insight into combustions from a molecular and a continuum point of view. The book presents derivations of the basic equations of combustion theory and contains appendices on the background of subjects of thermodynamics, chemical kinetics, fluid dynamics, and transport processes. Diffusion flames, reactions in flows with negligible transport and the theory of pre-mixed flames are treated, as are detonation phenomena, the combustion of solid propellents, and ignition, extinction, and flamibility pehnomena.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 issuesFire and combustion presents a significant engineering challenge to mechanical, civil and dedicated fire engineers, as well as specialists in the process and chemical, safety, buildings and structural fields. We are reminded of the tragic outcomes of 'untenable' fire disasters such as at King's Cross underground station or Switzerland's St Gotthard tunnel. In these and many other cases, computational fluid dynamics (CFD) is at the forefront of active research into unravelling the probable causes of fires and helping to design structures and systems to ensure that they are less likely in the future. Computational fluid dynamics (CFD) is routinely used as an analysis tool in

fire and combustion engineering as it possesses the ability to handle the complex geometries and characteristics of combustion and fire. This book shows engineering students and professionals how to understand and use this powerful tool in the study of combustion processes, and in the engineering of safer or more fire resistant (or conversely, more fire-efficient) structures. No other book is dedicated to computer-based fire dynamics tools and systems. It is supported by a rigorous pedagogy, including worked examples to illustrate the capabilities of different models, an introduction to the essential aspects of fire physics, examination and self-test exercises, fully worked solutions and a suite of accompanying software for use in industry standard modeling systems. · Computational Fluid Dynamics (CFD) is widely used in engineering analysis; this is the only book dedicated to CFD modeling analysis in fire and combustion engineering · Strong pedagogic features mean this book can be used as a text for graduate level mechanical, civil, structural and fire engineering courses, while its coverage of the latest techniques and industry standard software make it an important reference for researchers and professional engineers in the mechanical and structural sectors, and by fire engineers, safety consultants and regulators · Strong author team (CUHK is a recognized centre of excellence in fire eng) deliver an expert package for students and professionals, showing both theory and applications. Accompanied by CFD modeling code and ready to use simulations to run in industry-standard ANSYS-CFX and Fluent software.Underground Coal Gasification (UCG) is carried out in unmined coal seams, using wells drilled from the surface and converting coal into synthesis gas. The gas can be used for power generation and synthesis of automotive fuels, fertilizers and other products. UCG offers financial, social, and environmental benefits over conventional coal extraction and utilization methods and may play a critical role in ensuring energy security in the future. Underground Coal Gasification and Combustion provides an overview of underground coal gasification technology, its current status and future directions. Comprehensive in approach, the book covers history, science, technology, hydrogeology, rock mechanics, environmental performance, economics, regulatory and commercial aspects of UCG projects. The first book on the subject in forty years, it is unique in analysing more than a century of global UCG developments by experts from Australia, Canada, Poland, Russia, Ukraine, United Kingdom, the USA and Uzbekistan. Provides researchers, engineers, industry, educators and regulators with an authoritative overview of science and practical applications of underground coal gasification technologies Offers insight into efficiency, environmental performance, costs, permitting issues and commercial aspects of UCG projects Written by scientists and practitioners of UCG technology sharing hands-on experience of step-by-step UCG implementationFundamentals 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 demonstrationsCombustion 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.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 stabilizationThis 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.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 gasesThis 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.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 fieldThis 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.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.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.Non-uniform combustion, as encountered in diesel and gas turbine engines, furnaces, and boilers, is responsible for the conversion of fossil fuel to energy and also for the corresponding formation of pollutants. In spite of great research efforts in the past, the mechanism of non-uniform combustion has remained less explored than that of other combustion types, since it consists of many, mostly transient processes which influence each other. In view of this background, a group research project, "Exploration of Combustion Mechanism", was established to explore the mechanism of combustion, especially that of diffusive combustion, and also to find efficient ways to control the combustion process for better utilization of fuel and the reduction of pollutant emission. The group research was started, after preparatory activity of 2 years, in April 1988, for a period of 3 years, as a project with a Grant-in-Aid for Scientific Research of Priority Area subsidized by the Ministry of Education, Science and Culture of Japan. The entire group of 43 members was set up as an organizing committee of 13 members, and five research groups, consisting of 36 members. The research groups were: (1) Steady combustion, (2) Unsteady spray combustion, (3) Control of combustion, (4) Chemistry of combustion, and (5) Effects of fuels. At the beginning of the project it was agreed that we should pursue the mechanism of combustion from a scientific

viewpoint, namely, the target of the project was to obtain the fundamentals, or "know why", rather than "know how" of combustion.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.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.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.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.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 processingStudents 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.Combustion under sufficiently fuel-lean conditions can have the desirable attributes of high efficiency and low emissions, this being particularly important in light of recent and rapid increases in the cost of fossil fuels and concerns over the links between combustion and global climate change. Lean Combustion is an eminently authoritative, reference work on the latest advances in lean combustion technology and systems. It will offer engineers working on combustion equipment and systems both the fundamentals and the latest developments in more efficient fuel usage and in much-sought-after reductions of undesirable 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 and its role in meeting current and future demands on combustion systems. 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. The book will also offer abundant references and examples of recent real-world applications. Covers all major recent developments in lean combustion science and technology, with new applications in both traditional combustion schemes as well as such novel uses as highly preheated and hydrogen-fueled systems Offers techniques for overcoming difficult ignition problems and flame extinction with lean fuel mixtures Covers new developments in lean combustion using high levels of pre-heat and heat re-circulating burners, as well as the active control of lean combustion instabilitiesOxy-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 practiceCombustion 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 studThis 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 findingsIn 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 ofcombustion. 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 modellingof 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 investigationCombustion Thermodynamics and Dynamics builds on a foundation of thermal science, chemistry, and applied mathematics that will be familiar to most undergraduate aerospace, mechanical, and chemical engineers to give a first-year graduate-level exposition of the thermodynamics, physical chemistry, and dynamics of advection-reaction-diffusion. Special effort is made to link notions of time-independent classical thermodynamics with time-dependent reactive fluid dynamics. In particular, concepts of classical thermochemical equilibrium and stability are discussed in the context of modern nonlinear dynamical systems theory. The first half focuses on time-dependent spatially homogeneous reaction, while the second half considers effects of spatially inhomogeneous advection and diffusion on the reaction dynamics. Attention is focused on systems with realistic detailed chemical kinetics as well as simplified kinetics. Many mathematical details are presented, and several quantitative examples are given. Topics include foundations of thermochemistry, reduced kinetics, reactive Navier-Stokes equations, reaction-diffusion systems, laminar flame, oscillatory combustion, and detonation.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.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.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 emissionsAlthough the basic theories of thermodynamics are adequately covered by a number of existing texts, there is little literature that addresses more advanced topics. In this comprehensive work the author redresses this balance, drawing on his twenty-five years of experience of teaching thermodynamics at undergraduate and postgraduate level, to produce a definitive text to cover thoroughly, advanced syllabuses. The book introduces the basic concepts which apply over the whole range of new technologies, considering: a new approach to cycles, enabling their irreversibility to be taken into account; a detailed study of combustion to show how the chemical energy in a fuel is converted into thermal energy and emissions; an analysis of fuel cells to give an understanding of the direct conversion of chemical energy to electrical power; a detailed study of property relationships to enable more sophisticated analyses to be made of both high and low temperature plant and irreversible thermodynamics, whose principles might hold a key to new ways of efficiently covering energy to power (e.g. solar energy, fuel cells). Worked examples are included in most of the chapters, followed by exercises with solutions. By developing thermodynamics from an explicitly equilibrium perspective, showing how all systems attempt to reach a state of equilibrium, and the effects of these systems when they cannot, the result is an unparalleled insight into the more advanced considerations when converting any form of energy into power, that will prove invaluable to students and professional engineers of all disciplines.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 researchCombustion, the process of burning, is defined as a chemical reaction between a combustible reactant (the fuel) and an oxidizing agent (such as air) in order to produce heat and in most cases light while new chemical species (e.g., flue gas components) are formed. This book covers a gap on the market by providing a concise introduction to combustion. Most of the other books currently available are targeted towards the experienced users and contain too many details and/or contain knowledge at a fairly high level. This book provides a brief and clear overview of the combustion basics, suitable for beginners and then focuses on practical aspects, rather than theory, illustrated by a number of industrial applications as examples. The content is aimed to provide a general understanding of the various concepts, techniques and equipment for students at all level as well as practitioners with little or no prior experience in the field. The authors are all international experts in the field of combustion technology and adopt here a clear didactic style with many practical examples to cover the most common solid, liquid and gaseous fuels. The associated environmental impacts are also discussed so that readers can develop an understanding of the major issues and the options available for more sustainable combustion processes. With a foreword by Katharina Kohse-HöinghausCombustion 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.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.