

## The Cativa Process For The Manufacture Of Acetic Acid

Transition Metal Catalyzed Carbonylation Reactions is a comprehensive monograph focusing on carbon monoxide usage. This book provides students and researchers in organic synthesis with a detailed discussion of carbonylation from the basics through to applications. The authors have structured the book around the types of reactions, based on the different nucleophiles involved. Scientists working in carbonylation or with carbon monoxide, as well as teachers of organic synthesis can use this book to become familiar with this important area of organic chemistry.

Since the discovery of ferrocene and the sandwich-type complexes, the development of organometallic chemistry took its course like an avalanche and became one of the scientific success stories of the second half of the twentieth century. Based on this development, the traditional boundaries between inorganic and organic chemistry gradually disappeared and a rebirth of the nowadays highly important field of homogeneous catalysis occurred. It is fair to say that despite the fact that the key discovery, which sparked it all off, was made more than 50 years ago, organometallic chemistry remains a young and lively discipline.

Sustainable development, the circular economy and environmental issues are at the forefront of public and Government concern. The field of green chemistry aims to provide environmentally benign products from sustainable resources, using processes that do not harm people or the environment at the same time as helping solve key societal problems such as climate change. Updated throughout, this third edition features an expanded section on legislation, a revised chapter on measurement, and a completely re-written chapter on renewable resources, bringing readers the latest developments in this quickly-growing area. Case studies now include more recent examples of real-world applications from industry to demonstrate how the techniques of green chemistry work in practice. This fascinating textbook is suitable for undergraduate and postgraduate courses covering green chemistry, and it encourages new ways of thinking about how products and processes are developed.

Methanol - The Chemical and Energy Feedstock of the Future offers a visionary yet unbiased view of methanol technology. Based on the groundbreaking 1986 publication "Methanol" by Friedrich Asinger, this book includes contributions by more than 40 experts from industry and academia. The authors and editors provide a comprehensive exposition of methanol chemistry and technology which is useful for a wide variety of scientists working in chemistry and energy related industries as well as academic researchers and even decision-makers and organisations concerned with the future of chemical and energy feedstocks.

From the contents: Robert H Crabtree: Introduction and History. - Montserrat Diéguez, Oscar Pàmies and Carmen Claver: Iridium-catalysed hydrogenation using phosphorous ligands. - David H. Woodmansee and Andreas Pfaltz: Iridium Catalyzed Asymmetric Hydrogenation of Olefins with Chiral N,P and C,N Ligands. - Ourida Saidi and Jonathan M J Williams: Iridium-catalyzed Hydrogen Transfer Reactions. - John F. Bower and Michael J. Krische: Formation of C-C Bonds via Iridium Catalyzed Hydrogenation and Transfer Hydrogenation. - Jongwook Choi, Alan S. Goldman: Ir-Catalyzed Functionalization of C-H Bonds. - Mark P. Pouy and John F. Hartwig: Iridium-Catalyzed Allylic Substitution. - Daniel Carmona and Luis A. Oro: Iridium-catalyzed 1,3-dipolar cycloadditions.

This book is essential reading for scientists and students interested in both organic and inorganic chemical technology. The authors cover the production of chemical reagents as well as trends from adjacent fields including biotechnology and process simulation. Chemical Technologies and Processes is of interest to chemical engineers, materials scientists, as well as chemists in both academia and industry.

Ranging from hydrogenation to hydroamination, cycloadditions and nanoparticles, this first handbook to comprehensively cover the topic of iridium in synthesis discusses the important advances in iridium-catalyzed reactions, namely the use of iridium complexes in enantioselective catalysis. A must for organic, complex and catalytic chemists, as well as those working with/on organometallics.

Applied Industrial Catalysis, Volume 1 provides a practical description of catalysis by industrial scientists. This book provides information pertinent to industrial catalysis, which is influenced by science, business, economic, markets, and politics. Organized into 10 chapters, this volume starts with an overview of the significance of industrial catalysis and its effect on human lifestyle and environment. This text then describes how to take a laboratory catalyst to successful commercialization with minimum problems. Other chapters consider in detail two major refinery processes, namely, hydrotreating and reforming. The reader is introduced to the specific processes for polyethylene and polypropylene manufacture. This book reviews as well ethylene oxide synthesis and explains oxychlorination of ethylene to ethylene dichloride. The final chapter reviews methanol carbonylation to acetic acid, which is produced by continuously reacting methanol and carbon monoxide in a homogeneous catalytic reactor at Industrial scientists and process engineers will find this book useful.

Part I: Process design -- Introduction to design -- Process flowsheet development -- Utilities and energy efficient design -- Process simulation -- Instrumentation and process control -- Materials of construction -- Capital cost estimating -- Estimating revenues and production costs -- Economic evaluation of projects -- Safety and loss prevention -- General site considerations -- Optimization in design -- Part II: Plant design -- Equipment selection, specification and design -- Design of pressure vessels -- Design of reactors and mixers -- Separation of fluids -- Separation columns (distillation, absorption and extraction) -- Specification and design of solids-handling equipment -- Heat transfer equipment -- Transport and storage of fluids.

Mechanistic Studies of By-product Formation in the Cativa Process Iridium Catalysis Springer Science & Business Media

With a focus on actual industrial processes, e.g. the production of light alkenes, synthesis gas, fine chemicals, polyethylene, it encourages the reader to think "out of the box" and invent and develop novel unit operations and processes. Reflecting today's emphasis on sustainability, this edition contains new coverage of biomass as an alternative to

fossil fuels, and process intensification. The second edition includes: New chapters on Process Intensification and Processes for the Conversion of Biomass Updated and expanded chapters throughout with 35% new material overall Text boxes containing case studies and examples from various different industries, e.g. synthesis loop designs, Sasol I Plant, Kaminsky catalysts, production of Ibuprofen, click chemistry, ammonia synthesis, fluid catalytic cracking Questions throughout to stimulate debate and keep students awake! Richly illustrated chapters with improved figures and flow diagrams Chemical Process Technology, Second Edition is a comprehensive introduction, linking the fundamental theory and concepts to the applied nature of the subject. It will be invaluable to students of chemical engineering, biotechnology and industrial chemistry, as well as practising chemical engineers. From reviews of the first edition: "The authors have blended process technology, chemistry and thermodynamics in an elegant manner... Overall this is a welcome addition to books on chemical technology." – The Chemist "Impressively wide-ranging and comprehensive... an excellent textbook for students, with a combination of fundamental knowledge and technology." – Chemistry in Britain (now Chemistry World)

The book discusses the sciences of operations, converting raw materials into desired products on an industrial scale by applying chemical transformations and other industrial technologies. Basics of chemical technology combining chemistry, physical transport, unit operations and chemical reactors are thoroughly prepared for an easy understanding. This book comprehensively covers iodine, its chemistry, and its role in functional materials, reagents, and compounds. • Provides an up-to-date, detailed overview of iodine chemistry with discussion on elemental aspects: characteristics, properties, iodides, and halogen bonding • Acts as a useful guide for readers to learn how to synthesize complex compounds using iodine reagents or intermediates • Describes traditional and modern processing techniques, such as starch, copper, blowing out, and ion exchange resin methods • Includes seven detailed sections devoted to the applications of iodine: Characteristics, Production, Synthesis, Biological Applications, Industrial Applications, Bioorganic Chemistry and Environmental Chemistry, and Radioisotopes • Features hot topics in the field, such as hypervalent iodine-mediated cross coupling reactions, agrochemicals, dyesensitized solar cells, and therapeutic agents

Carbonylation reactions are of major importance in both organic and industrial chemistry. Due to the availability, price and reactivity pattern, carbon monoxide is becoming a more and more important building block for fine and bulk chemicals. The major reaction types of carbon monoxide are comprehensively discussed by leading experts from academia and industry. The authors highlight important carbonylation reactions such as hydroformylation, alkoxy-carbonylations, co/olefin-copolymerization, Pauson-Khand reactions and others. They illustrate applications in organic synthesis and give industrial examples. This volume is designed to provide graduate students and researchers with essential information on the use of carbon monoxide in organic synthesis. Therefore, the reader will get a balanced view of this developing and complex subject.

Advances in Transition-Metal Mediated Heterocyclic Synthesis provides an overview of recent catalytic reactions involving transition metals to produce heterocyclic compounds. The book is organized according to the type of transformation used to achieve the synthesis of the heterocyclic systems (mainly aza- and oxa-heterocycles). As such, it covers recent applications on the synthesis of heterocycles, also describing the details of the novel transformations in a didactic manner to motivate readers in search of new catalytic processes. The editors have included state-of-the-art strategies, including transition-metal reactions involving unsaturated systems (reactions of allenes, new gold(I)-catalyzed reactions, and Prins reaction). Chapters highlight the versatility of organopalladium chemistry dealing with carbonylative transformations, C-H activation reactions, coupling processes, and the control of the ambiphilic character of organopalladium species. Finally, the book discusses new reactions leading to heterocycles based on C-H activation processes catalyzed by other metals (Rh, Ru, Co). Written by an outstanding team of authors who are leading experts in organometallic chemistry and organic synthesis, this book is a valuable resource not only for chemists mainly focused on synthesis, but also for those interested in reaction mechanisms involving transition metals. Helpfully organized by transformation type to stimulate the search for new synthetic processes Completely illustrated and written by global experts Includes thoughtfully selected strategies chosen by the editors to exemplify the state-of-the-art of the subject, including transition-metal reactions involving unsaturated systems, organopalladium chemistry, and metal-catalyzed C-H activation

Based on Collman et al.'s best-selling classic book, Principles and Applications of Organotransition Metal Chemistry, Hartwig's text consists of new or thoroughly updated and restructured chapters and provides an in-depth view into mechanism, reaction scope, and applications. It covers the most important developments in the field over the last twenty years with great clarity with a selective, but thorough and authoritative coverage of the fundamentals of organometallic chemistry, the elementary reactions of these complexes, and many catalytic processes occurring through organometallic intermediates, making this the Organotransition Metal Chemistry text for a new generation of scientists.

Publisher Description

A thoroughly up-to-date overview of carbonylation reactions in the presence of carbon monoxide In Carbon Monoxide in Organic Synthesis: Carbonylation Chemistry, expert researcher and chemist Bartolo Gabriele delivers a robust summary of the most central advances in the field of carbonylation reactions in the presence of carbon monoxide. Beginning with a brief introduction on the importance of carbon monoxide as a building block in modern organic synthesis, the author goes on to describe metal-catalyzed carbonylations utilizing iron, cobalt, nickel, copper, and manganese. Descriptions of palladium, ruthenium, and rhodium-catalyzed reactions follow, as do discussions of metal-free carbonylation processes. The book is organized by metal to make the book useful as a guide for researchers from both academia and industry whose work touches on the direct synthesis of carbonyl compounds, carboxylic acid derivatives, and heterocycles. It aims to stimulate further discoveries in this rapidly developing field. Readers will also enjoy: A thorough introduction to carbonylations promoted by first row transition metal catalysts,

including cobalt-catalyzed and nickel-catalyzed carbonylations An exploration of carbonylations promoted by second row transition metal catalysts, including ruthenium-, rhodium-, palladium(0)-, and palladium(II)-catalyzed carbonylations Practical discussions of miscellaneous carbonylation reactions, including carbonylations promoted by third row transition metal catalysts and metal-free carbonylation processes Perfect for catalytic and organic chemists, Carbon Monoxide in Organic Synthesis: Carbonylation Chemistry is also an indispensable resource for chemists working with organometallics and industrial chemists seeking a summary of important processes used to synthesize value-added products.

A fully updated edition of a popular textbook covering the four disciplines of chemical technology?featuring new developments in the field Clear and thorough throughout, this textbook covers the major sub-disciplines of modern chemical technology?chemistry, thermal and mechanical unit operations, chemical reaction engineering, and general chemical technology?alongside raw materials, energy sources and detailed descriptions of 24 important industrial processes and products. It brings information on energy and raw material consumption and production data of chemicals up to date and offers not just improved and extended chapters, but completely new ones as well. This new edition of Chemical Technology: From Principles to Products features a new chapter illustrating the global economic map and its development from the 15th century until today, and another on energy consumption in human history. Chemical key technologies for a future sustainable energy system such as power-to-X and hydrogen storage are now also examined. Chapters on inorganic products, material reserves, and water consumption and resources have been extended, while another presents environmental aspects of plastic pollution and handling of plastic waste. The book also adds four important processes to its pages: production of titanium dioxide, silicon, production and chemical recycling of polytetrafluoroethylene, and fermentative synthesis of amino acids. -Provides comprehensive coverage of chemical technology?from the fundamentals to 24 of the most important processes -Intertwines the four disciplines of chemical technology: chemistry, thermal and mechanical unit operations, chemical reaction engineering and general chemical technology -Fully updated with new content on: power-to-X and hydrogen storage; inorganic products, including metals, glass, and ceramics; water consumption and pollution; and additional industrial processes -Written by authors with extensive experience in teaching the topic and helping students understand the complex concepts Chemical Technology: From Principles to Products, Second Edition is an ideal textbook for advanced students of chemical technology and will appeal to anyone in chemical engineering. This first book to focus on catalytic processes from the viewpoint of green chemistry presents every important aspect: · Numerous catalytic reductions and oxidations methods · Solid-acid and solid-base catalysis · C-C bond formation reactions · Biocatalysis · Asymmetric catalysis · Novel reaction media like e.g ionic liquids, supercritical CO<sub>2</sub> · Renewable raw materials Written by Roger A. Sheldon -- without doubt one of the leaders in the field with much experience in academia and industry -- and his co-workers, the result is a unified whole, an indispensable source for every scientist looking to improve catalytic reactions, whether in the college or company lab.

The petrochemical industry is a scientific and engineering field that encompasses the production of a wide range of chemicals and polymers. The purpose of this book is not only to provide a follow-on to form the later chapters of the highly successful Chemistry and Technology of Petroleum 5th Edition but also provides a simplified approach to a very diverse chemical subject dealing with the chemistry and technology of various petroleum and petrochemical process. Following from the introductory chapters, this book provides the readers with a valuable source of information containing insights into petrochemical reactions and products, process technology, and polymer synthesis. Provides readers with a valuable source of information containing insights into petrochemical reactions and products, process technology, and polymer synthesis Introduces the reader to the various petrochemical intermediates are generally produced by chemical conversion of primary petrochemicals to form more complicated derivative products The reactions and processes involved in transforming petroleum-based hydrocarbons into the chemicals that form the basis of the multi-billion dollar petrochemical industry are reviewed and described The book includes information on new process developments for the production of raw materials and intermediates for petrochemicals Includes a description of the origin of the raw materials for the petrochemicals industry – including an overview of the coal chemicals industry

Membrane Based Technologiesfor Environmental Pollution Control explains the application of this green technology while offering a systematic approach for accurately utilizing mathematical modeling methods for optimizing system design and scale-up. The book provides in-depth coverage of membrane processes, materials and modules, along with their potential application in various pollution control systems. Each chapter provides a systematic approach for dynamic model development and solutions. With this reference, researchers and those responsible for the design of pollution control systems will find a source that can maximize their efforts to reduce or prevent pollutants from entering all types of environmental media. Provides a systematic approach for designing membrane technology based systems for pollution reduction or prevention in all types of environmental media Includes case studies to illustrate actual projects to explain the problems and solutions associated with system scale-up Introduces dynamic modeling and analysis for process intensification

Over the last decade, the area of homogeneous catalysis withtransition metal has grown in great scientific interest andtechnological promise, with research in this area earning threeNobel Prizes and filing thousands of patents relating tometallocene and non-metallocene single site catalysts, asymmetriccatalysis, carbon-carbon bond forming metathesis and cross couplingreactions. This text explains these new developments in a unified, cogent, andcomprehensible manner while also detailing earlier discoveries andthe fundamentals of homogeneous catalysis. Serving as a self-studyguide for students and all chemists seeking to gain entry into thisfield, it can also be used by experienced researchers from bothacademia and industry for referring to leading state of the artreview articles and patents, and also as a quick self-study manualin an area that is outside their immediate expertise. The bookfeatures: • Topics including renewable feed stocks (biofuel, glycerol), carbon dioxide based processes (polycarbonates), fluorosolvents, ionic liquid, hydroformylation, polymerization, oxidation, asymmetric catalysis, and more • Basic principles of organometallic chemistry, homogeneous catalysis, and relevant technological issues • Problems and answers, industrial applications (casestudies), and examples from proven industrial processes with cleardiscussions on environmental and techno-commercial issues • Extensive references to cutting edge research withapplication potential and leading patents • Tables and illustrations to help explain difficultconcepts

This volume documents developments in the study of catalysis relating to organic synthesis and its application in industrial processes. It surveys a wide range of homo- and heterogeneous catalysis for industrial and pharmaceutical chemicals. It covers enantioselective hydrogenation, catalyzed hydrogens and oxidation, carbonylation, hydroaminomethylation, and more.

Acyclic Acids—Advances in Research and Application: 2013 Edition is a ScholarlyBrief™ that delivers timely, authoritative, comprehensive, and specialized information about ZZZAdditional Research in a concise format. The editors have built Acyclic Acids—Advances in Research and Application: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about ZZZAdditional Research in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Acyclic Acids—Advances in Research and Application: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at <http://www.ScholarlyEditions.com/>.

The first to combine both the bioinorganic and the organometallic view, this handbook provides all the necessary knowledge in one convenient volume. Alongside a look at CO<sub>2</sub> and N<sub>2</sub> reduction, the authors discuss O<sub>2</sub>, NO and N<sub>2</sub>O binding and reduction, activation of H<sub>2</sub> and the oxidation catalysis of O<sub>2</sub>. Edited by the highly renowned William Tolman, who has won several awards for his research in the field.

Organometallic Chemistry is the study of chemical compounds containing bonds between carbon and metal. The term "e;Metal"e; is defined deliberately broadly in this context and may include elements, such as silicon or boron, which are not metallic but are considered to be metalloids. Almost all branches of chemistry and material science now interface with organometallic chemistry. Organometallics find practical uses in stoichiometric and catalytic processes, especially processes involving carbon monoxide and alkene-derived polymers. Organometallic (OM) chemistry is the study of compounds containing, and reactions involving, metal-carbon bonds. The metal-carbon bond may be transient or temporary, but if one exists during a reaction or in a compound of interest, we're squarely in the domain of organometallic chemistry. Despite the denotational importance of the M-C bond, bonds between metals and the other common elements of organic chemistry also appear in OM chemistry: metal-nitrogen, metal-oxygen, metal-halogen, and even metal-hydrogen bonds all play a role. Metals cover a vast swath of the periodic table and include the alkali metals (group 1), alkali earth metals (group 2), transition metals (groups 3-12), the main group metals (groups 13-15, "e;under the stairs"e;), and the lanthanides and actinides. The principal idea of this book is to offer a comprehensive coverage of unconventional and thought-provoking topics in organometallic chemistry. It also supplies practical information about reaction mechanisms, along with the descriptions of contemporary applications to organic synthesis, organized by mechanism and kinetic. It will serve as a valuable reference tool for students and professional of organic and post organic chemistry, who need to become better acquainted with the subject.

Now in its 3rd Edition, Industrial Catalysis offers all relevant information on catalytic processes in industry, including many recent examples. Perfectly suited for self-study, it is the ideal companion for scientists who want to get into the field or refresh existing knowledge. The updated edition covers the full range of industrial aspects, from catalyst development and testing to process examples and catalyst recycling. The book is characterized by its practical relevance, expressed by a selection of over 40 examples of catalytic processes in industry. In addition, new chapters on catalytic processes with renewable materials and polymerization catalysis have been included. Existing chapters have been carefully revised and supported by new subchapters, for example, on metathesis reactions, refinery processes, petrochemistry and new reactor concepts. "I found the book accesible, readable and interesting - both as a refresher and as an introduction to new topics - and a convenient first reference on current industrial catalytic practise and processes." Excerpt from a book review for the second edition by P. C. H. Mitchell, Applied Organometallic Chemistry (2007)

In the quest to mitigate the buildup of greenhouse gases in Earth's atmosphere, researchers and policymakers have increasingly turned their attention to techniques for capturing greenhouse gases such as carbon dioxide and methane, either from the locations where they are emitted or directly from the atmosphere. Once captured, these gases can be stored or put to use. While both carbon storage and carbon utilization have costs, utilization offers the opportunity to recover some of the cost and even generate economic value. While current carbon utilization projects operate at a relatively small scale, some estimates suggest the market for waste carbon-derived products could grow to hundreds of billions of dollars within a few decades, utilizing several thousand teragrams of waste carbon gases per year. Gaseous Carbon Waste Streams Utilization: Status and Research Needs assesses research and development needs relevant to understanding and improving the commercial viability of waste carbon utilization technologies and defines a research agenda to address key challenges. The report is intended to help inform decision making surrounding the development and deployment of waste carbon utilization technologies under a variety of circumstances, whether motivated by a goal to improve processes for making carbon-based products, to generate revenue, or to achieve environmental goals.

Catalysis, the basic principle for overcoming the kinetic inhibition of chemical reactions, is fundamental in chemistry. In particular, organometallic catalysis plays an overwhelming role in both research and industry. It opens the way to entirely novel synthetic methods and finds widespread applications ranging from mass-production of everyday polymers to stereocontrolled synthesis of bioactive chemicals used as pharmaceuticals and agrochemicals. The targeted development of improved and novel catalysts demands understanding of the relationships between their structures and catalytic properties. Accordingly, this textbook offers the reader a fundamental understanding of the course of organometallic-catalyzed reactions, starting at the molecular level. The initial chapters explain the principles of catalysis and the elementary steps in organometallic catalysis. The book then explores important organometallic-catalyzed reactions, with a focus on mechanism. Current developments are emphasized throughout. Asymmetric synthesis is covered in depth. Finally, the book examines the catalytic behavior of particular metalloenzymes. A look at nitrogen fixation offers a comparative examination of the three major areas of catalysis - homogeneous, heterogeneous, and enzymatic. In addition to problems, the textbook offers solutions, making the book an invaluable learning tool. It is a must-have for advanced students in chemistry and biochemistry, as well as for inorganic and organic chemists, for those working with organometallics, and for those specializing in catalysis.

The completely revised third edition of this four-volume classic is fully updated and now includes such topics as as CH-activation and multicomponent reactions. It describes the most important reaction types, new methods and recent developments in catalysis. The internationally renowned editors and a plethora of international authors (including Nobel laureate R. Noyori) guarantee high quality content throughout the book. A "must read" for everyone in academia and industry working in this field.

Showcases the important role of organometallic chemistry in industrial applications and includes practical examples and case studies This comprehensive book takes a practical approach to how organometallic chemistry is being used in industrial applications. It uniquely offers numerous, real-world examples and case studies that aid working R&D researchers as well as Ph.D. and postdoc students preparing to ace interviews in order to enter the workforce. Edited by two world-leading and established industrial chemists, the book covers flow chemistry (catalytic and non-catalytic organometallic chemistry), various cross-coupling reactions (C-C, C-N, and C-B) in classical batch chemistry, conjugate addition reactions, metathesis, and C-H arylation and achiral hydrogenation reactions. Beginning with an overview of the many industrial milestones within the field over the years, *Organometallic Chemistry in Industry: A Practical Approach* provides chapters covering: the design, development, and execution of a continuous flow enabled API manufacturing route; continuous manufacturing as an enabling technology for low temperature organometallic chemistry; the development of a nickel-catalyzed enantioselective Mizoroki-Heck coupling; and the development of iron-catalyzed Kumada cross-coupling for the large scale production of Aliskiren intermediates. The book also examines aspects of homogeneous hydrogenation from industrial research; the latest industrial uses of olefin metathesis; and more. -Includes rare industrial case studies difficult to find in current literature -Helps readers successfully carry out their own reactions -Covers topics like flow chemistry, cross-coupling reactions, and dehydrative decarbonylation -Features a foreword by Nobel Laureate R. H. Grubbs -A perfect resource for every R&D researcher in industry -Useful for PhD students and postdocs: excellent preparation for a job interview *Organometallic Chemistry in Industry: A Practical Approach* is an excellent resource for all chemists, including those working in the pharmaceutical industry and organometallics.

*Direct Methane to Methanol: Foundations and Prospects of the Process* offers a state-of-the-art account of one of the most interesting and potentially commercial technologies for direct conversion of natural gas into valuable chemicals. The book thoroughly explains the complex and unusual chemistry of the process, as well as possible applications for direct methane to methanol (DMTM). It covers topics involving thermokinetics, pressure, direct oxidation of heavier alkanes, and more, and provides detailed appendices with experimental data and product yields. This book provides all those who work in the field of gas processing and gas chemistry with the theory and experimental data to develop and apply new processes based on direct oxidation of natural gas. All those who deal with oil and natural gas production and processing will learn about this promising technology for the conversion of gas into more valuable chemicals. Reviews more than 350 publications on high-pressure, low-temperature oxidation of methane and other gas phase hydrocarbons Contains rare material available for the first time in English Explains the reasons of previous failure and outlines the way forward for commercial development of the conversion technology Presents a deep theoretical knowledge of this complex conversion process

Catalysis underpins most modern industrial organic processes. It has become an essential tool in creating a 'greener' chemical industry by replacing more traditional stoichiometric reactions, which have high energy consumption and high waste production, with mild processes which increasingly resemble Nature's enzymes. *Metal-Catalysis in Industrial Organic Processes* considers the major areas of the field and discusses the logic of using catalysis in industrial processes. The book provides information on oxidation, hydrogenation, carbonylation, C-C bond formation, metathesis and polymerization processes, as well as on the mechanisms involved. In addition two appendices offer a concise treatment of homogeneous and heterogeneous catalysis. Numerous exercises referring to problems of catalytic processes, and research perspectives complete the book. This definitive reference source, written by practising experts in the field, provides detailed and up-to-date information on key aspects of metal catalysis.

Adopting a didactic approach at an advanced, masters level, this concise textbook provides an array of questions & answers and features numerous industrial case studies and examples, with references for further, more detailed reading and to the latest peer-reviewed articles at the end of each chapter. A significant feature is the book's treatment of more recently developed catalytic processes and their applications in the pharmaceutical and fine chemical industries, with an indication of their present and future commercial impact. Written by a dedicated lecturer with a wealth of experience in industry, this is an invaluable tool for practicing chemical engineers and chemists who need to advance their education in this vibrant and expanding field.

*Green Chemistry* concerned with chemical research and engineering that encourages the design of products and processes that minimize the use and generation of hazardous substances. It is effective in controlling the impact of chemicals on human health and the environment. Chemists and chemical engineers applying green chemistry look at the entire life cycle of a product or process, from the origins of the materials used for manufacturing to the ultimate fate of the materials after they have finished their useful life. This book is written especially for researchers at various levels e.g. in industry, R&D Laboratories, University and College laboratories etc. It describes a large number of organic reactions under green conditions. The conditions used are aqueous phase, using PTC catalyst, sonication and microwave technologies.

Discusses the most recent advances in the theories and concepts of selective oxidation technology. Examines the synthesis, characterization, and performance of new catalytic materials used in the oxidation of hydrocarbons in the range of C<sub>1</sub> to C<sub>4</sub>. Highlights the use of transition metal oxides in one of several redox states in industrial oxidation processes. Also presents state-of-the-art developments in engineering and applications to new processes.

This bestselling text introduces descriptive inorganic chemistry in a less rigorous, less mathematical way. The book uses the periodic table as basis for understanding chemical properties and uncovering relationships between elements in different groups. Rayner-Canham and Overton's text also familiarizes students with the historical background of inorganic chemistry as well as with its crucial applications (especially in regard to industrial processes and environmental issues), resulting in a comprehensive appreciation and understanding of the field and the role it will play in their fields of further study

No available as softcover No other book available that gives insight into so many reactions of importance, while the field of homogeneous catalysis is becoming more and more important to organic chemists, industrial chemists, and academia. Gives real insight in the many new and old reactions of importance, based on the author's extensive experience in both teaching and industrial practice. Provide background to chemists trained in a different discipline and graduate and masters students who take catalysis as a main or secondary topic.

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