

Industrial Organic Chemistry By Klaus Weissermel

The fields of glycochemistry and glycoscience are rich and varied and where much can be learned from Nature. As Nature is not always able to produce carbohydrates in quantities useful for not only in research but also as therapeutic agents, new ways need to be found to optimize the yield. This book presents an overview of the latest developments in the field of carbohydrates, ranging from de-novo approaches via cyclodextrin chemistry to the synthesis of such highly complex glycoconjugates as glycosphingolipids and GPI anchors. The main emphasis remains on the synthetic aspects making the book an excellent source of information for those already involved in carbohydrate chemistry, as well as for those organic chemists who are beginners in this field. Equally of interest to synthetic chemists, as well as medicinal chemists and biochemists.

Biocatalysis has become an essential tool in the chemical industry and is the core of industrial biotechnology, also known as white biotechnology, making use of biocatalysts in terms of enzymes or whole cells in chemical processes as an alternative to chemical catalysts. This shift can be seen in the many areas of daily life where biocatalysts—with their environmentally friendly properties—are currently employed. Drivers are the big societal challenges resulting from

concerns about the global climate change and the need for an assured energy supply. Modern biocatalysis relies to a large extent on the tremendous advances in the so-called omics techniques and the structural elucidation of biomolecules, which have led to synthetic biology and metabolic engineering as new research fields with high application potential for the rational design of enzymes and microbial production strains. In this book, renowned scientists discuss the actual developments in these research fields together with a variety of application-oriented topics.

This first overview of mass spectrometry-based pharmaceutical analysis is the key to improved high-throughput drug screening, rational drug design and analysis of multiple ligand-target interactions. The ready reference opens with a general introduction to the use of mass spectrometry in pharmaceutical screening, followed by a detailed description of recently developed analytical systems for use in the pharmaceutical laboratory. Applications range from simple binding assays to complex screens of biological activity and systems containing multiple targets or ligands -- all highly relevant techniques in the early stages in drug discovery, from target characterization to hit and lead finding.

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.

For twenty-five years, *Dermatotoxicology* has stood as the definitive reference book in the field. A generation of toxicologists and dermatologists has consulted this volume throughout their careers, finding within it a wealth of theoretical and practical guidance. Updated and expanded to reflect the latest developments in skin toxicology, *De*

Solid State NMR A thorough and comprehensive textbook covering the theoretical background, experimental approaches, and major applications of solid-state NMR spectroscopy Nuclear Magnetic Resonance (NMR) spectroscopy is a powerful non-destructive technique capable of providing information about the molecular structure and dynamics of molecules. Alongside solution-state NMR, a

well-established technique to study chemical structures and investigate physico-chemical properties of molecules in solutions, solid-state NMR (SSNMR) offers many exciting possibilities for the analysis of solid and soft materials across scientific fields. SSNMR shows unique capabilities for a detailed investigation of structural and dynamic properties of materials over wide space and time ranges. For this reason, and thanks to significant advances in the past several years, the application of SSNMR to materials is rapidly increasing in disciplines such as chemistry, physics, and materials and life sciences. Solid State NMR: Principles, Methods, and Applications offers a systematic introduction to the theory, methodological concepts, and major experimental methods of SSMR spectroscopy. Exploring the unique potential of SSNMR for the structural and dynamic characterization of soft and either amorphous or crystalline solid materials, this comprehensive textbook provides foundational knowledge and recent developments of SSNMR, covering physical and theoretical background, experimental methods, and applications to pharmaceuticals, polymers, inorganic and hybrid materials, liquid crystals, and model membranes. Written by two expert authors to ensure a clear and consistent presentation of the subject, this textbook: Includes a brief introduction to the historical aspects and broad theoretical background of solid-state NMR spectroscopy Provides helpful

illustrations to explain the various SSNMR concepts and methods Features accessible descriptive text with self-consistent use of quantum mechanics Covers the experimental aspects of SSNMR spectroscopy and in particular a description of many useful pulse sequences Contains references to relevant literature Solid State NMR: Principles, Methods, and Applications is the ideal textbook for university courses on SSNMR, advanced spectroscopies, and a valuable single-volume reference for spectroscopists, chemists, and researchers in the field of materials.

Reimagining our global economy so it becomes more sustainable and prosperous for all Our global economic system is broken. But we can replace the current picture of global upheaval, unsustainability, and uncertainty with one of an economy that works for all people, and the planet. First, we must eliminate rising income inequality within societies where productivity and wage growth has slowed. Second, we must reduce the dampening effect of monopoly market power wielded by large corporations on innovation and productivity gains. And finally, the short-sighted exploitation of natural resources that is corroding the environment and affecting the lives of many for the worse must end. The debate over the causes of the broken economy—laissez-faire government, poorly managed globalization, the rise of technology in favor of the few, or yet another

reason—is wide open. Stakeholder Capitalism: A Global Economy that Works for Progress, People and Planet argues convincingly that if we don't start with recognizing the true shape of our problems, our current system will continue to fail us. To help us see our challenges more clearly, Schwab—the Founder and Executive Chairman of the World Economic Forum—looks for the real causes of our system's shortcomings, and for solutions in best practices from around the world in places as diverse as China, Denmark, Ethiopia, Germany, Indonesia, New Zealand, and Singapore. And in doing so, Schwab finds emerging examples of new ways of doing things that provide grounds for hope, including: Individual agency: how countries and policies can make a difference against large external forces A clearly defined social contract: agreement on shared values and goals allows government, business, and individuals to produce the most optimal outcomes Planning for future generations: short-sighted presentism harms our shared future, and that of those yet to be born Better measures of economic success: move beyond a myopic focus on GDP to more complete, human-scaled measures of societal flourishing By accurately describing our real situation, Stakeholder Capitalism is able to pinpoint achievable ways to deal with our problems. Chapter by chapter, Professor Schwab shows us that there are ways for everyone at all levels of society to reshape the broken pieces of the global

economy and—country by country, company by company, and citizen by citizen—glue them back together in a way that benefits us all.

Publisher Description

The Chemistry of Heterocyclic Compounds, since its inception, has been recognized as a cornerstone of heterocyclic chemistry. Each volume attempts to discuss all aspects – properties, synthesis, reactions, physiological and industrial significance – of a specific ring system. To keep the series up-to-date, supplementary volumes covering the recent literature on each individual ring system have been published. Many ring systems (such as pyridines and oxazoles) are treated in distinct books, each consisting of separate volumes or parts dealing with different individual topics. With all authors are recognized authorities, the Chemistry of Heterocyclic Chemistry is considered worldwide as the indispensable resource for organic, bioorganic, and medicinal chemists.

World-renowned economist Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, explains that we have an opportunity to shape the fourth industrial revolution, which will fundamentally alter how we live and work. Schwab argues that this revolution is different in scale, scope and complexity from any that have come before. Characterized by a range of new technologies that are fusing the physical, digital and biological worlds, the developments are affecting all disciplines, economies, industries and governments, and even challenging ideas about what it means to be human. Artificial intelligence is already all around us, from

supercomputers, drones and virtual assistants to 3D printing, DNA sequencing, smart thermostats, wearable sensors and microchips smaller than a grain of sand. But this is just the beginning: nanomaterials 200 times stronger than steel and a million times thinner than a strand of hair and the first transplant of a 3D printed liver are already in development. Imagine "smart factories" in which global systems of manufacturing are coordinated virtually, or implantable mobile phones made of biosynthetic materials. The fourth industrial revolution, says Schwab, is more significant, and its ramifications more profound, than in any prior period of human history. He outlines the key technologies driving this revolution and discusses the major impacts expected on government, business, civil society and individuals. Schwab also offers bold ideas on how to harness these changes and shape a better future--one in which technology empowers people rather than replaces them; progress serves society rather than disrupts it; and in which innovators respect moral and ethical boundaries rather than cross them. We all have the opportunity to contribute to developing new frameworks that advance progress. Pharmaceutical manufacturing was one of the first industries to recognize the importance of green chemistry, with pioneering work including green chemistry metrics and alternative solvents and reagents. Today, other topical factors also have to be taken into consideration, such as rapidly depleting resources, high energy costs and new legislation. This book addresses current challenges in modern green chemical technologies and sustainability thinking. It encompasses a broad range of topics

covered by the CHEM21 project – Europe's largest public-private partnership project which aims to develop a toolbox of sustainable technologies for green chemical intermediate manufacture. Divided into two sections, the book first gives an overview of the key green chemistry tools, guidance and considerations aimed at developing greener processes, before moving on to look at cutting-edge synthetic methodologies. Featuring innovative research, this book is an invaluable reference for chemists across academia and industry wanting to further their knowledge and understanding of this important topic.

Ideal for getting an overview of applied organic chemistry' This bestselling standard, now in its 3rd completely revised English edition, is an excellent source of technological and economic information on the most important precursors and intermediates used in the chemical industry. Right and left columns containing synopsis of the main text and statistical data, and numerous fold-out flow diagrams ensure optimal didactic presentation of complex chemical processes. The translation into eight languages, the four German and three English editions clearly evidence the popularity of this book. The first IUPAC Manual of Symbols and Terminology for Physicochemical Quantities and Units (the Green Book) of which this is the direct successor, was published in 1969, with the object of 'securing clarity and precision, and wider agreement in the use of symbols, by chemists in different countries, among physicists, chemists and engineers, and by editors of scientific journals'. Subsequent revisions have taken

account of many developments in the field, culminating in the major extension and revision represented by the 1988 edition under the simplified title Quantities, Units and Symbols in Physical Chemistry. This 2007, Third Edition, is a further revision of the material which reflects the experience of the contributors with the previous editions. The book has been systematically brought up to date and new sections have been added. It strives to improve the exchange of scientific information among the readers in different disciplines and across different nations. In a rapidly expanding volume of scientific literature where each discipline has a tendency to retreat into its own jargon this book attempts to provide a readable compilation of widely used terms and symbols from many sources together with brief understandable definitions. This is the definitive guide for scientists and organizations working across a multitude of disciplines requiring internationally approved nomenclature.

The rise of physical methods lies at the heart of the transformation of chemistry over the second half of the 20th century, says Rienhardt (history of science, U. of Regensburg, Germany). He analyzes a sample of individual research programs and strategies that illustrate this change. Only companies and people are indexed. Since the book first appeared in 1976, *Methods of Seawater Analysis* has found widespread acceptance as a reliable and detailed source of information. Its second extended and revised edition published in 1983 reflected the rapid pace of instrumental and methodological evolution in the preceding years. The development has lost nothing

of its momentum, and many methods and procedures still suffering their teething troubles then have now matured into dependable tools for the analyst. This is especially evident for trace and ultra-trace analyses of organic and inorganic seawater constituents which have diversified considerably and now require more space for their description than before. Methods to determine volatile halocarbons, dimethyl sulphide, photosynthetic pigments and natural radioactive tracers have been added as well as applications of X-ray fluorescence spectroscopy and various electrochemical methods for trace metal analysis. Another method not previously described deals with the determination of the partial pressure of carbon dioxide as part of standardised procedures to describe the marine CO₂ system.

This bestselling standard, now in its fifth, completely revised English edition, is an excellent source of technological and economic information on the most important precursors and intermediates used in the chemical industry. Both a handbook and ready reference, this volume has a uniform structure for ease of use, with a number of fold-out flow charts illustrating complex chemical processes, plus summaries and relevant statistical data in the margins. The text is rounded off by a comprehensive list of references and a detailed subject index. From reviews of previous editions (authored by K. Weissermel/H.-J. Arpe) "This book is an immensely comprehensive and practical work. University chemistry students would benefit from reading this book as it provides a valuable insight into chemical technology, which is often lacking in undergraduate

chemistry courses. The university lecturer can obtain examples of applied organic syntheses and keep up to date with the constant changes in chemical manufacturing. It should appeal most to chemists and engineers in the chemical industry, who should benefit from the technological, scientific and economic interrelationships and their potential developments." (Synthesis - Journal of Synthetic Organic Chemistry) "It would be unkind and misleading to call this book a poor man's Kirk Othmer, but it could almost be described as an encyclopedia... it is easy to read and one has to admire the authors' dedication and endeavor in getting so much into a single volume. They have provided a book that is interesting reading as well as being an excellent reference. It is a highly recommended book, which I hope the authors will find the energy to continue updating on a regular basis." (Chemistry in Britain) "...it should be ready to hand to every chemist or process engineer involved directly or indirectly with industrial organic chemistry. It should be in the hand of every higher-graduate student, especially if chemical technology is not part of the study, like in many college universities..." (Tenside-Surfactants-Detergents) "Whether student or scientist, theorist or practitioner - everybody interested in industrial organic chemistry will appreciate this work. ..." (farbe + lack) Resulting from the premier forum for pesticide development and use, this volume provides comprehensive coverage and even captures emerging technologies within the industry. All facets of pesticides are addressed here, including agriculture, agrochemicals, and environmental health aspects, as well as such global issues as

food quality and safety.

Now ubiquitous in public discussions about cutting-edge science and technology, nanoscience has generated many advances and inventions, from the development of new quantum mechanical methods to far-reaching applications in electronics and medical diagnostics. Ushering in the next technological era, *Fundamentals of Picoscience* focuses on the instrumentation and experiments emerging at the picometer scale. One picometer is the length of a trillionth of a meter. Compared to a human cell of typically ten microns, this is roughly ten million times smaller. In this state-of-the-art book, international scientists and researchers at the forefront of the field present the materials and methods used at the picoscale. They address the key challenges in developing new instrumentation and techniques to visualize and measure structures at this sub-nanometer level. With numerous figures, the book will help you: Understand how picoscience is an extension of nanoscience Determine which experimental technique to use in your research Connect basic studies to the development of next-generation picelectronic devices The book covers various approaches for detecting, characterizing, and imaging at the picoscale. It then presents picoscale methods ranging from scanning tunneling microscopy (STM) to spectroscopic approaches at sub-nanometer spatial and energy resolutions. It also covers novel picoscale structures and picometer positioning systems. The book concludes with picoscale device applications, including single molecule electronics and optical computers. Introductions in each

chapter explain basic concepts, define technical terms, and give context to the main material.

Most current state-of-the-art overview of this important class of compounds, encompassing many new and emerging applications The number of articles on organic azides continues to increase tremendously; on average, there are more than 1000 new publications a year Covers basic chemistry as well as state-of-the-art applications in life science and materials science World-ranked authors describe their own research in the wider context of azide chemistry Includes a chapter on safe synthesis and handling (azides can decompose explosively)

In the 1990s, nanoparticles and quantum dots began to be used in optical, electronic, and biological applications. Now they are being studied for use in solid-state quantum computation, tumor imaging, and photovoltaics. Handbook of Nanophysics: Nanoparticles and Quantum Dots focuses on the fundamental physics of these nanoscale materials and structures. Each peer-reviewed chapter contains a broad-based introduction and enhances understanding of the state-of-the-art scientific content through fundamental equations and illustrations, some in color. This volume provides an overview of the major categories of nanoparticles, including amorphous, magnetic, ferroelectric, and zinc oxide nanoparticles; helium nanodroplets; and silicon, tetrapod-shaped semiconductor, magnetic ion-doped semiconductor, and natural polysaccharide nanocrystals. It also describes their properties and interactions. In the group of chapters

on nanofluids, the expert contributors discuss the stability of nanodispersions, liquid slip at the molecular scale, thermophysical properties, and heat transfer. They go on to examine the theory, self-assembly, and teleportation of quantum dots. Nanophysics brings together multiple disciplines to determine the structural, electronic, optical, and thermal behavior of nanomaterials; electrical and thermal conductivity; the forces between nanoscale objects; and the transition between classical and quantum behavior. Facilitating communication across many disciplines, this landmark publication encourages scientists with disparate interests to collaborate on interdisciplinary projects and incorporate the theory and methodology of other areas into their work.

Revised and updated, this highly acclaimed work, now in its fourth edition, remains the most comprehensive source of information available on organic pigments. It provides up-to-date information on synthesis, reaction mechanism, physical and chemical properties, test methods, and applications of all the industrially produced organic pigments available on the world market. This fourth edition now includes new chapters on the latest applications and three-dimensional X-ray analysis, while the chapters on legislation, ecology, and toxicology have been rewritten to reflect recent developments. Sets the international standard for information on the synthesis, reaction mechanisms, properties, relevant test methods, and applications of organic pigments Contains all industrially produced pigments of the world market, even those which can no longer be found in producers' catalogs are described Standardized methods allow test results to

be compared throughout the book The reader is given useful hints as to which pigment is best for a given application Clearly structured and concise text with up-to-date references to the pertinent literature Ecological and toxicological properties of organic pigments are outlined Appendix offers invaluable flow diagrams on the manufacture of numerous pigments, a table of all described pigments with information about their C.I. and CAS registration, and an in-depth subject index

In August 2007 a Russian flag was planted under the North Pole during a scientific expedition triggering speculation about a new scramble for resources beneath the thawing ice. But is there really a global grab for Polar territory and resources? Or are these activities vastly exaggerated? In this rich and wide-ranging book, Klaus Dodds and Mark Nuttall look behind the headlines and hyperbole to reveal a complex picture of the so-called scramble for the poles. Whilst anxieties over the potential for conflict and the destruction of what is often perceived as the world's last wildernesses have come to dominate Polar debates and are, to some extent, justified, their study also highlights longer historical and geographical patterns and processes of human activity in these remote territories. Over the past century, Polar landscapes have been probed, drilled, fished, tested on and dug up, as their indigenous populations have struggled to protect their rights and interests. No longer remote places, or themselves 'poles apart' from one another, the contemporary geopolitics of the Polar regions has lessons for us all as we confront a warming world where access to resources is a concern for states,

big and small.

'Everything there is to know about organic pigments' Revised and updated, this highly acclaimed work, now in its third edition, remains the most comprehensive source of information available on synthetic organic pigments. The book provides up-to-date information on synthesis, reaction mechanisms, physical and chemical properties, test methods, and applications of all industrially produced organic pigments of the world market. Standardized methods have been used to obtain the data thus facilitating comparison between pigments. Chemists, engineers, colorists, and technicians are sure to find this book invaluable. 'Presentation throughout is of the highest quality and the volume must now become the standard reference text in this important area of colouring matters.' Dyes and Pigments 'This is a very wide-ranging reference work ... it would be difficult to find a topic in this field not covered by this book.' Ecochem

Volumes in the Proven Synthetic Methods Series address the concerns many chemists have regarding irreproducibility of synthetic protocols, lack of identification and characterization data for new compounds, and inflated yields reported in chemical communications—trends that have recently become a serious problem. Featuring contributions from world-renowned experts and overseen by a highly respected series editor, Carbohydrate Chemistry: Proven Synthetic Methods, Volume 4 compiles reliable synthetic methods and protocols for the preparation of intermediates for carbohydrate synthesis or other uses in the glycosciences. Exploring carbohydrate chemistry from

both the academic and industrial points of view, this unique resource brings together useful information into one convenient reference. The series is unique among other synthetic literature in the carbohydrate field in that, to ensure reproducibility, an independent checker has verified the experimental parts involved by repeating the protocols or using the methods. The book includes new or more detailed versions of previously published protocols as well as those published in not readily available journals. The essential characteristics of the protocols presented are reliability, updated characterization data for newly synthesized substances and the expectation of wide utility in the carbohydrate field. The protocols presented will be of wide use to a broad range of readers in the carbohydrate field and the life sciences, including undergraduates taking carbohydrate workshops.

A symbol of modernity, the Viennese Secession was defined by the rebellion of twenty artists who were against the conservative Vienna Künstlerhaus' oppressive influence over the city, the epoch, and the whole Austro-Hungarian Empire. Influenced by Art Nouveau, this movement (created in 1897 by Gustav Klimt, Carl Moll, and Josef Hoffmann) was not an anonymous artistic revolution. Defining itself as a “total art”, without any political or commercial constraint, the Viennese Secession represented the ideological turmoil that affected craftsmen, architects, graphic artists, and designers from this period. Turning away from an established art and immersing themselves in organic, voluptuous, and decorative shapes, these artists opened themselves to an

evocative, erotic aesthetic that blatantly offended the bourgeoisie of the time. Painting, sculpture, and architecture are addressed by the authors and highlight the diversity and richness of a movement whose motto proclaimed “for each time its art, for each art its liberty” – a declaration to the innovation and originality of this revolutionary art movement.

'Ideal for getting an overview of applied organic chemistry' This bestselling standard, now in its 3rd completely revised English edition, is an excellent source of technological and economic information on the most important precursors and intermediates used in the chemical industry. Right and left columns containing synopsis of the main text and statistical data, and numerous fold-out flow diagrams ensure optimal didactic presentation of complex chemical processes. The translation into eight languages, the four German and three English editions clearly evidence the popularity of this book. '... it is where I look first to get a quick overview of the manufacturing process of a product... Weissermel/Arpe has been serving me for years as an indispensable reference work.' (Berichte der Bunsengesellschaft für Physikalische Chemie) 'Whether student or scientist, theorist or practitioner - everyboby interested in industrial organic chemistry will appreciate this work.' (farbe + lack) '...it should be ready to hand to every chemist or process engineer involved directly or indirectly with industrial organic chemistry . It should be in the hand of every higher-graduate student, especially if chemical technology is not part of the study, like in many college universities...'

(Tenside-Surfactants-Detergents)

What would life be like without color? Ever since one can think back, color has always accompanied mankind. Dyes - originally obtained exclusively from natural sources - are today also produced synthetically on a large scale and represent one of the very mature and traditional sectors of the chemical industry. The present reference work on Industrial Dyes provides a comprehensive review of the chemistry, properties and applications of the most important groups of industrial dyes, including optical brighteners. It also outlines the latest developments in the area of functional dyes. Renowned experts in their respective fields have contributed to the chapters on chemical chromophores, synthesis and application of the various dye classes, textile dyeing and non-textile dyeing. The book is aimed at all professionals who are involved in the synthesis, production, manufacture or application of dyes and will prove to be an indispensable guide to all chemists, engineers and technicians in dye science and industry.

This second edition of a bestselling textbook offers an instructive and comprehensive overview of our current knowledge of biocatalysis and enzyme technology. The book now contains about 40% more printed content. Three chapters are completely new, while the others have been thoroughly updated, and a section with problems and solutions as well as new case studies have been added. Following an introduction to the history of enzyme applications, the text goes on to cover in depth enzyme

mechanisms and kinetics, production, recovery, characterization and design by protein engineering. The authors treat a broad range of applications of soluble and immobilized biocatalysts, including wholecell systems, the use of non-aqueous reaction systems, applications in organic synthesis, bioreactor design and reaction engineering. Methods to estimate the sustainability, important internet resources and their evaluation, and legislation concerning the use of biocatalysts are also covered.

Do you need to know what's new in organosilicon chemistry? This book provides in-depth coverage of the latest developments in this interdisciplinary and fast-evolving field: - selectivity and reactivity of organosilicon compounds - new synthetic applications - structure and bonding - applications in materials and polymer science Written by leading experts, this book is a well-referenced and critical overview of modern silicon chemistry. 'I recommend this book to the student and the practitioner in this new, very different, and very exciting field'. Eugene G. Rochow /Harvard University

Aerosol Measurement: Principles, Techniques, and Applications Third Edition is the most detailed treatment available of the latest aerosol measurement methods. Drawing on the know-how of numerous expert contributors; it provides a solid grasp of measurement fundamentals and practices a wide variety of aerosol applications. This new edition is updated to address new and developing applications of aerosol measurement, including applications in environmental health, atmospheric science, climate change, air pollution, public health, nanotechnology, particle and powder

technology, pharmaceutical research and development, clean room technology (integrated circuit manufacture), and nuclear waste management.

Membrane Technology - a clean and energy saving alternative to traditional/conventional processes. Developed from a useful laboratory technique to a commercial separation technology, today it has widespread and rapidly expanding use in the chemical industry. It has established applications in areas such as hydrogen separation and recovery of organic vapors from process gas streams, and selective transport of organic solvents, and it is opening new perspectives for catalytic conversion in membrane reactors. Membrane technology provides a unique solution for industrial waste treatment and for controlled production of valuable chemicals. This book outlines several established applications of membranes in the chemical industry, reviews the available membranes and membrane processes for the field, and discusses the huge potential of this technology in chemical processes. Each chapter has been written by an international leading expert with extensive industrial experience in the field.

This new up-to-date edition of the successful handbook and ready reference retains the proven concept of the first, covering basic and advanced methods and applications in infrared imaging from two leading expert authors in the field. All chapters have been completely revised and expanded and a new chapter has been added to reflect recent developments in the field and report on the progress made within the last decade. In

addition there is now an even stronger focus on real-life examples, with 20% more case studies taken from science and industry. For ease of comprehension the text is backed by more than 590 images which include graphic visualizations and more than 300 infrared thermography figures. The latter include many new ones depicting, for example, spectacular views of phenomena in nature, sports, and daily life.

This handbook and ready reference brings together all significant issues of practical importance in selected topics discussing recent significant achievements for interested readers in one single volume. While covering homogeneous and heterogeneous catalysis, the text is unique in focusing on such important aspects as using different reaction media, microwave techniques or catalyst recycling. It also provides a comprehensive treatment of key issues of modern-day coupling reactions having emerged and matured in recent years and emphasizes those topics that show potential for future development, such as continuous flow systems, water as a reaction medium, and catalyst immobilization, among others. With its inclusion of large-scale applications in the pharmaceutical industry, this will equally be of great interest to industrial chemists. From the contents * Palladium-Catalyzed Cross-Coupling Reactions - A General Introduction * High-turnover Heterogeneous Palladium Catalysts in Coupling Reactions: the Case of Pd Loaded on Dealuminated Y Zeolites Palladium-Catalyzed Coupling Reactions with Magnetically Separable Nanocatalysts * The Use of Ordered Porous Solids as Support Materials in Palladium-Catalyzed Cross-Coupling Reactions * Coupling Reactions Induced by Polymer-Supported Catalysts * Coupling Reactions in Ionic Liquids * Cross-Coupling Reactions in Aqueous Media * Microwave-Assisted Synthesis in C-C and C-

Heteroatom Coupling Reactions * Catalyst Recycling in Palladium-Catalyzed Carbon-Carbon Coupling Reactions * Nature of the True Catalytic Species in Carbon-Carbon Coupling Reactions with * Heterogeneous Palladium Precatalysts * Coupling Reactions in Continuous Flow Systems * Large-Scale Applications of Palladium-Catalyzed Couplings in the Pharmaceutical Industry

Safety of Lithium Batteries describes how best to assure safety during all phases of the life of Lithium ion batteries (production, transport, use, and disposal). About 5 billion Li-ion cells are produced each year, predominantly for use in consumer electronics. This book describes how the high-energy density and outstanding performance of Li-ion batteries will result in a large increase in the production of Li-ion cells for electric drive train vehicle (xEV) and battery energy storage (BES or EES) purposes. The high-energy density of Li battery systems comes with special hazards related to the materials employed in these systems. The manufacturers of cells and batteries have strongly reduced the hazard probability by a number of measures. However, absolute safety of the Li system is not given as multiple incidents in consumer electronics have shown. Presents the relationship between chemical and structure material properties and cell safety Relates cell and battery design to safety as well as system operation parameters to safety Outlines the influences of abuses on safety and the relationship to battery testing Explores the limitations for transport and storage of cells and batteries Includes recycling, disposal and second use of lithium ion batteries

This high-class book reflects a decade of intense research, culminating in excellent successes over the last few years. The contributions from both academia as well as the industry leaders combine the fundamentals and latest research results with application know-how and

examples of functioning displays. As a result, all the four important aspects of OLEDs are covered: - syntheses of the organic materials - physical theory of electroluminescence and device efficiency - device conception and construction - characterization of both materials and devices. The whole is naturally rounded off with a look at what the future holds in store. The editor, Klaus Muellen, is director of the highly prestigious MPI for polymer research in Mainz, Germany, while the authors include Nobel Laureate Alan Heeger, one of the most notable founders of the field, Richard Friend, as well as Ching Tang, Eastman Kodak's number-one OLED researcher, known throughout the entire community for his key publications.

Nitrogen is unique among the non-carbon atoms in its ability to form single, double, and triple bonds with itself, giving rise to a wide range of organic-chemical groups containing several nitrogen atoms in different states and geometries. The present volume surveys the properties and chemical behaviour of all important nitrogen-rich organic-chemical groups, including azides, azimines, aziridines, diazo compounds, nitramines, nitrenes, nitrosamines, polyazine N-oxides, tetrazoles, triazanes, triazenes, and triazoles. A special focus lies on commercially important species which are used, e. g., as powerful explosives. PATAL's Chemistry of Functional Groups publishes comprehensive reviews on all aspects of specific functional groups. Each volume contains outstanding surveys on theoretical and computational aspects, NMR, MS, other spectroscopic methods and analytical chemistry, structural aspects, thermochemistry, photochemistry, synthetic approaches and strategies, synthetic uses and applications in chemical and pharmaceutical industries, biological, biochemical and environmental aspects. To date, almost 150 volumes have been published in the series.

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