Chromic Phenomena
Technological Applications of Colour Chemistry

Michael Hutchings
Peter Bamfield

Synopsis
Chromic or colour related phenomena are produced in response to a chemical or physical stimulus. This new edition will update the information on all those areas where chemicals or materials interact with light to produce colour, a colour change, or luminescence, and where ‘coloured’ compounds are used to transfer energy or manipulate light in some way. In the past eight years since the previous edition, there has been an increase in number of papers and reviews being produced reflecting the growth of interest in this area. This ongoing research interest is matched by a large number of new technological applications of commercial value. This book appeals to industrial chemists, professionals, postgraduates and possibly as high level recommended reading for colour technology courses.

Brief Contents
- Colour Change Phenomena and their Applications
- Luminescent Materials and their Applications
- Light Processing Materials in Biomedical, Energy and Other Applications
- Light Manipulation Materials, Structural Colours and Photonics
- Appendices
- Subject Index.

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Electrochemical Reduction of Carbon Dioxide
Overcoming the Limitations of Photosynthesis

David Fermin University of Bristol, UK
Frank Marken University of Bath, UK

Synopsis
One of the crucial challenges in the energy sector is the efficient capture and utilisation of CO2 generated from fossil fuels. This book covers the most recent developments in the field of electrochemical reduction of CO2, from first-principle mechanistic studies to technological perspectives. An introduction to basic concepts in electrochemistry and electrocatalysis is included to provide a background for newcomers to this field. This book provides a comprehensive overview for researchers and industrial chemists working in environmental science, electrochemistry and chemical engineering.

Brief Contents
- The Role of Electrochemistry in the Control of CO2 Emissions and Conversion to High Added Value Products
- Fundamental Aspects of Electrocatalysis and Photoelectrochemistry
- First Principle Studies of Electrocatalytic Processes and CO2 Reduction
- Electrochemical Reduction of CO2 at Single Crystal Electrodes
- Electrochemical Reduction of CO2 at Semiconductor and Metal Oxides
- Probing Intermediates Species Employing In-situ Infrared, Raman Spectroscopy and Mass Spectrometry
- Nanoscale Electro catalysts
Intensification of Biobased Processes

Andrzej Gorak  TU Dortmund University, Germany
Andrzej Stankiewicz  Delft Technical University, The Netherlands

Synopsis
Providing a comprehensive overview of modern process intensification technologies used in bioprocessing, this book focusses on four different categories of biobased products: bio-fuels and platform chemicals; cosmeceuticals; food products; and polymers and advanced materials. It covers various intensification aspects of the processes concerned, including (bio)reactor intensification; intensification of separation, recovery and formulation operations; and process integration. This is an invaluable source of information for researchers and industrialists working in chemical engineering, biotechnology and process engineering.

Brief Contents
- Part 1: Bio-fuels and Platform Chemicals
- Intensification of Enzymatic Hydrolysis of Cellulose Using High-frequency Ultrasound
- Process Integration and Intensification of Enzymatic Cellulose Hydrolysis in a Membrane Bioreactor
- Intensified Biomass Pre-processing
- Plasma-enhanced Biomass Gasification
- Transforming Biomass with Ionic Liquids: Process Intensification and the Development of a High-gravity, One-pot Process for the Production of Cellulosic Ethanol

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Metal-free Functionalized Carbons in Catalysis
Synthesis, Characterization and Applications

Alberto Villa Universidad degli Studi di Milano, Italy
Nikolaos Dimitratos Cardiff University, UK

Synopsis
Metal-free carbons have recently shown great efficiencies in several catalytic processes. Providing an overview on the preparation, characterization and application of metal-free functionalized carbons, this book looks at carbon nanotubes, graphene, carbon nitride and covalent organic frameworks (COF). It is ideal for researchers and industrialists working in catalysis, gas sensing and carbon dioxide storage.

Brief Contents
- Covalent methods
- Non-covalent methods
- C3N4 and Covalent Triazine Framework (CTF)
- Morphology/Raman
- XPS
- Liquid phase reaction
- Gas phase reaction
- Electrochemistry
- Photocatalysis
- Sensors

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**NOx Trap Catalysts and Technologies**

**Fundamentals and Industrial Applications**

Luca Lietti, Politecnico di Milano, Italy  
Lidia Castoldi, Politecnico di Milano, Italy

**Synopsis**

For the first time, this book provides a review of the current state of the technology in NOx traps. Covering both the fundamental and applied issues, the book features chapters from people within academia and industry. The book concludes with case studies demonstrating how these technologies are currently put into practice. This book is a fascinating reference for researchers and industrialists working in the treatment of exhaust fumes, as well as people in catalysis and in environmental monitoring.

**Brief Contents**

- Review of deNOx Technology for Mobile Applications  
- NSR Technology  
- NSR Catalytic Materials  
- Degradation of NSR Catalytic Materials: Causes, Effects, Mechanisms and Regeneration Strategies  
- Mechanism and Kinetics of NOx Storage  
- Active Sites for NOx Adsorption and Nature of NOxAdsorbed Species  
- Mechanistic Aspects of the Reduction of the Stored NOx by H2 Investigated by Isotopic Labelling Experiments and FTIR Spectroscopy  
- Microkinetic Models for the Reduction of Stored NOx by H2

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Preventing Chemical Weapons
Arms Control and Disarmament as the Sciences Converge

Michael Crowley University of Bradford, UK
Malcolm Dando University of Bradford, UK
Lijun Shang University of Bradford, UK

Synopsis
In this book, international leaders in various aspects of weapons prevention assess likely future trajectories in the chemical and life sciences alongside the risks of their application in the development of chemical or biological weapons. The current capabilities and limitations of existing international control regimes tasked with the prevention and elimination of chemical and toxin weapons are analysed. This book will be of interest to academic and research communities in the fields of pharmacology, toxicology, social science and those with an interest in the legal and ethical aspects of chemical and biological weapons prevention.

Brief Contents
- Preventing the Re-emergence of Chemical Weapons
- The Changing Nature of the Chemical and Biological Weapons Threat
- The Chemical Weapons Convention – Past Success, Current Challenges
- The Biological and Toxin Weapons Convention
- United Nations Mechanisms to Combat Development, Acquisition and Use of Chemical Weapons
- International Legal Constraints on the Weaponisation of Toxic Chemicals
- Convergence of Chemistry and Biology, and Nanotechnology
- Advances in Understanding Targets in the Central Nervous System (CNS)
- Advances in Targeted Delivery of Biochemical Agents

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Professional Development of Chemistry Teachers

Theory and Practice

Rachel Mamlok-Naaman Weizmann Institute of Science, Israel
Ingo Eilks University of Bremen, Germany
George Bodner Purdue University, USA
Avi Hofstein The Weizmann Institute of Science, Israel

Synopsis
Continuous professional development of chemistry teachers is essential for any effective chemistry teaching, due to the evolving nature of the subject matter and its instructional techniques. Professional development aims to keep chemistry teaching up-to-date and to make it more meaningful, more educationally effective, and better aligned to current requirements.

Brief Contents
- Understanding the Nature of Chemistry Teachers’ Knowledge Base and Learning
- Models of Understanding Chemistry Teachers’ Professional Growth
- Essential Elements of Chemistry Education in Chemistry Teachers’ Pre-service Education
- Essential Elements of Chemistry Education in In-service Professional Development Systems for Teachers
- External Factors that Influence the Professional Development of Chemistry Teachers
- Development of Chemistry Leading Teachers

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Quenched-phosphorescence Detection of Molecular Oxygen
Applications in Life Sciences

Dmitri B Papkovsky University College Cork, Ireland
Ruslan I Dmitriev University College Cork, Ireland

Synopsis
Providing an overview of the recent developments in oxygen sensing employing quenching of phosphorescent materials including dyes, polymers and pigments, this book will bring the literature up to date as this field has seen major progress and deployment of advanced sensor chemistry, materials and detection systems. The applications are broad and developing particularly in biomedical, food packaging and environmental areas open to commercialisation. Aimed at researchers in academia and industry interested in oxygen measurement and technologies, it delivers practical guidance for potential new users and researchers.

Brief Contents
- Fundamentals of quenched phosphorescence O2 sensing and rational design of sensor materials
- New polymer-based sensor materials and fabrication technologies for large-scale applications
- Evolution of Cell-Penetrating Phosphorescent O2 Probes
- Hydrophilic Ir(III) complexes for in vitro and in vivo oxygen imaging
- Protection of triplet excited state materials from oxygen quenching and photooxidation in optical sensing applications
- Progress in phosphorescence lifetime measurement instrumentation for oxygen sensing

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Synopsis

The increased understanding of molecular aspects associated with chronic diseases, such as cancer and the role of tumor microenvironment, has led to the identification of endogenous and exogenous stimuli that can be exploited to devise "stimuli-responsive" materials for site-specific drug delivery applications. This book provides a comprehensive account on the design, materials chemistry, and application aspects behind these novel stimuli-responsive materials.

Setting the scene, the editors open with a chapter addressing the need for smart materials in delivery applications for therapy, imaging and disease diagnosis. The following chapter describes the key physical and chemical aspects of smart materials, from lipids to polymers to hybrid materials, providing the reader with a springboard to delve into the more application oriented chapters that follow.

Brief Contents

- Fundamentals of Stimuli-Responsive Drug and Gene Delivery Systems
- Materials and Chemistry of Stimuli-Responsive Drug Delivery Systems
- pH-responsive drug delivery systems
- Thermo-Responsive Nanomedicines for Drug Delivery in the Gastrointestinal Tract
- Redox-Responsive Drug Delivery Systems
- Magnetically-Responsive DDS
- Light-responsive Drug Delivery Systems
- Integrated Polymer Composites for Electro-Responsive Drug Delivery
- Enzyme-responsive drug delivery systems
Sustainable Catalysis for Biorefineries

Francesco Frusteri Institute for Advanced Energy Technologies ‘Nicola Giordano’, Italy
Donato Aranda Universidade Federal do Rio de Janeiro, Brazil
Giuseppe Bonura Institute for Advanced Energy Technologies ‘Nicola Giordano’, Italy

Synopsis
Biorefineries are becoming increasingly important in providing sustainable routes for chemical industry processes. This book explores the most effective or promising catalytic processes for the conversion of biobased components into high added value products, as platform chemicals and intermediates. With a focus on heterogeneous catalysis, this book is ideal for researchers working in catalysis and in green chemistry.

Brief Contents
- The Biorefinery Concept
- Catalytic Processes and Catalyst Development in Biorefining
- Catalysts for Depolymerization of Biomass
- Catalysts for Biomass Products Upgrading
- Catalysts for Biofuels Production
- Catalytic Upgrading of Bio-oils
- Catalysts for Microalgae Conversion into Biofuels and Biochemical
- Biomethane and Biohydrogen Production
- Catalysts for High-performance Biolubricants and Bio-polymers
- Biochar as a Promising Industrial Catalyst

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