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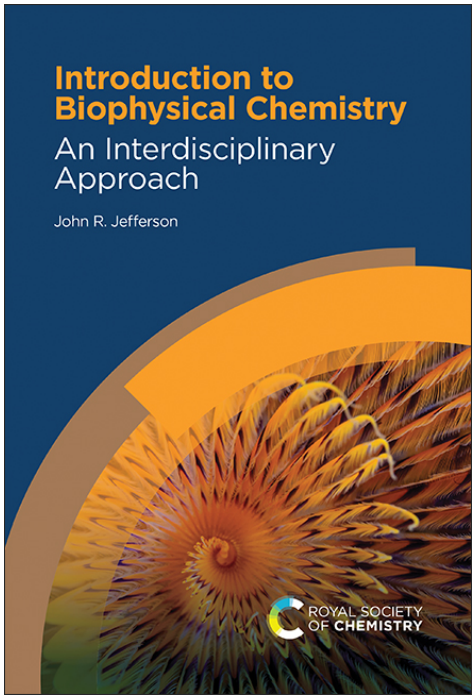

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Introduction to Biophysical Chemistry

An Interdisciplinary Approach

John R Jefferson Luther College, USA

Synopsis

Biophysical chemistry is an interdisciplinary field which applies the principles of physical chemistry to biochemical systems. Students entering this field generally have diverse backgrounds; either coming from predominantly chemical training or from predominantly biological training with a lack of confidence when faced with the mathematical descriptions of these systems. This book works for both audiences by showing how quantitative descriptions can enhance the understanding of the biological systems. This is done with examples from current applications to persistent biochemical problems such as protein mis-folding, diseased states and possible remedies. Written by an author with extensive experience in teaching and first-hand knowledge of how the students approach their course, this text provides extensive supplementary material, interactive activities and thought-provoking questions to encourage discussion.

Brief Contents

- Physics
- Physical Chemistry: Molecular Thermodynamics and Equilibrium
- Organic Chemistry
- Biochemistry: Structure and Function of the Major Classes of Biological Molecules
- Cell Biology
- Recombinant Technology
- Spectroscopy
- Microscopy
- Separation Methods: Centrifugation and Chromatography
- Mass Spectrometry and NMR
- Proteomics (Function and Structure)
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- Aging and diseases
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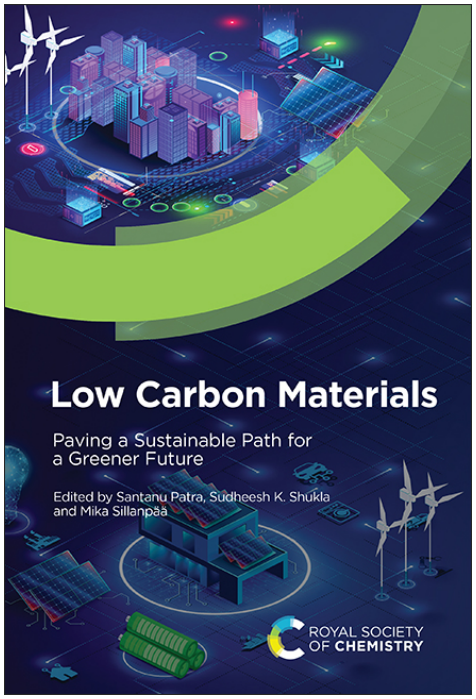

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Low Carbon Materials

Paving a Sustainable Path for a Greener Future

Santanu Patra Danmarks Tekniske Universitet, Denmark
Sudheesh K. Shukla Shobhit University, India
Mika Sillanpää University of Johannesburg, South Africa

Synopsis

In recent years, the issue of climate change has brought the importance of sustainability and environmental responsibility to the forefront of global discussions. Industries worldwide are seeking solutions to reduce their carbon footprints and contribute to a low carbon economy. One of the key areas with potential for impact is the development and implementation of materials with a lower carbon footprint. Encompassing a variety of different industries and applications this book captures the dynamic landscape of these developments. It is a great resource for both materials scientists and green chemists alike.

Key Features and Highlights

- Encompasses a variety of industries and applications to provide a dynamic overview of research into materials with a reduced carbon footprint
- Envisions a path towards a greener and more sustainable future using these materials
- Bridges the gap between materials scientists interested in sustainability and green chemists interested in materials

Brief Contents

- Low Carbon Materials: Unlocking Economic and Environmental Benefits
- Low Carbon Battery Materials
- Low Carbon Supercapacitors Materials
- Low Carbon Fuel Cell Materials
- Low Carbon Energy Harvesting Materials
- Low Carbon Materials for Electrochemical Water Splitting
- Low Carbon Materials for Healthcare Monitoring
- Low Carbon Materials in Biosensors Applications
- Low Carbon Materials for Electrochemical Biomedical Sensors
- Role of Low Carbon Materials in Construction and Infrastructure
- Low Carbon Materials for Environmental Monitoring
- Low Carbon Materials: Transportation and Automotive Applications
- Low Carbon Materials for Reducing Air Pollutants
- Recycling of Low Carbon Materials
- Toward a Greener Future with Low Carbon Materials

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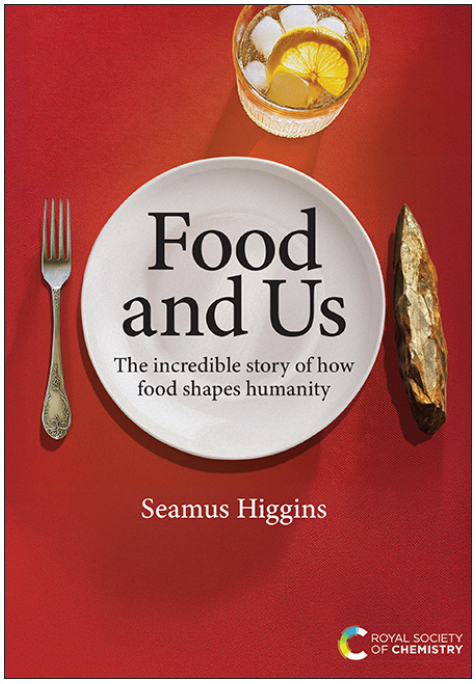

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BISAC:	CKB041000, SOC055000, HIS054000, TEC012000, SCI075000

Food and Us

The incredible story of how food shapes humanity

Seamus Higgins University of Nottingham, UK

Synopsis

This book explores our extraordinary food journey over the past 3 million years and details the subsequent physical and cultural evolution that has transpired because of it. Food has not only fuelled our evolution for millions of years but has also dictated how we live, from hunter-gatherers to agricultural societies to our current urban and industrialised societies. It also details how our favourite foods have developed over the past millennia since the Neolithic revolution. Indisputably, food and its production matters to everyone on the planet as our history shows they always have!

Key Features and Highlights

- A popular science title for all levels of reader which will create a better understanding of how both our food system and us have evolved.
- Details an understanding of the intricate interplay between our genetic and physical makeup and the food we eat.
- Looks at the changes needed to our current food systems as future populations and urbanisation grows as well as significant societal costs these changes will bring.

Brief Contents

- Introduction
- From Hominins to *Homo sapiens*
- The 1st Agricultural (Neolithic) Revolution
- Ceres, the Goddess of Grain and Agriculture
- "Give Us, This Day, Our Daily Bread"
- Regional Food Develops
- A Cornucopia of New World Food
- The 20th Century: Industrialised Agriculture
- The 20th Century and the Business of Food Production
- 20th-century Food Advice
- The 21st Century: Diet Food, Profitability, and Environmental Concerns
- Food and Us: Our Unique DNA and Physical Makeup
- Divining Food Energy and Nutritional Intake
- Rethinking Our Food System's Status Quo
- Towards a More Sustainable Future Food System

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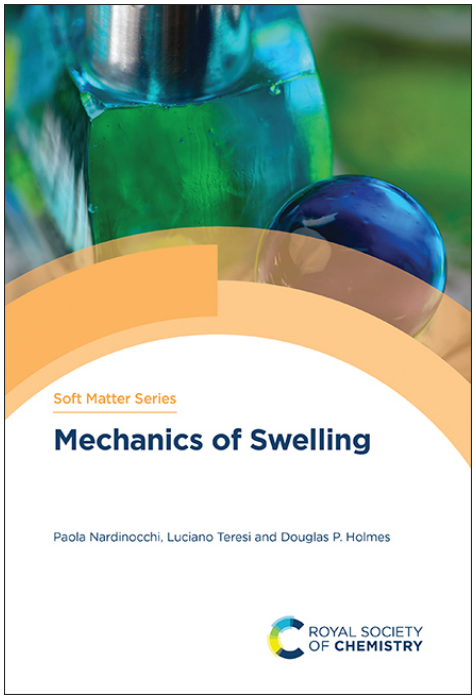

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THEMA:	PHFC1, PNNP, TGB
BISAC:	SCI097000, TEC009070
Series:	Soft Matter Series Volume 24

Mechanics of Swelling

Paola Nardinocchi Sapienza Università di Roma, Italy
Luciano Teresi Università Roma Tre, Italy
Douglas P Holmes Boston University, USA

Synopsis

Soft materials, found in biological tissues and various products, often swell when absorbing fluids, affecting their functionality. Understanding and modelling this swelling is crucial. This book integrates soft matter physics, nonlinear mechanics, and materials science to explain the mechanics of swelling in soft polymers. It serves as a comprehensive reference, offering theoretical insights and practical computational exercises for anyone interested in this field, regardless of their scientific background.

Key Features and Highlights

- The first comprehensive text to unify perspectives from materials science, soft matter physics, and continuum mechanics, offering a shared framework for researchers across disciplines.
- Includes tutorials, worked examples, and finite element codes, enabling readers to apply theoretical concepts to real-world swelling problems in soft polymers.
- Uniquely addresses swelling phenomena from both microscale (polymer chain behaviour) and macroscale (structural mechanics) viewpoints, incorporating coupled diffusion–mechanical models and active material systems.

Brief Contents

- Introduction to Swelling
- Introduction to Polymer Physics and Mechanics
- From Theory to the Lab
- Essential Elements of the Theory
- Rules for Stresses and Fluxes
- Free Energy: Mixing and Elasticity
- General Mechano-diffusion Problem
- Mechano-diffusion Theory for Polydomains
- Linear Mechano-diffusion Problems
- Equilibrium Solutions
- Computational Practice Through Worked Examples

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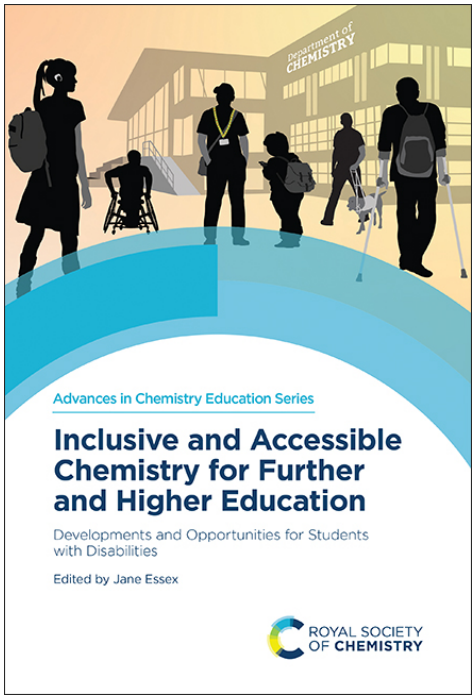

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Series:	Advances in Chemistry Education Series Volume 14

Inclusive and Accessible Chemistry for Further and Higher Education

Developments and Opportunities for Students with Disabilities

Jane Essex University of Strathclyde, UK

Synopsis

Chemistry should be welcoming and accessible to everyone with an interest. However, stigma and discrimination often colour the experiences of students with disabilities. With improved awareness and understanding of the functional needs of students with different types of disability we can make chemistry in higher education accessible to all. Drawing on research evidence on approaches to inclusion and describing examples of the inclusion of chemistry students with differing types of disability, this book sets out how we can successfully create inclusive higher education.

Key Features and Highlights

- Draws on research evidence to offer advice on approaches to creating inclusive chemistry learning environments
- Discusses barriers faced, helpful strategies and recommendations for improving accessibility and inclusivity in higher education
- Brings together research and experiences around a variety of different disabilities including visual and hearing impairments, neurodiversity

Brief Contents

- What is Inclusion and What Might that Look Like in Chemistry Education?
- Deaf Students' Experiences in Chemistry Further and Higher Education: Barriers, Support and Innovation
- New Vision for the Blind in the Chemical Sciences
- Mobility Issues, Fine Motor Impairment, and Service Dogs
- A Practical Approach to Supporting Chemistry Student Mental Health at University
- Sharing Our Experiences of Supporting Neurodivergent Students in Higher Education
- Autism as an Example of a Disability Presenting Very Varied Support Needs
- Applying Universal Design for Learning in Postsecondary Chemistry Courses: Examples from Practice
- Digital Technologies for Inclusion
- Universal Design for Inclusion in Chemistry, An Account of How to Plan Proactively for Inclusive Lab Provision
- Conclusion

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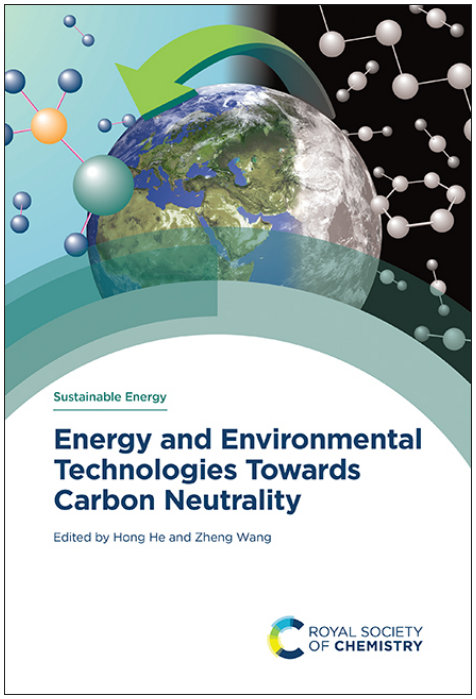

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THEMA:	TH, RNF, RNU
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Series:	Sustainable Energy Volume 4

Energy and Environmental Technologies Towards Carbon Neutrality

Zheng Wang Research Center for Eco-Environmental Sciences Chinese Academy of Sciences, China
Hong He Research Center for Eco-Environmental Sciences (CAS), China

Synopsis

This book provides an overview of carbon neutrality technologies combining energy conversion with environment control, covering one of the hot topics in the field of energy and the environment. It includes in-depth discussions, thus providing a comprehensive reference for the field of energy and the environment.

Bringing together internationally recognized experts from multiple disciplines, this book serves as an important reference for the whole community, including chemists, materials scientists, engineers and environmental scientists across academia, industry, and government.

Brief Contents

- Development and Techno-economic Analysis of Renewable Energy Utilization Towards Carbon Neutrality
- Development of Photovoltaic Power Technology
- Green Hydrogen Production
- Artificial Photosynthesis via Photocatalytic, Electrocatalytic, Photoelectrocatalytic CO_2 Conversion
- Functional Materials and Techniques for the Biomass Conversion and Utilization
- Advanced Clean Conversion and Efficient Utilization of Fossil Fuels
- Status and Evaluation of Energy Storage Technology: Advances and Challenges in Phase Change Materials
- Advances in CO_2 Capture and Utilization
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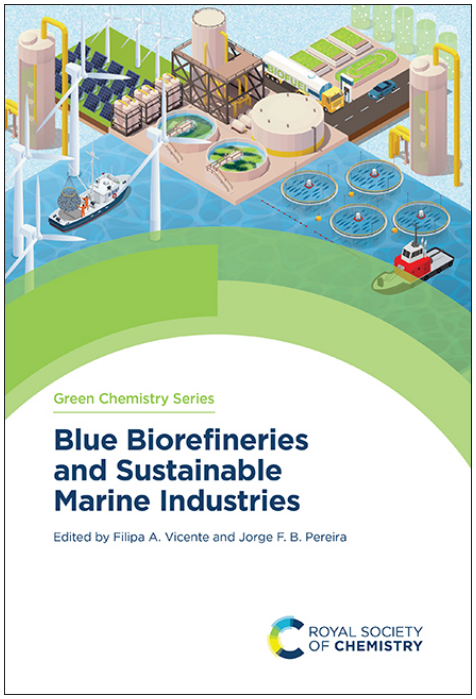

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BISAC:	SCI010000, TEC018000, SCI013060
Series:	Green Chemistry Series Volume 90

Blue Biorefineries and Sustainable Marine Industries

Filipa A Vicente National Institute of Chemistry, Slovenia
Jorge F B Pereira University of Coimbra, Portugal

Synopsis

The integration of biorefinery concepts into traditional industries is key to enabling the transition to a bio-based economy model (bioeconomy). The marine environment offers a source of chemically interesting biomass, much of which is regularly discarded as waste from fish and shellfish industries. Highlighting the importance and urgency of developing efficient and sustainable blue biorefineries, this book provides the latest advances in the extraction, purification and applications of the high added value compounds present in macro- and microalgae as well as crustacean and fish waste. Industrial case-studies and techno-economic and environmental analysis for the different blue biorefineries all add to a valuable vision for the future sustainability of marine industries.

Key Features and Highlights

- Highlights the importance and urgency of developing efficient and sustainable blue biorefineries
- Provides an overview on the different types of marine biomasses, their high added value compounds and the latest advances in their extraction, purification and applications
- Includes industrial case-studies and techno-economic and environmental analysis to inform and inspire academics and industrialists alike

Brief Contents

- The Importance of Developing an Efficient and Sustainable Blue Economy
- Development of Blue-based Biorefineries: Circular and Eco-friendly Technologies for Processing Marine
- Biomass and Waste
- Macroalgae
- Microalgae
- Crustacean Production and Waste Valorisation: A Sustainable Approach for the Seafood Industry
- Fish Waste
- Marine Biomasses as Sustainable Sources of Lipids
- Pigments
- Proteins and Peptides
- Polysaccharides from Marine Sources
- Platform Chemicals and Biofuels from Microalgae
- Techno-economic Analysis
- Life Cycle Assessment
- Macroalgae – Current Scenario and Industrial Case Studies
- From Crustacean Waste to Value: Market Prospects of Exploring Blue Biorefineries
- Fish Waste and Macroalgal Biorefinery Perspectives for Industrial Implementation
- Marine Biorefineries: Final Insights Towards a Realised Future

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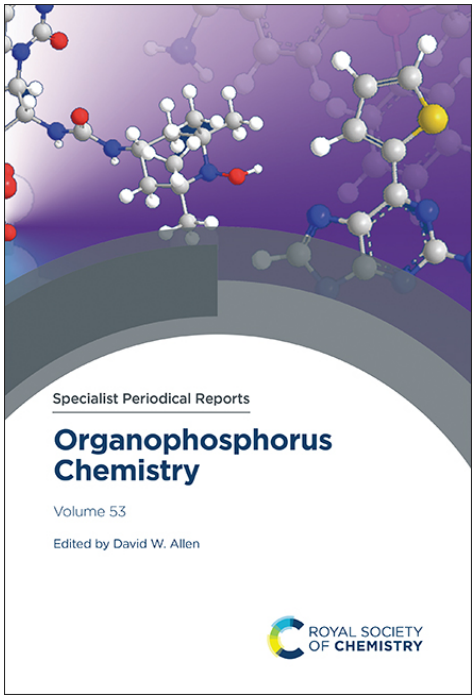

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Series:	Specialist Periodical Reports - Organophosphorus Chemistry Volume 53

Organophosphorus Chemistry

Volume 53

David W Allen Sheffield Hallam University, UK

Synopsis

This annual review of the literature provides a comprehensive and critical survey of a vast field of study involving organophosphorus compounds, ranging from phosphines, phosphine-related P–C bonded compounds and their chalcogenide derivatives, phosphonium salts and P-ylides, to tervalent and quinquevalent phosphorus acid derivatives and penta- and hexa-coordinated phosphorus compounds. Recent developments in applications as reagents in green synthetic procedures are also given. With an emphasis on interdisciplinary content, this book will appeal to the worldwide organic chemistry and engineering research communities.

Brief Contents

- Phosphines and related P-C bonded compounds
- Tervalent phosphorus acid derivatives
- Phosphine chalcogenides
- Phosphonium salts and P-ylides
- Quinquevalent phosphorus acids
- Pentacoordinated and hexacoordinated compounds
- Green synthetic approaches in organophosphorus chemistry: recent developments

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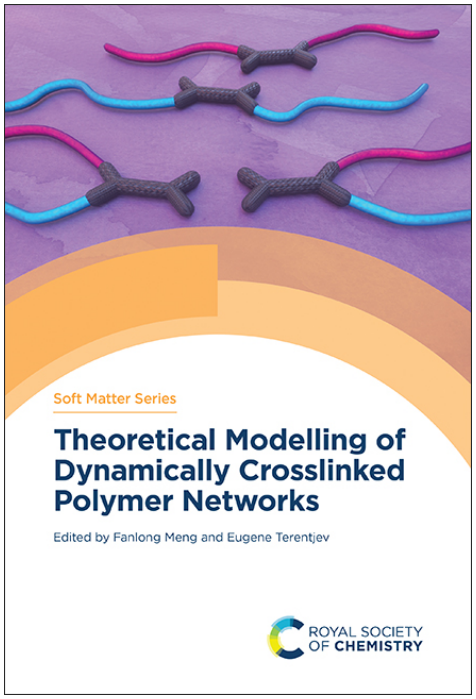

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BISAC:	SCI013050, SCI040000
Series:	Soft Matter Series Volume 23

Theoretical Modelling of Dynamically Crosslinked Polymer Networks

Fanlong Meng Chinese Academy of Sciences, China
Eugene Terentjev University of Cambridge, UK

Synopsis

This book explores dynamically crosslinked polymer networks, including vitrimers, focusing on their tuneable properties and applications. It covers theoretical foundations, the Tanaka–Edwards model, microscopic and continuum theories, and numerical simulations. Leading experts provide a comprehensive overview, concluding with future research directions. Bridging theory and experiment, this book is an essential reference for researchers and a valuable resource for postgraduate students in polymer physics and materials science.

Brief Contents

- Dynamical Models of Transient Polymer Networks
- Molecular Theory for the Physical Response of Transient Networks: A Review
- Modelling the Rheology of Associative-type Covalent Adaptable Networks (CANs)
- Molecular Dynamics Simulations of Dynamically Crosslinked Polymer Networks
- Patchy Particle Simulations of Transient Polymer Networks
- Outlook

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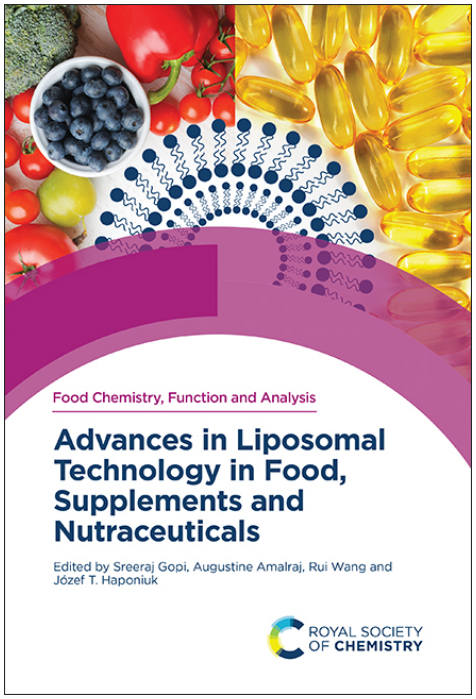

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BISAC:	TEC012000,
Series:	Food Chemistry, Function and Analysis Volume 46

Advances in Liposomal Technology in Food, Supplements and Nutraceuticals

Sreeraj Gopi Molecules Food Solution Private Limited, India
Augustine Amalraj Molecules Food Solutions Private Limited, India
Rui Wang Shanghai University, China
Józef T Haponiuk Gdansk University of Technology, Poland

Synopsis

Liposomal technology plays a significant role in encapsulation of various bioactive compounds to improve stability and bioavailability. Benefits have been seen in applying this technology to foods, supplements and nutraceuticals, particularly in industrial settings. This comprehensive book highlights recent research on liposomal technologies and their potential applications in these areas. Starting with an introduction and overview of liposome design, development and structure, exploration of the advantages and feasibility of liposomes in various food science applications follows. Provided mainly for researchers and industrialists in the food and nutraceutical sectors, this book benefits those in multidisciplinary fields investigating the possibilities provided by the liposomal technology.

Brief Contents

- Introduction and Overview of Liposomes
- Liposomes: Design, Development, Structure, Composition, Types and Related Techniques
- Liposome Composition in Food and Nutraceutical Supplements: Design, Synthesis, Characterization and Applications
- Application of Liposomal Technology in Food and Nutraceutical Supplements: Processing, Preservation and Safety Assessment
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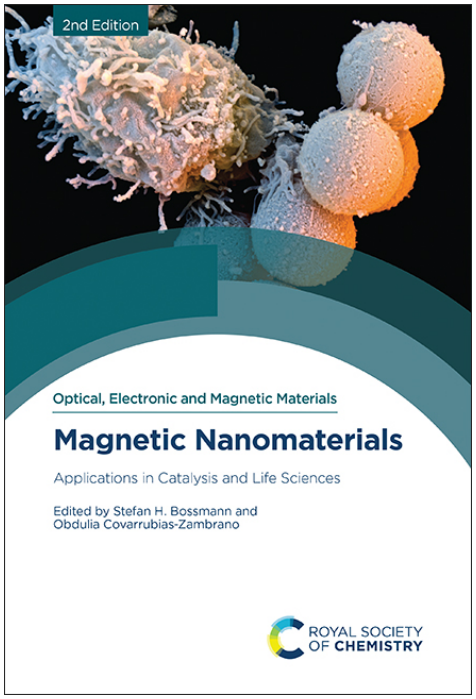

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BISAC:	SCI050000, SCI013030
Series:	Optical, Electronic and Magnetic Materials Volume 4

Magnetic Nanomaterials

Applications in Catalysis and Life Sciences

Stefan H Bossmann The University of Kansas Medical Center, USA

Obdulia Covarrubias-Zambrano The University of Kansas Medical Center, USA

Synopsis

Magnetic nanomaterials have undergone a significant evolution since the publication of the first edition of this book. This second edition of **Magnetic Nanomaterials** will provide a comprehensive overview of the latest research in the area of magnetic nanoparticles and their broad applications in synthesis, catalysis, theranostics, imaging and liquid biopsies. Written and edited by experts working within the field across the world, this book will appeal to students and researchers interested in nanotechnology, engineering and physical sciences.

Brief Contents

- Magnetism in Nanomaterials: Heat and Force from Colloidal Magnetic Nanoparticles
- Magnetic Nanoparticle Design and Application in Magnetic Hyperthermia
- Contrast Agents to Improve Anatomical and Quantitative MR Imaging
- Magnetic Nanomaterials for Sustainable Approaches in Water Remediation and Pharmaceutical-biomedical Innovation
- Recyclable Magnetic Materials for Biomass Conversion
- Magnetic Nanocontrast Agents for Tracking Stem Cells and Chimeric Antibody Receptor T Cells
- Development of Magnetic Theranostic Agents
- Image-guided Cancer Thermal Therapies
- Magnetic Nanoformulations for Enhanced Drug Delivery and Retention
- Cell-based Magnetic Nanomaterials for Tracking and Therapy
- Nanobiosensors for Cancer Detection with Magnetic Cores

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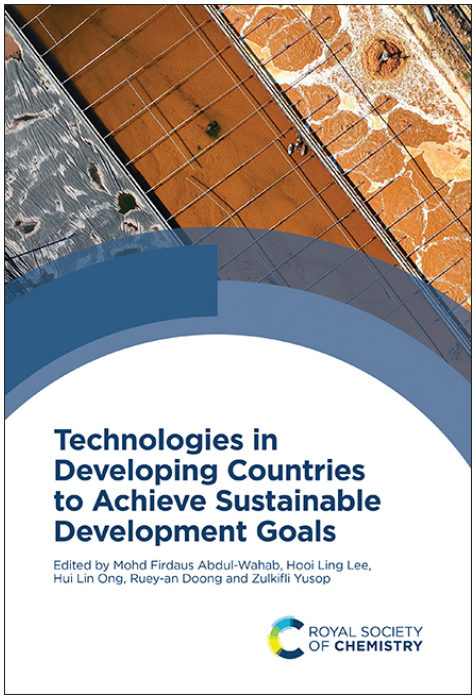

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BISAC:	SCI092000, TEC031010, TEC010030, SCI024000

Technologies in Developing Countries to Achieve Sustainable Development Goals

Mohd Firdaus Abdul-Wahab Universiti Teknologi Malaysia, Malaysia
Hooi Ling Lee Universiti Sains Malaysia, Malaysia
Hui Lin Ong Universiti Malaysia Perlis, Malaysia
Ruey-an Doong National Tsing Hua University, Taiwan
Zulkifli Yusop Universiti Teknologi Malaysia, Malaysia

Synopsis

This book acts as a reference point for policymakers to understand how policies related to clean water and sustainable energy can be implemented or improved. It focuses on the current state of, and future approaches to, the clean water and sustainable energy nexus in the developing countries and least developed countries (LDCs) in Asia, particularly on the latest technologies, governance, management practices, and the socioeconomic impacts.

It demonstrates the efforts taken by the countries in making clean water management and energy production the basis for their sustainable development agenda, according to the UN Sustainable Development Goals.

Brief Contents

- Technological Challenges and Current Trends in Clean Water and Sustainable Energy in Developing Countries in Asia
- Highly Efficient and Selective Electrodialysis Membranes for Advanced Wastewater Purification
- Roles of Microbial Fuel Cells in Heavy Metal and Toxic Contaminant Remediation
- Climate Change Induced Trends in Basin-scale Extreme Rainfall for the Johor River Basin, Malaysia
- Water Governance and SDG 6: Strategies and Insights from Central Himalaya, Nepal
- The Development of Carbon Markets in Southeast Asian Countries
- Biological Utilisation of Waste Materials for Bioenergy Production
- Lignocellulosic Bioethanol Production: Advances in Genetic Engineering and Synthetic Biology
- Sustainable Solution: Titanium Based Nanocomposites as Photothermal Agents in Photodynamic Therapy (PDT)
- Bioenergy for Circular Bioeconomy: Uncovering Biomass Potential for Sustainable Zero-waste Energy
- Progress in Renewable Energy Initiatives in Developing Countries: A Case Study in Malaysia
- Micro-tubular Solid Oxide Fuel Cells: Theory, Configurations, Materials, and Fuel Challenges
- Conducting Polymer-GO/RGO Nanocomposites: New Generation Hybrid Materials for Supercapacitor Applications

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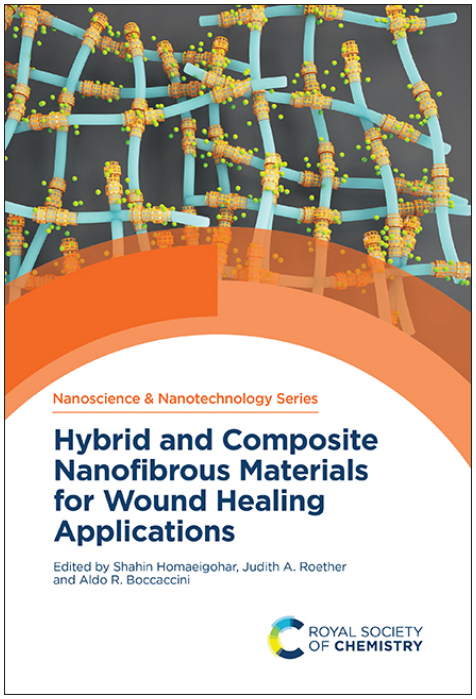

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BISAC:	TEC021000, MED034000
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Hybrid and Composite Nanofibrous Materials for Wound Healing Applications

Shahin Homaeigohar University of Dundee, UK
Judith A Roether University of Erlangen-Nuremberg, Germany
Aldo R Boccaccini University of Erlangen-Nuremberg, Germany

Synopsis

Nanofibrous materials have emerged as a promising new class of wound dressings, offering unique advantages like a biomimetic extracellular matrix structure and high surface area. This comprehensive book explores the latest developments in hybrid and composite nanofibrous systems designed to accelerate wound healing and is an essential reference for researchers, clinicians and industry professionals working on wound dressings.

Key Features and Highlights

1. Covers diverse composite and hybrid nanofiber formulations with wound healing potentials.
2. Discusses the commercialization potentials and challenges of nanofiber wound dressings.
3. Draws on a global expertise, offering an essential resource for academics and clinicians.

Brief Contents

- Extracellular Matrix (ECM) Mimicking Hybrid and Composite Nanofiber Materials: A General Perspective on Structural and Chemical Biomimicry and Their Role in Wound Healing and Skin Modelling
- Bioactive Glass Reinforced Biodegradable Polymer Fibers for Skin Wound Healing
- Metal and Metal Oxide Nanoparticle-incorporated Polymer Nanofibers for Wound Healing
- Wound Healing Composite Nanofiber Materials: Polymer Nanofibers Reinforced with Nature-derived Components
- Growth Factor (and Drug) Delivery Nanofibers for Wound Healing
- Composite and Hybrid Conductive Nanofibers for Accelerated Wound Healing
- Blend Nanofibers (Natural and Synthetic Polymers) for Wound Healing
- Wound Healing Biohybrid Nanofibre Materials (Protein/Polysaccharide Surface Loaded Polymer Nanofibres)
- Oligopeptide-functionalized Polymer Nanofibers for Wound Healing

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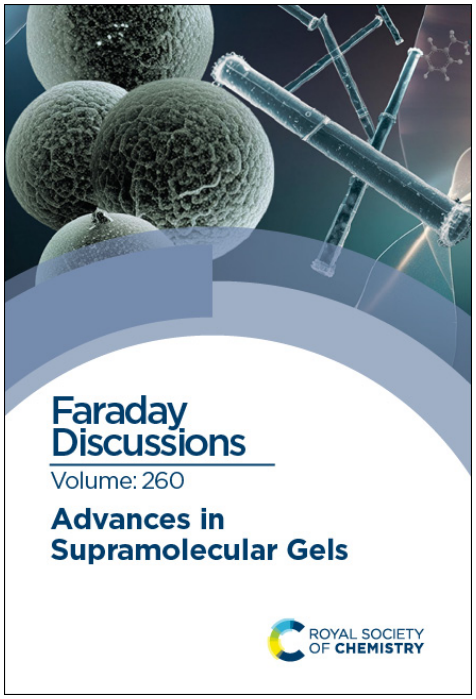

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BISAC:	SCI013040, SCI077000, TEC055000
Series:	Faraday Discussions

Advances in Supramolecular Gels

Faraday Discussion

Synopsis

Our ability to make soft materials based on the fundamental principles of self-assembly has led to a rich and varied global interdisciplinary community, particularly in the area of functional supramolecular gels. These gels are formed by the self-assembly of small molecules into one dimensional structures that entangle to form a network. Their applications are broad; gels have been shown to be of value in the life sciences in 3D cell culture, with a number of recent spin-out companies focused in this area but also have promise as new optoelectronic materials. The inherent interdisciplinarity of the field provides opportunities for chemists, physicists, biologists and engineers to work together, but also raises a number of challenges. Exciting new developments are opening up in transient and dynamic gels, and in the techniques used to study these systems – in particular contrast-matched small-angle scattering, cryo-TEM, and super-resolution microscopy.

Brief Contents

- **Design of gelling systems**
  Design of gelling systems is currently mainly a result of trial-and-error iteration around known structures or fortuitous discovery. We will bring together computational and experimentalists to discuss approaches to solving this. This session will explore and contrast effective approaches to gelator design (both experimental and computational), discuss how these approaches can be used to design the material properties of the resulting gels and what data are needed to inform these approaches.
- **Characterising supramolecular gels**
  Characterising supramolecular gels requires understanding across multiple length scales with all techniques used having advantages and disadvantages. To move forward, we need to be able to effectively combine multiple techniques. Recent innovations such as the use of superresolution microscopy have real potential but are not yet routinely applied to gels and there are real opportunities using more detailed cryo-TEM experiments. This session will bring together those inside and outside the community to spark ideas and drive new concepts.
- **Multicomponent systems**
  Multicomponent systems are a major potential step forward – here, we refer to combining gelling systems or mixing a gelling system with an additive. Both cases add significant complexity in terms of understanding but many opportunities that are not available with single component gels. The key discussion points in this session will be designing multicomponent systems, understanding and characterising all of the possibilities, and developing a language to describe these systems.
- **Using supramolecular gels**
  Designing gels for applications is difficult as it requires control of properties over many length scales as well as understanding of processing kinetically trapped materials. This session will also include aspects such as gels that change with time and how these can be used as well as 3D printing of gels. The key discussion points will be understanding how to control properties so that the gels can used for specific applications, with a focus on how to link measured properties to specific applications. Here, we aim to bring together users of gels for applications such as drug delivery, tissue culturing, optoelectronics etc. with those who are more focussed on preparing and characterising materials.

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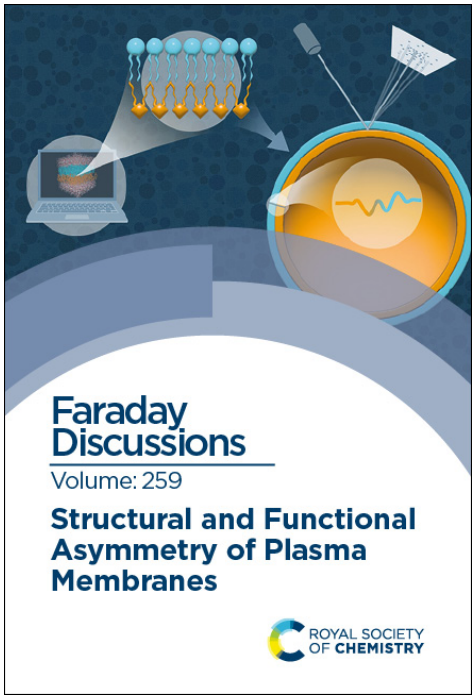

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Series:	Faraday Discussions

Structural and Functional Asymmetry of Plasma Membranes

Faraday Discussion 259

Synopsis

Recent developments in experimental and computational chemistry, physics and life sciences have enabled a greater quantitative understanding of lipid asymmetry and its coupling to protein function. This Discussion explores the various facets of membrane asymmetry, bringing together experts in membrane physical chemistry, membrane biophysics, and membrane physiology.

Brief Contents

- **Plasma membrane asymmetry and lipid homeostasis**
  The omics era has provided much data on phospholipids, sphingolipids, sterols and proteins located in different membranes, although information on their functional relevance remains limited. This section address challenges such as measuring trans-leaflet lipid distribution, including the spatiotemporal relation to overall lipid composition, and dissecting secondary lipid messengers from lipid ‘players’ with respect to bulk membrane properties.
- **Engineering plasma membrane mimics**
  Quantification of physicochemical properties of realistic plasma membrane mimics hinges on the controlled production of asymmetric bilayers in the presence and absence of integral or peripheral membrane proteins. This section discusses recently developed asymmetric membrane procedures and how these might be improved.
- **Structure and dynamics of asymmetric membranes**
  This session seeks to obtain physicochemical insights from lipid-only plasma membrane mimics. The section includes minimum realistic mimics of mammalian or bacterial plasma membranes, as well as the role of cholesterol in tuning and maintaining membrane asymmetry.
- **Proteins in asymmetric membranes**
  This section focuses on integral proteins functionally reconstituted into asymmetric membranes. Topics will include folding and reconstitution of proteins in asymmetric lipid membranes, control of protein directionality, and stability of lipid asymmetry in the presence of integral proteins.

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