Synopsis

Dynamic soft materials that have the ability to expand and contract, change stiffness, self-heal or dissolve in response to environmental changes, are of great interest in applications ranging from biosensing and drug delivery to soft robotics and tissue engineering. This book covers the state-of-the-art and current trends in the active and exciting field of bioinspired soft matter, its fundamentals and comprehension from the structural-property point of view, as well as materials and cutting-edge technologies that enable their design, fabrication, advanced characterization and underpin their biomedical applications.

Brief Contents

- The Mutable Collagenous Tissue of Echinoderms
- Synchrotron X-ray Imaging Combined with Multiscale Modeling
- Biomimetic and Collagen-based Biomaterials
- Silk Fibroin-based Soft Biomaterial/Scaffolds for Tissue Engineering
- Protein Aggregation Suppression and Folding Promotion by Synthetic Molecules
- Levan Polysaccharide for Biomedical Applications
- Alginate Particulate Gels for Oral Drug Delivery
- Extending the Functionality of Marine-origin Polysaccharides
- Elastin-like Recombinamers (ELRs) for Biomedical Applications
- Minimalistic Peptide Self-assembly into Supramolecular Biomaterials
- Recent Advances in the Design of Surface-initiated Polymer Brushes
- Bioinspired and Bioinscriptive Surfaces to Control Mesenchymal Stem Cells
- Biomimetic Surface Modifications Using a Layer-by-layer Technique
- Smart Porous Silica-Polymer Nanomaterials for Theranostics
- Liposomes for Biomedical Applications
- Cyclodextrin-based Drug Delivery Systems
- Soft Fibrillar Biomaterials by Fibre Spinning Routes
- Shaping Soft Structures Using Bottom-up Layer-by-layer Assembly
- Nanobiomaterials for Smart Delivery
- Liposomes in Targeted Drug Delivery
- Polysaccharide-based Hydrogels for the Controlled Delivery of Therapeutic Biomacromolecules
- Stimuli-responsive Drug Delivery Hydrogels
- Stimuli-responsive Nanocomposite Hydrogels Incorporating Nanoparticles
- 3D-printed Soft Hydrogels for Cell Encapsulation
- Decellularized Matrix Hydrogels for In Vitro Disease Modeling
- Animal Protein-based Soft Materials
- Soft Robotics Solutions for Minimally Invasive Surgery
- Cell-based Soft Biomaterials

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Time-resolved Imaging of Photo-induced Dynamics
Faraday Discussion 228

Synopsis
Photo-induced processes are of tremendous importance in the natural world and across science. Due to the intrinsic complexity of photo-induced processes, they remain the least understood type of physical and chemical processes. This Volume includes discussion on emerging time-resolved diffraction methods made possible by new x-ray lasers, time-resolved photo-induced spectroscopy that can be performed using new table-top ultrashort XUV and VUV light sources, experimental and theoretical aspects of strong-field physics and the new scientific opportunities made possible by the operation of X-ray free-electron lasers.

Brief Contents
- Time-resolved Diffraction
- Time-Resolved Ultrafast Spectroscopy
- Strong-Field Physics
- Ultrafast X-ray Science

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Advance Book Information

Catalysis
Volume 33

James Spivey Louisiana State University, USA
Yi-Fan Han East China University of Science and Technology, China
Dushyant Shekhawat National Energy Technology Laboratory, USA

Synopsis
This volume looks at modern approaches to catalysis and reviews the extensive literature. Chapters highlight 2D materials in biomass conversion catalysis, plasmonic photocatalysis, catalytic demonstration of mesoporosity in the hierarchical zeolite and the effect of surface phase oxides on supported metals and catalysis. Looking to the future a chapter on ab initio machine learning for accelerating catalytic materials discovery is included. Appealing broadly to researchers in academia and industry, these illustrative chapters bridge the gap from academic studies in the laboratory to practical applications in industry not only for catalysis field but also for environmental protection. Chemical reactions in ball mills is also explored. The book will be of great benefit to any researcher wanting a succinct reference on developments in this area now and looking to the future.

Brief Contents
- Microwave-assisted Heterogeneous Catalysis
- Plasmonic Photocatalysis
- Catalytic Routes and Mechanisms for Vinyl Acetate Synthesis
- Precise Composition/Kinetic Characterization of Solid Catalysts using Temporal Analysis of Products
- The Effect of Surface Phase Oxides on the Properties of Supported Metals and Catalysis
- Catalysis for Production of Jet Fuel from Renewable Sources by Hydrodeoxygenation and Hydrocracking
- Comprehending the Application of 2D Materials in Biomass Conversion
- Catalytic Demonstration of Mesoporosity in the Hierarchical Zeolite
- Titanate Nanotubes Produced by Hydrothermal Synthesis
- Catalytic Reactions in Ball Mills
- Ab Initio Machine Learning for Accelerating Catalytic Materials Discovery
- In-Situ Studies of Catalytic Reactions over Well-defined Model Catalysts
- Electrocatalysts

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Prebiotic Photochemistry
From Urey-Miller-like Experiments to Recent Findings

Franz Saija Italian National Research Council (CNR), Italy
Giuseppe Cassone Institute of Biophysics (IBP) of the Czech Academy of Sciences (CAS), Czech Republic

Synopsis

Photochemistry is an important facet in the study of the origin of life and prebiotic chemistry. Solar photons are the unique source of the large amounts of energy likely required to initiate the organisation of matter to produce biological life. The Miller-Urey experiment simulated the conditions thought to be present on the early earth and supported the hypothesis that under such conditions complex organic compounds could be synthesised from simpler inorganic precursors. The experiment inspired many others, including the production of various alcohols, aldehydes and organic acids through UV-photolysis of water vapour with carbon monoxide. This book is an ideal companion for postgraduates and researchers in prebiotic chemistry, photochemistry, photobiology, chemical biology and astrochemistry.

Brief Contents

- The Light of Photophysics and Photochemistry
- Extraterrestrial Photochemistry: Principles and Applications
- Gas-phase Prebiotic Chemistry Driven by Ultraviolet Photolysis of Simple Molecules
- Unveiling Early Earth Photochemistry Through Experimental Simulations of Planetary Atmospheres
- Rethinking UV-induced Prebiotic Selection of Biomolecules
- The Role of Photochemistry in the Prebiotic Model of Formamide
- Nucleobases as Molecular Fossils of Prebiotic Photochemistry: Excited-state Dynamics of C2 and C6 Substituted Purines
- Comets, Do They Have a Role in Prebiotic Photochemistry?
- Life Chooses Homochirality: The Role of Cosmic Dust in Chiral Selection
- Interstellar Complex Organic Molecules: A Step Toward Biomolecule Building Blocks in the Skies
- The Buried Chemical Wealth of Ices in Protoplanetary Discs
- Consequences of Heavy Bombardment on Prebiotic Synthesis
- The Birth and Fate of Glycine: From the Interstellar Medium to Primitive Earth
- Reconciling the Genetics-first and Metabolism-first Scenarios of the Origin of Life: Cyclic GMP as the Seed of Life

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Advance Book Information

Vampirology
The Science of Horror’s Most Famous Fiend

Kathryn Harkup

Synopsis
Our fascination with the vampire myth has scarcely diminished since Bram Stoker’s publication of the classic Dracula tale in 1897, but how much of the lore is based in fact and can science explain the origins of horror’s most famous fiend? Vampirology charts the murky waters of the vampire myth – from stories found in many cultures across the globe to our sympathetic pop-culture renditions today – to investigate how a scientific interpretation may shed light on the fears and phenomena of the vampire myth.

Brief Contents
- Prologue
- Evolution
- Vampirology
- Undead
- Blood
- Sunlight
- Supernatural
- Shapeshifting
- Disease
- Species
- Vampiroids
- Prevention
- Slaying
- Epilogue

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Synopsis
Heterogeneous catalysis is a core area of contemporary physical chemistry posing major fundamental and conceptual challenges. It lies at the heart of the chemical industry - an immensely successful and important part of the overall UK economy, and catalysis plays a crucial part in the production of 80% of all manufactured goods. This Faraday Discussion discusses key aspects of reaction mechanism studies and how this can drive rational design of catalysts.

Brief Contents
- Theory and reaction mechanisms
- Challenges of using advanced characterisation methods for in situ reaction mechanism studies
- Opportunities for understanding reaction mechanisms under flow conditions
- Dynamic catalytic systems on the border of heterogeneous/homogeneous catalysis

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Polymer Functionalized Graphene

Arun Kumar Nandi | Indian Association for the Cultivation of Science, India

Synopsis

There is an immense variety of research on polymer functionalized graphene (PFG). Applications of these graphene polymer hybrids are included in chemical and biological sensing, photovoltaic devices, supercapacitors and batteries, dielectric materials and drug/gene delivery vehicles. This book sheds light on the synthesis, properties and applications of these new materials, covering two methods (covalent and noncovalent) for producing polymer functionalized graphene. Graduate students and researchers in polymer chemistry and nanoscience will find this book valuable reading.

Brief Contents

- Introduction
- Covalent Functionalization of Polymers
- Noncovalent Polymer Functionalization of Graphene
- Physical Properties of Polymer Functionalized Graphene
- Optical Properties of Polymer Functionalized Graphene: Application as Optical Sensor
- Mechanical Properties of Polymer Functionalized Graphene
- Electronic Properties of Polymer Functionalized Graphene
- Polymer Functionalized Graphene as Dielectric Metal
- Applications of Polymer Functionalized Graphene in Energy Harvesting: Photovoltaics
- Applications of Polymer Functionalized Graphene in Energy Harvesting: Fuel Cells
- Polymer Functionalized Graphene in Energy Storage Devices
- Polymer Functionalized Graphene in Biomedical and Bio-technological Applications
Food Proteins and Peptides
Emerging Biofunctions, Food and Biomaterial Applications

Chibuike C Udenigwe University of Ottawa, Canada

Synopsis

This book discusses the chemistry of food proteins and peptides and their relationship with nutritional, functional, and health applications. Bringing together authorities in the field, it provides a comprehensive discussion focused on fundamental chemistries and mechanisms underpinning the structure-function relationships of food proteins and peptides. Research into this area behind the functional, health and nutritional benefits is burgeoning and has gained the interest of scientists, the industry, regulatory agencies, and consumers. This book fills the knowledge gap providing an excellent source of information for researchers, instructors, students, food and nutrition industry, and policy makers.

Brief Contents

- Food Protein Structures, Functionality and Product Development
- Research Advances in Food Protein Digestibility
- Food Protein Allergenicity: Characterization, Epitope Mapping and Deactivation
- Food Proteins as Biomaterial for Delivery Functions
- Controlled Protein-based Aggregates as Interfacial Stabilizers: Fabrication, Mechanism and Potential Application as Food Ingredients
- Chemistry and Functional Roles of Food Protein Hydrogels
- Protein-based Bioplastics for Food and Pharmaceutical Packaging
- Protein Modifications and the Food Matrix: Consequences, Chemistry and Characterization
- Therapeutic Protein Production from Genetically Modified Foods
- Stability of Bioactive Peptides During Processing
- Transport, Cellular Uptake and Bioavailability of Food Peptides
- Food-derived Peptides in Lipid Metabolism
- Food Peptides in Energy Metabolism
- Food Proteins in Controlling Satiety
- Food Peptides in Blood Pressure Regulation
- Chemistry and Function of Antimicrobial Peptides
- Use of Bioinformatics to Discover Biofunctional Food Peptides
- Chemistry and Biological Mechanisms of Peptides That Modulate Taste
- Omics Approach to Understanding the Distribution of Food Peptides in Food and Biological Samples

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NMR and MRI of Electrochemical Energy Storage Materials and Devices

Yong Yang Xiamen University, China
Riqiang Fu Florida State University, USA
Hua Huo Harbin Institute of Technology, China

Synopsis
This book introduces NMR and MRI methods for investigating electrochemical storage materials and devices including the theory of paramagnetic interactions and relevant calculation methods, a number of specific NMR approaches developed for battery materials and case studies of a variety of related materials. NMR has emerged as a powerful tool to enable an understanding of the working/failing mechanisms of energy storage materials and devices. The book is written for academics – postgraduate and above – and industrial readers requiring an overview of new methodologies being developed in the electrochemical arena. Each chapter includes some basic level information aimed at readers less familiar with the topics, including undergraduates.

Brief Contents
- NMR Principles of Paramagnetic Materials
- The Methodology of Electrochemical In Situ NMR and MRI
- Dealing with Quadrupolar Nuclei in Paramagnetic Systems
- Dynamic Nuclear Polarisation Enhanced NMR
- Oxide-based Cathode Materials for Li-and Na-ion Batteries
- NMR Studies on Polyanion-type Cathode Materials for LIBs/NIBs
- Intercalation and Alloying Anode Materials for Rechargeable Li/Na Batteries
- Electrolyte Evolution and SEI Interfaces
- NMR Studies of Oxide-type Solid State Electrolytes in All Solid State Batteries
- Organic and Organic-Inorganic Composite Solid Electrolytes
- Sulfide-based Electrolytes in Solid State Batteries
- NMR Characterization of Super-capacitors
- Characterising Non-aqueous Metal-Air Batteries Using NMR Spectroscopy
- Electrocatalyst and Electrode Reactions in Fuel Cells
- Surface Structures and Their Reactions in Transition Metal Oxides
- In Situ NMR Techniques for Li-ion Batteries
- Stray Field Imaging for High Resolution In Situ Analysis of Lithium-ion Batteries

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Two-dimensional Inorganic Nanomaterials for Conductive Polymer Nanocomposites

Chaoying Wan University of Warwick, UK
Xingyi Huang Shanghai Jiao Tong University, China
Chris Bowen University of Bath, UK

Synopsis

Functional, flexible and lightweight products are in high demand for modern technologies ranging from microelectronics to energy storage devices. The majority of polymers are thermal and electrical insulators, which hinder their use in these applications. This book highlights the synthesis, chemistry and applications of two-dimensional (2D) inorganic nanoplatelets in polymer nanocomposites. Chapters cover technical challenges, such as surface functionalisation, compatibilization, interfacial interaction, dispersion, and manufacturing technologies of the polymer nanocomposites. This title provides a much-needed overview of the field, giving advanced undergraduates, postgraduates and other researchers a convenient introduction to the topic.

Brief Contents

- 2D High-k Dielectric Ceramic Nanoplatelets for Polymer Nanocomposite Capacitors
- Surface Engineering of Boron Nitride Nanoplatelets for Thermal Conductivity Enhancement of Polymers
- Transition Metals Carbides (MXenes)-Polymer Nanocomposites
- Graphite Nanoplatelet-Carbon Nanotube Hybrids for Electrical Conducting Polymer Composites
- 2D Nanomaterial-based Polymer Composite Electrolytes for Lithium-based Batteries

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