

TOPICS IN CURRENT CHEMISTRY

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Volume Editor T.R. Kelly

Molecular Machines

 Springer

Molecular Machines Topics In Current Chemistry

Joachim Frank



Molecular Machines Topics In Current Chemistry:

Molecular Machines T. Ross Kelly, 2005-12-20 The chapters in this volume describe bottom up strategies and chronicle cutting edge advances from several of the world's leading laboratories engaged in the development of molecular machines. The Nobel Prize in Chemistry 2016 was awarded jointly to Jean Pierre Sauvage, Sir J Fraser Stoddart and Bernard L Feringa for the design and synthesis of molecular machines. Both Jean Pierre Sauvage and Sir J Fraser Stoddart have also contributed to this book. *Molecular Machines and Motors* Alberto Credi, Serena Silvi, Margherita Venturi, 2014-09-30 Molecular Machines and Motors Alberto Credi, Serena Silvi, Margherita Venturi, 2014-09-02 The cutting edge advances in this research field are nicely pictured in the chapters of this volume. They come from world's leading laboratories engaged in the development of molecular machines and are authored by some of the most respected scientists in the field. This volume shows on the one hand the level of ingenuity and technical capability reached in the construction of artificial nanomachines roughly two decades after their inception. On the other hand it conveys the excitement about the enormous opportunities as well as the challenges this research area presents as the interest of researchers is shifting from ensemble to single molecule measurements and from homogeneous to heterogeneous environments. Indeed as Feynman said when we have some control of the arrangement of things on a molecular scale we will get an enormously greater range of possible properties that substances can have. Although the answer to the when question is not easy to find there is no doubt that artificial molecular machines and motors will lead to a wide variety of applications which we cannot even envisage today. The Nobel Prize in Chemistry 2016 was awarded jointly to Jean Pierre Sauvage, Sir J Fraser Stoddart and Bernard L Feringa for the design and synthesis of molecular machines. Both Jean Pierre Sauvage and Bernard L Feringa contributed to this volume. The goal of each thematic volume in this series is to give the non specialist reader whether in academia or industry a comprehensive insight into an area where new research is emerging which is of interest to a larger scientific audience. Each review within the volume critically surveys one aspect of that topic and places it within the context of the volume as a whole. The most significant developments of the last 5 to 10 years are presented using selected examples to illustrate the principles discussed. The coverage is not intended to be an exhaustive summary of the field or include large quantities of data but should rather be conceptual concentrating on the methodological thinking that will allow the non specialist reader to understand the information presented. Contributions also offer an outlook on potential future developments in the field. Review articles for the individual volumes are invited by the volume editors. Readership: research chemists at universities or in industry, graduate students. **Macrocyclic and Supramolecular Chemistry** Reed M. Izatt, 2016-08-01 This book commemorates the 25th anniversary of the International Izatt Christensen Award in Macrocyclic and Supramolecular Chemistry. The award, one of the most prestigious of small awards in chemistry, recognizes excellence in the developing field of macrocyclic and supramolecular chemistry. *Macrocyclic and Supramolecular Chemistry: How Izatt Christensen Award Winners Shaped the*

Field features chapters written by the award recipients who provide unique perspectives on the spectacular growth in these expanding and vibrant fields of chemistry over the past half century and on the role of these awardees in shaping this growth. During this time there has been an upsurge of interest in the design synthesis and characterization of increasingly more complex macrocyclic ligands and in the application of this knowledge to understanding molecular recognition processes in host guest chemistry in ways that were scarcely envisioned decades earlier. In October 2016 Professor Jean Pierre Sauvage and Sir J Fraser Stoddart, author for chapter 22 Contractile and Extensile Molecular Systems Towards Molecular Muscles by Jean Pierre Sauvage, Vincent Duplan and Frédéric Niess, and 20 Serendipity by Paul R McGonigal and J Fraser Stoddart, respectively, were awarded the Nobel Prize in Chemistry alongside fellow Wiley author Bernard Feringa for the design and synthesis of molecular machines.

Molecular Machines in Biology Joachim Frank, 2011-12-19. The concept of molecular machines in biology has transformed the medical field in a profound way. Many essential processes that occur in the cell, including transcription, translation, protein folding, and protein degradation, are all carried out by molecular machines. This volume focuses on important molecular machines whose architecture is known and whose functional principles have been established by tools of biophysical imaging: X-ray crystallography and cryo-electron microscopy and fluorescence probing single molecule FRET. This edited volume includes contributions from prominent scientists and researchers who understand and have explored the structure and functions of these machines. This book is essential for students and professionals in the medical field who want to learn more about molecular machines.

Macrocycles Frank Davis, Séamus Hignson, 2011-02-23. Macrocyclic molecules contain rings made up of seven or more atoms. They are interesting because they provide building blocks for synthesizing precise two or three dimensional structures, an important goal in nanotechnology. For example, they can be used to develop nanosized reaction vessels, cages, switches, and shuttles, and have potential as components in molecular computers. They also have applications as catalysts and sensors.

Macrocycles: Construction, Chemistry, and Nanotechnology Applications is an essential introduction to this important class of molecules and describes how to synthesise them, their chemistry, how they can be used as nanotechnology building blocks, and their applications. A wide range of structures synthesised over the past few decades are covered, from the simpler cyclophanes and multi ring aromatic structures to vases, bowls, cages, and more complex multi ring systems and 3D architectures such as pumpkins, interlocking chains, and knots. Topics covered include principles of macrocycle synthesis, simple ring compounds, multi ring aromatic structures, porphyrins and phthalocyanines, cyclophanes, crown ethers, cryptands and spherands, calixarenes, resorcinarenes, cavitands, carcerands, and heterocalixarenes, cyclodextrins, cucurbiturils, cyclotrimeratylenes, rotaxanes, catenanes, complex 3D architectures including trefoils and knots.

Macrocycles: Construction, Chemistry, and Nanotechnology Applications distills the essence of this important topic for undergraduate and postgraduate students and for researchers in other fields interested in getting a general insight into this increasingly important class of molecules.

Immobilisation of DNA on Chips: DNA

adsorption on carbonaceous materials S. Alegret, 2005-11-03 M I Pividori S Alegret DNA Adsorption on Carbonaceous Materials F Luderer U Walschus Immobilization of Oligonucleotides for Biochemical Sensing by Self Assembled Monolayers Thiol Organic Bonding on Gold and Silanization on Silica Surfaces Y Okahata T Kawasaki Preparation and Electron Conductivity of DNA Aligned Cast and LB Films from DNA Lipid Complexes A del Campo I J Bruce Substrate Patterning and Active Strategies for DNA Chip Fabrication D V Nicolau P D Sawant Scanning Probe Microscopy Studies of Surface Immobilised DNA Oligonucleotide Molecules A Guiseppi Elie L Lingerfelt Impedimetric Detection of DNA Hybridization Towards Near Patient DNA Diagnostics Comprehensive Nanoscience and Technology , 2010-10-29 From the Introduction Nanotechnology and its underpinning sciences are progressing with unprecedented rapidity With technical advances in a variety of nanoscale fabrication and manipulation technologies the whole topical area is maturing into a vibrant field that is generating new scientific research and a burgeoning range of commercial applications with an annual market already at the trillion dollar threshold The means of fabricating and controlling matter on the nanoscale afford striking and unprecedented opportunities to exploit a variety of exotic phenomena such as quantum nanophotonic and nanoelectromechanical effects Moreover researchers are elucidating new perspectives on the electronic and optical properties of matter because of the way that nanoscale materials bridge the disparate theories describing molecules and bulk matter Surface phenomena also gain a greatly increased significance even the well known link between chemical reactivity and surface to volume ratio becomes a major determinant of physical properties when it operates over nanoscale dimensions Against this background this comprehensive work is designed to address the need for a dynamic authoritative and readily accessible source of information capturing the full breadth of the subject Its six volumes covering a broad spectrum of disciplines including material sciences chemistry physics and life sciences have been written and edited by an outstanding team of international experts Addressing an extensive cross disciplinary audience each chapter aims to cover key developments in a scholarly readable and critical style providing an indispensable first point of entry to the literature for scientists and technologists from interdisciplinary fields The work focuses on the major classes of nanomaterials in terms of their synthesis structure and applications reviewing nanomaterials and their respective technologies in well structured and comprehensive articles with extensive cross references It has been a constant surprise and delight to have found amongst the rapidly escalating number who work in nanoscience and technology so many highly esteemed authors willing to contribute Sharing our anticipation of a major addition to the literature they have also captured the excitement of the field itself in each carefully crafted chapter Along with our painstaking and meticulous volume editors full credit for the success of this enterprise must go to these individuals together with our thanks for largely adhering to the given deadlines Lastly we record our sincere thanks and appreciation for the skills and professionalism of the numerous Elsevier staff who have been involved in this project notably Fiona Geraghty Megan Palmer and Greg Harris and especially Donna De Weerd Wilson who has steered it through from its inception We

have greatly enjoyed working with them all as we have with each other **SUPRAmolecular dye chemistry** Frank Würthner, 2005-09-29 Handbook of Nanofabrication , 2010-05-25 Many of the devices and systems used in modern industry are becoming progressively smaller and have reached the nanoscale domain Nanofabrication aims at building nanoscale structures which can act as components devices or systems in large quantities at potentially low cost Nanofabrication is vital to all nanotechnology fields especially for the realization of nanotechnology that involves the traditional areas across engineering and science Includes chapters covering the most important Nanofabrication techniques which aids comprehensive understanding of the latest manufacturing technologies encountered in the field of nano level manufacturing which is essential for preparing for advanced study and application in nanofabrication techniques by enabling thorough understanding of the entire nanofabrication process as it applies to advanced electronic and related manufacturing technologies Each chapter covers a nanofabrication technique comprehensively which allows the reader to learn to produce nanometer level products as well as collect process and analyze data improve process parameters and how to assist engineers in research development and manufacture of the same Includes contributions from recognized experts from around the globe making the reader aware of variations in similar techniques applied in different geographical locations and is better positioned to establish all possible global applications **Prebiotic Chemistry** Peter Walde, 2005-10-13

Stimuli-Responsive Materials Marek W Urban, 2019-03-15 The ability for a material to change properties in response to external stimuli is an attractive feature for numerous applications and as such stimuli responsive materials are gaining attention across many different fields This book introduces the concepts of stimuli responsiveness including the fundamental materials properties required for design It provides readers with comprehensive scientific principles and developments of stimuli responsive materials as well as the recent technological advances Written by a renowned expert in the field this book is suitable for anyone interested in stimuli responsive materials working in polymers biochemistry biotechnology and materials science **New Horizons in Computational Chemistry Software** Michael Filatov, Cheol H. Choi, Massimo Olivucci, 2022-06-28 This volume presents the current status of software development in the field of computational and theoretical chemistry and gives an overview of the emerging trends The challenges of maintaining the legacy codes and their adaptation to the rapidly growing hardware capabilities and the new programming environments are surveyed in a series of topical reviews written by the core developers and maintainers of the popular quantum chemistry and molecular dynamics programs Special emphasis is given to new computational methodologies and practical aspects of their implementation and application in the computational chemistry codes Modularity of the computational chemistry software is an emerging concept that enables to bypass the development and maintenance bottleneck of the legacy software and to customize the software using the best available computational procedures implemented in the form of self contained modules Perspectives on modular design of the computer programs for modeling molecular electronic structure non adiabatic dynamics kinetics as

well as for data visualization are presented by the researchers actively working in the field of software development and application. This volume is of interest to quantum and computational chemists as well as experimental chemists actively using and developing computational software for their research. Chapters MLatom 2 An Integrative Platform for Atomistic Machine Learning and Evolution of the Automatic Rhodopsin Modeling ARM Protocol are available open access under a CC BY 4.0 License via link.springer.com

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Immobilisation of DNA on Chips: Immobilization of DNA on microarrays Christine Wittmann, 2005. With contributions by numerous experts. *The Sliding-Filament Theory of Muscle Contraction* David Aitchison Smith, 2019-02-05. Understanding the molecular mechanism of muscle contraction started with the discovery that striated muscle is composed of interdigitating filaments which slide against each other. Sliding filaments and the working stroke mechanism provide the framework for individual myosin motors to act in parallel, generating tension and loaded shortening with an efficient use of chemical energy. Our knowledge of this exquisitely structured molecular machine has exploded in the last four decades thanks to a bewildering array of techniques for studying intact muscle, muscle fibres, myofibrils, and single myosin molecules. After reviewing the mechanical and biochemical background, this monograph shows how old and new experimental discoveries can be modelled, interpreted, and incorporated into a coherent mathematical theory of contractility at the molecular level. The theory is applied to steady state and transient phenomena in muscle fibres, wing beat oscillations in insect flight muscle, motility assays, and single molecule experiments with optical trapping. Such a synthesis addresses major issues, most notably whether a single myosin motor is driven by a working stroke or a ratchet mechanism, how the working stroke is coupled to phosphate release, and whether one cycle of attachment is driven by the hydrolysis of one molecule of ATP. Ways in which the theory can be extended are explored in appendices. A separate theory is required for the cooperative regulation of muscle by calcium via tropomyosin and troponin on actin filaments. The book reviews the evolution of models for actin-based regulation, culminating in a model motivated by cryo-EM studies where tropomyosin protomers are linked to form a continuous flexible

chain It also explores muscle behaviour as a function of calcium level including emergent phenomena such as spontaneous oscillatory contractions and direct myosin regulation by its regulatory light chains Contraction models can be extended to all levels of calcium activation by embedding them in a cooperative theory of thin filament regulation and a method for achieving this grand synthesis is proposed Dr David Aitchison Smith is a theoretical physicist with thirty years of research experience in modelling muscle contractility in collaboration with experimental groups in different laboratories

Molecular Devices Andrei A. Gakh, 2018-07-12 Comprehensive look at mechanical molecular devices that mimic the behavior of man made devices Molecular devices and molecular machines are individual molecules and molecular systems capable of providing valuable device like functions Many of them have distinct conventional prototypes and therefore can be identified as technomimetic molecules The last decade has seen an increasing rate of practical applications of molecular devices and machines primarily in biomedical and material science fields Molecular devices An Introduction to Technomimetics and its Biological Applications focuses on mechanical molecular devices including the early set of technomimetic molecules Topics covered include the many simple molecular devices such as container compounds gearing systems belts and tubes and tweezers It touches upon each molecular machine and discusses in great detail the importance of their applications as well as the latest progress in the fields of chemistry physics and biotechnology Interdisciplinary Must have content for physicists chemists and biologists Comprehensive Details an extensive set of mechanical technomimetic molecular devices Thorough Starts with the fundamental material characterization and finishes with real world device application Molecular devices An Introduction to Technomimetics and its Biological Applications is an important book for graduate students researchers scientists and engineers in the fields of chemistry materials science molecular physics engineering biotechnology and molecular medicine

Advances in Heterocyclic Chemistry, 2019-03-19 Advances in Heterocyclic Chemistry Volume 129 is the definitive series in the field one of great importance to organic chemists polymer chemists and many biological scientists Because biology and organic chemistry increasingly intersect the associated nomenclature also is being used more frequently in explanations Written by established authorities in the field from around the world this comprehensive updated release includes chapters on Metal Catalyzed Direct Arylation of 1,2-Azoles The Literature of Heterocyclic Chemistry Part XVII 2017 Pyrrolo Imidazoquinolines and Pyrroloquinazolines with a Bridgehead Nitrogen Synthesis and Reactions of Arsole Stibole and Bismole Advances in Synthesis and Chemistry of Aziridines and more Considered the definitive serial in the field of heterocyclic chemistry Serves as the go to reference for organic chemists polymer chemists and many biological scientists Provides the latest comprehensive reviews written by established authorities in the field Combines descriptive synthetic chemistry and mechanistic insight to enhance understanding of how chemistry drives the preparation and useful properties of heterocyclic compounds

Chemoinformatics and Advanced Machine Learning Perspectives: Complex Computational Methods and Collaborative Techniques Lodhi, Huma, Yamanishi, Yoshihiro, 2010-07-31 This book is a timely compendium of

key elements that are crucial for the study of machine learning in chemoinformatics giving an overview of current research in machine learning and their applications to chemoinformatics tasks Provided by publisher

Photochemistry and Photophysics Vincenzo Balzani, Paola Ceroni, Alberto Juris, 2014-06-09 This textbook covers the spectrum from basic concepts of photochemistry and photophysics to selected examples of current applications and research Clearly structured the first part of the text discusses the formation properties and reactivity of excited states of inorganic and organic molecules and supramolecular species as well as experimental techniques The second part focuses on the photochemical and photophysical processes in nature and artificial systems using a wealth of examples taken from applications in nature industry and current research fields ranging from natural photosynthesis to photomedicine polymerizations photoprotection of materials holography luminescence sensors energy conversion and storage and sustainability issues Written by an excellent author team combining scientific experience with didactical writing skills this is the definitive answer to the needs of students lecturers and researchers alike going into this interdisciplinary and fast growing field

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