Protein Targeting with Small Molecules

Chemical biology aims to elucidate biological processes and phenomena by using techniques and methods that originate from chemistry. The development and use of small-molecule ligands to perturb protein function is a core technique at the heart of chemical biology research. Successful targeting of proteins with small molecules requires the use of a variety of complementary techniques, which range from synthetic organic chemistry to biochemical and biological screening methods, the identification and confirmation of targets by means of biophysical and cell-biological techniques, and fully fledged biological investigations. The book edited by Hiroyuki Osada, one of the foremost chemical biologists of today, aims to cover this enormously wide field by 12 complementary reviews written by experts in their individual areas of research.

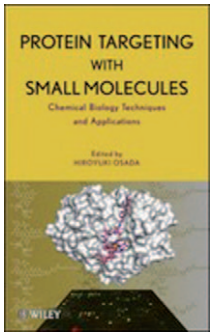
After an introductory chapter, four reviews deal with target identification and profiling by various biophysical methods, and by methods such as affinity isolation, proteomics approaches, small-molecule arrays, and phage-display techniques. A later chapter also discusses the use of yeast as an organism that is genetically readily tractable for chemical genetics and chemical genomics. The book's coverage of the technology also includes a chapter about the development of fluorescent probes and a review of the development of small-molecule ligands and inhibitors. Applications of chemical probes in the study of nuclear receptors and processes related to cell motility are highlighted in two separate chapters, which are complemented by an excursion into the chemical biology of cell-surface oligosaccharides.

The book ends with an overview of successful cases of target identification using bioactive small molecules. Taken together, the book provides a broad-ranging overview of numerous techniques, approaches, and methods that are applied in small-molecule ligand design, synthesis, and screening, the identification and validation of targets, as well as applications in selected fields.

In view of the wide range of topics covered, it has, of course, not been possible to treat individual methods and techniques in depth in a book of fewer than 300 A5 pages. Instead, the main strength of the book lies in providing an overview of the field. Thus, in reading the chapters the reader is made aware of the variety of chemical, biophysical, biochemical, and biological techniques that are typically applied in chemical biology research based on small molecules. Consequently, this is not really a textbook that would be suitable as an introduction to the field. Rather, it makes good reading for the trained researcher who is eager to learn about the tricks of the trade, possibly with a desire to become acquainted with or to enter the field.

The individual chapters vary in length and in depth of coverage of the topics, and some are more of the nature of educational or literature-update material, or even have personal review character. Given the fact that the chapters are written by a diverse group of authors, this is not unexpected. However, it does require that the reader should work proactively with the book, digging into the current literature or consulting textbooks of, for example, biophysics or cell biology rather than merely being entertained. This compendium of review articles does not make easy and uncomplicated reading, for example on a business trip, but it is the starting point for a very rewarding concentrated reading exercise, complemented, for example, by reading original papers chosen from the many literature references. As such, I strongly recommend the book to researchers with advanced training in chemistry, biophysics, biochemistry, or biology who have a desire to broaden their research into neighboring disciplines and are ready to become chemical biologists.

Herbert Waldmann
Max Planck Institute of Molecular Physiology, Dortmund (Germany)



Protein Targeting with Small Molecules
Chemical Biology Techniques and Applications. Edited by Hiroyuki Osada. John Wiley & Sons, Hoboken 2009. 297 pp., hardcover € 82.90.—ISBN 978-0470120538

Fullerene Polymers

Owing to their peculiar electronic properties, fullerene derivatives are attractive building blocks for polymer chemistry. The theoretical importance and potential applications of fullerene has resulted in numerous fullerene polymers having been developed to enhance, for example, its solubility and processability. Written by an outstanding team of experts from interdisciplinary areas of research, this book is based on a new classification of the different types of fullerene polymers according to their chemical structures. It covers all aspects, from different classes, to their synthesis and applications in material science.

Chapter 1 by Giacalone, Martin, and Wudl constitutes an overview of the field, including a classification of the different polyfullerenes.

Main-chain and side-chain fullerene polymers are the subject of Chapter 2 by Giacalone and Martin. They summarize results which demonstrate that fullerenes may be introduced into the main

WILEY InterScience DISCOVER SOMETHING GREAT
© 2010 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim

chain of an organic polymer to form a pearl necklace polymer, in which the fullerene unit is part of the polymer chain, or into the side chain of a polymer as a pendant group to form a charm bracelet polymer.

Chapter 3 by Ravi, Dai, and Tam emphasizes current developments in the synthesis and physicochemical properties of acrylate and methacrylate fullerene end capped polymers in aqueous solution or selective solvents.

Semi-interpenetrating polymer networks are distinguished from interpenetrating polymers, as described by Goh in Chapter 4, because the constituent linear or branched polymers can, in principle, be separated from the constituent polymer networks without breaking chemical bonds

Synthetic routes to polymer stars with a fullerene core are discussed by Mathis in Chapter 5. Particular emphasis is placed on polymers and block copolymers grafted onto fullerenes as a template to achieve organization.

Yashima and Maeda emphasize recent advances in the synthesis and structures of fullerene-containing helical polymers. To this end, Chapter 6 presents helical arrays composed of covalent and noncovalent bonding along polymer backbones or encapsulation into helical cavities.

Li, Zhou, and Huang summarize in Chapter 7 some of the most important issues on the preparation of advanced composite materials based on polymers containing fullerenes.

It is notable, for example, that polymers made of fullerenes tend to be more resilient than other polymers, and thus may well find applications in the areas of photovoltaics. This aspect is discussed by Cravino and Sariciftci in Chapter 8.

Chapter 9 by Haino provides an overview on fullerene-containing polymers—from synthesis to their physicochemical properties. In light of the unique chemical structure of fullerene, different fullerene-containing polymeric architectures have been synthesized, where fullerenes can be located either on the backbone or the branch chain.

In chapter 10, Nierengarten describes the plethora of fullerene-rich dendrons and dendrimers that are emerging from molecular engineering to illustrate the current state-of-the-art of fullerene chemistry for the preparation of new dendritic materials.

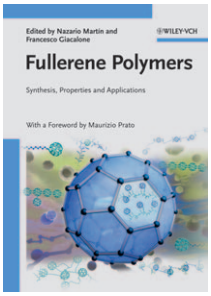
Guillon, Donnio, and Deschenaux highlight in chapter 11 fullerene-containing thermotropic liquid crystals. A great asset is the concept that they developed, for example, in the use of liquid-crystalline malonates in the Bingel reaction, which led to mesomorphic mono- and hexaadducts of C_{60}.

Chapter 12 by Herranz and Martin covers the timely topic of interfacing polymers with carbon nanotubes (CNTs). Of particular importance is the recent attention on the optical and electronic features of CNT/conjugated polymer composites that stem from strongly interacting π electrons of CNTs and π electrons that correlate with the lattice of the polymer skeleton.

Overall, the chapters should prove very useful to both students and researchers in the different areas. Personally, I would recommend this book to synthetic chemists, polymer chemists, chemical physicists, and physical chemists as well as to those broadly interested in carbon materials.

Dirk Guldi
Lehrstuhl für Physikalische Chemie I
Universität Erlangen-Nürnberg (Germany)

DOI: 10.1002/anie.200907061



Fullerene Polymers
Synthesis, Properties and Applications. Edited by Nazario Martín and Franceso Giacalone. Wiley-VCH, Weinheim 2009. 314 pp., hardcover € 129.00.—ISBN 978-3527322824

© 2010 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim