several more, for a really cool example of amphiphilic nanorods.[1]

The overall didactic quality of the book serves as a confirmation of a famous statement by the expert on university learning, Ken Bain: "Outstanding teachers know their subjects extremely well".[2] The authors, Ludovico Cademartiri and Geoffrey A. Ozin, have already published the second edition of the comprehensive textbook *Nanochemistry: A Chemical Approach to Nanomaterials*, which is an advanced text serving as a complement to *Concepts of Nanochemistry*; Geoffrey Ozin is, of course, universally recognized as a founding father of nanochemistry.

In conclusion, nanochemistry really seems to be mature enough now to be included in the first years of studying chemistry. The book *Concepts* can serve as a superb guide into nanochemistry for university teachers, students, and the interested general public. It can be emphatically recommended. Read it, or you will be missing something extraordinary.

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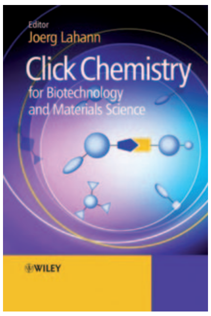
[1] F. S. Ou, M. M. Shaijumon, P. M. Ajayan, *Nano Lett.* **2008**, *8*, 1853.
[2] K. Bain, *What the Best College Teachers Do*, Harvard University Press, Cambridge, **2004**.

Click Chemistry for Biotechnology and Materials Science



Click Chemistry for Biotechnology and Materials Science
Edited by Joerg Lahann. John Wiley & Sons, Hoboken 2009. 432 pp., hardcover € 125.00.—ISBN 978-0470699706

Since the concept of click chemistry was introduced by Sharpless in 2001 as a set of powerful, highly reliable, and selective reactions for drug discovery, the use of click chemistry has undergone an explosive growth in nearly all fields of chemistry. The high yields, orthogonality, simple reaction conditions, and absence of side products are the advantages that make click chemistry ideal for efficient coupling and functionalization of large substrates; thus explaining its importance for biotechnology and materials science. In the book *Click Chemistry for Biotechnology and Materials Science*, Joerg Lahann has recognized the importance of click chemistry in these fields and brought together relevant leading experts, resulting in an impressive overview of the state of the art. The book comprises 16 individual chapters, which provide an overview of different aspects of click chemistry in review style.

The first chapter introduces the concept of click chemistry to the reader by listing the requirements that were defined by Sharpless for click chemistry reactions. Interestingly, it is noted that despite the fact that click chemistry was introduced for drug discovery, two-thirds of the publications about click chemistry are related to biotechnology and materials science. In addition, this chapter provides an overview of the various reactions that have been recognized as click chemistry. Finally, some limitations of the present click methodologies are discussed, such as the need to use a copper catalyst, and the limited availability of the reagents.

Chapters 2, 3, and 4 are devoted to synthetic aspects of the use of click chemistry in biotechnology. The synthesis of azide and alkyne functionalized building blocks based on peptides, oligonucleotides, and carbohydrates is discussed in Chapter 2. Chapter 3 focuses on the use of metal-free click reactions in chemical biology, which is of utmost importance for in vivo applications because of the toxicity of copper. Finally, the application of oxime chemistry for the preparation of polymer conjugates with proteins and peptides is described in Chapter 4.

The following five chapters are devoted to the use of click chemistry in polymer science, starting with a chapter that highlights the most prominent examples of copper(I)-catalyzed azide–alkyne cycloadditions (CuAAC) for the synthesis of complex polymer structures. Chapter 6 provides a clear and concise overview of the synthesis of block, star, and comb polymers and copolymers using click chemistry, including a detailed evaluation of various synthetic strategies, approaches to purification of the products, and methods for the characterization of such polymer architectures. Chapter 7 gives a broad overview of the use of CuAAC click chemistry to synthesize a wide variety of supramolecular materials, which range from rotaxanes to self-assembled polymeric vesicles, and from polymer networks to self-assembled monolayers. The next chapter discusses dendrimers, focusing both on the use of click chemistry to functionalize known dendrimers and on repetitive click reactions to build novel dendritic structures. Chapter 9 reports on the use of reversible Diels–Alder chemistry as click reactions to build polymer networks.

The remainder of the book focuses on various potential applications of click chemistry in biotechnology and materials science. Chapters 10, 11, and 12 describe the use of CuAAC click chemistry for the formation of biohybrid materials, for the production of functional nanoparticles, and for surface functionalization, respectively. Different strategies to introduce azides and alkynes into proteins are discussed in Chapter 13 as a basis for the development of novel methods for the in vivo identification of newly synthesized proteins. Chapter 14 provides a detailed overview of fluorogenic species that are turned on by CuAAC click reactions, and serve as important probes for bioconjugation, as well as for in vitro and in vivo labeling. The next chapter also deals with the use of click chemistry for the synthesis and functionalization of biomolecules, including the preparation of natural product analogues and the development of enzyme inhibitors. Lastly, Chapter 16 reports on the use of Diels–Alder click chemistry for the development of electro-optical polymers and dendrimers.

Throughout the book, the importance and advantages of click chemistry for biotechnology and materials science are clearly demonstrated. However, a critical evaluation of the different types of potential click reactions in relation to the requirements stated by Sharpless is not given; that would have strengthened the book by placing the different types of chemistry in perspective. For instance, several less common coupling reactions, such as oxime chemistry and Diels–Alder reactions, are reported as click chemistry without any critical notes pointing out that they are less efficient than CuAAC and/or require elevated temperatures.

Each chapter of the book is of high quality and provides and excellent overview of the respective field. However, they are only weakly interconnected, leading to a rather scattered collection of topics in the book. Unavoidably, incorporating 16 individual review-type chapters into a book also leads to some overlap between the chapters and makes it difficult to achieve a clear, logical ordering of the topics. However, these critical remarks are only valid if one reads the entire book from the beginning to the end.

Altogether, this book is a high-quality reference for people working in the field or for people interested in using click chemistry in biotechnology and/or materials science. As a consequence of the limited connectivity between the chapters, the book is not suitable for undergraduate students. Nevertheless, I recommend this book to all scientists working in the fields of biotechnology, materials science, click chemistry, or any related fields, since it provides an excellent overview of the current state of the art and illuminates the future potential of click chemistry.

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