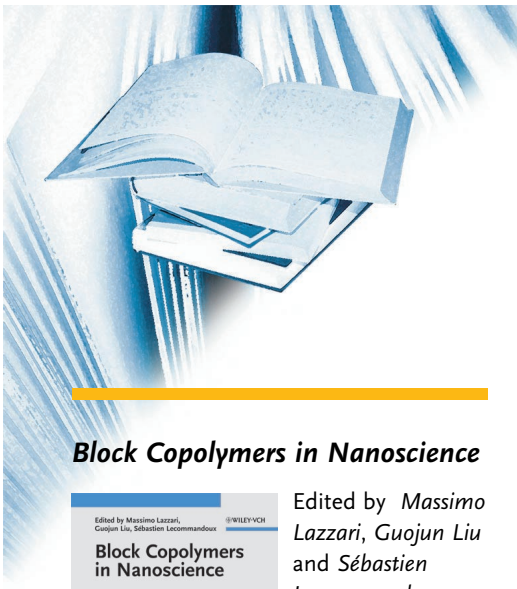
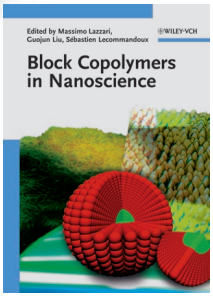


## Block Copolymers in Nanoscience




Edited by *Massimo Lazzari*, *Guojun Liu* and *Sébastien Lecommandoux*. Wiley-VCH, Weinheim 2006. 428 pp., hardcover € 120.00.—ISBN 978-3-527-31309-5

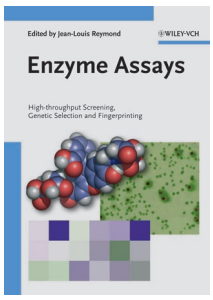
*Block Copolymers in Nanoscience*, edited by Lazzari, Liu, and Lecommandoux, covers a wide range of interdisciplinary areas, from synthetic polymer chemistry to morphology and structure formation. This science leads to useful tailor-made polymeric and hybrid materials with definite sizes and functionalities. The topics covered here fit very well into the most active research areas in polymer science, and they originate from a bottom-up approach, which is characteristically based on self-assembly of individual molecules leading to nanostructures. One of the basic questions that the bottom-up approach has to deal with is the opening of new horizons that have not been explored by well-established, classical, top-down approaches using lithography, anodic etching, etc. Here, one has to regard these two approaches as complementary rather than competing tools in the search for highly interdisciplinary and innovative applications in the area of polymeric, hybrid, and biological materials.

The book is divided into different fields based on the material aspects rather than on structural or chemical characteristics. Thus, the earlier chapters deal with biological materials based on micelles and vesicles, and the later chapters cover the hybrid materials. The very recent developments in all-organic fully functionalized block copolymers for electrooptical and optical applications are not covered in this book. Although the second chapter briefly describes the diverse synthetic procedures used for the versatile polymer architecture, it is very difficult to cover the whole spectrum of synthetic strategies in such a short treatment, and it would have been better to devote more space to the synthesis of block copolymers. One major topic in the field of dynamics and control of structure formation in block copolymers, namely theoretical studies and simulations, is missing from this book. In the last few years there have been intensive theoretical efforts to understand the formation of nanostructures and the influence of external stimuli on the manipulation of these structures. To include those aspects would have enriched the contents of this book enormously. The use of cutting-edge experimental techniques and tools that are necessary to characterize the nanostructures, their formation, and their manipulation is also given too little space here. The book mainly covers the formation of nanostructures in solution and in the bulk solid state. However, most of the advanced applications involve hierarchical structures on surfaces and thin films. This question of fixing the nanostructures in a desired way to get smart surfaces, interfaces, and thin films should also have found some place in this book. The text insets and labels in some of the figures and sketches have poor resolution and require improvement.

However, despite those faults this book gives an excellent overview of the various approaches in materials science that are based on the block copolymer strategy. The emphasis is on materials synthesis rather than on the physics of block copolymers. It is more a reference book for young scientists than a textbook for students who are entering this field of research.

*Mukundan Thelakkat*
Applied Functional Polymers
University of Bayreuth (Germany)
Monograph on Materials Science

## Enzyme Assays




High-Throughput Screening, Genetic Selection and Fingerprinting. Edited by *Jean-Louis Reymond*. Wiley-VCH, Weinheim 2006. 368 pp., hardcover € 139.00.—ISBN 3-527-31095-9

Biocatalysts play increasingly important roles in the synthesis of chemical intermediates and products, in particular in the synthesis of chiral compounds. A significant number of chemical processes already incorporate reactions catalyzed by enzymes, and the number is set to increase because of regulatory pressures to adopt environmentally friendly processes and products. Any researcher who is looking for a new biocatalyst now has an impressive array of potential resources at hand: genomic databases of microorganisms and higher organisms generate large numbers of candidates with predicted catalytic activities, and the corresponding genes can be easily obtained and often expressed in high-throughput mode. Once a suitable protein has been identified, the biocatalytic properties can be improved by directed evolution techniques, thereby generating large numbers of mutants in a short period of time. The bottleneck in biocatalyst discovery has now shifted from protein production to the next step, which is the enzyme assay.

The present monograph provides a forum for presenting the current state of the art in enzyme-assay development, and covers both well-established methods and very recent techniques. This book is certainly a very useful undertaking, since the enzyme assays are generally buried in the primary literature, which tends to focus more on application than method development.

The book is a multi-author project. It contains a general introduction by the editor and 12 chapters written by an impressive selection of contributors who are prominent in their subject areas. The chapters are grouped into three parts, which cover: I. High-Throughput

Screening, II. Genetic Selection, and III. Enzyme Fingerprinting.

Part I addresses the need for high-throughput screening systems, which is particularly important for biocatalysis, as a number of substrates must be screened against a bank of enzymes to obtain the best catalyst. In contrast to more traditional biochemical assays, screens for biocatalysts should also be "label-free" and generic, that is, applicable to a broad range of substrates, and importantly they should take stereochemistry into account.

The first four chapters of the book describe a wide variety of methods that address these requirements and have been used for biocatalyst screening. The section starts with the discussion of colorimetric assays for hydrolases, with a focus on generic methods that use dyes to detect intrinsic pH changes during the hydrolytic reaction. A useful discussion on estimating and measuring the stereoselectivity of reactions is included. Although optical methods of detection are still widely used, it is often difficult to design truly generic assay systems, and there has been a drive to introduce "label-free" spectroscopic detection systems. These include liquid and gas chromatographic methods coupled to mass spectrometry (MS) and to nuclear magnetic resonance (NMR) spectroscopy. The latter two methods can now be used in a medium- to high-throughput mode, albeit with significant capital investment. The fourth chapter of the book has a useful discussion on industrial perspectives of assay development. It highlights the advantages of assays involving MS and flow-injection NMR spectroscopy, in that they are generic and have very short development times, such that competitive timelines can be achieved in chemical custom manufacturing.

Biocatalysis is an interdisciplinary area that is most successful when both physical scientists and biologists are involved, and Part I of the book illustrates how chemists have brought in their generic tools of MS and NMR spectroscopy. Part II, on the other hand, shows how biological tools, in particular genetic selection, have been successfully adopted by chemists for biocatalysis screening and selection. These methods are particularly powerful when a large number of variants are screened against a limited number of substrates. Chapter 5 describes enzyme screening methods that can be performed directly on agar plates. Such a method has great advantages in terms of effort, costs, and throughput ($10^5$ to $10^6$), since the individual enzymes do not need to be isolated. The assay systems depend on finding a reaction product that can be detected colorimetrically, which is feasible for some classes of enzymes (e.g., oxidases that produce hydrogen peroxide). For even larger numbers of variants, a generic selection system seems particularly powerful, and Chapters 6 and 7 describe phage display, in vitro compartmentalization, and chemical complementation, with illustrations of successful applications in directed evolution of enzymes.

In Part III, the book broadens out to cover enzyme activity fingerprinting, which consists of measuring the activity of a single enzyme under a set of different conditions, such as with a series of different substrates. Here, high-throughput assays based on using microtiter plates and solid arrays have proved very successful. Current applications of this technology are described for hydrolases, with a separate chapter on determining protease specificity. Fingerprinting of such enzyme families is important for biocatalysis, but has broader applications in diagnostics and in the development of therapeutics.

In summary, the book gives an authoritative overview of current thinking in this area of enzyme-assay technology, with a good mix of discussion of fundamental principles, classical well-established methods, and new techniques that are waiting to be evaluated. Despite the multi-authorship, the book is well organized and coordinated, with only minimal overlap between chapters. A number of experimental protocols are included, which should help readers to adopt key methods in their own laboratories.

The applications described in the book are mainly focused on biocatalysis. However, the assay systems will be more generally useful to a very wide community of chemists and biologists who are interested in medium- to high-throughput generic assay systems. This book could be used in several ways: it might provide a good basis for an advanced lecture course in enzyme-assay systems, it would be a good introduction for chemists or biologists starting in the area, and it would also serve an experienced researcher who is looking for inspiration.

*Sabine Flitsch*
School of Chemistry
Manchester Interdisciplinary Biocentre (MIB)
Manchester (UK)

**DOI: 10.1002/anie.200685425**