

answered questions in the field and detail some work that should be done in the future. Perhaps this book will stimulate more of us to get involved in the development of novel experimental methods and to continue trying to answer the critical unanswered questions.

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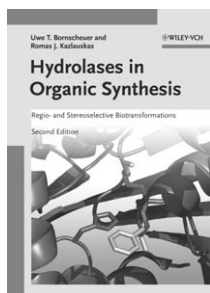
Hydrolases in Organic Synthesis: Regio- and Stereoselective Biotransformations

By *Uwe T. Bornscheuer* and
Romas J. Kazlauskas.

Wiley-VCH, Weinheim 2005, XII + 356 pp.,
hardcover € 139.00.—ISBN 3-527-31029-0

Enzyme catalysis is one of the key technologies of the expanding area of Industrial Biotechnology.

The use of enzymes in fine-chemical synthesis is a well-established field that has faced an explosive growth in recent years, and the need for new literature summarising recent achievements has been urgent. Hydrolases are a class of enzymes of major importance for organic chemists and they are the most well-known and frequently used enzymes in the field. All hydrolases belong to main class 3 of the Enzyme Commission nomenclature system and there are 1065 different EC numbers for hydrolases classified today (www.expasy.ch/enzyme, June 2006). The number of different existing hydrolases is even higher since all enzymes catalys-



ing the same reaction have the same EC number.

The first edition of the book *Hydrolases in Organic Synthesis* by Bornscheuer and Kazlauskas was very well received when it appeared in 1999. Since then, the field has expanded and developed, as shown by the close to 1000 publications in the field since 1999. The new edition has been rearranged and some sections, like the one on lipid modification, have been markedly shortened. Instead, a new section on catalytic promiscuity has been added, and several other chapters have been extended and updated, such as the one on dynamic kinetic resolution and the one on directed evolution. The result is a very appealing, logical and comprehensive overview.

After a short introductory chapter, the second chapter describes kinetic resolution, dynamic kinetic resolution and various strategies for racemisation. This section is new and is divided according to the method of racemisation. Chapter 2 ends with a short part on stereoselective synthesis with prochiral and meso compounds. The following chapter deals with aqueous and organic reaction media. This chapter is shortened and parts from the first edition, such as the ones on acyl donors, amide bond synthesis and hydrolase assays have been moved to other chapters. The section on ionic liquids is new, and the section on immobilisation is extended. These changes result in a very nice and focused chapter on reaction media, water activity and immobilisation. Chapter 4 is new and contains excellent overviews of directed-evolution techniques and of the catalytic promiscuity of hydrolases. Catalytic promiscuity means the ability of an enzyme active site to catalyse more than one different chemical transformation. This is a new, important and growing area of research in this field. The rest of the chapters are devoted to the major subclasses of hydrolytic enzymes. Chapter 5 covers lipases and esterases and contains more than 120 pages. This is the largest chapter of the book, with a survey of numerous enantio-, regio- and

chemoselective reactions of alcohols, carboxylic acids and lactones. Proteases and amidases are covered in Chapter 6, and this chapter is a similar detailed but shorter survey of reactions for these enzyme subclasses. Chapter 7 is short and describes phospholipase applications. The next chapter covers epoxide hydrolases with some updates on, for instance, mechanism, structure and recombinant production. The hydrolysis of nitriles is covered in Chapter 9. This chapter is updated and extended, and new tables on the characteristics of nitrilases and nitrile hydratases have been added as well as recent information on mechanistic details. Chapter 10 is the final chapter, called "Other Hydrolases", it contains an extended section on glycosidases and new sections on the very interesting subclasses haloalcohol dehalogenases and phosphotriesterases.

The outline of the book is excellent, and the figures and tables are of a perfect high quality throughout. The second edition contains 255 figures compared to 214 in the previous edition. The comprehensive reference list of almost 100 pages at the end compiles more than 1800 references written with full titles. This is an extremely valuable source of information. The index at the end of the book, containing around 700 keywords and phrases, unfortunately points to the wrong page numbers. However, a quick search led me to web pages where the authors provide a corrected version: http://www.chemie.uni-greifswald.de/~biotech/assets/downloads/Index_2ndedition.pdf or http://kazlauskas.cbs.umn.edu/Index_2nd_ed.pdf. This index is very useful, and the corrected version is highly recommended. Bornscheuer and Kazlauskas have now with the 2nd edition clearly evidenced that their book on hydrolytic enzymes is and will continue to be one of the key standard references in the field of biotransformations.

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