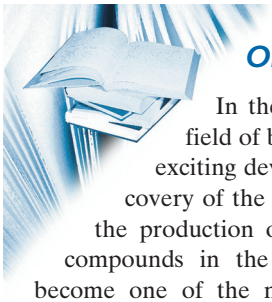

Biocatalysis in Organic Synthesis

In the last three decades, the field of biocatalysis has shown an exciting development. Since the discovery of the potential of enzymes for the production of enantiomerically pure compounds in the 1970s, biocatalysis has become one of the most important catalytic disciplines in organic synthesis and plays a considerable role in the development of sustainable chemistry. Traditionally, this discipline has been on the interface between chemistry, biology, and chemical engineering. In recent years, the tremendous progress in molecular biology tools has greatly facilitated the identification, production, and manipulation of biocatalysts. This gave rise to an impressive acceleration of the field, which in turn resulted in a multitude of reaction concepts and an increased number of available biocatalysts. In several areas of asymmetric synthesis, biocatalysis is bound to become the method of choice rather than being considered a replacement of traditional chemical methods.

In the present compendium, Faber, Fessner, and Turner have brought together this great diversity by sorting biocatalysis into three volumes with 50 chapters. The editors have assembled a large team of authors whose expertise covers all aspects of biocatalysis from initial enzyme discovery to synthetic applications in the chemical and pharmaceutical industry. The introductory chapters give an instructive overview to the history of the field and show the impressive diversity of reaction concepts that biocatalysis offers. They explain how to identify an adequate enzyme class for the synthesis of a given target molecule—and how to find or develop a suitable biocatalyst that meets the demands of the desired chemical process. The major part of the three volumes features a comprehensive presentation of synthetically useful enzymatic transformations. The first volume mainly focuses on hydrolytic transformations including esterases, lipases, and the hydrolysis of nitriles and amides. The second volume starts with reactions on carbon–carbon bonds: enzymatic C–C bond breaking and forming, enolate reduction, and nucleophilic additions to C=C bonds. Then, reductive transformations such as carbonyl reduction and reductive amination reactions are explained. The third volume outlines the most important oxidative transformations by monooxygenases, laccases, and oxidases. The final sections deal with new trends, namely enzymatic cascade reactions, the combination of enzymes with chemocatalysts, and emerging enzyme classes. Two chapters on up-scaling and on examples from total synthesis add a very practical note.

An intuitive structure with a series of graphical abstracts, a list of chapters and a detailed table of contents allows the reader to navigate easily and makes the book very suitable as work of reference. Each chapter explains the mechanism and general properties of an enzymatic reaction type and then outlines the most important synthetic reactions with relevant examples. Selected reactions are illustrated by detailed experimental procedures. The reader can peruse these sections and get first-hand information on all practical aspects that are decisive for the synthetic utility of a catalytic reaction. The large number of references and the abundance of synthetic reactions are impressive and underline that the concept of biosynthetic retrosynthesis is indeed on its way towards realization. Still, the three-volume set represents a well-balanced choice of content which combines a detailed representation of the most-applied enzyme classes and at the same time concedes space for new concepts and emerging biocatalysts such as amine reductases or halogenases.

The comprehensive character and the systematic approach make this book set particularly suitable as reference work for researchers looking for a specific reaction. At the same time, it gives a comprehensive overview on the current state-of-the-art of this rapidly developing field and is therefore also highly recommended for newcomers who would like to go beyond textbooks (such as the well-known *Biotransformations in Organic Chemistry* by Faber).

To summarize, the Science of Synthesis compendium *Biocatalysis in Organic Synthesis* is an excellent reference book that should be available in every well-equipped chemistry library. It will certainly prove to be helpful for many researchers as a practical guide through the dynamic and diverse field of biocatalysis.

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