

Biocatalysts and Enzyme Technology

For millennia, mankind has utilized biocatalysts, isolated enzymes, or whole cells to provide us with the blockbusters of biotechnology, for products such as beer, wine and vinegar, yoghurt and cheese, to name only a few. The industrial use of enzymes began after 1890, when their application was extended into areas beyond food. Nowadays, for example, enzymes have become standard additives in laundry detergents, allowing lower temperatures and significant energy savings, and they are routinely used to make antibiotic drugs. The earlier enzyme processes mostly relied on wildtype enzymes as found in nature and isolated from its original organism. It is only during the last few decades that the paradigm has shifted. Advances in molecular biology have made it possible to express enzymes recombinantly and, through many manipulations, to adapt them and optimize them for purposes beyond their evolutionary role. These new technologies have opened up many new fields of application. Today, in the pharmaceutical industry there are already several production processes that make use of engineered enzymes (e.g., for generic versions of atorvastatin). Given the advances in protein engineering and the need for innovative, sustainable production processes, it is not surprising that the fields of biotechnology in general and of biocatalysis in particular are attracting much interest due to their evident promise. Therefore, it is timely and welcome that a completely revised and enlarged second edition of *Biocatalysts and Enzyme Technology* is now available.

Although the general style as a textbook remains similar to that of the first edition, e.g., with exercises and questions at the end of each chapter, the book has undergone some major additions. Most noticeably, the areas of enzyme discovery and protein engineering, and also metabolic engineering, have been introduced. It might be debated whether metabolic engineering is a quintessential part of enzyme technology, but as there will likely be more production processes using engineered whole cells in the future, it makes a useful addition to the book. The relevant chapter provides the reader with a brief overview and conveys the basic concepts, which is useful as an introduction to this field. With these new chapters,

the latest edition now covers all aspects of enzyme technology, today and in the foreseeable future.

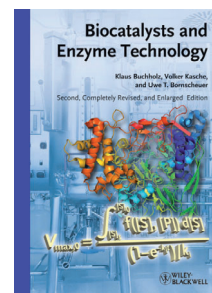
In addition to the introduction of new chapters, also the chapters of the previous edition have been thoroughly updated. Chapter 4 now includes many relevant and recent examples of the use of enzymes—both wildtype and engineered—in organic chemistry. The chapter on enzyme production and purification now covers downstream processing, and chromatography in particular, in more depth. The new chapter describing case studies expands on previous material from the first edition, but also adds further examples. Because of its historical importance, the topic of immobilization still occupies a large part of the book. Although it can be seen, for example in the new case studies mentioned above, that immobilization methods are becoming less relevant for smaller-volume products such as pharmaceutical intermediates, they will still play a role for large-volume chemical products. Therefore, immobilization will continue to be an important technology for enzyme processes in the future, and it is appropriate that it is still discussed to some extent in this second edition.

For all chapters the literature references are recent and are categorized as textbooks, reviews, and original publications where appropriate, which will allow the reader quick access to further reading in the respective fields. Due to the updates and additions, the second edition has grown in volume by about 30 %, but due to the clear structure, with boxed summaries and exercises, it is still a very readable and manageable textbook.

Overall, the second edition is up-to-date and can be recommended without hesitation for every reader interested in enzyme catalysis and applications. An improvement could be made in the quality of some figures, as both old and newly drawn ones are used, and even a few of the new ones are of poor quality in print. But this does not detract from the value of the new edition as a concise, well-rounded, and useful book. The fact that all the figures are available online as supplementary material makes it possible to seamlessly integrate the textbook into chemistry, biology, and engineering studies, so that it can be used by many practitioners in the field.

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