

Book Review

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Biocatalysis: fundamentals and applications

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As the field of biocatalysis approaches maturity there is an increasing need for texts that bring together its essential elements from the more traditional studies of chemistry, chemical engineering, biology and bioengineering. Furthermore, rapid advances made in new disciplines such as bioinformatics have profound implications for biocatalysis. This book aims to bridge the apparent gap between the frontiers of research and more established knowledge in the individual areas, to make an integrated whole that is the rapidly growing and interdisciplinary field of contemporary biocatalysis.

The introductory chapter includes a well-reasoned discussion on the state of acceptance of biocatalysts at the turn of the 21st century. Here, a consideration of recent advances is used largely to dismiss some of the long-held views on the drawbacks of biocatalysis, including that enzymes only feature limited substrate specificity and require complicated co-substrates such as cofactors. The authors make the point that the time lag between research, development, and large-scale application of new biocatalysis technologies just had to pass before the range of such processes in industrial practice today could be witnessed. It would seem that the present text is timely in its intent.

There are 20 chapters, most of which may be loosely catalogued according to

subject matter: basic tools; more advanced tools; and applications. Basic tools include characterization of (bio)-catalysts, isolation and properties of microorganisms, molecular biology tools for biocatalysts, and enzyme reaction engineering. As one might expect for a text with such wide scope, readers from particular disciplines will have studied the content of some chapters before and to greater depth; this is especially the case for those trained in molecular biology. The more advanced tools include chapters dealing with: methods for the investigation of proteins; protein engineering; applications of recombinant DNA technology; biocatalysts in non-conventional media; biotechnology processing steps for enzyme manufacture; and bioinformatics. These chapters are likely to have wide readership appeal, providing a useful perspective and update for those trained in molecular biology, and readily digestible explanations of biological concepts for those from chemical and engineering backgrounds. Chapters concerned with applications of biocatalysts encompass not only different industrial sectors, but also the new intellectual frontiers for biological catalysts: applications of enzymes as bulk actives, and as catalysts; systems biology for biocatalysis; evolution of biocatalytic function; stability of proteins; artificial enzymes; and design of biocatalytic processes. The final chapter compares biological and chemical catalysis for novel processes, which includes useful comments on Jacobsen's criteria for judgement of (bio)-catalytic processes.

Each chapter is underpinned by reference to recent literature, and suggested

further reading is provided. The reader is left in no doubt as to currency of the various aspects considered. Tables, which appear sparingly within the body of the text, tend to be catalogues of (often uninteresting) information. The figures are generally uncluttered line diagrams that effectively illustrate points, and tend to enliven the topics under consideration.

Whilst several recent books deal with aspects of biocatalysis, such as those relevant to fine chemical synthesis, none deals with the entire field. The main merit of the present book, therefore, lies in its integrated whole, which successfully combines contemporary knowledge and established practice from related disciplines to provide a timely update of contemporary biocatalysis. It is recommended to practitioners in industry and to researchers seeking to gain an overview of the field. In particular, the book should have value to those from chemical backgrounds seeking to gain understanding of how developments in biology might be exploited to address catalytic problems. I would also expect this text to take its rightful place on the bookshelves of university libraries to support studies on the plethora of degree courses that include a component on bioprocess technology.

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