M. Doble, A.K. Kruthiventi and V.G. Gaikar, Biotransformations and Bioprocesses, Marcel Dekker, Inc, New York, USA, 2004 (xii +371 pp., £99.00, ISBN 0-8247-4775-5)

Biotransformations and Bioprocesses is concise yet comprehensive, covering chemistry and engineering aspects of biotransformation and giving an overview of the various steps involved during the transition from a lab to the plant. From the laboratory to full-scale commercial production, this book provides a clear and in-depth analysis of bioreactor design and operation and encompasses critical aspects of the biocatalytic manufacturing process, clarifying principles in reaction and biochemical engineering, synthetic and biotransformation chemistry, and biocell and enzyme kinetics for successful applications of biocatalysis and bioprocess technologies in the food, chiral drug, vitamin, pharmaceutical, and animal feed industries.

This book is divided into four parts. The first part deals with the fundamentals, namely chemistry, enzyme chemistry, frontiers in biotransformations, and enzyme and biocell kinetics (chapter 2-7). The second part deals with bioreactors selection, types of bioreactors and their design including fermentors and aspects of biochemical engineering (chapter 8-12). The third part touches on the downstream separation techniques (chapter 13), and the fourth part, on industrial examples of biotransformations, waste treatment, and scale-up of bioreactions (chapter 14-16).

The opening chapter gives the introduction and interview of the book and expresses some basic principles which are presented in the next chapters. The second chapter gives an introduction to molecules, structures and their relationships, quantum mechanical approach, and different types of reactions starting from small to supra molecules. Then the structure and activity of enzymes and proteins, difference between enzymes and conventional heterogeneous catalysts and the thermodynamic aspects of the biocatalytic reaction are described in the third chapter. The next two chapters deal with the reactions catalyzed by enzymes, whole cells, and microbes and various experimental techniques and analytical techniques a bioorganic chemist will employ in the lab respectively. The frontier research areas in the area of biotransformation that includes cross-linked enzymes, designer enzymes, abzymes, site-selective modification of enzymes, etc., are all aimed toward improving their stability, activity, and specificity (chapter 6). The last chapter of first part deals with enzyme kinetics, inhibition, Michaleis-Menten approach to modelling biocatalytic reactions, and cell growth.

The first two chapters of second part deal with biochemical reactor selection, different types of reactor and their salient features and fermentation, namely fermentation classification, issues in fermentation, modelling of molds, and four stages of biocell growth respectively. The next two chapters give an overview of reaction engineering principles and deal with the sirred bioreactors in detail. The last chapter of this part describes a detailed analysis of tower bioreactors.

The only chapter of third parts expresses an introduction to biochemical separation and downstream processing and purification. The first chapter of fourth chapter deals with industrial examples of where biocatalyst is used successfully. The next chapter deals with in situ and ex situ waste treatment procedures for solid, liquid, and gas. The last chapter of this book discusses a large number of scale-up rules which need to be followed for successfully translating a process from bench to commercial scale.

This book has illustrations, homework problems, and innovative extensions. This approach will encourage students to obtain a more in-depth understanding of key scientific and engineering concepts. It is designed to be a textbook for undergraduate and graduate-level courses in biotechnology and other interdisciplinary courses in pharmacy, biosciences, and organic synthesis.

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