Book Reviews

Modern Biooxidation. Enzymes, Reactions and Applications. Edited by Rolf D. Schmid and Vlada B. Urlacher. Wiley-VCH, Weinheim, Germany. 2007. xvii + 299 pp. 17.5 × 24.5 cm. ISBN 978-3-527-31507-9. $175.00.

For many medicinal chemists, biooxidation as a route to new chemical entities may seem esoteric or impractical. In this book, Schmid and Urlacher have assembled 12 chapters describing various aspects of biooxidation, and the main focus of the book is on reactions with practical industrial application.

The first chapter describes oxidations by acetic acid bacteria, starting from simple conversion of alcohols to aldehydes or acids and progressing to preparatrion of an important precursor to oseltanavir (Tamiflu). Another deals with oxygenases that accomplish Baeyer−Villiger reactions without the use of peroxy acids or peroxides. Still another chapter reviews steroid hydroxylation; most commercial steroids are prepared by modification of readily available phytosterols, and some enzymes are able to hydroxylate the unactivated 11-position stereospecifically.

Several chapters are devoted to oxidations carried out by cytochrome P-450s. Recombinant human P450s are important in predicting and preparing human metabolites of drugs. One group has prepared a library of 250 bacterial P450s that can be expressed and used in screening experiments; starting with testosterone, 36 different P450s were found to produce nine different hydroxylated products. Bacterial P450s can be engineered to alter or to fine-tune substrate specificity, allowing oxidation of polycyclic aromatics, polychlorinated aromatics, alkanes, and terpenoids.

There is a chapter reviewing selective microbial oxidations on an industrial scale. For example, *n*-octanol can be produced from octane on a scale of 10 000 tons per year. Brassylic acid, a musk oil precursor, can be made from an alkane on a scale of 150 tons per year (the complete annual market) by a *Candida tropicalis* mutant. Other biooxidations accomplish aromatic hydroxylation (to produce catechols and herbicide precursors), convert toluene derivatives to the corresponding benzaldehydes, and convert glycerol into dihydroxyacetone.

An important issue in many biooxidations is the cost or the difficulty of producing NAD(P)H or flavin cofactors. The final chapter reviews chemical, enzymatic, photochemical, and electrochemical approaches to this problem.

With increasing emphasis on green chemistry, biooxidation will likely begin to replace synthetic chemistry methods for some applications. This book should be of value to those interested in developing such processes, as well as to readers who need to accomplish specific oxidations that are synthetically difficult.

D. Eric Walters

Department of Biochemistry and Molecular Biology
Rosiland Franklin Universiuty of Medicine and Science
North Chicago, Illinois 60064

JM800308F

10.1021/jm800308f