

Preface

Important topics in biocatalysis for organic synthesis are described in this book, for experts and non-experts. Especially, the book focuses on those reactions that are under development now and will be more significant in the future. Therefore, each chapter describing a specific theme summarizes not only the present state but also the direction of the research. The prospects and dreams that will become possible, using biocatalysis, in the future to construct a sustainable society are also included.

The book consists of four sections: the enzymatic reaction under unusual conditions, unique biocatalytic reactions, valuable compounds synthesized using biocatalysis and latest molecular biology methods to make useful biocatalysts. The first section dealing with unusual reaction conditions for biocatalysis begins with the use of ionic liquid as a solvent to develop green chemistry. Then, the reaction under extreme temperatures, use of light energy as a driving force to proceed biocatalysis and catalysis by enzyme-metal combinations are described. The second section covers very unique reactions such as carboxylation using decarboxylases and carbon dioxide, Baeyer-Villiger reaction using monooxygenases, reactions in aldoxime-nitrile pathway including dehydration in aqueous solvent and addition of nitrile to carbonyl compounds to synthesize chiral cyanohydrin. The third section highlights novel compounds synthesized using biocatalysts. Chiral heteroatom-containing compounds such as chiral phosphorus compounds, polymer materials and sugars are selected to demonstrate the usefulness of biocatalysts. The last section describes the use of molecular biology technique to find novel biocatalysts. Alcohol dehydrogenase and decarboxylase are chosen as an example for the use of techniques since detailed and interesting researches have been conducted using these enzymes.

Through this book, I hope to introduce the novelty and future directions in biocatalysis. Importantly, I wish to contribute to conserve and beautify the natural environment by editing the book, showing the power of enzymes, treasure from Mother Nature, to catalyze the necessary reaction for mankind in an environmental-friendly manner.

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