

PREFACE

Green chemistry is a goal and an approach to design safer, more efficient, and less expensive chemical processes. Many disciplines can contribute to green chemistry: organometallic chemists design new catalytic reactions and invent better ligands; others discover organocatalysts or safer solvents derived from biomass. Process chemists and engineers scale up reactions and find ways to carry out several steps in the same solvent, often water. Although this wide-ranging and multidisciplinary approach is essential for progress in green chemistry, it makes it hard for green chemists to exchange ideas and the tips and tricks that lead to progress in the field.

This book focuses on one important tool of green chemistry—biocatalysis. Though the focus is only on this one tool, this book explores more of the details, and exchanges some of these tips and tricks with others to spur further progress in this area. It shows how biocatalysis contributes to a wide range of industrial applications.

Biocatalysis is one of the most important tools for green chemistry. Biocatalysis is environmentally benign (often even edible!), and, because it can catalyze otherwise difficult transformations it can eliminate multiple steps involved in complex chemical syntheses. Eliminating the steps reduces waste and hazards, improves yields, and cuts costs.

This book describes recent progress in biocatalysis-driven green syntheses of industrially important molecules. The first three chapters introduce recent technological advances in enzymes and cell-based transformations, and green chemistry metrics for synthetic efficiency. The remaining chapters are case studies of biotechnological production of pharmaceuticals, including small molecules, natural products and biologics, flavor, fragrance and cosmetics, fine chemicals, value-added chemicals from glucose and biomass, and polymeric materials.

Currently, there are no books specifically devoted to a comprehensive overview of green chemistry applications of enzyme-driven transformations for a wide range of industries. There are a number of books that discuss green chemistry or biocatalysis, which mention these applications, but not in a comprehensive manner.

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