PREFACE

Enzymatic catalysis has gained considerable attention in recent years as an efficient tool in the preparation of natural products, pharmaceuticals, fine chemicals, and food ingredients. The high selectivity and mild reaction conditions associated with enzymatic transformations have made this approach an attractive alternative in the synthesis of complex bioactive compounds, which are often difficult to obtain by standard chemical routes. However, the majority of organic compounds are not very soluble in water, which was traditionally perceived as the only suitable reaction medium for the application of biocatalysts. The realization that most enzymes can function perfectly well under nearly anhydrous conditions and, in addition, display a number of useful properties, e.g., highly enhanced stability and different selectivity, has dramatically widened the scope of their application to the organic synthesis.

Another great attraction of using organic solvents rather than water as a reaction solvent is the ability to perform synthetic transformations with relatively inexpensive hydrolytic enzymes. It is worth reminding the reader that in vivo, the synthetic and hydrolytic pathways are catalyzed by different enzymes. However, elimination of water from the reaction mixture enables the "reversal" of hydrolytic enzymes and thus avoids the use of the expensive cofactors or activated substrates that are required for their synthetic counterparts. Also, one should bear in mind that water is by no means an ideal solvent for synthesis; it is relatively expensive to remove on a large scale and it often participates in unwanted side reactions. Thus, the use of enzymes in conventional industrial solvents generally makes it easier and cheaper to incorporate a biotransformation step into the overall synthetic sequence.

Indeed, there are numerous examples of the successful application of enzymes in low water media to industrial-scale production of pharmaceuticals, food ingredients, and fine chemicals.

Methods are very important in any area of research, even more so in a field like nonaqueous biocatalysis, where many methods have been developed relatively recently and have not yet been standardized completely in all laboratories. All too often, the format of standard research papers does not allow methods to be fully described. The importance of key details may be known in the originating laboratory, but may not be appreciated in another, because they cannot be stressed enough, nor reasons explained. The prime objective of *Enzymes in Nonaqueous Solvents* is to address this issue because it was com-

piled to communicate such details. There will also be critical features of methods that are at present not appreciated by anyone, but that may be causing different results in different laboratories. Here again, the fuller presentations in this book should be a basis for the identification of such differences.

For the convenience of the reader, the editors decided to split the submitted material into three parts; broadly, these deal with the biocatalysts, synthetic chemistry, and systems other than just neat organic solvents or solvent mixtures. Those familiar with the subject will no doubt appreciate that such a separation is to a large extent arbitrary and is bound to result in some overlaps. The editors felt, however, that this would provide the book with a certain structure and make it easier for the reader to find specific pieces of relevant information. In addition, each part has a short introduction that surveys the contributions included.

Authors of standard research papers are understandably keen to emphasise their interesting results. Some signs of this can perhaps be detected in contributions to this volume too. As editors, we have tried to encourage authors to include as much detail as possible in describing their methods, and not to dismiss this as rather boring or unnecessary. We hope the result of the authors' efforts will prove valuable to all who are interested in studying or using enzymes in nonaqueous media.

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