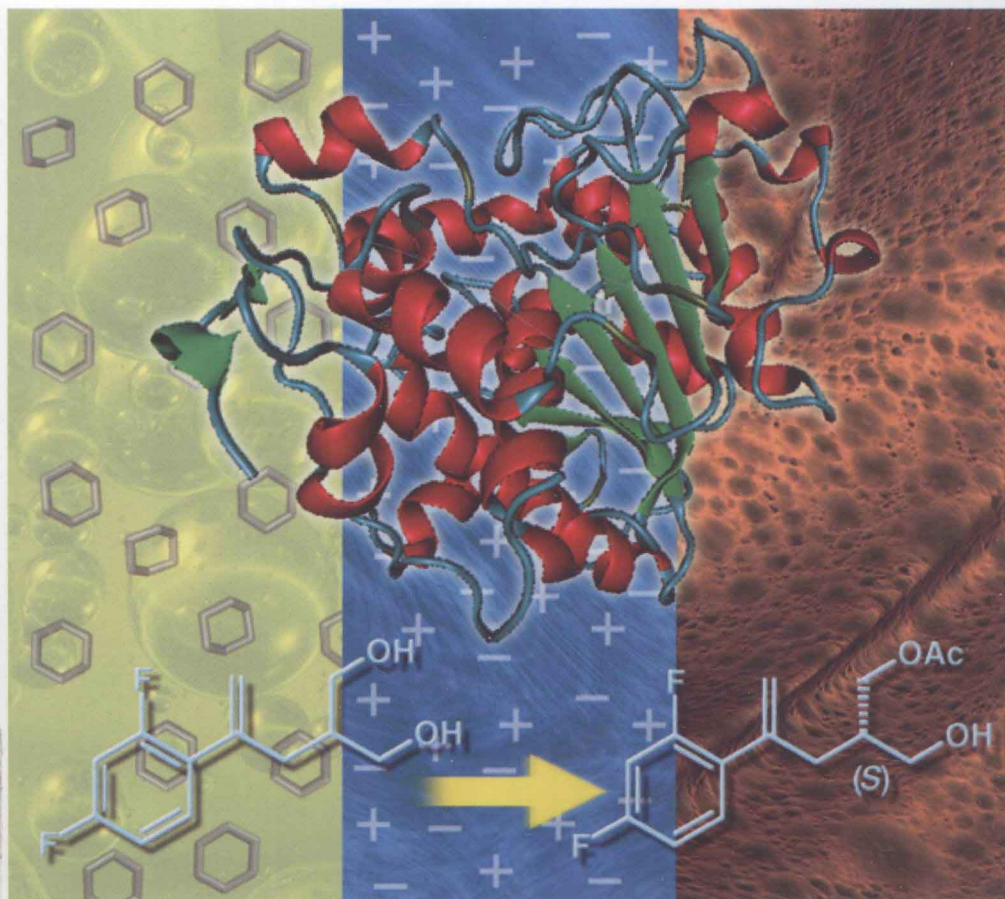


Edited by Giacomo Carrea
and Sergio Riva

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Organic Synthesis with Enzymes in Non-Aqueous Media



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*Edited by
Giacomo Carrea and
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Preface

Once upon a time . . . there was water. Long after enzymes began to be used for preparative-scale transformations of organic compounds, this peculiar solvent was still considered to be not only the most suitable but the “only” medium in which the natural biocatalysts could exert their activity. Then both scientific curiosity and practical problems (the need to overcome the poor solubility of most of the substrates in aqueous solutions) prompted different scientists to add small amounts of water-miscible organic solvents to the aqueous medium. And it worked: in most cases the enzymes were still fully alive.

The next step was the addition of water-immiscible organic solvents to give biphasic systems in which the biocatalysts were still solubilized in water and the organic phase was acting both as a substrate reservoir and a product extractor. Again the outcome was surprisingly positive, in some cases allowing inhibition of substrate(s) and/or product(s) to be overcome. This happened in the seventies.

At this point it became logical to raise the question “how much water do enzymes really need?”. In trying to answer to this question it was found that some enzymes—particularly lipases and proteases—were still active even in neat organic solvents. This happened in the early eighties, and was the beginning of so-called “non-aqueous enzymology”.

In 1996 Klibanov (the “father” of non-aqueous enzymology) and Koskinen published a book discussing progress in this exciting area of research and highlighting the successes, the questions that were still open, and the foreseeable developments [1].

When we received the invitation from Wiley to act as the Editors for a new book, we thought that now was the time, about ten years after the publication of the earlier book, for a general reflection on what had been achieved in the meantime.

As well as biocatalysis in neat organic solvents and biphasic systems (fundamentals and synthetic applications), the present volume covers new and promising aspects of non-aqueous enzymology that have emerged in recent years, including biocatalysis with undissolved solid substrates or vaporized compounds, the use of ionic liquids as solvents, and the preparative-scale exploitation of oxynitrilases and “dynamic kinetic resolutions”. For the sake of completeness and comparison,

some of the chapters devoted to synthetic applications necessarily also include a few examples of biotransformations performed in aqueous systems.

It has been a privilege to compile this volume. We have first of all to acknowledge the invited contributors for the timeliness of their contributions: despite the tightness of the schedule, they have done their best to assemble all the published information relevant to their assigned topics and to discuss all aspects exhaustively. Thanks are also due to Dr. Elke Maase, Dr. Steffen Pauly, and Dr. Andreas Sendtko of Wiley-VCH Publishers for their invitation and for their painstaking technical editorial support.

Finally, we would like to thank our readers in advance, with the hope that they might find this volume useful and stimulating for their research and/or teaching activities.

Milano, July 2007

*Giacomo Carrea
Sergio Riva*

- 1 "Enzymatic reactions in organic media", A. M. P. Koskinen and A. M. Klibanov, Eds., Blackie Academic & Professional, Glasgow (UK), 1996.

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