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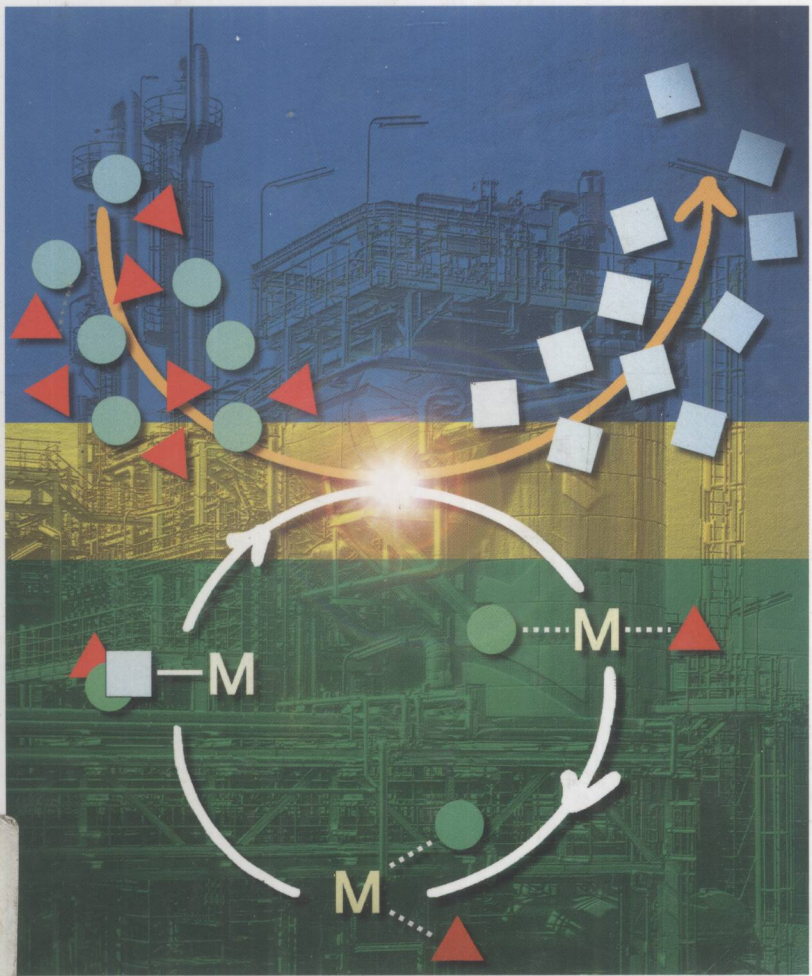

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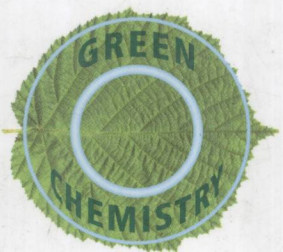

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Volume 1

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2002
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Preface

This book describes for the first time all homogeneously catalyzed reactions in *multiphase* operation. Thus it summarizes the progress which became possible by the introduction of separate phases in the context of "homogeneous" catalysis: an apparent contradiction with far-reaching consequences. The book reviews all the realistic possibilities described so far using multiphase operation of homogeneous catalysis: processes with organic/organic, organic/aqueous, or "fluorous" solvent pairs (solvent combinations), nonaqueous ionic solvents, supercritical fluids, and systems with soluble polymers. The accounts concentrate on the modification and the handling of homogeneous catalysts under multiphase conditions in general, and the removal and subsequent recycling of the catalyst in particular.

Why multiphase systems? This goes back to the 1980s and the enormous impetus which was given to the homogeneous catalysis community by the first realization of Ruhrchemie/Rhône-Poulenc's aqueous-phase oxo process at the Oberhausen plant site. Astonishingly, this fact (and *not* the earlier SHOP process of Shell) sensitized the scene to the possibilities of multiphase action to imitate the decisive advantage of heterogeneous catalysis: the immediate separation of catalyst and substrates/products just after reaction which makes it possible to avoid additional separation steps post-reaction, such as distillations and other thermally stressing procedures.

All proposals have the same target: to enable the homogeneous catalyst to be bound to a suitable "support", i.e., another phase, without losing its superior homogeneous catalytic activity and selectivity. Within the scope of this book the editors define "phase" not only thermodynamically (as uniform states of matter of *one* substance which are separated (and separable) from each other by unequivocal phase boundaries; for example, water–ice or normal–supercritical states) but also as *different* states of aggregation of different compounds, such as systems consisting of water–organic liquids. Thus this book deals with the various possibilities of homogeneous catalysts on *liquid* supports. Additionally, the processes described imply two- or three-phase reactions.

The status of the different variants of multiphase homogeneous catalysis is described with the state-of-the-art as at the end of 2004.

The editors, as well-known players in their respective fields of homogeneous and homogeneously multiphase catalysis, have tried to portray the scene from the basic idea through the development stage up to commercial applications and the

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processes which are on the track to economical realization. Within the definitions as given in the introductory Chapter 1, the contents of the individual sections are the responsibility of the respective editor. Some contradictory statements within the various chapters of the book may arise from the fact that the authors started from very differing experiences and used different focal points to emphasize the importance of "their" multiphasic approach. All sections give outlooks about the developments to come.

Once more, we have to express our thanks not only to the authors and co-authors but also to the team at Wiley-VCH at Weinheim, especially Claudia Grössl and Melanie Rohn for the production and Elke Maase, the publishing editor. Diana Boatman from Redhill, Surrey (UK), served as freelance copy-editor and was an invaluable help for all of us who write in English, but not as our first language, during the difficult process of completion.

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