Preface

The design of green and economically feasible processes for the production of fine chemicals is certainly one of the major needs and biggest challenges for a sustainable development of our planet. Catalysis contributes substantially to this goal by providing comparatively lower impact technologies and further in the recent years several efforts have been exerted aimed at broadening the scope of the catalysts, increasing their accessibility and efficiency, lowering their costs and ensuring their reuse.

This book collects the contributions of some of the leading scientist working in the field of the heterogenization of homogeneous chemical catalysts. The snapshot we get is a clear evidence of the level of expertise and sophistication reached with this methodology. The fascinating world of "heterogenized catalysis" is perfectly introduced in Chapter 1, where the differences and the advantages of the approach, compared to the two traditional disciplines of homogeneous and heterogeneous catalysis, are illustrated. The following chapters focus on the solid support materials, either inorganic, organic, dendrimer or nanosized, to show their subtle, often determining influence on the catalyst performance and how the mastered elaboration of new materials may be used as a tool to tailor and improve this. Selected examples of application reported in Chapters 9–11 testify the versatility and the potential of the method. No surprise that most processes are carried out in an enantioselective fashion. This is a prerogative of molecular catalysts which, coupled with the easy handling and recycling typical of immobilized systems, favourably differentiate heterogenized catalysts from the conventional heterogeneous ones. To this end, particularly evocative is the possibility to engineer enzyme-mimicking solid catalysts, as properly described in Chapter 2. The contributes dealing with membranes and reactors were purposefully included to provide insights of the technological opportunities and solutions offered by the heterogenization of homogeneous catalysts. Further, clear distinction of immobilized molecular systems is their possibility to enable both a systematic design of new catalysts and an easier characterization of the active sites, compared to the classical heterogeneous catalysts. Chapters 12 and 13 are paradigmatic in this sense.

Nevertheless, despite the above advantageous features and the progresses achieved by academia in this research area, with a few notable exceptions [1], examples of the use of heterogenized catalyst in industrial processes are still rare. This issue is critically analyzed in the "industrial" viewpoint reported in Chapter 7.

In conclusion, the main aim of the book was to provide the reader not only with an update on the state-of-the-art of the heterogenization of molecular catalysts, but also to offer a guide on the basic concepts behind this emerging, multidisciplinary technology which integrates several of the subdivision of chemistry, at the border of physics and chemical engineering; to assess the critical points in the field and, at the same time, to indicate the future perspectives and possible strategies. Our feeling is that the target was fully achieved. Likely, this is the first text in which the subject is treated comprehensively in all its essential facets. Therefore, we are confident that this book will be a helpful companion and deliver key hints to those, in the academia and in the industry, who decide to move their research interests in this direction.

Finally, we wish to thank the Authors of this volume for their enthusiasm and care in drawing up their contribution, all people at Springer's office, London for their precious assistance and the IDECAT (www.idecat.org) and NANO-HOST (www.nano-host.eu) Networks for providing substantial inputs to the topic of the book.

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Reference

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