Green Catalysis

The general awareness of the limitedness of natural resources and of the need to protect the environment is paralleled by the increasing importance of green and sustainable chemistry. Thus, no modern chemist can ignore these areas any longer. The three volumes of *Green Catalysis*, edited by Robert H. Crabtree, are the first part of the 12-volume *Handbook of Green Chemistry*, a series edited by Paul T. Anastas, recognized pioneer and author of multiple publications on this topic, as well as founder of the "twelve principles of green chemistry" (http://www.yale.edu/anastasgroup/). The next three parts, *Green Solvents*, *Green Processes*, and *Green Products*, will follow in nine volumes to be published by November 2010. The three volumes of *Green Catalysis* cover homogeneous catalysis, heterogeneous catalysis, and biocatalysis, in 33 chapters written by 70 authors.

To write a comprehensive and well-structured reference book on a rapidly developing topic such as green catalysis is a challenging task. Surprisingly, the editors abstained from writing an introduction or a foreword, in which they could have given an overview or commented on the ordering principle of the books. Instead, two introductory chapters can be identified that outline the principles of green catalysis, quantitative criteria such as the E factor or atom economy, and representative developments. However, whereas the chapter "Heterogreeneous Chemistry" by H. Jacobsen, is very insightful, the first chapter, "Atom Economy—Principles and some Examples", falls short of that high quality and contains a surprisingly large number of mistakes [Rh_2(*R*-DOSP)$_2$; HBHP; anime; (Scheme 1.7c); …].

All the chapters are skillfully written by recognized experts, and either deal with quite specialized topics (examples: "Applications of Environmentally Friendly TiO_2 Photocatalysts in Green Chemistry: Environmental Purification and Clean Energy Production under Solar Light Irradiation"; "Chemistry and Applications of Iron-TAML Catalysts in Green Oxidation Processes Based on Hydrogen Peroxide") or with broad topics that might also be included in general catalysis handbooks and journals (e.g., "Organocatalysis" and "Zeolites in Catalysis").

A true highlight is the insightful and well-structured chapter on applications of homogeneous enantioselective catalysts in industry, written by Blaser and co-authors, leading experts in this field. However, the authors could have focused somewhat more on *green* catalysis, as has been nicely realized in the much more specialized chapter "Microwave-Accelerated Homogeneous Catalysis in Water".

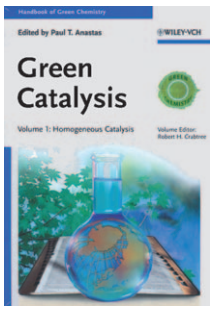
In the chapter on "Organocatalysis", the authors sensibly limit themselves to asymmetric organocatalyzed transformations of general synthetic scope. In the many relevant examples, the chapter emphasizes the strong points, but also recognizes the challenges and shortcomings of these methods. Naturally, the focus of this treatment has to be somewhat biased (e.g., only one example on NHC catalysts is presented), but the authors provide a good overview of this exciting and rapidly evolving field. However, here again, as in many other chapters of this handbook, a focus on the special aspects of green catalysis is not provided. Instead, a one-page introduction tries to convince the reader of the green nature and the superiority of organocatalysis, which in part seems to be somewhat simplified ("*[organo]catalysts are inexpensive and also they are more stable than metal-based or bio-organic analogs*").

The importance of green catalysis in everyday life becomes apparent in the beautiful description of another success story: the development of catalysts for automotive emission control (Farrauto/Hoke). From three-way catalysts to fuel cells, heterogeneous catalysts protect the environment.

Another skillfully written chapter in Volume 3 (Biocatalysis) deals with the application of biotransformations in the pharmaceutical industry. The authors Meyer, Ghisalba, and Leresche show the need for efficient and environmentally friendly methods for the synthesis of enantiomerically pure compounds in industry. This leads the authors to analyze the green nature and sustainability of typical organic reactions and to compare them with alternative biotransformations in table form. In addition, a comparative analysis of the chemical and the enzymatic syntheses of the Parkinson's disease drug L-dopa is provided. This very insightful chapter with its clear focus and analyses is a role model for a perfect chapter on green catalysis.

As in many multi-author books, thematic overlap could not be avoided. For example, many chapters start with a quite general introduction, so that the twelve principles of green chemistry are presented several times.

In conclusion, this handbook contains many highly interesting chapters by renowned authors and, arguably, is the most comprehensive of its kind. The index is fairly comprehensive, amounting to about 5 % of the total pages. However, as a result of the sometimes non-intuitive structuring and focus of these volumes, the work is not very well-suited as a handbook. Instead, it provides a felicitous summary of the state of the art in many modern areas of catalysis related to green catalysis. Consequently, it is highly recommended for all researchers in academia and industry who are interested in these diverse areas. In addition, the



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self-contained chapters are also well-suited for advanced students and allow them to expand their textbook knowledge and to get in touch with modern research. Thus, these first three volumes of the *Handbook of Green Chemistry* are essential additions to any library, especially at universities. A (comprehensive) introduction by the editors, some more coordination between the different chapters, and a stronger focus on green catalysis in some chapters would increase the value of the next edition of this reference book even further.

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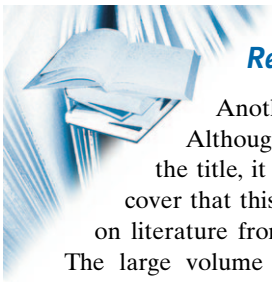

Calixarenes and Resorcinarenes

Another book on calixarenes! Although it is not obvious from the title, it is explained on the back cover that this text is essentially based on literature from the period 2005–2008. The large volume of work referred to is certainly a testament to the continuing vigorous research in the field of calixarene chemistry. Unfortunately, it is difficult to find other positive remarks to add to this description of the book.

Also on the back cover, it is stated that the text is "clearly divided into three main topic areas", whereas the table of contents defines four "Parts" spread over 14 chapters, leaving one to guess that the three main topics might be synthesis, properties, and applications. Such obscurity is compounded by the fact that the authors make essentially no attempt to define the terms "calixarene", "cavitand", and "resorcinarene", and thus to distinguish the properties of molecules carrying these names. The more subtle, but nonetheless important, point that in some literature resorcinarenes are termed "resorcarenes" is completely ignored. As a result, there is even one sentence where a molecule is referred to as both a calixarene and a cavitand, something that is not necessarily incorrect but which would confuse any reader using this text as an introduction to calixarene chemistry.

Of course, it is true that in their "Conclusions" the authors only make the modest claim that they hope this book will "shed some light on calixarene and resorcinarene chemistry" and "will be of use for those working in this scientific area". In the age of instant electronic access to the literature, it is hard to see how the second objective might be satisfied unless the authors were to offer some