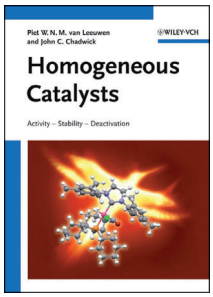


Homogeneous Catalysts
Activity—Stability—Deactivation. By Piet W. N. M. van Leeuwen and John C. Chadwick. Wiley-VCH, Weinheim, 2011. 404 pp., hardcover, € 139.00.—ISBN 978-3527323296

Homogeneous Catalysts

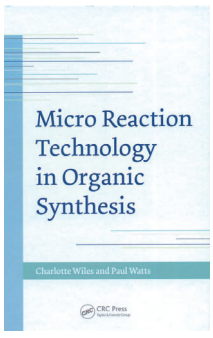
This book by Piet van Leeuwen and John Chadwick provides the reader with an overview of catalyst development in various chemical transformations, those that are typically carried out in a homogeneous solution phase. As the title suggests and unlike other books in the area, *Homogeneous Catalysts* turns the spotlight on the catalysts: their activity, their stability, and their deactivation pathways. Written by two veterans of the homogeneous catalysis arena, this is an immensely valuable resource for anyone researching homogeneous catalyst design and development. Both authors have made their careers in industrial as well as in academic labs. Their life-long experience in the field has resulted in a book wherein they generously share their in-depth knowledge and understanding of the area of homogeneous catalysis.

While the focus is on the catalysts, the book is structured in a traditional format, starting with the elementary steps that compose a catalytic cycle and subsequently an overview of the various ligand types available to the catalytic chemist. Chapters 2–6 give an extensive overview of catalyst development in the area of olefin polymerization and oligomerization. By having five out of ten chapters devoted to these two topics, the balance of the book is slightly skewed in favor of this particular aspect of homogeneous catalysis. Nevertheless, Chadwick's in-depth knowledge of this area, the industrial insights in particular, make these chapters a fascinating read. Chapters 7–10 show van Leeuwen's expertise, covering the other main areas where homogeneous catalysts are traditionally applied: asymmetric hydrogenation, carbonylation chemistry, including hydroformylation and alcohol carbonylation, followed by C–C coupling reactions and metathesis. Again, the industrial perspective in several of these chapters is very informative and provides an insightful glimpse behind the curtain of industrial secrecy.

A real strength of this book, and where it stands out compared to other books in the area, is that in each chapter the focus is not only on catalyst activity, but emphatically on catalyst stability and deactivation pathways for the ligands and the metal complexes—an aspect of homogeneous catalysts that is too often ignored in many publications and patents. One example from the authors is particularly illustrative: out of 6000 hits in SciFinder on "asymmetric hydrogenation", only 34 publications were left after narrowing down on "deactivation". Catalyst deactivation occurs in all areas of homogeneous (and heterogeneous) catalysis but systematic studies or reviews on this topic are rare. An important take-home message from this book is that catalyst stability and an understanding of the catalyst's decomposition pathways are as important as their evaluation of catalytic activity.

Homogeneous Catalysts will provide a highly valuable resource for researchers working on the development of homogeneous catalysts in industrial and academic labs. I, for one, am very glad to have a copy.

George J. P. Britovsek
Department of Chemistry
Imperial College London (UK)



Micro Reaction Technology in Organic Synthesis
By Charlotte Wiles and Paul Watts. CRC Press, Boca Raton, 2011. 453 pp., hardcover, £ 89.00.—ISBN 978-1439824719

Micro Reaction Technology in Organic Synthesis

Microreaction technology and the related field of flow chemistry have expanded rapidly over the past decade, and numerous specialized reviews have appeared. In the present book the authors build and expand upon their previous review papers to provide a comprehensive and up-to-date overview (ca. 650 references with the latest from 2010) of organic syntheses performed in flow equipment, specifically in microreactors.

The title could be interpreted as a book focused on technology employed in realizing organic synthesis. However, the book is in fact written by and for chemists, and the majority of the chapters summarize the many chemical transformations performed in microreactors to date. Only the opening chapter provides a brief summary of microreaction technology in terms of designs, materials of construction, connection to macroscopic fluid components, and in situ reaction monitoring techniques. References are given to recently published and more detailed descriptions of the technology for the readers wanting further information. Researchers interested in applying microreactors will find the final section that summarizes commercially available technology particularly useful. The summary of advantages and challenges of microreaction technology represents an additional useful feature.

The major Chapters 2–5 provide an up-to-date compendium of reactions performed in flow—starting with gas-liquid reactions, progressing through liquid and multi-phase reactions, and finally covering electrochemical and photochemical transformations. The organization of reactions

by type (C–C bond formation, C–N bond formation, oxidation, reduction, rearrangement …) makes locating reactions of interest easy. Tables summarizing reactions and representative studies would have been a helpful feature as well as highlights of the particular advantages of applying microreactors in some of the selected, otherwise up-to-date case studies. Gas-phase reactions are summarized in a dedicated Chapter 2, and homogeneous liquid-phase reactions and selected liquid–liquid reactions appear in Chapter 3. This choice of organization reduces the impact and treatment of liquid–liquid phase transfer catalytic reactions that would benefit from the enhanced mass transfer in microreactors. Chapter 4 is titled "Multi-Phase Reactions", but a more descriptive title would have been "Immobilized Catalysts, Reagents, and Scavengers". Chapter 5 covers electrochemical and photochemical applications of microreactors and is a new and welcomed addition to the microreaction literature.

Coverage in Chapter 6 of droplet microfluidic techniques along with the synthesis of nano- and microparticles complements the book's focus on organic synthesis and summarizes key advances in the field. The material here is not at the depth or breadth of the previous chapters' collection of organic transformations, which is understandable given the size of the droplet and particle synthesis literature. Nevertheless, the chapter gives a short, useful overview of techniques for generating and using drops in reactions, synthesizing polymer and inorganic particles, and microencapsulation.

Chapter 7, on industrial interest in microreaction technology, comprises two topics: 1) use of microreactors in production of fine chemicals, and 2) synthesis of active pharmaceutical ingredients (APIs). The latter treatment contains mostly proof-of-principle syntheses of known APIs (or intermediates) in academic research laboratories without a discussion of the critical application and regulatory challenges to continuous-flow synthesis of pharmaceuticals. The summary of reactions relevant to fine chemical production represents a nice collection of studies emphasizing the advantages of microreaction technology in terms of safety, throughput resulting from small reaction residence times, and enhanced heat and mass transfer characteristics.

The final Chapter 8 on microscale continuous separation and purification is a much needed new addition to the microreaction book family. Work-up is a critical challenge in the realization of micro- and mesoscale continuous synthesis. The authors give a complete, up-to-date summary of micro-separation devices for extraction and gas-liquid separation along with examples of scavenger techniques and crystallization. The latter topic could have been a starting point for describing the general difficulties of handling solid reactants and products in microreactors—a major challenge for the broad application and acceptance of microreaction technology.

Overall, the book by Wiles and Watts provides a thorough and up-to-date listing of organic synthesis in microreactors with useful forays into related topics of particle synthesis and separation techniques. It will be a useful entry for newcomers to the field as well as a reference to researchers already engaged in microreaction technology.

Kevin D. Nagy, Klavs F. Jensen
Department of Chemical Engineering
Massachusetts Institute of Technology (USA)

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