

Science of Synthesis Workbench Edition: Water in Organic Synthesis

Science of Synthesis Workbench Edition: Water in Organic Synthesis. Edited by Shu Kobayashi. Thieme: Stuttgart, Germany. 2012. pp 960 + l. \$299; €249. ISBN 978-3-13-169351-8.

The Science of Synthesis is an outstanding series, and all organic chemists should have access to the volumes. The latest volume, *Water in Organic Synthesis* continues the high-standards. The editor, Shu Kobayashi, is to be congratulated on getting so many of the top researchers in the field to contribute to the compilation.

I particularly liked the chapter on Organic Synthesis, “On Water”, in which the authors, A. Chanda and V. V. Fokin, give not only a practical account of the subject, but also one which will surely appeal to the process chemist—the quote below says it all. This may explain why water is still not widely used as a reaction medium in large-scale processes:

“Although claims of the ecological advantages and greenness of water are almost invariably found in the reports describing aqueous reactions, they should be taken with a pinch of salt. The low cost, relative abundance and inherent safety of water notwithstanding, the environmental impact of a process is determined by many factors, such as the efficiency of the reaction in terms of atom economy, the nature of solvents used in the reaction work up, the residual concentration of regulated organic compounds and metal catalysts remaining in the aqueous waste, and the costs of its clean-up or disposal. The mere finding that a process performs as well in water as it does in an organic solvent tells us little about its potential environmental impact.”

The chapter on “Industrial Applications other than Hydroformylation”, however, is merely a list of well-known examples with little discussion. It does not explain why the examples are so few on large scale or what the difficulties are that prevent more applications.

The rest of the volume covers many reactions in great depth; examples are oxidations, reductions, conjugate additions, cyclopropanations, metathesis, alkylations and arylations, cycloadditions and cyclisations, rearrangements, allylic and aromatic substitutions, cross-couplings and ring-openings of epoxides and aziridines. Named reactions such as Heck, Mannich, and Baylis–Hillman are also covered.

Organic chemists reading this comprehensive text, however, should not only concentrate on the synthetic chapters but also dip into other chapters which give a fundamental understanding of why the chemistry works so well in water when reactants (and sometimes reagents) have little solubility. Thus, the chapter on “Structure and Properties of Water” is an excellent review of the subject and provides the reader with substantial background knowledge to be able to understand the chemistry.

As in all volumes of the Science of Synthesis series, the indexes are superb. However, a limitation in this volume is that the references in some chapters are only to 2009. A further minor limitation (in the series as a whole) is a failure to record

the affiliation of the individual chapter authors. I like to see who is from an industrial background.

Overall, however, this paperback version is highly recommended to all who are contemplating carrying out reactions in water.

Trevor Laird, Editor

■ AUTHOR INFORMATION

Notes

The authors declare no competing financial interest.