



Basics of Flow Microreactor Synthesis

Flow chemistry and microreactor technology is a relative new field, which got popular in organic synthetic chemistry in the last decade. At the outset of this research field, research has been dominated by engineers designing the tools and reactors that chemists nowadays use to carry out their chemistry in a continuous fashion. However, flow chemistry is far from “just pushing the chemicals through a tube and see what comes out” and a basic understanding of the fundamentals is recommended for any practitioner. Most books are written for experts and it might be overwhelming for newcomers in the field to start off with such books. The book by Yoshida fills in this gap and can be a nice start for chemists who want to start doing flow chemistry, as it is concise and to the point. The book is conceived on a series of lectures given by the author at the Micro Chemical Production Study Consortium at Kyoto University and was first written in Japanese. This year, the monograph was translated to English and made available to the rest of the research community. As acknowledged by the author in the preface, the book deals mainly with examples from the lead author itself and is thus far from exhaustive. Interestingly, at the end of the book, an appendix is provided in which the author directs the user for further and more detailed reading to other books and reviews on this topic.

The book is organized in 10 chapters plus 1 outlook chapter, each chapter has a short abstract with a summary. The book kicks off with a short introduction highlighting the differences between batch and flow chemistry and giving some definitions of key flow terminology. The next chapter deals with the importance of controlling the residence time in flow and how this can be used to the advantage of a chemist. The author explains the concept with the generation and reaction of organolithium species. What I particularly like is the very simple representations for sometimes

complex phenomena, which gives one an immediate eureka moment. In chapter 3, the importance of mixing is discussed and several strategies to reduce the mixing time are discussed. Chapter 4–7 detail on the preparation of short-lived species, mostly transmetalation reactions, and how to prepare and use them efficiently prior to decomposition. This strategy allows for protecting group-free synthesis (Chapter 5), to control isomerization (Chapter 6) and competitive consecutive reactions (Chapter 7). In chapter 8, a short introduction is given to the concept of Flash Chemistry, a term coined by the author. Space integration is discussed in Chapter 9 and details on multistep syntheses: consecutive lithium–halogen exchanges are carried out to decorate a molecule in a step-wise fashion. Chapter 10 discusses the potential of microreactors to carry out polymerization reactions with a high degree of control.

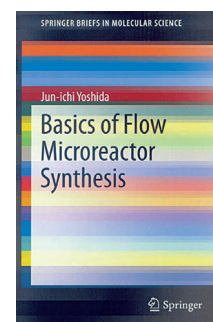
In conclusion, this monograph gives a nice introduction to the field of flow chemistry and represents definitely a must-have for most people that are new in the field. However, there lies also the weakness of this book; the book is strongly focused on the basics of flow chemistry. The examples throughout the book are centered around transmetalation chemistry and the use of residence time control to increase the efficiency of such fast reactions. Many interesting aspects of flow chemistry, such as heat transfer, scalability, photochemistry, multistep reaction sequences, etc. are not discussed in this book. However, as the author pointed out in the preface and the outlook, this was not the main objective of this book and the reader is directed to other reviews and books for more in depth reading on these matters. Nevertheless, the book is of great interest to students and to newcomers in the field and its low cost will make it a compulsory reading for this target group.

Timothy Noël

Eindhoven University of Technology
(The Netherlands)

International Edition: DOI: 10.1002/anie.201508143

German Edition: DOI: 10.1002/ange.201508143



Basics of Flow Microreactor Synthesis
SpringerBriefs in Molecular Sciences Series. By Jun-ichi Yoshida. Springer, 2015. 108 pp., softcover, € 52.99.—ISBN 978-4431555131