

# Preface

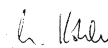
During the last dozen years, droplet-based microfluidics and the technique of micro-segmented flow have been evolving into a key strategy for lab-on-a-chip devices as well as for micro-reaction technology. The unique features and advantages of these technologies with regard to the generation and manipulation of small liquid portions in microsystems have attracted widespread attention from scientists and engineers and promise a large spectrum of new applications. The steep increase of scientific interest in the field corresponds to a quickly rising number of publications and to the increasing importance of the field for numerous scientific conferences. Among them, the CBM workshop on miniaturized techniques in chemical and biological laboratories has dealt with droplet-based methods and micro-segmented flow since 2002. In particular, the sixth workshop—held in Elgersburg/Germany in March 2012—focussed on recent developments in micro-segmented flow. This meeting highlighted the progress of the field over the past few years and reflected a well-developed state in the understanding of droplet-based microfluidics, segment operations, in the development and manufacture of devices and in their applications in chemistry and biotechnology. The focus of the meeting on the state-of-the-art in research and development in the science, technology and application of micro-segmented flow proved an opportune occasion for a summarizing description of the main aspects of *Micro-Segmented Flow* in the form of this book.

The authors and editors of this book understand their writing as a mission for giving a representative overview of the principles and basics of micro-segmented flow as well as a description of the huge number of possibilities for processing micro-fluid segments and their applications in chemistry, material sciences as well as in biomedicine, environmental monitoring, and biotechnology. So, the book is divided into three parts: the first part introduces the fascinating world of droplet and segment manipulation. The described methods range from droplet handling by surface forces and light to electrical switching and chip-integrated systems and to sensing of the presence and content of micro-fluid segments. In the second part, the application of micro-segmented flow in the synthesis and operation of micro and nanoparticles is chosen as a typical example of taking advantage of micro-fluid segments in chemical technology. Beside the large spectrum of applications in the preparation of new and homogeneous materials, the potential of micro-segmented flow for the screening of nanoparticle compositions, shapes, and sizes by

combinatorial synthesis is shown by the example of plasmonic nanoparticles and the tuning of their optical properties. Finally in the third part, two important aspects of miniaturized cell cultivation and screenings have been selected for demonstrating the power of micro-segmented flow in biological applications. In both of these chapters, the use of micro-segmented flow for the determination of highly resolved dose/response functions for toxicology, for the characterization of combinatorial effects in two- and three-dimensional concentration spaces and for the application of droplet-based methods and micro segmented flow in the search for new antibiotics are reported.

All authors are active researchers in the field of micro-segmented flow. The chapters follow the concept of connecting a review-like overview of the specific topics with a report on recent examples of the researcher's own research. So, it is expected that the reader will find a very informative survey of the most important aspects and an authentic introduction into the fastly developing and fascinating world of segmented-flow microfluidics.

Ilmenau, April 2013



Micro-Segmented Flow

Applications in Chemistry and Biology

Köhler, J.M.; Cahill, B.P. (Eds.)

2014, XVII, 272 p. 163 illus., 91 illus. in color.,

Hardcover

ISBN: 978-3-642-38779-1