

Preface

Heterogeneous catalytic reactions take place at interfaces – micro-reaction technology is an interfacing topic. Like the contacting of several phases in a reactor, it is a topic which crosses discipline boundaries. Homogeneous catalytic reactions facilitate transport paths even more – true interdisciplinary works thus involve ‘mixing’, e.g. of the experts’ opinions, of research towards collaborated efforts, by birth of new disciplines, and by crosslinking of the experts themselves. Now, in this special issue, which is dedicated to the new field of catalytic microstructured reactors, the corresponding experts have ‘met’, at least in a virtual sense. In their papers, they do not only bridge to conventional fixed-bed technology, but also to the field of (otherwise) structured reactors using catalytic foams, vleeces, or other porous networks.

The interplay between the fields of catalysis, micro chemical engineering and modelling and simulation is a particular successful example of interfacial works. There is a trend in modern catalysis towards rational catalyst design and enhanced molecular mechanistic understanding through surface sciences. Microstructured reactors offer another facet, which may be termed process-tailored chemical engineering. The operation under conditions with virtually no mass-transfer limitations and with superior heat transfer (‘isothermal processing’) or in the explosive regime are just a few of the new means. Thereby, intrinsic kinetic studies may be performed or direct synthesis routes established, sometimes with no classical analogue. Thus, micro-reactor processing acts as enabling technology for the fundamental science topic catalysis.

Besides applications in catalyst testing, many catalytic gas-phase processes have been studied and optimised using micro-channel operation. Currently, we see that the majority

of the investigations refer to selective hydrogenations and oxidations to value products, and in a few cases other reaction classes like fragmentations or additions. The field of fuel processing has become a topic of special interest, both from academia and industry. All the steps of micro-reactor fuel processing have been covered in the past, e.g. steam reforming, partial oxidation, combustion, water-gas-shift, preferential oxidation, and more. This importance is reflected by having several contributions to this theme in this special issue.

This special issue comprises 21 papers which have been grouped by subtopics indicated by the headings on the pages. At the beginning, there is a review paper giving an up-to-date summary on modern catalytic micro-reactor engineering, and then follow many technical papers on heterogeneous and homogeneous catalysis. We were especially glad to have contributions from authors from both sides of the “interface” – catalyst-based and micro-engineering-based researchers. Actually, the guest editors themselves were “split” and are “unified” in this way, coming initially from the fields of structured catalyst reactors/homogeneous catalysis and chemical micro process engineering.

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