



Preface

Spatially structured systems are commonly encountered in nature. In Catalysis and Chemical Reaction Engineering, on the other hand, random systems have long dominated the field. It is clear that today also in Catalysis Engineering, structured systems get more and more attention. The drivers are new paradigms of the field, such as minimisation of energy consumption and of waste formation. In fact it is a must to drastically reduce environmental impact, so that a social and technological sustainability can be realised. Catalysis as such is a major enabling technology; and structured catalysts and reactors have a large potential in reaching these objectives. They give a degree of freedom in design, allowing high precision that might well revolutionise the field. Many structured systems that are applied or considered for application have shapes that are very elegant in their appearance. Very often they are real pieces of art! However, in nature even more beautiful structures are encountered. This should make us modest on the one hand and inspire us on the other hand. Let us learn from nature, although we should not be as patient!

In the early stage of the organisation of ICOSCAR-1 it was decided to treat catalyst and reactor as non-separable entities. According to every definition, a catalyst particle is already a chemical reactor. However, in the case of random beds it is useful to distinguish between the reactor and the particle. In structured reactors, e.g. in monoliths, this difference vanishes. Such reactors should be treated in an integral way.

In this special issue of Catalysis Today, the state-of-the-art in structured catalysts and reactors is presented. In Process Intensification it is hoped that the so-called multifunctional reactors, e.g. reactors integrating reaction and separation processes, will shift the existing technological boundaries. Undoubtedly, structured catalysts form an essential ingredient of multifunctional catalytic reactors. It is therefore not

surprising that membrane reactors and catalytic distillation are covered in this issue. Also novel processes based on structured catalysts are presented, such as photo-catalytic oxidation or propane dehydrogenation in a rotating monolith. Other chemical engineering subjects presented include hydrodynamics in structured reactors and manipulation of concentration and temperature profiles. In this respect structured reactors allow innovative designs that are not possible in random systems.

Preparation of structured catalysts presents another dominant subject of the contributions. In our view, this supports the conclusion that structured catalysts and reactors have generally been accepted as promising and having high potential. Of course, this implies that process demonstration is called for and in order to do it, catalyst preparation has to be focused upon.

We hope that this special issue of Catalysis Today will stimulate the scientific and technical community to further investigate, design and apply more sophisticated reaction systems.

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