

Book Review

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**Separations and reactions in organic
supramolecular chemistry: perspectives
in supramolecular chemistry, volume 8**

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This book is a part of the 'Perspectives in Supramolecular Chemistry' series founded by J.-M. Lehn. The title of the book suggests a very broad area; however, the book is mainly focused on the chemistry of solid inclusion complexes. It is arranged in nine chapters written on specific topics by internationally renowned experts.

The authors consider stereo- and regio-selective formation of solid inclusion compounds in great detail. A diverse range of synthetic examples (most of them recent) is complemented by a description of physico-chemical approaches to the analysis of inclusion equilibria. This is followed by a discussion of host-controlled solid-state reactions of the encapsulated guests. Finally, the reader finds a case study of the development of a commercialized inclusion complex (biocide). Apart from the chemistry of inclusion compounds, an excellent overview of synthetic strategies for regio- and stereo-selective preparation of polyfunctionalized fullerenes is presented.

The first four chapters describe selective recognition of enantiomers and other isomers by specific host compounds, e.g. ureas, bile acid derivatives, arylglycine-based dipeptides, etc. Although not comprehensive, the coverage gives the reader a good, balanced overview of the different types of inclusion complex and the achievable ranges of selectivity. Despite the fact that inclusion compounds have been known for decades, our understanding of this phenomenon

is still in its infancy. With the availability of many X-ray structures, one can decipher the intermolecular interactions that cement the inclusion complexes; however, it is extremely difficult to predict the complexation behaviour of unknown molecules. The authors, therefore, make little generalization; the formation of inclusion complexes is, instead, categorized with respect to the specific functional groups of the hosts and guests and the types of solid matrix formed.

Chapter 5 presents a physico-chemical perspective of the formation of inclusion compounds. This area has been mostly explored by synthetic chemists; development of selective inclusion, however, requires a quantitative understanding of the strength of interactions in the complex. This chapter describes simple, yet powerful, techniques for analysis of the complex formation. I believe it will be helpful to all synthetic chemists working in the area.

Chapter 6 is devoted to fullerene chemistry. Selective synthesis of fullerene derivatives nominally lies outside the bounds of supramolecular chemistry, and this area may, therefore, seem rather distant from the topics covered by the rest of the book. Nevertheless, the chapter provides an excellent overview of available synthetic strategies. Controlled preparation of multiply substituted fullerenes requires clever use of templating reagents. The design of selective reagents is, in most cases, rational, and the description of this chemistry makes for very interesting reading. The chapter is written in a concise, yet logical and compelling, style. I would recommend it to everybody interested in fullerene chemistry.

Chapters 7 and 8 are dedicated to reactions in the matrices of inclusion complexes. The formation of such solid supramolecular assemblies inherently restricts the geometry of the reaction products and intermediates. Therefore, it

is theoretically possible to induce regio- and enantio-selectivity by encapsulating the reactants in a suitable solid matrix. Unfortunately, the prediction of these effects is very difficult, and little generalization is possible. The progress in this area is still mainly achieved by a trial-and-error method. On the contrary, Chapter 8 describes a rational approach to the design of selective reactivity. The formation of inclusion complexes brings the functional groups of the guests close together. By exploiting strong intermolecular forces and rigid, well-defined hosts, it is possible to design systems in which mutually reactive functionalities are brought together in a controlled fashion. This allows one to facilitate solid-state reactions and induce regioselectivity. Several examples of such controlled syntheses are discussed.

Chapter 9 describes inclusion complexation from an industrial point of view. Supramolecular chemistry is playing a major role in developing modern formulations of active ingredients in pharmaceutical and agricultural chemistry, and inclusion complexation is an interesting type of such formulation that has potential to alter the physical properties of the active ingredients substantially while maintaining their chemical activity. This chapter gives an overview of a successful commercialization of an inclusion complex of a known biocide.

This book will be useful for all scientists working in the areas of inclusion complexation or fullerene chemistry.

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