Handbook of Combinatorial Chemistry - Drugs, Catalysts and Materials; edited by K. C. Nicolaou, R. Hanko and W. Hartwig; Wiley-VCH: Weinheim, **2002**; 2 Volumes, 1114 pp, € 371.30; ISBN 3-527-30509-2

The use of insoluble supports to assist organic synthesis dates back more than 60 years to the days when chemists first used ion exchange resins as, what would currently be called, polymer-supported (PS) acids or bases and PS scavengers. The field developed steadily until 1963 when it received an enormous boost with the publication of Merrifield's method of 'solid phase' peptide synthesis (SPPS). In the following two decades it was not only SPPS that was pursued enthusiastically. The same general ideas were applied in studies of other organic reactions. These involved PS substrates, PS reagents or PS catalysts. Many PS chiral catalysts were used for asymmetric synthesis. It gradually became clear how PS reactions differ from the corresponding reactions in solution. The difficulties of carrying out reactions using PS substrates were well recognised at that time and the benefits of having the target molecules in solution appreciated. Indeed, many of the general ideas discovered then are still exploited today. The amount of published work up to 1985 amounted to well over 1000 references, many of them in 'polymer journals'. Interest in the field then slowly wained until, in 1988–1991, it received a further major boost with the publication of the 'split and mix' approach to peptide synthesis. This provided a means to prepare from hundreds to millions of peptides rapidly. By appropriate manipulation, products with all the possible combinations of the chosen building blocks could be prepared with each polymer bead carrying just one combination. When, in the late 1980s and early 1990s advances in biological screening created a need for the more rapid synthesis of organic compounds for biological testing, many synthetic organic chemists began to take a keen interest in PS reactions. The publication explosion since then has been enormous. Now PS reactions are a standard part of the synthetic organic chemists' tool kit.

The two volumes of this edited book cover most aspects of the field, but the focus is mainly on work done since the late 1980s and, in particular, on those aspects of most interest to synthetic organic chemists. It is divided into five Parts. Part I consists of six chapters covering 'General Aspects', including chapters on polymer supports, linkers, encoding technologies and instrumentation. Part 2, the heart of the first volume, discusses 'Synthetic Chemistry'. It consists of a series of fourteen chapters organised by reaction type, for example, radical reactions, nucleophilic substitutions, carbonyl group chemistry, oxidations and reductions. All these topics are discussed in the context of high throughput/combinatorial chemistry and in this Part alone there are nearly 1200 references.

Part III, the first in the second volume, discusses 'Special Synthetic Topics'. It begins by discussing the impressive work on the solid phase syntheses of natural products and natural product-like libraries. The PS synthesis of, for example, vancomycin derivatives and taxanoids illustrates just what complex chemistry can be carried out successfully with large molecules bound to polymer beads. Other chapters deal with multicomponent reactions and strategies for creating diversity in oligosaccharides. Part IV consists of four chapters concerned with the 'Molecular Design and Combinatorial Compound Libraries'. Here design criteria, pharmacokinetics and modelling are all discussed.

Part V is devoted to 'Novel Applications of Combinatorial Chemistry'. In many ways this section of six chapters contains some of the most original ideas, covers areas, which are very much at the cutting edge and provides food for thought with regard to the future. Many of the techniques and screening methods being developed are very ingenious. Particularly interesting are the two chapters on developing both homogeneous and heterogeneous catalysts using combinatorial methods. Finally, there are chapters on the up-and-coming area of combinatorial materials and on combinatorial biosynthesis.

Each chapter is written by an expert drawn from industry or academia. Most authors are from, Germany or the USA though these are by no means the only countries with major contributors to the field. The standard of writing and presentation is high but, as ever with edited multi-author volumes, some topics tend to be repeated and others fall down the cracks. In this case, for example, the coverage of analytical aspects is patchy. Overall it is an excellent reference book that most researchers in the field will want on their bookshelves and/or in their library even if the price is high.

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