

Preface

Supramolecular chemistry – the branch of chemistry associated with the formation of complex multimolecular entities from relatively simple molecular components – has been a major research theme over the past four decades. Researchers were provided with a unifying vision of the field following the award of the 1987 Nobel Prize in chemistry to three of its pioneers: Jean-Marie Lehn, Donald Cram and Charles Pedersen. Subsequently there have been a number of excellent texts on the subject ranging from undergraduate primers and books on supramolecular design to comprehensive works and encyclopaedias. To date the theoretical aspects of this fascinating area of science have been well served by texts at all levels. As far as laboratory-based supramolecular chemistry is concerned there are some edited works in which research teams have presented the syntheses of compounds that they pioneered. By and large the syntheses are extended forays into specific groups of compounds which, while they are invaluable to the experienced researcher, may seem a little daunting to the neophyte. Isolated examples of other synthetic methods are to be found in a number of undergraduate practical guides; however, they are rarely placed in a supramolecular context. Finally, one or two classic syntheses of compounds, including crown ethers and calixarenes, are to be found among the pages of the collective volumes of *Organic Syntheses*.

This book is intended to take the historical and theoretical background of supramolecular chemistry into the laboratory and to be used as an entry level synthetic guide for those with little or no prior experience in supramolecular chemistry yet who wish to incorporate aspects of it in their own research or teaching. It incorporates practical syntheses designed so that chemists who are not necessarily supramolecular specialists can prepare archetypal compounds used in supramolecular chemistry – crown ethers, podands, resorcinarenes, calixarenes and the like – using straightforward experimental procedures. All syntheses are simple enough to be undertaken using equipment available in most university and college chemistry laboratories. As a result the procedures are not necessarily those with the highest yields but those that have been ‘tried and tested’ as the most reproducible. Techniques commonly used in the prediction and analysis of supramolecular phenomena are also discussed with some examples described in detail. Compounds that are prepared from directions in the text can then be used to illustrate particular supramolecular phenomena such as clathrate formation or may be developed further as part of the researcher’s own work. Experimental

procedures for representative ligands in each class are preceded by brief outlines of the historical and current interest in them. Given the vast scope of contemporary supramolecular chemistry this book cannot hope to cover every class of compound or experimental technique of interest to the community. Many compounds were prepared during the research for this book but failed to be included either because the methods required specialist equipment, not always to hand in an undergraduate laboratory, or because of complex work-up procedures. To aid in the identification of products, the compounds described are accompanied by approximate yield, melting point (where appropriate), infrared and ^1H nuclear magnetic resonance data. Note that most values have been rounded up or down so that infrared data, for example, are reported generally to the nearest five wavenumbers. As trace impurities, often solvents, can have a significant effect on spectral and melting point values, the data reported should be used as a guide.

In some cases the synthesis given is based closely on one available in the literature, albeit sometimes from a quite obscure paper, and where this is the case the relevant authors and papers are clearly cited. These references should be given in any published works where the compounds appear.

Acknowledgements

Firstly I must acknowledge a great debt to the many supramolecular chemists past and present who have pioneered or developed many of the synthetic routes described herein. As will be clear from an examination of the cited literature, there are several prolific individuals and their research groups without whom some exciting supramolecular avenues would have remained unexplored. There are, of course, many others who have contributed to the field and have helped to make supramolecular chemistry the vibrant discipline it is today. Alongside this must go thanks to members of my own research group who have been joining me on my adventures in supramolecular chemistry for the past decade. Thanks to Flavia Fucassi who ran many of the spectra and repeated some of my experiments to prove that they worked. Thanks also to Andy Slade and Rachael Ballard at Wiley who twisted my arm to write this book and then left me in peace for two years while I got on with the job. The experimental work was carried out in the School of Pharmacy and Biomolecular Sciences at the University of Brighton. All the *in silico* simulations and computer graphics were generated by Spartan '03 software (Wavefunction, Inc., Irvine, CA). Finally, and most importantly, thanks to Margaret for all her support – ever since we met in that supramolecular lab in Tuscaloosa.

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