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Book reviews

Supramolecular chemistry

J. W. Steed and J. L. Atwood
John Wiley & Sons Ltd, Chichester, 2000
xxvii + 745 pages. £29.95 (paperback)
ISBN 0-471-98791-3

This book is presented in ten chapters and 745 pages. It is designed as an introduction to supramolecular chemistry. The front cover of the cover is somewhat strange, depicting the Rosetta stone from the British Museum. This stone proved to be the key to understanding the ancient Egyptian writing of hieroglyphics. This book functions in much the same way, by unravelling and explaining the world of supramolecular chemistry. In short, this book is excellent. I have no doubt that it will prove itself to be one of the cornerstones of an undergraduate chemical education.

The book is extremely well written, the diagrams are clear and informative and the progression chosen to explain the topic is logical. The book contains up-to-date references to other key work in the area. A set of problems is included at the end of each chapter. Answers to the problems can be found at the web site www.ch.kcl.ac.uk/supramol/textbook.htm.

The book starts with an introduction to supramolecular chemistry and a definition of the subject. The role of the chelate and macrocyclic effects, preorganization and complementarity, thermodynamics and kinetic selectivity and host design are then presented. The other chapters of the book deal with (in order) the supramolecular chemistry of life, cation-binding hosts, binding of anions, binding of neutral molecules, crystal engineering, templates and self-assembly, molecular devices, biological mimics and liquid interfaces, liquid crystals and liquid clathrates. The authors have woven a very complex subject into manageable sections without losing the integrity of the subject. Students from a variety of chemistry, biology, materials science and polymer science backgrounds will find this book useful.

In the UK university system, the book would probably be most useful for final year undergraduates studying a course on supramolecular chemistry. Postgraduate students, however, will find the book an important read and a reference source for further study. This book is groundbreaking and will help to foster new courses at university level.

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Technetium: chemistry and radiopharmaceutical applications

K. Schwochau
Wiley–VCH, 2000
xii + 446 pages. £115
ISBN 3-527-29496-1

Technetium ('artificial') is a man-made element, first made in 1937. There is no shortage of it today: a typical nuclear reactor in a power station produces about 10 kg of ^{99}Tc per year from uranium fission. More important commercially than the long-lived isotope ^{99}Tc (half-life 2×10^5 years) is the metastable isotope ^{99m}Tc, a γ-emitter with a 6 h half-life. Over 80% of the radiopharmaceuticals used in a clinic are based on ^{99m}Tc, and the proportion is increasing. Although the whole of Section B of the book is devoted to radiopharmaceuticals, it is only 50 pages long, the last chapter. Much of the chemistry described in the other chapters, however, is directly relevant to radiopharmaceuticals.

There is much clever chemistry going on in the radiopharmaceuticals area. The breakthrough in the late 1950s was the development of the portable ^{99m}Tc generator in which the $^{99m}TcO_4^-$ is eluted from an aluminium oxide column loaded with $^{99}MoO_4^-$. The necessary redox and substitution chemistry must all then be done quickly in high yield in the hospital. By suitable choice of oxidation state and ligands, ^{99m}Tc complexes can be synthesized that allow imaging of, for example, brain and heart perfusion, bone, the liver, kidney, and even specific cellular receptors.

Most of the book consists of Chapter 12 (208 pages), a comprehensive survey of compounds containing all the oxidation states from Tc(VII) to Tc(-1), including clusters and organometallic complexes. The weak β-radiation of ^{99}Tc means that it can be handled easily in the laboratory without special precautions. There is good discussion of preparative and characterization methods and extensive tabulation of structural data, particularly for Tc(V) and the $(Tc{=}O)^{3+}$ core. The high stability of some Tc(I) complexes is remarkable (low-spin d^6), especially the octahedral hexakis(isonitrile) complexes used for diagnostic imaging and $[Tc(CO)_3(H_2O)_3]^+$ which shows promise as a ^{99m}Tc-labelling agent.

Overall, this book is an excellent reference work for