

Book reviews

Element Speciation in Bioinorganic Chemistry

S. Caroli (ed.)

John Wiley and Sons, Chichester, 1996

474 pages: £75.00

ISBN 0-471-57641-7

Elemental speciation is now not only considered vital in many areas of chemistry, but is the subject of more and more research papers both at conferences and in the literature. It is therefore not surprising that an increasing number of books have been published on this topic recently. This particular volume, I feel, is one of the better of those I have seen, although somewhat ambitious in terms of content given that it attempts to cover more than the title suggests.

This is Volume 135 in a series of monographs on analytical chemistry and its applications. Like many other books in this series it is an edited collection of contributions, in this case from a group of no less than 29 authors largely chosen from workers in Italy and Spain. The book is structured into 13 chapters covering both instrumental developments and applications of speciation. The first five chapters discuss both the importance of speciation studies and the various methods that have been developed to determine individual species. Thus, for example, methods of separation (e.g. selection extractions, derivitization procedures, selective volatilization and the more common chromatographic approaches) are covered. Detection methods are also discussed in some detail, with a particular emphasis on electrochemical methods such as anodic stripping voltammetry, neutron activation analysis, radiotracer methods and coupled chromatography with ICP–AES. Surprisingly, however, the role of ICP–MS—although mentioned briefly in various parts of the book—is not particularly prominent. The sixth chapter deals with quality control in speciation analysis. The inclusion of this topic is most welcome since, whilst few would doubt its importance, it is often overlooked or poorly presented in published text. The authors of this section are well-known authorities with much experience of working within the EC Standards, Measurement, and Testing programme. The section is well written and reviews the principles of quality assurance, potential sources of error and a number of specific examples of method validation in speciation studies. The final chapters are more element-specific and discuss aluminium and silicon speciation in biological materials, organotin compounds in both marine organisms and coastal environments, chromium and selenium in natural waters, and arsenic speciation and health. There are also chapters on trace-metal complexation in seawater and the speciation of trace elements in milk.

Overall the book is well presented with many useful tables and figures. Although I would recommend it to

anybody with an interest in elemental speciation, it does have some negative features. For example, there is a degree of repetition, with some information being given in more than one chapter. In addition, although the book is well referenced, most of the references are now a little dated. An example is the chapter on new methods of speciation analysis, where only eight of the 113 references cited are post-1988. Thus many recent and important advances are omitted. There is also a general tendency for the authors to look back rather than offer an insight to the potential of speciation studies in the field of bioinorganic chemistry in the future. However, that said, the material that is included is informative, with details of both the advantages and disadvantages of the various techniques and applications described. Perhaps any book that claims to be ‘a complete reference for the analytical and instrumental aspects of speciation’ is going to fall short of its aims, since the subject area is now so vast. However, this is still one of the best books around on this topic and one which I am sure will find its way onto the book shelves of both established workers in elemental speciation and those who are venturing into this area for the first time.

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Industrial Organic Chemicals

Harold A. Wittcoff and Bryan G. Reuben

John Wiley & Sons, New York, 1996

531 pages: £60

ISBN 0-471-54036-6

This book provides a comprehensive, well-organized and up-to-date picture of how organic chemicals and polymers are produced. It also indicates the major uses for these substances. The first chapter explains the importance of the chemical industry to the economies of the developed nations with particular reference to the USA, where it provides the greatest added value in manufacturing with the third largest annual revenue after food and transportation equipment. Key international characteristics of the industry, including maturity, capital intensity and the growing importance of competition from developing countries such as Saudi Arabia and Canada are discussed. Much informative numerical data are provided in this chapter, including a table of the world's top 30 chemical companies, listing sales and profitability in 1993.

About 90% by weight of the organic chemicals used worldwide come from petroleum and natural gas and Chapter 2 explains how the seven chemicals on which the industry is based—ethylene, propylene, the C_4 olefins, benzene, toluene, the xylenes and methane—are derived from these sources. The importance of the techno-commercial interface between petroleum refining and the petrochemical industry is emphasized in this chapter. Separate chapters then describe how a wide range of chemicals and polymers are manufactured from each of these seven basic chemicals, with two additional chapters covering products derived from C_5 olefins and alkanes (other than methane) respectively. The chemistry involved is described in a way which points out significant aspects of the technology involved and sufficient numerical data, e.g. product prices, production volumes and changes of these with time, given to indicate the commercial importance of the major products. After dealing with the major products, for example the polyethylenes, most chapters contain sections dealing with 'lesser-volume' products, e.g. ethylene oxide derivatives in the chapter concerned with ethylene.

The 10% of organic chemicals and polymers not derived from petroleum or natural gas are covered in three chapters. The first deals with chemicals from coal, which although important to the development of the industry is now relegated mainly to production of a limited range of aromatic and heterocyclic chemicals (including naphthalene) from coke oven distillate. The industrial chemistry of fats and oils, concerned mainly with surfactants, is covered in the next chapter, while the third chapter in this group deals with a wide range of special products based on carbohydrates, including starch and cellulose.

Polymer production consumes about half the total volume of organic chemicals produced, so the penultimate chapter, 'How polymers are made', is concerned entirely with these materials. It indicates the application areas of polymers, e.g. plastics, fibres and elastomers, and lists the more important polymers in these areas, giving the volumes produced in the USA in 1993. Basic polymerization chemistry is reviewed, starting with step-growth polycondensations and proceeding through the more important chain-growth polymerization mechanisms; it also gives some examples of step-growth polymerizations leading to cross-linked products such as epoxy resins. This chapter also provides a brief review of the physical properties of polymers on which their usefulness depends. The last chapter is concerned with 'Industrial catalysis' and provides a brief but wide-ranging review of this very important area.

This book will provide a useful review of the field for both students and graduates with some knowledge of organic chemistry. The references to each chapter are given mainly in the form of annotated bibliographies which provide introductions to the relevant literature. Thus, this book can also be used as a source reference to

searchers looking for detailed information about particular areas in this wide general field.

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Aqueous Organometallic Chemistry and Catalysis

I. T. Horváth and F. Joó (eds)

Kluwer Academic Publishers, Dordrecht, 1995

317 pages. £117

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There have been two recent review articles^{1,2} on homogeneous catalysis by metal complexes in aqueous solution, so the appearance of a book on the same topic may strike some readers as superfluous. In any case this book is not exclusively concerned with catalysis but that is the main theme. The reason for its publication is to report the proceedings of a NATO Advanced Research Workshop on Aqueous Organometallic Chemistry and Catalysis held at Debrecen, Hungary, from 29 August to 1 September 1994. The book consists of three short introductory, mainly historical, articles, an eight-page summary of the discussion at the conference, and 28 contributed papers (296 pages). There are also separate Subject and Author indexes. The historical survey omits the Wacker process.

Over half the contributions deal with catalytic hydrogenation or hydroformylation, but other topics include olefin metathesis, the Heck reaction, oxidation of chlorinated hydrocarbons and coordination compounds of nucleotide bases. A major attraction of the book is that it describes the diversity of methods by which organometallic chemistry can be carried out in water. Thus, in addition to the well-known use of sulphonated phosphines in the Rhône Poulenc/Ruhrchemie hydroformylation process,³ the following methods are described: (1) the use of phase-transfer catalysts in addition to the organometallic catalyst; (2) supported aqueous-phase catalysts in which a water-soluble homogeneous catalyst is adsorbed in a thin layer of aqueous solution on a solid support; (3) micellar and vesicular systems in conjunction with a homogeneous catalyst. The final three contributions in the book are concerned with the hydrogenation of biological systems and two of these describe work done by one of the book's editors (F. Joó) at Debrecen.

To summarize: this is an interesting book and the general standard of the contributions is very high. It covers a wide range of topics although, strangely for a book on aqueous chemistry, hydration is not mentioned.

REFERENCES

1. W.A. Herrmann and C. W. Kohlpainter, *Angew. Chem., Int. Ed. Engl.* **32**, 1524 (1993).
2. P. Kalck and F. Monteil, *Adv. Organomet. Chem.* **34**, 219 (1992).
3. E. G. Kuntz, *Chemtech* **17**, 570 (1987).

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