Book Reviews

Gmelin Handbook of Inorganic and Organometallic Chemistry, 8th edition Iron, Organoiron Compounds, Part A, Ferrocene 10
Springer-Verlag, Berlin, 1991, pp. 365 + xiii. DM 1890. ISBN 3-540-93640-8

This volume covers the literature systematically until the end of 1986. It finishes the treatment of unbridged disubstituted ferrocenes started in Ferrocene 7, and deals with substituents based on P, As, or a metal. It also deals with trisubstituted ferrocenes.

This volume is the usual impeccable Gmelin production, and it will be of considerable value to research groups, not least my own. However, if it takes five years to publish from completion of information collection, and 10 volumes do not suffice to deal with all of ferrocene chemistry, it may lead one to doubt the long-term viability of the Gmelin project. At least one point is worth making. A detailed literature search, in say Chemical Abstracts, to identify and organise material on an aspect of ferrocene dealt with here would take many man hours. If these are properly costed, the prices of these volumes becomes suddenly quite reasonable. Long may they continue.

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Gmelin Handbook of Inorganic and Organometallic Chemistry, 8th edition Iron, Organoiron Compounds, Part C 6a, Trinuclear Compounds Springer-Verlag, Berlin, 1991, pp. 320 + xiii. DM 1665. ISBN 3-540-93631-9

This volume covers the literature completely up to the end of 1989, and in part up to mid-1991. It deals with trinuclear iron compounds with ligands only of the Gmelin type ^{1}L. These are mainly, but not exclusively, carbonyls, and the data are arranged in order of increasing CO content, from three CO up to nine CO. The nuclearity as defined in these volumes is determined by the iron alone. Thus, the volume deals with compounds such as $[Fe_3(CO)_8(RhC_5Me_5)(\mu_4\text{-}PPh)_2]$ though this might be thought of as tetranuclear. The bridging ligands include compounds of elements of Groups 15 and 16, and the additional transition metal hetero-atoms are from Groups 6–11.

As usual, this is a comprehensive and invaluable production. I am still happier using a book for basic reference than a computer terminal and find the presentation very acceptable. How long the Gmelin Institute can carry on this labour of love is not clear, but I hope that it is for a considerable time to come.

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The Chemistry of Organophosphorus Compounds, Volume 2: Phosphine Oxides, Sulphides, Selenides, and Tellurides
Edited by Frank R. Hartley, in the series *The Chemistry of Functional Groups*, edited by Saul Patai, John Wiley and Sons, Chichester, 1992, pp. 647. £160.00 ISBN 0-471-93056-3

This is the second of a planned 4-volume series on the chemistry of organophosphorus compounds. The first chapter, by Gilheany (287 references) considers structural and bonding aspects in tertiary phosphine chalcogenides, and builds on the same author's contribution to Volume 1. A variety of experimental and theoretical approaches are discussed concerning the non-involvement of d-orbitals in these types of compounds, and the differing views on the multiplicity of the P=O bond. An understanding of the contents of this chapter is crucial for a proper appreciation of all the subsequent chapters, and the author has assembled the often conflicting information in a very readable way.

Gallagher reviews structural and stereochemical aspects of secondary and tertiary phosphine chalcogenides (94 references), mainly concentrating on oxides. Attention is paid to resolution methods and spectroscopic studies aimed at the elucidation of diastereoisomerism and conformation. Stereochemical

consequences of reactions involving the phosphoryl group are also discussed.

The variety of synthetic methods that have been employed in the preparation of phosphine chalcogenides is discussed by Bhattacharya and Roy (458 references), although their coverage only involves P^{V} systems, and not P^{III} compounds. The authors have updated the many existing reviews, and the wide range of methods leading to new organophosphorus compounds reflects the continuing activity in this field.

Chemical properties and reactions of phosphine chalcogenides are covered by Edmundson (481 references). The discussion focusses on (a) reactions of the P=X group, (b) reactions of the organic substituents, (c) formation of phosphinoyl carbanions and their subsequent reactions with aldehydes or ketones (the Horner reactions), (d) P–C cleavage reactions, and (e) reactions of primary and secondary phosphine chalcogenides. This is a rich area of organophosphorus chemistry and is of considerable synthetic and mechanistic interest.

Dankowski discusses the photochemistry of phosphine chalcogenides (153 references) and includes information on radical formation and the use of phosphine oxides as polymerisation initiators. The review covers a wide variety of structural types, such as derivatives of acylphosphines, phosphenes, diazophosphines, phospholes, and phosphorins.

The relatively short chapter by Davidson on spectroscopy of phosphorus chalcogenides nevertheless contains over 300 references. The main focus is on (a) UV and vibrational spectroscopy, and (b) multinuclear NMR studies. These aspects should be read in conjunction with the theoretical chapter by Gilheany, in view of some authors' interpretation of their data in terms of d_{π}–p_{π} bonding.

The longest chapter, by Lobana, is on the coordination chemistry of phosphine chalcogenides including analytical and catalytic applications. Almost 1800 references are cited, indicating the widespread use of these types of phosphorus compounds as ligands. The chapter covers work published up to November 1990, and also contains a useful Table summarising previous reviews in this area. As might be expected, studies on phosphine oxides, sulphides, and selenides greatly exceeds those on tellurides. The 27 Tables of data are particularly useful in quickly establishing information for particular metals. Considerable information is to be found in the section on analytical aspects of this class of compounds, particularly liquid-liquid extraction of metal ions, reversed-phase chromatography, and ion-selective electrodes. A wide range of catalytic reactions using phosphine chalcogenides, which are more usually associated with organometallic systems, is also tabulated.

The article by Santhanam on *Electrochemistry of Organophosphorus(V) Compounds* (154 references) sits very uncomfortably alongside the other chapters in this volume. There is a brief discussion of polarographic, cyclic voltammetry, ESR, redox properties, and interfacial adsorption behaviour of triphenylphosphine oxide, followed by much longer sections devoted to (a) phosphates, (b) phosphazenes, (c) phosphorus-bridged metallics, and (d) phosphonium salts. The rationale for including this material in Volume 2 is not obvious to this reviewer, and many of the topics discussed, particularly under (b), (c), and (d), relate only marginally to the main theme of the book.

In spite of the reservations expressed above, Volume 2 can be recommended as being a worthy addition to Volume 1, and the Series Editor should be congratulated for assembling this extensive subject matter.

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