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Book reviews

Metal Sites in Proteins and Models: Iron Centres Structure and Bonding, Volume 88
H. A. O. Hill, P. J. Sadler and A. J. Thomson (eds)
Springer, Heidelberg, 1997
xi + 225 pages. £76
ISBN 3-540-62870-3

In bio-inorganic terms, iron is a wonderfully versatile element. Ferrous–sulphur chemistry provided the energy for life before the world became aerobic. The switch to an aerobic atmosphere presented new chemical challenges. Oxidation of the ferrous to the ferric state yielded insoluble ferric oxy-species and the new aerobic life forms had to find ways to sequester and utilize these species for their metabolism. Reactions between oxygen and the ferrous state lead to highly reactive radical species which damage biological materials and need to be controlled. Needless to say, life forms rose to these challenges and iron is ubiquitously present in aerobic organisms, where it fulfils diverse roles.

The volume under review describes the systems for sequestering and transporting iron in aerobic cells and how iron cofactors are involved in enzyme-catalyzed metabolic reactions. The studies call upon the full range of physical methods for study of the structure and chemistry of bio-inorganic centres.

Ferritin is a multi-subunit protein designed to sequester vast amounts of iron in a form in which it can be mobilized readily within the cell. The structural nature of the ferric oxyhydroxide mineral core of transferrin is critically examined in the chapter by Powell using iron oxy-compounds as models. This theme is continued in a later chapter by Le Brun, Thomson and Moore on bacterioferritin, which intriguingly has haem iron in addition to the ferric oxyhydroxide core. It is a frustrating fact that whilst the structure of the protein is known to atomic resolution, the structure of the core iron is not fully elucidated despite a full range of spectroscopic techniques being applied to the problem. This investigation is elegantly described by the authors, who point out similarities between the binding sites for non-haem iron in bacterioferritin and in ribonucleotide reductase. The topic of ribonucleotide reductases is taken further in the chapter by Sjöberg, who presents the case that although the metallo-sites involved in catalysis differ in different life forms, the free-radical chemistry involved in this chemistry is conserved.

The chapter by Sun, Cox, Li and Sadler describes the structural characteristics of the transferrins which are involved in transporting iron between cells. The chapter considers carefully the factors involved in uptake and release of iron, and the chemistry governing the specificity of metal-ion binding in the transferrins and other metalloproteins.

Chapman, Daff and Munro give their chapter the provocative title 'Haem: the most versatile redox centre in biology?' This becomes a statement at the top of each page of the chapter but re-emerges as a question on the last page. A strong case is made in support of the claim, citing cytochromes, flavocytochromes, cytochrome *c* oxidase and cytochrome *P*-450 as examples. It is graciously conceded that when it comes to high-potential electron-transfer mediators, copper-containing proteins have the edge over haem proteins.

The topic of cytochrome *P*-450 is addressed further in the chapter by Wong, Westlake and Nickerson. Protein engineering of the bacterial protein to recognize new substrates and to make fusion constructs involving the three redox components of the *P*-450 system makes fascinating reading and has great biotechnological potential.

Volume 88 is well up to the standards set in this excellent series. The minor quibbles, such as the absence of figure legends in the chapter by Powell, are vastly overwhelmed by the overall quality of the presentation. The book is recommended as an authoritative, readable account of a fascinating area of science.

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Advances in Organometallic Chemistry, Vol. 43
R. West and A. F. Hill (eds)
Academic Press, New York, 1999
xi + 425 pages. £79.95
ISBN 0-12-031143-7

This volume has a new editor in Tony Hill, while Gordon Stone, the instigator and co-editor of the well-known series, becomes Founding Editor. That these volumes are so well respected and widely used is in no small part due to Stone's editorial hand and it is hoped that the quality

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and success of the books will continue with the new co-editor. This volume certainly continues the well-established trend; it contains six chapters covering a wide range of organometallic chemistry of both main-group and transition-metal elements.

The first chapter, by Belzner and Ihmels, concerns silylenes coordinated to Lewis bases, and focuses on the recent interest in these species from a theoretical, spectroscopic and mechanistic point of view. A chapter by Dyson concentrates on the chemistry of the ruthenium-carbide clusters $Ru_5C(CO)_{15}$ and $Ru_6C(CO)_{17}$ and details the systematic studies on these higher-nuclearity clusters in comparison with smaller trinuclear complexes. The clusters and their derivatives undergo a range of unusual and potentially useful reactions and it will be of interest to see if any become of importance as catalysts.

A chapter by Fischer, Stumpf and Roth describes the chemistry of transition metal complexes containing $RR'C{=}E$ (E = S, Se or Te) ligands, i.e. heteroaldehyde and heteroketone species. Simple examples of such species are relatively rare and highly reactive as free compounds, but coordination to a metal centre allows many more to be stabilized and their chemistry to be investigated. The review concentrates on mono- and bi-nuclear clusters and excludes complexes with π-donor heteroatom substituents at the carbon atom of the C═E function. Volume 42 of this series contained a chapter on catalytic dehydrocoupling of main-group elements and here Reichl and Berry expand the area to cover a range of recently reported metal-catalysed reactions of Si, Ge and Sn. The chapter covers many reactions of silicon compounds of industrial interest, such as the formation of carbosilanes, Si–O and Si–N bonds, but not the copper-catalysed Direct Process or hydrosilylation. This is a useful review as it covers a diverse range of related chemistry that is not usually found in one place.

Unlike the earlier chapters, that by Smith on the organometallic compounds of Na, K, Rb and Cs, concentrates on the structural aspects of these highly reactive and interesting compounds. A fascinating array of structures is described and, despite difficulties in the preparation of some of the compounds, their reactivity may sometimes offer advantages over their more well-known lithium derivatives. The final chapter is the second part (see Vol. 42 for Part I) of a description of 'Organometallic complexes in nonlinear optics' by Whittall *et al.*, this time covering third-order nonlinearities and optical limiting studies. As in Part I, there is a good background and experimental techniques section before various properties are discussed. Little information is given about the synthesis, reactions or structures of the compounds concerned.

Overall the book contains a wealth of information that is well presented and described. It should be available to all organometallic chemists.

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