

with the interesting perchlororganic derivatives of metals, but it is confined strictly to organic compounds. Not surprisingly, since it is written by the outstanding contributor to this branch of chemistry, it provides an excellent survey of the field, which has some very unusual features. Those chemists who are not aware of the very remarkable properties of perchlorobenzyl radicals (in my experience the great majority) will find this account of them very surprising. The radical $(\text{Cl}_5\text{C}_6)_3\text{C}\cdot$, for example, is a bright red solid, completely dissociated; its half-life in air is estimated to be about 100 years, and it is inert towards concentrated sulphuric acid, nitric acid, chlorine, and bromine. As the author points out these 'inert free radicals' are "trivalent-carbon species possessing a general stability considerably higher than that of the overwhelming majority of normal tetravalent carbon compounds and materials."

The volume is well produced and is good value at today's prices.

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The Chemistry of the Metal–Carbon Bond, Volume 5; Organometallic Compounds in Organic and Biological Syntheses; edited by Frank R. Hartley, John Wiley and Sons, New York, 1989, xv + 590 pages, £120, ISBN 0-471-91556-4.

This is the fifth volume in a now well established series of books on the metal–carbon bond, within the *Chemistry of Functional Groups Series*. Its remit is the use of organometallics in organic and biological synthesis. The previous volume was also concerned with organometallics in synthesis, and focussed largely on the derivatives of main group metals. By contrast, most of the chapters here deal mainly with transition metal derivatives, and much of the material is organised according to the reactions, rather than the elements under consideration.

The first part of the book deals with synthetic techniques, and three relatively new areas are discussed in detail. The first of these, by D. Bremner, deals with sonochemistry, which has found very wide application in organometallic chemistry, particularly in surface reactions. It is only very recently that theories have been developed to explain the rate accelerations observed. The second chapter deals with organic photochemistry, and is a useful account of the subject, though the applications to serious multi-step organic syntheses were few. The third section, on phase transfer catalysis, deals with a very wide range of reactions; there is an excellent account of the palladium catalysed carbonylation reactions reported by Alper's group. One notable feature of the second and third of these sections is that they focus almost exclusively on transition metals; surely there were some reactions of main group systems which would have been appropriate.

Part 2 of the book is entitled Synthetic Reactions, and again contains three chapters. H. Brunner, on Enantioselective Syntheses with Optically Active Transition Metal Catalysts, runs through the standard series of reduction, oxidation and C–C bond formation. This is a nicely compact account of a field which is expanding so rapidly as to become unmanageable. Chapter 5, by Gabor Speier, details Organometallic Oxidation Catalysts, whilst Chapter 6, by W. James Feast and Vernon C. Gibson, considers Olefin Metathesis. Both are good clear accounts.

Part 3 is entitled Synthetic Reagents, and here is a move towards organometallics

used stoichiometrically rather than catalytically. The section on the uses of transition metal clusters deals with both reaction types, and evidence for the intermediacy of intact clusters in catalytic cycles is carefully presented. This is a long chapter (86 pages) with over 400 references, and provides an excellent account of the field. Chapter 8, by Gary A. Molander, discusses the uses of lanthanide reagents in organic synthesis, focussing mainly on cerium, ytterbium and samarium. The final chapter of this section deals with organoantimony and organobismuth reagents.

The last part of the book deals with biological synthesis, and Chapter 10, by Peter J. Craig, details Biological and Environmental Methylation of Metals, whilst the final section, by Kieran C. Molloy, considers Bioorganotin Compounds, with particular reference to toxicity and applications.

Overall the book is well produced, and I noticed only a few typographic errors. There is an author index, and an adequate subject index. The diagrams are mostly clear and well presented. Individual chapters are well referenced, mostly well into 1988.

All of the chapters in this volume seemed to me to be well written and extremely useful. However, looking back over the last couple of volumes in this series, I wonder how they were planned. Overall the series will probably provide the reader with a good account of all the main areas one would think important, but some of the groupings could have been more helpful. Nevertheless this is an excellent book, and despite the escalating price of this series, should be bought by all serious libraries.

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