

The first of these includes a discussion of coordinative unsaturation, oxidative addition, cyclometallation and migration/insertion reactions. The description of oxidative addition is particularly exhaustive, with a discussion of the general principles followed by an extensive series of examples. In the second there is comprehensive coverage of the complete spectrum of homogeneously catalysed reactions ranging from hydrogenation to olefin metathesis by way of hydroboration, hydroformylation and polymerization reactions, and the chapter concludes with a short section on supported homogeneous and phase-transfer catalysis. Many of the examples are from recent literature and this chapter is particularly well referenced.

The book concludes with four appendices: units and fundamental constants, ionization enthalpies of atoms, ionic radii, and basic concepts of molecular symmetry and character tables. These appear to be identical to the appendices in the 5th edition.

In conclusion, the new edition represents a significant advance on the previous one, which was becoming somewhat dated. There is no doubt that every chemistry library should have a copy of this comprehensive reference work. However at £58.50 (hardback) it is debatable whether many undergraduates will be persuaded to purchase it as a textbook.

DEREK A. TOCHER
University College London, UK

Organozinc Reagents
Paul Knochel and Philip Jones (eds)
Oxford University Press, Oxford, 1999
xvi + 354 pages. £75
ISBN 0-19-850121-8

The preparation of diethylzinc and ethylzinc iodide, reported by Edward Frankland in 1849, was a landmark in chemistry; here were compounds which had many of the properties of typical organic compounds, yet contained a metal. However, although the potential usefulness of such organozinc reagents in synthesis was recognized and investigated, they were rapidly overshadowed, first by organomagnesium compounds and then by organolithium compounds. Recent years have seen a resurgence of interest in organozinc reagents (and in related zinc-mediated reactions). An important factor in this revival of interest has been the introduction of very reactive forms of zinc metal, which allow many more reagents to be prepared directly from the metal and an organic halide. The improved availability of the reagents has in turn led to recognition of their particular patterns of reactivity, either alone or in conjunction with other metals.

Both the preparation of organozinc reagents and their

use in uncatalysed and catalysed reactions are covered in this book, together with the preparation and reactions of organozincates and other bimetallic reagents, and the Reformatsky reaction and zinc-mediated Barbier reactions. Each chapter includes a summary of the chemistry covered, but the book is subtitled *A Practical Approach*, and its heart is a collection of detailed experimental protocols. These will be a very valuable resource for chemists wishing to exploit these reagents, though it is a pity that more thought was not given to the format of the book. For use as a laboratory manual it would have been better to use some form of ring binding so that the pages of the open book lay flat, and to paginate protocols so that the second page faced the first.

Besides the main text there is a list of organozinc reagents with references (useful); a list of suppliers (not very useful, as there is only limited reference to named suppliers in the text, and some named suppliers are omitted from the list); and an index (almost useless — a full list of the experimental protocols would have been much more valuable).

Organozinc Reagents is expensive, but not excessively so for a specialized book. Chemists involved in organic synthesis will certainly wish to have access to it, in the library if they cannot afford a personal copy.

B. J. WAKEFIELD
Ultrafine Chemicals, Manchester, UK

General Aspects of the Chemistry of Free Radicals

Z. B. Alfassi (ed.)
John Wiley & Sons, Chichester, 1999
x + 563 pages. £150
ISBN 0-471-98760-3

This is one volume from the series on the *Chemistry of Free Radicals*, edited by Zeev Alfassi (Ben Gurion University, Israel), the other titles to date being *Peroxy Radicals*, *N-Centered Radicals*, and *S-Centered Radicals*. There should be scope here for a series which would be the successor to the two classics in the field, Walling's *Free Radicals in Solution* (Wiley, 1957) and Kochi's edited *Free Radicals* (Wiley, 1973), but none of the present series has a foreword which sets out the editor's intentions. What results is rather like one of Patai's series on *Functional Groups* (Wiley): a series of vignettes at various levels reflecting the special interest of the authors, rather than a source of first resort on the general properties of radicals. The word 'general' in the title should not be taken to imply that some of the contents are not specialized or specific.

The first chapter, by G. R. Buettner, falls between two stools in trying to compress the basics of ESR spectroscopy into 18 pages. It cannot go deeply enough to be

useful to someone who is already familiar with the topic, nor argue the case in enough detail for the beginner to follow, and the choice of examples is questionable. Only two experimental spectra and one simulation are illustrated; none is identified and the most complicated shows a doublet of nitrogen triplets. There is a section on spin trapping, and reference is given to a database on nitroxyl spectra, but not to Fischer's general and comprehensive data in Landolt-Börnstein *Magnetic Properties of Free Radicals*, Fischer H (ed.), Springer: Berlin, 1965, 1980, 1990). There are also too many errors which should not have escaped the author and editors: confusion of Planck's constant h with magnetic field H , and of nuclear spin m_I with electron spin m_s , wrongly labeled energy levels, inconsistent symbolism, and misplaced terms in equations.

T. J. Wallington and O. J. Nielsen's chapter on the measurement of rate constants in the gas phase is much more detailed and gives block diagrams of the sometimes complex apparatus which is used. G. V. Buxton's chapter on the measurement of rate constants in the liquid phase emphasizes pulse radiolysis studies on aqueous systems. Nowhere, however, is there an analysis of the rate constants. There then follows a thorough account by E. Denisov of models for abstraction and addition reactions of free radicals. The various methods are examined critically, and illustrated with worked examples.

The ultimate fate of radicals is usually a radical-radical reaction leading to combination or disproportionation, and the various models which have been developed for analysing these processes are discussed in a chapter by Z. B. Alfassi. Elsewhere in the book, though not in this chapter, the unpaired electron on radicals is indicated on the formula, and I would have appreciated consistency: it is a distraction to have to check whether a missing hydrogen atom represents a radical or a clerical error in the formula.

The chapter by J. Gebicki and A. Marcinek on radical ions concentrates on the reactions of radical cations, but it is up to date and heavily referenced (eight times more so than the first chapter) and provides a good review of the present state of the subject.

O. Ito's chapter on free-radical polymerization provides a good critical review of the mechanism and kinetics of these centrally important reactions. This is followed by a survey by J. E. Chateaufort of reactions of free radicals in supercritical fluids (SCFs), which is a very useful field for studying SCF solvation and its effects. E. R. Bittner reviews quantum-mechanical numerical simulations of free-radical dynamics in solution, and N. Cohen gives a very readable account of the thermochemistry of organic radicals, emphasizing Benson's group additivity approach.

Accounts of the measurement of reduction potentials of inorganic radicals in water (D. M. Stanbury) and of the redox potentials of organic radicals (K. Daasbjerg, S. U. Pedersen and H. Lund), are accompanied by extensive tables of data.

G. Marston, P. S. Monks and R. P. Wayne's chapter on

the correlation between rate parameters and molecular properties concentrates on the gas-phase reactions of hydroxyl and nitrate radicals, which are important in atmospheric chemistry.

Z. B. Alfassi's second contribution concerns empirical correlational solvent effects in free-radical chemistry, and the book concludes with a useful chapter by C. Chatgililoglu and P. Renaud on recent developments in organic synthesis by radical reactions.

The overall result is something of a lucky dip. I would have preferred a firmer editorial hand and a more consistent approach, but it is well worth knowing what the book does contain: it might be just what you are looking for.

A. G. DAVIES

University College London, UK

Handbook of Copper Compounds and Applications

H. W. Richardson (ed.)

Marcel Dekker, New York, 1997

viii + 432 pages. \$175

ISBN 0-8247-8998-9

This is really a company book; half of the 15 chapters are written by employees of Phibro-Tech Inc.; the others emanate from universities and research institutes. Phibro-Tech is to be congratulated on giving its employees the time to document their experience.

No other book covers this ground in this depth; even Kirk-Othmer devotes only 15 pages to the applications of copper compounds. Sadly, for readers of this journal, the applications of organic copper compounds in catalysis is hardly mentioned and the basic reference work here, Wilkinson's *Comprehensive Organometallic Chemistry*, Vol. 2, is not mentioned at all. Heterogeneous catalysis by inorganic copper compounds is reviewed by David Dollimore, but from an academic rather than an industrial viewpoint.

The chapter on basic chemistry disappointed me. It does not mention the fact that anhydrous copper sulphate is colourless (known to all schoolchildren but, to my knowledge, still unexplained), nor does it mention the intriguing volatile anhydrous copper nitrate, the first anhydrous nitrate of a transition metal to be prepared.

The applications covered are mostly biological — fungicides, bactericides, algicides, wood preservatives, underwater antifouling and nutritional additives for plants and animals. Manufacture of copper compounds and recovery of copper from wastes are well described.

The editor does not expect any new large-volume markets for copper compounds to emerge, but does look forward to measurable and sustained growth in his industry.

There are a few spelling errors (Bemberg, cathode,