

## Book reviews

### Iron-Carbene Complexes Scripts in Inorganic and Organometallic Chemistry, Volume 1

Gmelin-Institut, Frankfurt/Main (ed)

Wolfgang Petz

Springer Verlag, Berlin, 1993

viii + 202 pages: soft cover DM 68.00

ISBN 3-540-56258-3

This is the first of a series of books based on the *Gmelin Handbook of Inorganic and Organometallic Chemistry*. It is claimed that this new series will review selected areas of inorganic and organometallic chemistry in textbook style. Its object is to provide the lecturer, advanced student and research chemist with a digest of the main features of each topic.

The book covers the chemistry and structural aspects of all compounds in which a formally double-bonded carbene (Chapter 1) or vinylidene (Chapter 2) ligand is coordinated to an  $^5\text{LFe}$  moiety (where  $^5\text{L}$  represents an organic ligand coordinated to the Fe atom by five carbon atoms in an  $\eta^5$ -manner).

This book is said to contain all the compounds referred to in *Organoiron Compounds* (Vol. 16a of the *Gmelin Handbook of Inorganic and Organometallic Chemistry*) and their most important spectroscopic data.

Chapter 1 gives a good detailed account of carbene complexes and is split into seven main sections. The first four are on cationic complexes, the next is on neutral carbene complexes, the sixth deals with anionic carbene complexes and the final section covers carbene compounds with two carbene ligands. The chapter begins with a brief introduction that explains nomenclature used, then throws the reader straight into the chemistry. As expected, the book is on a high level and assumes a good background knowledge of the subject. The known compounds in each section are listed, along with their preparations (yields), colours and melting points. The main spectroscopic data listed routinely are  $^1\text{H}$ ,  $^{13}\text{C}$  and (if relevant)  $^{31}\text{P}$  NMR. Only occasional references are made to IR spectra: more would have been useful. An unspoken aim of the book appears to be to give just enough information for the reader to characterize the compound—this, then, is what is meant by 'important spectroscopic data'. This will be disappointing to many readers interested in spectroscopy, who will be further aggravated by being simply told in the Introduction that more detailed information concerning preparation and references may be obtained from the original version of the *Gmelin Handbook*.

The lack of references is a serious drawback to those readers who do not have easy access to the *Gmelin Handbook*. On the positive side, there are many side-comments on preparations and properties and some

good general remarks on classes of compounds. X-ray crystal structures are presented in 20 of the 23 main figures, and commented on briefly in the text.

The book fails the reader not by what it includes (its contents are good, and in that respect it fulfils its aims) but by giving no indication of what else is known on the compounds. This could have been achieved by tables or words simply listing other spectroscopies or techniques that may have been applied to these molecules. Yes, the book offers a drink but for me it doesn't quench the thirst.

JACK SILVER

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### The Barbier Reaction and Related One-Step Processes Reactivity and Structure: Concepts in Organic Chemistry, Vol. 31

Cornelius Blomberg

Springer-Verlag, 1993 (in English)

183 pages: DM186.00.

ISBN 3 540 57169 8

In 1899 Philippe Barbier described the reaction which was later to be named after him: a one-flask interaction between an organic halide and a carbonyl substrate in the presence of elemental magnesium. Here, Blomberg reviews this rather neglected reaction and similar ones using other metals in place of magnesium. The book itself is in the Springer-Verlag series *Reactivity and Structure: Concepts in Organic Chemistry*. One might argue that the secondary title, 'Related one-step processes', is slightly misleading because the Barbier reaction undoubtedly involves several mechanistic steps; the author, of course, refers to the number of experimental stages involved in the progression from reactants to products.

The book is divided into five chapters, the first of which briefly traces the history of the Barbier reaction from its beginnings, to be found in the classical researches of Frankland carried out in the middle of the 19th century. An interesting feature in this, and subsequent, chapters is the use of direct quotations (or translations) from key research papers. The next two, longer, chapters explore the various synthetic applications of the Barbier reaction and the possibility of replacing the magnesium by other reactive metals such

as sodium, lithium and zinc. Considerable discussion ensues as to the merits or otherwise of preforming a Grignard reagent before addition of the substrate: the 'two-step process'.

The mechanism of the Barbier reaction is the subject of the fourth chapter but, because of the limited amount of published data, the discussion focuses more on the mode of formation of Grignard reagents and the attack of organic halides on metal surfaces in general. Metal vapour co-deposition gets a brief introduction at this point in the monograph. The fifth, and last, chapter reviews experimental procedures used in Barbier reactions, particularly the methods of activating the chosen metal. Ultrasonic activation promises to be a powerful new development in Barbier chemistry.

The book is produced in typical Springer style and I found only a few trivial printing errors. In total, just under 500 references have been cited but only about 175 of these date from 1980 or later. Whilst the subject matter is presented in an interesting 'narrative' style, one is left with the feeling that there is perhaps insufficient published work on the Barbier reaction to warrant a full-scale book rather than, say, a script for *Chemical Reviews*.

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### The Organometallic Chemistry of the Transition Metals 2nd Edition

R H Crabtree

Wiley, New York, 1994

487 pages. £49.50

ISBN 0471 59240 4

The second edition of this excellent textbook is slightly expanded in comparison with the first edition (422 pages). The author says in the preface that he has been careful to make changes only when really needed and to avoid the temptation to add too many new sections. Both editions have 16 chapters, with only very slight changes in the chapter titles.

*The Organometallic Chemistry of the Transition Metals* is a general textbook written mainly from an inorganic chemist's point of view, although applications to organic synthesis (including non-transition metal organometallics) and homogeneous catalysis are also described. Each chapter contains about 40 references to the original literature, and problems at the end, with solutions at the back of the book. The first one I tried (No. 3 on p. 332) had a typographical error, but in general the book is remarkably free of these. Professor Crabtree is evidently an experienced teacher and on p. 26 spells out the two conventions of electron counting used in this field. I think it is true to say that most inorganic chemists regard ferrocene as a compound of Fe(II) with two  $C_5H_5^-$  six-electron ligands; but the alternative Fe(0) with two  $C_5H_5$  five-electron ligands is also used by some very eminent chemists. A very

helpful chapter, particularly for someone entering the field, is the account of the characterization of organometallic compounds. This has 22 pages on multinuclear NMR spectroscopy, with shorter sections on IR spectroscopy, X-ray crystallography and other methods. I would have liked to see more emphasis on elemental analysis; the figure of acceptability is ten times better than normal: i.e. the result is usually acceptable at  $\pm 0.3\%$ , not  $\pm 0.03\%$  as stated in this text.

The book is intended for senior undergraduate and graduate students, who I feel sure will find the clarity of the text to their liking. I certainly gained the impression that it was all in the mind of one person, which regrettably cannot be said of some multi-author efforts in this field. There are some omissions, such as the new *ansa*-metallocene catalysts for isotactic polypropylene from the section on the polymerization of alkenes.

In summary, this is a highly recommendable textbook in the area of organotransition metal chemistry, although I have some doubts as to whether the revisions have been extensive enough. Finally, as a plea from European students, could we please abandon the use of the kilocalorie?

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### Energetics of Organometallic Species

J. A. Martinho Simoes (ed)

Kluwer Academic Publishers Group, Dordrecht

Dfl215.00, £75.00

ISBN 0 7923 1707 6

Considering the fundamental importance of thermodynamics in any branch of chemistry, studies in the area of organometallic chemistry have sadly been rather few. This volume comprises 20 chapters, each of which deals with a particular aspect of organometallic thermochemistry. The subjects range from the quite general to the esoteric. In all, the volume contains a large body of information and, more to the point, a not inconsiderable collection of hard thermochemical data. It is thus a very useful addition to the reference literature for organometallic chemistry.

The contents of each chapter are as follows: historical perspectives (H. A. Skinner)—a good concise account of the background; the application of combustion calorimetry (G. Pilcher); organo-*f*-element thermochemistry (T. J. Marks and coworkers); the role of bond energies in hydrocarbon activation by transition metal centres (W. D. Jones and coworkers); organometallic rhodium porphyrins (B. B. Wayland); a very interesting chapter on the use of photoacoustic calorimetry (T. J. Burkey); the electrochemistry of radicals (D. D. M. Wayner); derivative cyclic voltammetry (M. Tilset); the use of calorimetric and sublimation techniques to study bond properties (A. S. Carson); the estimation of enthalpies of sublimation of hydrocar-