

Transition Metals For Organic Synthesis, Volumes 1 and 2. Edited by M. Beller, C. Bolm. Wiley-VCH: Weinheim, 1998, 673 pp., DM 798. Hardback. ISBN 3-527-29501-1.

This two volume set, weighing in at over 1000 pages and with over 150 authors, is without doubt a tremendous resource. It is packed full of useful, up to date information and must certainly be viewed as an essential addition to any university or industrial chemistry library. In addition, it would grace the bookshelf of any self-respecting organic chemist involved in fine-chemical manufacture or research. Although the work does have its shortcomings, these are massively outweighed by its overall utility. Opening either volume at random consistently provides a dense and rich text which makes fascinating reading. The subject areas that are within the remit of the title are so vast and so rapidly expanding, that to expect comprehensive coverage is unreasonable (despite what is claimed on back cover). However, the former point is dealt with in the preface, where Beller and Bolm (Eds.) emphasise that the work is focused on the most important transition-metal catalysed and mediated methods with particular emphasis on very recent developments. The mechanism by which this has, in part, been achieved involves the assembly of some 66 sections broadly organised into 6 chapters between two volumes. Volume 1 comprises an introductory chapter followed by two chapters on C-C bond forming reactions and volume 2 has three chapters: reductions, oxidations and "Special topics". The organisation of sections within chapters is somewhat arbitrary (although there is no immediately obvious way of doing it) but this is not an issue since the contents pages are extensive, clear and duplicated between volumes. Volume one begins with the shortest chapter (some 22 pages) which is supposed to serve to introduce the reader to the general concept of where and why transition metals are employed in fine chemical synthesis. In my opinion, this chapter is rather superfluous since the contents of the two volumes speak for themselves and such a vast field cannot be usefully generalised. The second chapter (Transition Metal-catalysed Reactions) contains all the classics (e.g. hydroformylation, carbonylations, cyclopropanations, cyclomerizations, cross-coupling reactions, Heck and allylic alkylations) as well as reactions that have come to the fore more recently (e.g. olefin metathesis, metallocene catalysed alkene alkylation, CH activation and lanthanoid catalysed additions). The third chapter (Transition Metal-mediated Reactions) has a broad range of coverage, taking in carbenoid-mediated processes (Fischer-type carbenes and Ti-based olefinations) and a diverse range of radical and covalent C-C couplings (V, Cr, Sm, Mn, Ti). This is followed by a thorough treatment of Zn-mediated reactions, carbometallations, Fe-chemistry, Cr-arene chemistry and concludes with the Pauson-Khand reaction. The wealth of knowledge of Cu-based chemistry is given surprisingly short coverage, with only one section on "conju-

gate addition reactions". About one third of the second volume is devoted to chapter 4 (Reductions). The chapter opens with a broad ranging and informative coverage of the field of hydrogenation (homogeneous, heterogeneous, transfer and asymmetric aspects) and concludes with the transition-metals catalysed application of hydridic reagents (Si-H, B-H, Al-H, Sn-H, Te-H). Chapter 5 (Oxidations) includes "the basics", followed by C-H oxidations (mostly bio-chemical or bio-mimetic), allylic and Baeyer-Villager oxidations, extensive coverage of dihydroxylation, aminohydroxylation and epoxidation, then continues with Wacker oxidation, Re-catalysed oxidations and heteroatom oxidations. The second volume concludes with chapter 6 which concerns the "Special topics" of supported catalysts, two phase catalysis, photocatalysis, usage of microwaves then finally high pressure applications. Although all of the sections are written by "experts" in the field, the breadth and depth of coverage and discussion varies enormously. This also applies to the figures whose styles are inconsistent throughout the book. This is undoubtedly a "copy-and-paste" phenomenon, indeed some sections predominantly had figures which had been re-cycled from papers published by the sections authors. Such sections were often biased or short and without fair coverage of other important, relevant and up-to-date research. In fairness, most sections were at the other end of the spectrum: being carefully prepared they provide an informative, honest and thorough overview of a particular topic. In summary, I really enjoyed reviewing this two volume set. It will certainly spend more time off my bookshelves than many of the other books that are there. This work might be described as a jig-saw of vignettes on modern applications of transition metals to organic synthesis and it covers a very impressive range of topics. The individual sections were mostly well referenced and would therefore provide a good starting point for further in-depth reading and for keeping up to date on advances after the ca. 1997 threshold at which the final work was assembled. On the areas I knew well already, I was occasionally irritated by the omissions and biases that were sometimes evident. However, that said, the bulk of the topics were new or much less familiar to me and made fascinating reading. Without doubt, the work will prove a valuable resource for anybody preparing courses or lectures on this field. The work concludes with an interesting and up-beat epilogue from the Editors. This, when read in conjunction with the preface, highlights the fact that although the application of transition-metals to organic synthesis has grown phenomenally over the last decades, it still has far to go and will remain a hot topic for years and years to come.

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Ligand Coupling Reactions with Heteroatomic Compounds. By Jean-Pierre Finet. Elsevier, 1998, 308 pp., US\$ 49.50. Softback. ISBN 0-08-042793-6.

The term "organo-nonmetallic chemistry" was widely introduced by J. C. Martin in 1983 with an intention to emphasize the importance of compounds, in which carbon is bound with non-metallic elements. At that time it was clear that the development of a specific set of ligands can provide a desired reactivity pattern about the central non-metal atom and this may lead to the development of the chemical reactions as interesting and useful as the reactions of organometallic compounds.

The book by J-P. Finet is dedicated to a rather young but quickly growing field of organo-nonmetallic (or heteroatom) chemistry – ligand coupling (LC) at a central atom. The ligand coupling concept has been widely used in transition metal chemistry for a long time, but for non-metals it gained considerable attention only 10–15 years ago. At that time it became evident that the radical mechanistic schemes do not explain many peculiarities of chemical behaviour of such compounds.

The reviewed book can be regarded as some kind of encyclopaedia on ligand coupling at heteroatoms. It consists of 8 chapters, the first two thoroughly explain the main terms and definitions used in this field (Chapter 1) and all mechanistic aspects of LC process (Chapter 2). Chapters 3 and 4 are dedicated to organosulfur and organophosphorus compounds. These chapters are very important because just these two types of compounds were investigated in detail from the point of view of the possible mechanism of ligand coupling. The synthetic value of LC process with organosulfur and especially with organophosphorus compounds is not too high because only ligands of 2-pyridyl

type showed good reactivity. The exception is the effective perfluoroalkylation of different C- and S-nucleophiles by perfluorosulfonium salts: usually electrophilic perfluoroalkylation is very difficult to perform. In my opinion, LC using alkynyl ligands deserved more thorough investigation – these ligands showed very good reactivity with thionyl chloride.

Chapters 5, 6 and 7 (organoiodine, organobismuth and organolead compounds respectively) are most interesting from the synthetic point of view. Many useful reactions including arylation, alkenylation, alkynylation, perfluoroalkylation and the preparation of 1,4-butanedione derivatives have been developed and the book gives a detailed survey of these synthetic instruments. To the best of my knowledge the reviewed book contains the most comprehensive collection of aryl-, vinyl- and polyfluoroalkyl cation equivalents.

The book by J-P. Finet is clearly written and is easy to read. It is well published (unfortunately, an important page 238 concerning the mechanism of organolead compounds reactivity is a little bit spoiled - maybe only in my copy).

The following brief conclusion may be done after this book is read: much is to be done to clarify the mechanistic aspects of the LC process, but it gives unique synthetic possibilities just now. I am sure that the book by J-P. Finet will be interesting to many organic chemists.

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