

Book reviews

Gmelin Handbook of Inorganic and Organometallic Compounds; Rhenium, Organorhenium Compounds. Part 4: Mononuclear Compounds, 8th edn

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This volume deals with compounds and in particular mononuclear compounds in the class ^5LR , such as $^5\text{LRe}(\text{CO})_3$, and ^5LRe compounds containing additional ligands ^nL where $n = 1-5$. At the end of the book, mononuclear ^6LRe compounds are described. The literature coverage is up to the end of 1987 and in some cases more recent data have been considered. There are 45 illustrations.

The first compounds to be described are in the class $\text{C}_5\text{H}_5\text{Re}[\text{CO}]_2$ with an additional ligand ^1L and further ligands. They include anionic compounds such as $[\text{CH}_3]_4[\text{C}_5\text{H}_5\text{Re}][(\text{CO})_2^1\text{L}]$. Related compounds include carbene and carbyne complexes and compounds containing rhenium–metal bonds.

The next section covers the extensive literature on $\text{C}_5\text{H}_5\text{Re}(\text{CO})_3$. There is a very considerable amount on the chemistry of this compound, which was first reported by Wilkinson in 1958. The preparation, properties and chemical behaviour are all given in detail as well as the many Lewis acid adducts in the class $\text{C}_5\text{H}_5\text{Re}(\text{CO})_3\text{-EX}_n$.

The next brief section is concerned primarily with isonitrile derivatives and nitrosyl compounds such as $\text{C}_5\text{H}_5\text{Re}(\text{NO})(\text{CO})\text{L}^+$.

The compounds $\text{C}_5\text{H}_5\text{Re}[\text{CO}]_2\text{L}$, where L = olefin or alkyne, are then described together with the related $\text{C}_5\text{H}_5\text{Re}[\text{L}']_2\text{L}$, where L' = tertiary phosphines.

There is a substantial section dealing with bis(cyclopentadienyl)rhenium compounds. $(\text{C}_5\text{H}_5)_2\text{ReH}$ was the first organotransition-metal hydride to be discovered and, interestingly, was the first transition-metal hydride compound for which the proton NMR spectrum was reported, which showed the now-characteristic high-field shift of the hydrogen attached to the metal.

Compounds which occur in the above classes but which contain substituents on the cyclopentadienyl rings are described separately, with a very substantial number of examples.

The final section of the book deals with compounds containing (η) -benzene–rhenium systems or related

substituted-benzene systems. Many of these compounds were prepared using metal-vapour synthesis techniques.

The primary function of the *Gmelin Handbook* is to provide a comprehensive, thorough and well-organized list of compounds described in the literature together with methods of preparation, spectroscopic properties, crystal structure information and reactions. This volume is well up to the very high standard that has become expected for a *Gmelin Handbook*. There is an immense amount of detail in the book, and it is very clearly laid out, well organized and accessible. In many cases, preparations in particular of key compounds are described in useful detail, and there is a very thorough presentation of relevant characterizing data including NMR, infrared and mass-spectroscopic structural information and other important information such as solubility and stability.

There is no doubt that this would be essential reading for anybody entering into the chemistry of the area covered by the text; since I have long experience in this area, I can confirm that, to my knowledge, the coverage is not only comprehensive but presented with extremely well-selected and useful accompanying data.

Crystal structures are provided, with selected data, and the diagrams are clearly drawn. The proposed structures are also provided of many compounds which have not yet been characterized crystallographically, but for which the evidence comes from NMR and other spectroscopic data.

At the end of the book there is an empirical formula index which also gives the proposed molecular formulae, and there is a also ligand formula index. These indexes make it is extremely convenient to search for particular compounds.

In conclusion, I have read the book thoroughly and have been unable to detect any omissions or typographical errors. The volume is an excellent reference work and would be invaluable to those working in the area or wishing to discover the prior art of those

organorhenium compounds which come under the various classes covered.

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Catalytic Reductive Carbonylation of Organic Nitro Compounds

S. Cenini and F. Ragaini

Kluwer Academic Publishers, Dordrecht, 1996

339 + xi pages. £115

ISBN 0-7923-4307-7, Hardback

Research workers in the area of metal-catalysed reactions of organic nitro compounds will be familiar with the work of the Milan group and the article by Professor Cenini and Colleagues.¹ This has now been updated and expanded to produce the current monograph. Experts in this area will be keen to make a comparison with the article by two researchers from Hoechst² which appeared only months after the literature deadline for this book, given as March 1996.

The book is divided into six chapters with a useful index. Chapter 1 is introductory: it sets out the most important objectives of the research in the field, and also describes how a nitro group can interact with a metal ion. Chapter 2 is concerned with the carbonylation of nitro compounds to give isocyanates, which are needed for the manufacture of polyurethanes. It is this reaction which has involved so much effort over the years, because a direct synthesis of an isocyanate from a nitro compound and carbon monoxide would eliminate the need for the use of the highly toxic phosgene. Chapter 3 describes the synthesis of carbamates and ureas. Carbamates can provide another route to isocyanates, as they may be thermally decomposed into the isocyanate and alcohol. Unfortunately the catalysts so far developed are not sufficiently active to be commercially attractive. Chapter 4 is devoted to the synthesis of non-cyclic compounds (oximes, amines, nitriles, azo compounds, Schiff bases and other miscellaneous derivatives), whereas Chapter 5 concentrates on heterocyclic compounds. The final chapter is a critical discussion of the mechanisms of the reductive carbonylation of nitro compounds; it is divided according to the catalytic metal, with over 20 pages devoted to palladium. The authors say in the

introduction to this chapter that whereas the first five chapters are essentially a literature survey, in the final chapter they give their interpretation of observations and it should be regarded as an original contribution rather than a review article. In other words, this is reductive carbonylation of organic nitro compounds '*alla Milanese*', and certainly none the worse for that. Some of the suggestions are controversial; for example, on p. 264 the authors suggest an alternative structure for an intermediate which had been deduced from spectroscopic evidence.

This is an extremely specialized book of over 300 pages on a topic which only receives about five pages of coverage in Parshall and Ittel's *Homogeneous Catalysis*.³ Those working in the field will be extremely grateful to the authors for giving such a comprehensive account together with their specialist insight.

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Chemistry of Tin, 2nd edn

P. J. Smith (ed)

Blackie Academic & Professional, London, 1997

578 pages. £149 (hardback)

ISBN 0-7514-0385-7

Tin is one of the world's most valuable metals. Although its annual consumption of around 200 000 tonnes is small

compared with that of many industrial metals, its importance lies in the fact that it is a vital component