

then there have been supplements on organogallium compounds (1987) and the present volume on coordination compounds. This covers the chemistry of complexes with oxygen-containing ligands such as water, alcohols, aldehydes, ketones, quinones, ethers, *O*-heterocycles and carboxylic acids, and complexes with ammonia, amines and *N*-heterocycles containing one nitrogen atom. Complexes of heterocycles containing two or more nitrogen atoms will be covered in the next volume, D2.

The literature has been comprehensively surveyed up to 1990 and in some cases the references cover even more recent work. The presentation, as always with Gmelin, is superb and the diagrams and formulae beautifully clear. By systematically considering classes of oxygen-containing molecules the authors have condensed a vast amount of information into a logical and manageable form. Thus at the beginning of each section the ligands are defined and sub-sections follow on complexes in the gaseous state, complexes in solution, and complexes isolated in the pure state and fully characterised.

Although organometallic compounds per se are not included, the volume will be of considerable interest and value to researchers in organogallium chemistry because of the many structural analogies between carbon, nitrogen and oxygen ligands and because coordination compounds are used in the analysis and characterisation of many organometallic compounds. The interplay between molecular and ionic forms: e.g. $2\text{LGaX}_3 \rightleftharpoons [\text{L}_2\text{GaX}_2][\text{GaX}_4]$ is familiar in organometallic chemistry and also a recurring theme in the coordination chemistry of gallium.

The research described in this volume is also important because of the industrial uses of coordination compounds of gallium; for example, in the semiconductor industry, and in the synthesis of modern materials. Another spur to the development of the chemistry of coordination compounds of gallium comes from the use of gallium in positron emission tomography. The speciation of gallium in the presence of the complex oxygen and nitrogen donors found in vivo is crucial to the successful exploitation of ^{67}Ga and ^{68}Ga in diagnosis or radiotherapy. In bringing the known information together and making it accessible the authors from the Gmelin Institute have performed an important task comprehensively and well.

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Transition Metals in the Synthesis of Complex Organic Molecules

Louis S. Hegedus, University Science Books, Mill Valley, California, USA, 1994, 358 pages. ISBN 0-93570Z-28-8

This book is based on a series of short industrial courses and graduate lectures. It was originally intended to be part of the third edition of 'Principles and Applications of Organotransition Metal Chemistry' but it is now presented as an independent volume. Its objective is to show how transition metal organometallic chemistry can be of use to synthetic organic chemists.

The first chapters form an introduction describing oxidation states, electronic configurations and bonding. The basic mechanisms of organometallic reactions are outlined. The main body of the book contains chapters on particular areas of synthetic application. These include synthetic applications of transition metal hydrides, of complexes containing metal-carbon σ bonds, transition metal carbonyl and carbene complexes, transition metal alkene, diene and alkyne complexes, η^3 -allyl transition metal complexes, and finally transition metal arene complexes. The coverage is therefore quite wide. There are many references to the original literature including a substantial number from the period 1986–1992. The book is well-written and indexed, and is copiously illustrated with examples which reveal the wide application of various methods. The emphasis throughout is on the role of the metal complex in the synthesis. Of particular interest to the organic chemist are the ways in which these modify the conventional regiochemistry of well-established reactions.

The book is easy to read and clearly produced. It can be recommended to synthetic organic chemists as a useful introduction to the application of transition metal organometallic chemistry in synthesis.

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Lanthanides in Organic Synthesis

Tsuneo Imamoto (*Best Synthetic Methods*, Series Editors A.R. Katritzky, O. Meth-Cohn and C.W. Rees) Academic Press Limited, London, 1994. £30.00
ISBN 0-12-370722-6

As the author rightly points out, organic syntheses involving lanthanide elements have become increas-

ingly important. The aim of the book is to provide a brief summary, with emphasis on practical aspects. Much of the information is presented by means of numerous schemes and tables. Mechanistic aspects are, on the whole, considered to be outside the scope of the work.

The organisation of the volume is such that a two page introduction, giving references to reviews, is followed by a second chapter dealing with general properties of the lanthanide elements (3 pages). Chapter 3 is entitled 'The Use of Lanthanide Metals in Synthesis', and deals with the topic in terms of the principal elements involved, namely cerium (2 pages), samarium (6 pages), ytterbium (3 pages), and alloys and activated metals (2 pages). Chapter 4 deals with lanthanide(II) complexes, including the preparation of the appropriate (Sm, Eu and Yb) reagents (3 pages); reduction of organic functional groups by samarium(II) iodide (17 pages); samarium(II) iodide-promoted C–C bond-forming reactions (22 pages); organic reactions with dicyclopentadienylsamarium(II) and bis(pentamethylcyclopentadienyl)samarium(II) (3 pages).

Chapter 5 is devoted to the chemistry of lanthanide(III) complexes, and has sections on carbonyl reductions promoted by lanthanide(III) reagents (10 pages), olefin hydrogenation catalysed by lanthanide(III) complexes (1 page), reductions of other functional groups (2 pages), C–C bond-forming reactions (33 pages), and miscellaneous functional group transformations promoted by lanthanide(III) salts (4 pages).

The final chapter is devoted to reactions of lanthanide(IV) complexes. Although in the introduction it is indicated that the elements in question are Ce, Pr, Nd, Tb and Dy, this is a somewhat doubtful proposition. Indeed, the chapter is essentially concerned with the role of various Ce compounds. The topics considered are oxidations of hydrocarbons (5 pages), oxidations of oxygen functionalities (13 pages), and the oxidation of functionalities involving nitrogen (2 pages), sulfur (2 pages), and other heteroatoms (1/2 page). Finally, in this chapter, oxidation of metal complexes, e.g. of $[\text{Fe}(\mu\text{-C}_4\text{H}_4)(\text{CO})_3]$, is considered (14 pages).

Each chapter has appropriate references (including a few for 1993). The book ends with an index of compounds and methods (6 pages).

All in all, this volume is a very welcome addition to the "Best Synthetic Methods" series.

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Gmelin–Durrer Metallurgy of Iron Vol 11 practice of Steelmaking 5 Continuous Casting

H. Hiebler (ed.) (Institut für Eisenhüttenkunde, Montanuniversität Leoben) Springer, Berlin, 1992. Vol 11a xiv + 355 pages Text, Vol 11b vi + 452 pages Illustrations (not available separately) DM 4500 ISBN 3-540-93654-8

This is the final volume in the fourth totally revised edition of the *Gmelin–Durrer Metallurgy of Iron* which now forms a supplement to the *Gmelin Handbook of Inorganic Chemistry System No. 59 Iron*. Volumes 1 and 2 cover general principles and iron ore; Volumes 3 and 4 blast furnace operation; Volumes 5 and 6 the theory and Volumes 7–11 the practice of steelmaking. Volume 12, already published, brings together the topics of the previous volumes and discusses the future of iron- and steel-making. As in the other volumes in the series the text and diagrams are bound separately so volumes 11a and 11b have to be read side-by-side.

Gmelin–Durrer is interdisciplinary in two senses. It spans the traditional disciplines of chemistry and metallurgy and it emphasises the coherence between theory, concentrated in universities and research institutes, and practice, concentrated in heavy industry. The volumes therefore serve as an important reference for academics and graduate students on the one hand, and technical and production managers on the other. Their strength lies in the skilful way in which theory and practice are interleaved and the rigorous scientific basis for modern industrial technology is shown. The authors, H.G. Baumann (Mannesmann Demag AG, Duisberg), G. Holleis and K. Schwaha (Voest-Alpine-Industrieanlagenbau GmbH, Linz) and M. Wolf (Wolftechnology, Zürich) have summarised both published material from the usual iron- and steel-making journals and conference abstracts, and numerous unpublished communications from their contacts in industry. There are 3250 references and 695 graphs and technical drawings.

The volume begins with a section describing the development of the continuous casting of steel. The second section covers the engineering of casters: this comprises an account of capacity planning and design criteria in which quantitative relations from chemical engineering are applied to the analysis of stresses and deformations, cooling and strand support. There is also a full account with many diagrams of plant layout and a brief discussion of integrated process automation. The next section covers the design and subsystems of continuous bow-type casters. The complex continuous casting plant is broken down into its components and each is discussed in turn with copious technical drawings. Continuous casting operation is covered next with subsections on pouring systems, mold operation, strand