sizeable number of authors there is inevitably some unevenness in standard and treatment, but in general the accounts simply list reactions without any attempt to indicate their relative importance or their value in actual synthesis. Nevertheless for someone coming new to the chemistry of a particular element and wanting to set about making bonds between that element and a halogen the information presented would provide an introduction to the topic and a useful list of leading references.

Of the 710 pages in this book, 60 are taken up by an author index and no less than 194 by a very inefficiently presented formula index. I question whether either of these indices has more than minimal value, since the great majority of readers will be looking not for information on the work of particular authors or on a particular compound, but rather on general methods, and these they will find readily from the contents list. The 34 page subject index on the other hand is of value, because it enables the reader to look up the reactions of typical compounds, whereas the overall organization is based on types of products.

*School of Chemistry and Molecular Sciences,*
*University of Sussex, Brighton BN1 9QJ (UK)*

**Colin Eaborn**

*Gmelin Handbook of Inorganic Chemistry, 8th Edition, Fe — Organoiron Compounds, Part A9: Ferrocene 9*; Springer-Verlag, Berlin, 1989, xiv + 384 pages, DM1,742.00. ISBN 3-540-93590-8.

It is three years since Part A8 of this series of volumes, dealing with the chemistry of ferrocene and its derivatives, appeared. Part A7 (1980) initiated a detailed survey of the mononuclear disubstituted ferrocene derivatives [$FeC_{10}H_8R^1R^2$], in which either (or both) $R^1$ and $R^2$ are organic functionalities containing oxygen, and described derivatives of alcohols and phenols (their esters, ethers, and ketones) and aldehydes. Part A8 continued this coverage with the ketone and carboxylic acid derivatives (including their salts, esters and acid chlorides), as well as heterocyclic derivatives with oxygen as the heteroatom. The current volume under review continues the coverage of mononuclear disubstituted ferrocene derivatives [$FeC_{10}H_8R^1R^2$], in which either (or both) $R^1$ and $R^2$ are organic functionalities containing nitrogen, sulfur, selenium, boron or silicon.

Not surprisingly, the bulk of this volume is concerned with *N*-containing substituents, including 1,1′-, 1,2- and 1,3- substituted derivatives of amines (75 pages), amides (25 pages), isocyanate, $-N{=}CR'R''$ and $-CR{=}NR'$ derivatives (7 pages), cyanides (37 pages), functionalities containing N–N and N=N linkages (including hydrazines, hydrazides, hydrazones, semicarbazones, azo compounds and azides) (10 pages), nitro compounds and oxime derivatives (19 pages), and derivatives of *N*-heterocycles (29 pages).

The following section (74 pages) deals with sulfur-containing substituents, including mercaptans, sulfonium salts, thiocarbonic acids and esters, thiocyanates, sulfones, sulfonic acids, sulfinic acids, and derivatives of *S*-heterocycles. The volume continues with much smaller sections describing derivatives of selenium-containing substituents (5 pages), boron-containing substituents (16 pages), and a longer section on silyl substituents (50 pages). The final 43 pages of the book contain a detailed formula index of the compounds described within the volume.

The text makes extensive use of tabulated data with detailed footnotes, thus giving maximized coverage to synthetic methods, and physical, spectroscopic and electrochemical properties. The literature coverage is overwhelmingly comprehensive, and the text is clear and well presented. However, the structural representations are very small and rather poorly formed and conceived, some showing artistic distortions of which Francis Bacon would have been proud. There are only four figures in the whole volume. It is very unusual for a volume of the Gmelin Handbook to be let down by its presentation, but this is a case were a little more care spent over the structural representations would have added substantially to the value of the text. Nevertheless, the volume is an invaluable compilation of synthetic, structural and spectroscopic data on an extremely important class of organometallic molecules. A must for all libraries.

*School of Chemistry and Molecular Sciences*
*University of Sussex, Brighton BN1 9QJ (UK)*

**Kenneth R. Seddon**

*Gmelin Handbook of Inorganic Chemistry, 8th Edition, W — Tungsten, Supplement Volume A3: Physical Properties (continued)*; Springer-Verlag, Berlin, 1989, xiv + 274 pages, DM 1260. ISBN 3-540-93594-0.

This is the eleventh volume of the Gmelin Handbook to describe the chemistry of tungsten (System No. 54) since the main volume was published in 1933. Of these, six have dealt (five exclusively) with tungsten oxide species, and none have yet considered the vital areas of the coordination and organometallic chemistry of tungsten. The current supplement volume (A3) continues the description of the physical properties of the element which was initiated in Supplement Volume A2, completing the coverage of the properties of bulk tungsten, and complements an earlier volume (A1; 1979) which described the metallurgy and technology of tungsten.

The first section (63 pages) completes the description of the crystallographic properties of bulk tungsten started in Supplement Volume A2, and includes sections on deformation, cleavage, recovery and recrystallization. The second section (71 pages) concentrates on the mechanical properties of tungsten, and describes (*inter alia*) its density, elasticity, plasticity, hardness and ductility. This is followed by a description of the thermal (44 pages), electrical (51 pages), magnetic (14 pages) and optical (33 pages) properties of tungsten. Of particular interest, the section on the thermal properties includes the thermodynamic functions for tungsten metal (*n.b.* it melts at 3695 K, the highest melting point of all metals), the section on electrical properties includes the electron energy loss spectrum (EELS), and the section on magnetic properties includes magnetic susceptibility measurements, NMR and EPR spectroscopy, and cyclotron resonance. The surface properties of tungsten will be described in a future volume.

The authors (E. Koch-Bienemann, L. Berg, and G. Czack) have produced a scholarly and detailed literature survey (up to the end of 1987). Although of little direct interest to the organometallic chemist, this is an essential compilation for any detailed consideration of the physics and chemistry of tungsten. This volume meets