

Book Review

Inorganic Reactions and Methods. Volume 1: The Formation of Bonds to Hydrogen (Part 1), edited by J.J. Zuckerman, VCH Publishers, Weinheim (Germany), 1986, xxv + 326 pages, DM 275. ISBN 3-527-26259-8.

The 1980's has undoubtedly been the decade in which inorganic chemists have been treated most royally by the major publishing companies. The Gmelin Handbook of Inorganic Chemistry appeared in English for the first time in its history, *Comprehensive Organometallic Chemistry* was published a few years ago, and *Comprehensive Coordination Chemistry* is promised for later this year. All of these major works share one thing in common, apart from excellence in style, content, presentation and editing - they are all organized upon the basis of elements and compound types. This is, and always has been (back to the days (1877) of the seminal volumes, *A Treatise on Chemistry*, by Roscoe and Schorlemmer, and Sidgwick's classic work, the *Chemical Elements and their Compounds*, published in 1950) the traditional and accepted method of describing inorganic compounds and, implicitly, inorganic chemistry. Jerry Zuckerman has now broken this mould with the appearance of the first two (of the first eighteen) volumes of *Inorganic Reactions and Methods*. Here, I believe for the first time, it is bond formation and type of reaction that forms the basis of the classification, i.e. the series is based on chemistry rather than chemicals. This, to my mind, is one of the most exciting developments in treating inorganic chemistry as an overall subject that I have ever encountered, and the global plan for the series is reproduced in the Figure. The pattern and overall philosophy of the series is clear from this, and the reaction types which do not fall facilely into the scheme of simple bond formation (e.g. oxidative addition, reductive elimination, insertions and eliminations, electron-transfer and electrochemical reactions, photochemical reactions and pulse radiolysis, catalysis, oligomerization, polymerization, and the formation of intercalation compounds and ceramics) are treated as special topics in the last five volumes. The planning, structuring and editing of such a series is a gargantuan task, and we will be eternally in Jerry Zuckerman's debt for masterminding (and devoting so much time to) this splendid series. The approach to the presentation, citations, and even the English language, can best be described as economical. A prime example comes

Inorganic Reactions and Methods

1.	Formation of Bonds to Hydrogen	3.7.	—Cu, Ag, Au or Zn, Cd, Hg	6.6.	—Group 0 Gases	11.5.	—Oxygen and the Heavier Elements of Group VIII
1.1.	Introduction	3.8.	Metals	6.7.	Formation of Borides	11.6.	—Halogens
1.2.	Formation of Hydrogen	3.9.	—Group 0 Gases			11.7.	Insertions into Metal-Metal Bonds
1.3.	Formation of Hydrogen-Halogen Bonds	3.10.	Formation of Nonstoichiometric Oxides			11.8.	Miscellaneous Insertions and Related Reactions
1.4.	Formation of Bonds between Hydrogen and O, S, Se, Te, Po	3.11.	Formation of Nonstoichiometric Sulfides, Selenides and Tellurides			12.	Electron-Transfer and Electrochemical Reactions
1.5.	—N, P, As, Sb, Bi					12.1.	Introduction
1.6.	—C, Si, Ge, Sn, Pb					12.2.	Electron Transfer
1.7.	—B, Al, Ga, In, Tl					12.3.	Electrochemical Reactions
1.8.	—Li, Na, K, Rb, Cs, Fr or Be, Mg, Ca, Sr, Ba, Ra					13.	Photochemical and Other Energized Reactions
1.9.	—Cu, Ag, Au or Zn, Cd, Hg					13.1.	Introduction
1.10.	—Transition and Inner-Transition Metals					13.2.	Photosubstitution and Photosensitization
1.11.	Group 0 Gases					13.3.	Photoinduced Cleavage of Metal-Metal Bonds
1.12.	Reversible Formation of Metal Hydrides by Direct Reaction of Hydrogen					13.4.	Photoinduced Electron-Transfer Reactions
2.	Formation of Bonds to Halogens					13.5.	Pulse Radiolysis
2.1.	Introduction					14.	Reactions Catalyzed by Inorganic Compounds
2.2.	Formation of Halogen-Halogen Bonds					14.1.	Introduction: Principles of Catalysis
2.3.	Formation of Bonds between Halogens and O, S, Se, Te, Po					14.2.	Types of Catalysts
2.4.	—N, P, As, Sb, Bi					14.3.	Hydrogenation Reactions
2.5.	—C, Si, Ge, Sn, Pb					14.4.	Addition Reactions
2.6.	—B, Al, Ga, In, Tl					14.5.	Olefin Transformations
2.7.	—Li, Na, K, Rb, Cs, Fr or Be, Mg, Ca, Sr, Ba, Ra					14.6.	Carbon Monoxide Reactions
2.8.	—Cu, Ag, Au or Zn, Cd, Hg					14.7.	Oxidations
2.9.	—Transition and Inner-Transition Metals					14.8.	Biorganic Catalysis
2.10.	Group 0 Gases					15.	Oligomerization and Polymerization
2.11.	Formation of Fluorides of High Oxidation State of Elements of Groups IB, IIB and Transition and Inner-Transition Metals					15.1.	Introduction
3.	Formation of Bonds to O, S, Se, Te, Po					15.2.	Ring-Opening and Ring-Polymer Interconversions
3.1.	Introduction					16.	Formation of Intercalation Compounds
3.2.	Formation of Bonds between O, S, Se, Te, Po and O, S, Se, Te, Po					16.1.	Introduction
3.3.	—N, P, As, Sb, Bi					16.2.	Formation of Clathrates
3.4.	—C, Si, Ge, Sn, Pb					16.3.	Formation of Tunnel Structures
3.5.	—B, Al, Ga, In, Tl					16.4.	Formation of Sheet Structures
3.6.	—Li, Na, K, Rb, Cs, Fr or Be, Mg, Ca, Sr, Ba, Ra					17.	Formation of Ceramics
						17.1.	Introduction
						17.2.	Preparative Methods
						17.3.	Synthesis and Fabrication of Ceramics for Special Applications

FIGURE: The overall plan for *Inorganic Reactions and Methods*

from the hierarchy of sub-headings, which form sentences in their own right. For example:

1.2. The Formation of Hydrogen

1.2.7. by Reactions of Water

1.2.7.5. involving Water Splitting

1.2.7.5.1. in Electrochemical Reactions.

Names, personalities, superfluous qualifications, adjectives, adverbs and compound names (formulae being used instead) have been ruthlessly excised in a manner to bring joy to the hearts of readers of Borges. The writing style is thus terse, cuttingly to the point, and instantly informative. Historical precedence for reactions and citations has been sacrificed on the altar of synthetic utility, high yield, convenience, and specificity. The result is a remarkably useful text - books for using, not for collecting dust. This revolutionary presentation is complemented by the most thorough indexing (in this, *Comprehensive Organometallic Chemistry* has clearly been emulated and, astoundingly, improved upon by the subject index editor - A.P. Hagen). In Volume 1, of the 326 pages of text, 90 pages are index pages. There is an author index, a compound index (based on empirical formulae appearing in all possible successive permutations to allow ease of reference to related compounds), and a subject index. These indices crown the accomplishment of the text. Access to the information is the key to success for these volumes, and the indices are superlative.

The above paragraphs more than adequately describe the philosophy behind this series. Now attention must be turned to the specific contents of Volume 1, the subject of this review. Inevitably, given the structure of the series, the opening volume deals with the formation of bonds to hydrogen, and the first real section describes the formation of dihydrogen itself (74 pages). The next section (25 pages) deals with the formation of hydrogen-halogen bonds, and the final section (128 pages) describes the formation of bonds between hydrogen and the elements of Group 16 (referred to here, archaically, as Group VIB). An odd, almost perverse, omission in this volume and series, organized as they are around the importance of the chemical bond and bond formation, is the subject of hydrogen bonding - it does not even appear in the subject index. This aside, though, the volume is an invaluable source of information about the hydrides of Groups 16 and 17. Once we get used to the format, and learn how to use these volumes automatically, I

believe that they will become the primary source for determining synthetic strategy.

No chemistry library can afford to be without these volumes, and would be well advised to take out a subscription, and avail themselves of the lower prices (DM 223 for this volume). The production of these type-set volumes is first class, but they are expensive, and the price will surely preclude them from private bookshelves. This is unfortunate but, given the amount of effort and team-work that it takes to produce volumes of this calibre, probably inevitable.

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