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Book reviews

Topics in Current Chemistry, Relationships and Mechanisms in the Periodic Table, Volume 150, contributions from D.J. Clouthier, P.L. Corio, N.D. Epiotis, C.K. Jørgensen and D.C. Moule, Springer-Verlag, 1989, 292 pages, ISBN 3-540-50045-6. DM168.00.

The first chapter in this volume asks the question "Are Atoms Significantly Modified by Chemical Bonding?". This is a thoughtful and thought provoking review, and involves consideration of compounds taken from the whole range of chemistry, from the simple molecules and ions beloved of theoreticians, to complex organic and inorganic species. The historical development of our modern theories of bonding is carefully discussed, but it is written by and for the theoretician, and makes it plain that quantum chemistry is not the appropriate tool for the solution of many practical chemical problems.

The second chapter, by Epiotis, is much the longest in the book and rightly so, since it deals with the vast subject of "Chemical Bonding Across the Periodic Table". It is a comprehensive introduction to the author's Molecular Orbital Valence Bond (MOVB) treatment of bonding, and its application to specific chemical problems. The first subsection is devoted to the exposition of the theory; the details will quickly get beyond most non-theoreticians, but the general concepts are reasonably easy to follow. The theory is then applied to the problem of the bond lengths in fluoromethanes, and the problems involved in the quantitative consideration of strain in organic molecules. Section 3 considers the problems of π-bonding, and allows the theory to be applied to organometallic species including ferrocene and metal carbonyls. Next it is argued that the mechanism of binding of alkyllithium oligomers is neither overlap nor ionic in character, but can be described by what is called Ionic Overlap Induction. The arguments are good and persuasive, but definitely hard going. The final section provides glimpses of the theory's application in stereoelectronics in organic chemistry, electron transfer in biology and heterogeneous catalysis. This article represents an attempt to make the rigour of theory more accessible to the experimentalist, and makes generous use of pictorial concepts. This is a worthwhile aim, and is at least partially successful. However, many of those whose undergraduate days lie far behind them, and for whom theory was not their favourite course, will find that any real understanding (rather than a superficial appreciation of the concepts) will be hard to achieve.

Chapter 3 is devoted to a consideration of periodic group relationships in the spectroscopy of carbonyls, ketenes and nitriles, and the effects of substitution of sulphur, selenium and phosphorus. This is a valuable and detailed account; the main interest for organometallic chemists will probably be the section on phosphaalkynes, which have recently been proving to be such fascinating ligands. The final section deals with the construction of theoretical models of reaction mechanisms.

Briefly this is a book which will be of primary interest to theoretical chemists, but inorganic and organometallic chemists will also find it a useful source of new ideas, and unexpected comparisons. As always in this series the book is well produced, with good illustration and few typographic errors. The series has now reached its 150th volume and fortieth anniversary; it remains an excellent source of timely reviews which should be accessible in all major chemistry libraries.

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Gmelin handbook of inorganic chemistry, 8th edition, *Sc, Y, La–Lu — Rare Earth Elements*, Springer-Verlag, Berlin, etc., *Volume A6a, Y, La, and the Lanthanoids. Geochemistry: Sedimentary Cycle. Metamorphic Cycle*, xi + 424 pages, DM1903, 1988. ISBN 3-540-93571-1. *Volume A6b, Y, La, and the Lanthanoids. Geochemistry: Hydrosphere. Atmosphere. Cosmo- and Geochemical Cycles. Balance*, xi + 207 pages, DM 989, 1988. ISBN 3-540-93548-7.

The two-part volume under review here completes the Gmelin coverage of the geochemistry of the lanthanides which was started in Volume A5 (1981; in German). It is only fair to state at the outset of this review that neither of these volumes is likely to be of more than passing interest to any reader of *J. Organomet. Chem.*, and their primary importance is clearly to geochemists. Indeed, it is not even worth listing in detail the contents of these volumes, except to state that Volume A6a considers the sedimentary and metamorphic cycles for lanthanides within the lithosphere, and Volume A6b deals with the lanthanides in the hydrosphere and the atmosphere, and concludes with a discussion of geochemical and cosmochemical cycles. However, as general background books (and, perhaps more importantly, for reference when teaching), these volumes are not without their points of interest. The second volume (A6b) is of the most general interest, in that the occurrence of the lanthanides in sea water and in the atmosphere has direct chemical consequences, and removal and precipitation techniques are discussed.

Both volumes show the technical excellence of production which is expected of the Gmelin Handbook, and the authors (R. Ditz (A6a), B. Sarbas (A6a and A6b), P. Schubert (A6a) and W. Töpper (A6a and A6b)) have performed an exhaustive task. One minor point of criticism: in the combined text length of 631 pages, there are only six Figures. The use of graphical representation for some of the data discussed would have made the text and arguments more accessible - one rather got the feeling that Figures were only included where they had been used in the literature, and that the overview that combining data and creating new graphical presentations would have given was missing.

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