Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (R. F. Bryan, Department of Chemistry, University of Virginia, McCormick Road, Charlottesville, Virginia 22901, USA). As far as practicable, books will be reviewed in a country different from that of publication.

Acta Cryst. (1997). B**53**, 323

Early transition metal clusters with π-donor ligands.

Edited by M. H. CHISHOLM. Pp. xii + 289. Weinheim: VCH Verlagsgesellschaft, 1995. Price DM 185.00. ISBN 1-56081-684-8.

Transition-metal cluster complexes traditionally fall into two distinct categories: those with π-acceptor ligands, mostly containing late transition metals in low oxidation states; and those with π-donor ligands, mostly containing early transition metals in high oxidation states. The editors of this VCH series of books on the chemistry of metal clusters do not break with this tradition. Following a book concentrating on the first category [(1990). *The Chemistry of Metal Cluster Complexes*, edited by D. F Shriver, H. D. Kaesz and R. D. Adams. Weinheim: VCH], this companion volume focuses on the second.

The treatment of the subject is far from exhaustive, the book being a collection of six inter-related monographs by leading authorities in the field. The topics covered are: halide-supported octahedral clusters of zirconium; clusters and metal–metal-bonded chains in molybdenum oxide systems; chalcogenide cluster complexes of the early transition metals; alkoxide clusters of molybdenum and tungsten; metal oxo clusters in molybdenum and vanadium phosphate solids; organophosphonate and organoarsonate complexes with oxovanadium and oxomolybdenum cores. The book has therefore no pretensions to be other than a selective coverage and viewed in that light, it succeeds admirably. The chosen topics are coherent, the text is clear and the diagrams (almost all of which are of crystal structures) are unambiguous and pertinent, although the lack of colour reduces the impact of some illustrations, particularly those in Chapters 5 and 6. I found the index, which should be an important part of a book of this kind, to be no more than adequate, a defect partly compensated by a well conceived and informative table of contents.

It was no accident that the rapid development of transition-metal cluster chemistry and the routine use of single-crystal diffraction techniques by inorganic chemists were coincident and the intimate relationship between the two is very apparent throughout the book. All six chapters are fundamentally underpinned by solid-state structures of clusters and, although a detailed discussion of structural parameters is not always forthcoming, all the chapters provide good access to the primary literature. Thus, the book may be seen as a key overview of the area from a structural point of view, the text providing an appropriate chemical context for the illustrated crystal structures. The book is, therefore, of special value to interested crystallographers as well as to synthetic chemists, with the wealth of structural information it provides suggesting avenues for further systematic study and encouraging the continuing development of rational low-temperature synthetic methods.

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Acta Cryst. (1997). B**53**, 323–324

Metallomesogens – synthesis, properties and applications.

Edited by J. L. SERRANO. Pp. xix + 498. Weinheim: VCH Verlagsgesellschaft, 1996. Price DM 298. ISBN 3-527-29296-9.

Metal-containing liquid crystals have been known for some 80 years, and longer if the lyotropic metal soaps are included. However, the topic has been recognized as a distinct area with an intrinsic interest of its own for less than 10 years. Indeed, the term 'metallomesogen' was introduced by our group in Sheffield only in 1990.

Metallomesogens reflect the idea that scientific advances often take place at the interfaces between disciplines, in this case that between liquid crystals and inorganic chemistry. The coordination templates of the 60 or so participating metals offer a wide variety of unusual molecular shapes (described *e.g.* as 'open books', 'bricks' and 'shish-kebabs'), which give rise to liquid crystalline properties and allow a large range of potential 'advanced materials' with interesting and unusual properties to be constructed. Liquid crystalline materials containing a metal atom in the organic molecular skeleton have properties derived from both the organic ligand and the metal. Thus, for example, the metal atom arranges the ligands around it in characteristic shapes and also offers a large and very polarizable electron density, which may give rise to new types of macroscopic (*e.g.* optical) properties.

The first review on the topic was published in 1991 and contained some 150 references. It reflects the rate of progress and the interest in the area, that its first book, a 500 page monograph, has now appeared. Its editor, J. L. Serrano, a liquid crystal chemist who specializes in the synthesis and characterization of these compounds, has gathered a group of Spanish colleagues and former students to put together an excellent and comprehensive account. The book begins with a general introduction to (organic) liquid crystals and describes

the essential features of the main classes (thermotropic, which change phase with temperature; lyotropic, which involve a solvent, usually water) and of the main subclasses of each [*e.g.* rod-like (calamitic) and disc-like (discotic) thermotropics]. The actual metallomesogens are arranged, in Part A, by both ligand and metal, making it easy to see which systems have already been investigated.

A further chapter, in Part B of the book, describes the principles behind the design and synthesis of the ligand systems which give rise to metallomesogens. Both low molecular weight and polymeric metallomesogens are discussed in full, though no experimental details of the syntheses are offered. In the low molecular weight sections, some macroscopic properties are rationalized, in terms of the molecular structures present, by adapting the general ideas developed for organic liquid crystals. These interpretations are very useful, since the appearance or absence of liquid crystal properties in any given molecule depends on subtle geometric and electronic factors.

Part C deals with methods for structural characterization, including X-ray diffraction and EPR spectroscopy; magnetic properties are explained, and there is also a section on the various optical properties exhibited by metallomesogens. Some comments on possible uses of these molecules are included.

The text is well organized and well illustrated with clear diagrams showing the essential features, both of the metallomesogenic molecules and the various liquid crystalline phases; as many of the concepts and molecular shapes may be unfamiliar, this is particularly helpful to the non-specialist. The text offers a good introduction to the inorganic chemist interested in new materials and new structures, and to the liquid crystal scientist who is interested in the new properties offered by these novel systems. If there is a caveat it is that since the novice entering a new research area will always make some mistakes before getting going, some of the known problems and pitfalls might have been more clearly marked out.

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Acta Cryst. (1997). B**53**, 324

Books Received

The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally, a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.

Structural electon crystallography. By DOUGLAS DORSET. Pp. xiii + 452. New York: Plenum Publishing Co., 1995. Price US$ 69.50. ISBN 0 306 45049 6. A review of this book, by Peter Goodman, has been published in the January 1997 issue of *Acta Crystallographica Section A*, page 102.

Introduction to crystallographic statistics. By URI SHMUELI and GEORGE H. WEISS (**IUCr Monographs on Crystallography**, No. 6). Pp. ix + 173. Oxford University Press/International Union of Crystallography, 1995. Price £45.00. ISBN 0-19-855926-7. A review of this book, by H. D. Flack, has been published in the March 1997 issue of *Acta Crystallographica Section A*, pages 251–252.