Acta Cryst. (1980). B**36**, 2861

Handbook on the physics and chemistry of rare earths. Vols. III and IV. Non-metallic compounds. Edited by K. A. GSCHNEIDNER JR and L. EYRING. Pp. Vol. III, xiii + 664; Vol. IV, xiii + 602. Amsterdam: North-Holland, 1979. Price US$107, US$95.

At first sight, one might expect these books to contain tables and figures carrying valuable data. According to the editors, however, the four volumes of this series are intended to be comprehensive, broad, up to date and critical reviews of the physics and chemistry of rare earths. Volumes III and IV, having the common subtitle *Non-Metallic Compounds*, contain 26 contributions dealing not only with various compounds formed by the rare earths but also with their analysis and geochemistry.

More than half of the total work is concerned with the solid-state chemistry and physics of different rare-earth compounds, towards which my interest is biased. Since it is impossible to cover a given topic exhaustively in any one article of a monograph by many authors, each contribution is different in character. Structural aspects are strongly emphasized in the voluminous reviews on the mixed rare-earth oxides (ch. 28) and the rare-earth chalcogenides (ch. 31). These are the longest articles in the two volumes and are especially abundant in crystallographic information. Crystal-growth procedures and thermodynamics as well as structures are summarized for the rare-earth halides (ch. 32). Recent progress in the rare-earth hydrides is concisely reported in chapter 26: Electrical, optical, magnetic and some other physical properties are critically reviewed, with respect to the rare-earth binary oxides as models for other systems (ch. 27), the rare-earth perovskites and garnets (ch. 29), ferroelectric molybdates(VI) (ch. 30) and pnictides (ch. 33). These chapters clearly show a fusion of thermodynamics, crystallography, crystal growth and solid-state physics in modern materials science where the fundamental research unifying materials preparation, properties and theoretical background is correlated to application. Spectroscopic features of the rare-earth ions in solids and their application are exemplified by rare-earth-activated phosphors (ch. 34) and optically-pumped solid-state lasers (ch. 35) followed by an interrelated theoretical review on non-radiative transitions of the rare earths in crystals (ch. 36).

Solution chemistry of the lanthanides is also important because considerable progress in the field of rare-earth science owes a great deal to the availability of very pure rare-earth materials. Chapter 22 summarizes the improved separation procedures utilizing different degrees of complex formation. Chapter 25 discusses the structure and the factors affecting the formation of the rare-earth complexes. Chapter 24 reports on the experimental results and theoretical interpretation of absorption and fluorescence spectra of the lanthanide ions in aqueous solution. On the other hand, modern aspects of the complexes in solution are also introduced: Stereospecific chemical shifts in the NMR spectra of some paramagnetic lanthanide chelates and their application as probes in biological systems are described in chapters 38 and 39, respectively.

There is also a chapter (ch. 37) of seven separate articles dealing with principles and experimental techniques for quantitative analysis of the rare-earth elements. The validity and limits of neutron-activation and mass spectrographic analyses, as well as spectrophotometric, polarographic, optical luminescent and atomic spectroscopic techniques, are summarized. Geochemistry and mineralogy (ch. 21), theoretical chemistry (ch. 23) and toxicity (ch. 40) of the rare earths, though rather unfamiliar topics to me, are of great value to the specialists.

It should be noted that other interesting aspects of rare-earth compounds are found in the preceding volumes: for example, superconducting compounds of the rare earths are described in chapter 10 of Vol. I. In Vol. II, chapter 19 deals with the europium chalcogenides as models for magnetic semiconductors, and chapter 20 with valence changes in rare-earth compounds under the influence of pressure, substitution and temperature.

Highly experienced authors have written each review usually at a level suitable for advanced postgraduate students and research workers from a variety of fields. With the great richness of information involving references to other review articles written from different points of view, these books are an important reference source and should be on the shelves of most libraries.

TAKAAKI KOBAYASHI

Laboratorium für Festkörperphysik
Eidgenössische Technische Hochschule
Hönggerberg
CH-8093 Zürich
Switzerland

Acta Cryst. (1980). B**36**, 2861–2862

Handbook of liquid crystals. By H. KELKER and R. HATZ. Pp. xviii + 917. Weinheim: Verlag Chemie, 1980. Price DM 420.00.

Reviewing a text of this magnitude is not a simple matter. Consequently, since the authors say in their preface that their main aim has been to produce a documentary account of the subject, emphasizing complete coverage, comprehensibility and fast retrieval of information rather than specific detail, it seemed that a fair test would be to keep the book on one's desk for several weeks and see just how useful it was in these respects. Covering as it does all literature up to the end of 1976, and most of the literature of 1977, the book has lived up to the aims with which it was written. No area of liquid crystals about which I have referred to the book for information has not been covered, and as a source of literature references it certainly cannot be faulted. Grouped under individual chapter numbers, pp. 633–897 contain over 8000 references. This mammoth compilation of literature references is also made distinctive and more valuable by the fact that the titles of all books, reviews, and papers are quoted. Incredible as it may seem, I have not found any reference that is wrong. The book is therefore indeed comprehensive, and a mine of literature information, and I have found it of great use and value. Penalties have of course been paid for the approach adopted by the authors. The vast number of literature references produces a rather interrupted text which makes smooth reading rather uneasy in parts. Also, in achieving this totality of coverage, it has not been possible for the authors to enter into any great detail, or to

express opinion on unresolved problems; as a result, the reader may find it disappointing in parts to have his interest aroused only to find that several references must be followed up to obtain more information. This is not a criticism. It is a statement intended to emphasize to would-be purchasers that this text is a first-class reference and source book of information, and not an easy-to-read text presenting all factual, experimental, theoretical, or technical detail.

Again, because of the completeness of coverage in the text, a fully comprehensive index would have been difficult to compile. The relatively short index of ten or eleven pages is therefore somewhat limited in scope, but this is compensated for by clear and specific chapter headings, each with a well defined and easily scanned list of sub-topics. Generally, therefore, the location of information relevant to a particular point can be found quite quickly.

The fifteen chapters cover the following main areas: Introductory material and textures; Chemical constitution; Theory of the liquid-crystalline state; Magnetic and electric field effects; Studies using X-ray, neutron, and other forms of radiation; Optical properties; Thermodynamic properties; Liquid crystals in GLC; NMR and ESR studies; Lyotropic mesomorphism; Living systems; Polymers; Technical applications. An additional listing of reviews, books and symposia is also of value.

Whilst not a beginner's text, it is difficult to see how any individual or group of individuals carrying out research on or using liquid crystals can now afford not to have access to this most valuable contribution to the list of books on liquid crystals. Though young research workers often choose to ignore the early literature on a subject, those who are more experienced know the folly of this. This *Handbook of Liquid Crystals* therefore represents something of an investment, since it will not date in its function of providing an excellent source of references up to about 1977.

In the latter respect, this review would not be complete without reference to the fact that the handbook is written with wisdom in relation to the early literature on the subject. This stems from Professor Kelker's long-standing studies of, and interest in, the history of liquid crystals, and it is relevant that the dust cover portrays electric-field effects in a cholesteric liquid crystal – of great importance to present-day technology – as observed by Lehmann in 1889!

Finally, the publishers have done a good job on the presentation of the book. The paper is of good quality, the print style is clear, figures and diagrams are excellent, and the binding should stand-up to the handling a reference text must endure.

G. W. GRAY

Department of Chemistry
The University
Hull
HU6 7RX
England

Acta Cryst. (1980). B**36**, 2862

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.

The nature of the surface chemical bond. Edited by T. N. RHODIN and G. ERTL. Pp. xii + 405, Figs. 105, Tables 22. Amsterdam, New York, Oxford: North-Holland Publishing Company, 1979. Price US $58·50, Dfl 120·00. A review of this book, by H. Beens, has been published in the November issue of *Acta Crystallographica*, Section A, page 1093.

Electron and magnetization densities in molecules and crystals. Edited by P. BECKER. Pp. xiii + 904. New York, London: Plenum Press, 1980. Price US $75.00. A review of this book, by D. Feil, has been published in the November issue of *Acta Crystallographica*, Section A, page 1092.

Organometallic chemistry reviews: annual surveys: silicon, germanium, tin, lead. Edited by D. SEYFERTH and R. B. KING. Pp. 614. Amsterdam: Elsevier, 1980. Price US $119.00, Dfl 245.00.

Phosphorus: an outline of its chemistry, biochemistry and technology (2nd ed.). By D. E. C. CORBRIDGE. Pp. x + 560. Amsterdam: Elsevier, 1980. Price US $95.00, Dfl 195.00. Next to carbon, hydrogen, oxygen and nitrogen, phosphorus is perhaps the most interesting of all the elements, in regard to the chemistry of life. It is also an element of great importance technologically and industrially. This book now in its second edition, is a fairly concise, yet remarkably comprehensive and well-referenced survey of all aspects of the chemistry of phosphorus. The techniques of X-ray diffraction do enter into this subject but are summarized here in a single page.

Petrology and genesis of leucite-bearing rocks. By A.-K. GUPTA and K. YAGI. Pp. xv + 252. Berlin, Heidelberg, New York: Springer, 1980. Price DM 69.50, US $41.00.