

THIS work is a detailed source book of the structure of all phosphorus compounds that have been reported up to 1972, with a footnote to each chapter, added in proof, to extend the scope to early 1973. The information presented covers that derived mainly by X-ray diffraction, nuclear magnetic resonance and infrared spectroscopic techniques, with the emphasis strongly on the first of these three. The author restricts himself to a comparative discussion and establishes the range of molecular dimensions to be found within various classes of compounds. Though the results are briefly interpreted, the strength of the book is in the results themselves.

The first chapter outlines the general bonding properties of phosphorus and contains an essential and salutary analysis of the reliance that can be placed on the molecular dimensions derived from X-ray structure determinations. The second chapter is devoted to the many structures of phosphorus and this complex story, very neatly exposed, leads naturally to the next chapter on phosphides, where the structural diagrams will, perhaps inevitably, only be easily understood by crystallographers.

Chapters 4-9 (202 pages) cover the compounds in which phosphorous is mainly bonded to elements in group six, among which oxygen predominates. A short survey of oxides, sulphides and selenides is followed by a longer discussion on orthophosphates. In these extended structures, as with the phosphides, the structural diagrams are not always easy to interpret. The condensed phosphates are ex-

amined in chapter 6 where this complex series of compounds are elegantly classified by their structures.

The phosphate esters are covered in chapter 7 which contains a lengthy digression on DNA and is one of the less satisfactory sections of the book, a reflection perhaps of the meagre structural information available for this class of compounds.

Chapter 8, on substituted phosphates, is lucid and concise and the structures of the isolated molecules that make up the greater part of this category lend themselves to the clear repre-

Phosphorus chemistry

T. S. Cameron

The Structural Chemistry of Phosphorus. By D. E. C. Corbridge. Pp. xiii + 542. (Elsevier: Amsterdam, London and New York, 1974) Dfl.250; \$96.20.

sentation they receive. The behaviour of bonds between phosphorus and oxygen atoms is examined in chapter 9 where a discussion on hydrogen bonding is concluded by a summary of P-O bond length (and interbond angles) over the range of compounds described in the previous five chapters.

Hydrides, nitrides, halides and phosphines are the subject of chapter 10 and the following chapter covers the compounds where phosphines act as ligands with metal atoms. There, with a vast range of material the author has little alternative but to compile a catalogue of the known structures. Details of the ring compounds of phos-

phorus are found in two chapters—12 and 14—with the first restricted to a simple survey of the structural chemistry of the phosphazines and the second swiftly covering all the remaining ring compounds. Curiously inserted between these two chapters is one on isomerism and optical activity.

The final chapter on cage structures is very short: few containing phosphorus have been reported, and the text is padded somewhat with analogies to cage systems formed by atoms other than phosphorus. There are appendices with a list of unit cell and spacegroup data for phosphorus compounds, an infrared correlation chart and NMR chemical shifts for typical compounds, and 2,649 references.

The book is printed on good quality paper with an elegant typographical balance between text and diagrams. It must have been a proof reading nightmare, but though few errors remain, it is disconcerting to find that a diagram of vitamin B₁₂ (labelled vitamin A) has a structural formula with two very uncanonical carbon atoms.

Throughout the work the author not only exercises a balanced judgement on his source material but presents the evidence on which he bases his judgement. The book will thus be a valuable aid and happy hunting ground for those working in the field of structural chemistry of phosphorus while still being able to supply single items of information, in context, with an evaluation for those with less specialised requirements. Despite its high price there will be few research laboratories that would want to be without access to this book.

Crystal chemistry

The Major Ternary Structural Families. (Crystal Chemistry of Non-Metallic Materials.) By O. Muller and R. Roy. Pp. ix + 487. (Springer-Verlag: Berlin and New York, 1974.) DM76; \$31.10.

IN his introduction to this first volume in the series of publications on the crystal chemistry of non-metallic materials, Professor Rustum Roy comments on the fact that few books have been published on the subject of crystal chemistry. If the forthcoming volumes in the series maintain the high standard set by this issue much of the deficit will have been made up.

The introduction is extremely comprehensive and makes certain that the reader understands how to make fullest use of the large amount of information given in the subsequent chapters. Frequently, introductions seem to have been written as an afterthought but

here one senses that considerable care has been taken with what should be a most important chapter.

Three major structural families are dealt with in detail: A₂BX₄, ABX₄ and ABX₃; with a small number of other structures collected together in table form at the end of the book. Each major structural family is subdivided into individual structural types based on a particular compound. Summaries at the start of each chapter indicate clearly the range of structures covered, thus enabling the reader to locate rapidly any structure of particular interest. Of especial value is the grouping of all the individual structure types into a structural field map at the end of every chapter. The reader can then appreciate to the full the interrelationships of each structure with those of others in the same group. All of the diagrams in the book are of very high quality.

A problem for any author writing on crystal chemistry is how best to pre-

sent the large amount of crystal data which are required. In this book the authors have chosen to place nearly all such data, in tabular form, into an appendix. Some selected data necessary for an understanding of the text is tabulated in each chapter. The result of this is, however, that almost half of the book is made up of the appendix.

There are two small, but pleasing, aspects of this book: first, the comprehensive and easily found tables of ionic radii, which may well be consulted more frequently than many of the tables; and second, the short sections on the applications of some of the compounds mentioned.

The volume is an excellent reference work and perhaps my only criticism is that the range of structures covered is limited; but one can appreciate that any volume which attempted to cover, in this amount of detail, the whole range of ternary structures would become overlong and unreadable.

M. G. Barker