Crystal chemistry of non-metallic materials. Vol. 4. The major ternary structural families. By O. MULLER and R. ROY. Pp. x+488, Figs. 46, Tables 148. Berlin, Heidelberg, New York: Springer-Verlag, 1974. Price DM 76, U.S. $31.10.

The four-volume series of which this is the first volume to be published has a dual purpose – to provide a textbook and a reference work on inorganic, non-metallic materials. The first two volumes of the series, *Principles of crystal chemistry* and *Properties of solids in relation to structure* will describe the essential background whilst the third and fourth volumes *The major binary structural families* and *The major ternary structural families* broadly speaking review structures of the type A_pX_q and $A_pB_qX_r$ respectively where A and B are cations and X is an anion. Any assessment of this volume must be incomplete in the absence of a knowledge of the contents of the first two volumes. The brief introductory chapter to this volume indicates that Vol. 1 will contain a full discussion of ionic radii and elsewhere we are told that another volume of the series will discuss ABX_3 structures containing tetrahedral BX_4 groups together with other silicate structures, but otherwise there are very few references to the other volumes in the series. Alone this volume may be treated as a survey of structures of the types A_2BX_4, ABX_4 and ABX_3 (only four pages are devoted to compounds of other formulae).

It is of value to consider what information a research worker would hope to find in such a survey. At one level a list of the compounds which adopt a particular structure together with brief indications of the stability field and important physical properties can be useful. If the crystal structures are to be described in any detail then careful consideration must be given to the framework used. The formal description of a structure in terms of cell dimensions, space group and atomic coordinates is an essential preliminary, but for descriptive purposes the shape of the coordination polyhedra (including interatomic distances and 'bond angles') and the way in which they are linked together are more valuable: in some cases the packing of the atoms is also significant. Perspective drawings or plans are essential if a full appreciation of a structure is to be obtained. In a detailed survey such as this the variation of crystal structure with composition, temperature and pressure should be discussed. The authors have attempted to do all this with varying success.

The volume contains five chapters in all: an introductory chapter, a chapter each on the A_2BX_4, the ABX_4 and the ABX_3 structures and a very brief chapter on *Other ternary structure families*. Each of the three main chapters is divided into three sections. The introductory section describes very briefly the structure types involved and their importance in various fields, presumably summarizing material covered more fully in the first two volumes. The second and major section is devoted to descriptions of the various structure types and the third to the relationships between them. The nomenclature used by the authors is rather pedantic. It is not really necessary to introduce a shorthand notation for structure type; for example, it is usually quite clear from the context whether 'calcite' refers to the mineral calcite or to the type of structure exemplified by calcite. There seem to be very few cases where the information summarized in the full 'coordination formula' would be adequate for anyone interested in that compound.

The description of each structure type includes cell dimensions, space group and number of formula units in a unit cell together with a general description of the coordination polyhedra of the cations and the way in which they are linked together. In some of the descriptions cell dimensions are given for one compound and bond lengths for another. Only a superficial idea of a particular structure type can be obtained from the brief, sparsely illustrated discussion and further reading is necessary before the comparison of one structure with another can be appreciated. The description of each structure is followed by a discussion of its compositional range. Those compounds which are known to adopt the structure are listed in tables, some of which are in the text and the rest in the substantial appendices which comprise over a third of the book. These tables give chemical formulae, cell dimensions, relevant references and what appear to be a rather haphazard selection of other data. For instance, in the ABX_3 compounds, the cell dimensions of the triple hexagonal unit cell are given for those compounds with the calcite structure, the cell dimensions of a sub-cell are given for low-YBO_3 structures, and the cell dimensions of three different cells are given for those compounds with the $LaAlO_3$ structure. In some of the tables the temperature at which the cell dimensions were measured is given; elsewhere there is just a note that the compound is a high-temperature polymorph. The tables are not of even approximately uniform format (or even type face) and this gives the book a rather restless aspect. The tables take up an unnecessarily large proportion of the available space and in addition the statement of the cell dimensions of each compound seems unnecessary for such information is easily accessible in *Crystal Data*.

The last section of each chapter is the most interesting. Room-temperature structure field diagrams (figures displaying the occurrence of various structure types on a plot of the radius of the A cation *versus* the radius of the B cation) and phase diagrams are used to discuss the interrelationships of the various structure types and the observed polymorphic transformations are set down. Unfortunately the discussion is brief and at times restricted to a statement of observed relationships, though the perovskite-like structures are discussed more fully.

The text is well produced and the volume should prove useful to anyone wishing to find out the 'state of play' for a particular compound. The authors give abundant references in the text, though the choice is occasionally rather indiscriminate (three textbook references are given to Pauling's second rule) and it is a pity that a book published in 1974 has a bibliography which scarcely extends beyond 1971.

This volume is invaluable as a long-needed reference book and the authors are to be congratulated on their energy in collecting so much information into a single volume. The textbook function of the series will presumably be satisfied by the first two volumes.

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