

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (A. J. C. Wilson, Department of Physics, University College, Cathays Park, Cardiff, Great Britain). As far as practicable books will be reviewed in a country different from that of publication.

Crystal Chemistry of Simple Compounds of Uranium, Thorium, Plutonium, Neptunium.

By E. S. MAKAROV. (Translated from the Russian by E. B. UVAROV). Pp. 145 with 38 figs. and 32 tables. New York: Consultant's Bureau, Inc.; London: Chapman and Hall. Price \$5.25; 42s.

The scope of this book may best be conveyed by the author's statement of his purpose. He sets himself to '... the elucidation of the principal features of the crystal structure of compounds formed between the actinide elements and all the elements of Mendeleev's periodic system, with retention of classification by groups and subgroups'. This he has done, and the result is a compact and highly systematized body of information concerning the structural properties of simple compounds of uranium, thorium, plutonium and neptunium. Three main topics will serve to outline the exposition. These are: an introduction to the general concepts of crystal chemistry; the presentation and discussion of structural results reported in the literature up to June 1957; and the examination and weighing of certain conclusions concerning the fundamental nature of the series of elements.

The introductory chapter deals briefly with such matters as the kinds of atomic aggregates of which crystals are built; bond types and their characteristics; crystal-chemical descriptions of metallic compounds. The review also serves to define the terminology used by the author in subsequent chapters.

The survey of the literature, which forms the main body of the work, is a collection of structural data, including results for the polymorphic modifications of the metals, and for several hundred simple compounds and binary systems. These data are displayed in a series of tables, each of which summarizes the structural characteristics of compounds formed between the actinides and the elements of a group or subgroup of the periodic system. For each compound listed, the chemical formula, the structure type and the source reference is tabulated. Blank spaces remain to show where information is lacking, or considered unreliable. Each table forms the basis for a discussion of the structural characteristics of the group. New or complex structure types are described and explained in unusual detail, with illustrative structure diagrams and full listings of interatomic distances. After all the elements of the periodic system have been considered in this way, a chapter is devoted to the important subject of the atomic radii of the actinides, with the presentation of tables of their ionic, covalent and metallic radii as derived by W. H. Zachariasen.

In the concluding chapter, the question of the genesis of the transuranic elements and of their probable electron configuration is considered in some detail. Differing views are advanced, almost in the words of their proponents, and various lines of evidence examined in an impartial manner. Though a strictly reportorial attitude has been maintained throughout the book, at this point the author

presents his own conclusions; in particular, that, though these elements are customarily referred to as actinides, it is by no means self-evident that actinium, rather than thorium, is the parent element; and that there is a preponderance of evidence in favor of considering them 5f-6d elements rather than 5f elements.

In the opinion of the reviewer, this book is excellent for reference, not only because of the extent of the data, but also because of its compact and logical organization. It should also serve well as an easily assimilated introduction to the field of actinide crystal chemistry.

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The greater part of this short monograph is taken up with descriptions of the structures of the elements and their compounds (including alloys) supplemented by numerous summarizing tables and 117 references, this compilation being largely based on literature published up to June 1957. This systematic part is preceded by a somewhat elementary introductory chapter on crystal chemistry and is followed by a short chapter on the ionic, covalent, and metallic radii of the actinides. The book concludes with a discussion of the chemical behaviour of these elements in relation to their probable electronic structures.

On the whole this translation is pleasant to read, though there are a few minor slips. For example, truncated octahedron is mistranslated as 'cubic octahedron' (p. 81) and in many places we find 'nearest interatomic distances' for 'shortest interatomic distances'. On the other hand, no one would object to the statement that 'W. Zachariasen is quite justified in describing atomic radii in the crystalline state as crystal radii'. The sentence: 'The quadrivalent oxides (dioxides?) ThO₂, UO₂, ZrO₂, and CeO₂... are not only isostructural but isomorphous with each other, as they form continuous series or very wide regions of solid solutions' leads the reviewer to enquire whether this distinction between isostructural and isomorphous is generally acceptable to crystallographers. Perhaps we should attempt to define some of the terms we use; this can be a very educational exercise.

Although the specialist will not find in this volume much that is new to him, there is a definite need for concise and reasonably up-to-date summaries of rapidly developing fields. This volume is competently prepared and should prove useful to anyone wishing to know more about the structural chemistry of this group of elements.

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