

Références

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International Union of Crystallography

Acta Cryst. (1981). B37, 1480.

Structure Reports

Volume 45A of *Structure Reports* has recently been published. It covers the literature for metals and inorganic compounds for 1979 (vi + 445 pages), and costs 136 Dutch guilders for subscribers with standing orders. The full price

for individual copies is 160 guilders but personal subscribers may buy a copy for their own use at 80 guilders. Volume 44B should be published later in 1981.

Orders should be placed direct with the publisher, D. Reidel Publishing Company, PO Box 17, 3300 AA Dordrecht, The Netherlands, or with Polycrystal Book Service, PO Box 11567, Pittsburgh, PA 15238, USA, or with any bookseller. Trade orders should be sent to Reidel.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

Acta Cryst. (1981). B37, 1480–1481.

Structure and bonding. Vol. 37. Structural problems.

Edited by J. D. DUNITZ *et al.* Pp. 216. Berlin, Heidelberg, New York: Springer-Verlag, 1979. Price DM 88.00, US \$48.40.

This recent volume in the series *Structure and Bonding* consists of three articles related to structural inorganic chemistry. Although the topics are diverse, the first two contributions on Jahn–Teller effects and cubic structure types will be of more interest to crystallographers than the last article on polyhalogens. Nevertheless, all three chapters are presented in a well organized format and are in keeping with the standard of excellence established in this series.

The first contribution in this volume is *Local and Cooperative Jahn–Teller Interactions in Model Structures* by D. Reinen and C. Friebel. As the title suggests, this article presents a detailed discussion and theoretical treatment of the well known Jahn–Teller effect in which octahedral coordination with σ -antibonding E_g ground states may result in geometrical distortion. The authors' model structures are limited to octahedral coordination of equal ligands. The first part of the article is a descriptive review of the local Jahn–Teller effect with several examples. Greater detail is given to describing cooperative Jahn–Teller phenomena that can occur as a result of lattice environment effects for both isolated and bridged octahedra. Some of the factors related to 'cooperative' Jahn–Teller deformation include orbital ordering (related to lattice orientation of the polyhedra), effects of counter-ion type, and the concentration of affected metal ions (such as d^9 Cu²⁺) in a host lattice. The subject is

developed further with a detailed examination of Jahn–Teller distortions in various nitro complexes and, in a separate section, a discussion of octahedral distortion in host-lattice structures. Various other examples are also given. Overall, the authors have provided a well balanced descriptive and theoretical account of Jahn–Teller effects observed by various spectroscopic and structural methods. This article will prove especially interesting and useful for structural inorganic chemists specializing in solid-state chemistry of transition-metal complexes.

The second chapter is *The Frameworks (Bauverbände) of the Cubic Structure Types* by E. E. Hellner. This extensive article (80 pages) is an ambitious approach to organizing all cubic structure types into a descriptive system of construction patterns or frameworks (*Bauverbände*). The *Bauverbände* notation consists of a symbol for one of the sixteen invariant cubic lattice complexes (a capital letter) along with additional indicators for the particular coordination polyhedron. Ideally, the *Bauverbände* classification symbol should not only permit the reconstruction of the structure type, but it should also show the relationship between different types. Under this system the structure types are grouped into families, main classes, and subclasses. In developing his subject, the author describes in some detail the homogeneous and heterogeneous sphere packings in the cubic system as well as the relations between structure types. The bulk of the article consists of examples used to explain the classification system. Since as many as two hundred different compounds are considered, it is fortunate for the reader that a good formula index is included at the end of the chapter. Finally, the numerous excellent illustrations in the article are indispensable to the reader's

appreciation of the symmetry relationships that the author is trying to convey.

The third chapter entitled *Polyhalogen Cations* by J. Shamir is a survey of research developments in this field over the past decade. The review is primarily descriptive and will be of greater interest to inorganic chemists (especially those studying fluorine compounds) than to crystallographers. The author divides the subject into two groups, isopolyhalogen cations (consisting of only one type of halogen) and heteropolyhalogen cations (those containing more than one type of halogen). Of the cations in the latter group, most contain fluorine. For the isopolyhalogen cations, however, none involving fluorine are reported. The most extensive research on the isopolyhalogens involves iodine (I_2^+ , I_3^+ , I_4^+ , I_5^+ , and I_7^+) and to a lesser extent bromine. Virtually all of the anions associated with both groups of cations contain fluorine and, needless to say, many difficulties arise in the synthesis and handling of these compounds. Because of such problems in the synthesis and growing of suitable crystals, only a limited number of single-crystal X-ray structures of these compounds have been reported. Most of the molecular structural information is based on other methods such as ^{19}F NMR and vibrational spectroscopy. Overall, the author has presented a well written summary of the physical, structural, and spectroscopic properties of polyhalogen cations that will be of considerable value to workers in the area.

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Acta Cryst. (1981). B37, 1481–1482.

Crystal structures of clay minerals and their X-ray identification. Edited by G. W. BRINDLEY and G. BROWN. Pp. 495. London: Mineralogical Society, 1980. Price £28.00, US \$70.00.

This long-awaited book is not a third edition of *The X-ray Identification and Crystal Structures of Clay Minerals* which was published in 1951 and updated in 1961. As indicated by the change in title, it is an entirely new book in concept and execution. Clay-mineral research was an active area in the last decades, and considerable progress was made, particularly in the field of structure determinations. The authors fully achieve the declared objective of providing an authoritative account of the fundamentals of the structures of clay minerals as well as a laboratory handbook. The book is divided into seven chapters written by six authors, all experts in the field. The transition from one chapter to the next is completely smooth and there are many cross-references.

In the first chapter, *Structures of Layer Silicates*, S. W. Bailey exhaustively surveys an impressive list of structure determinations, to which he himself has made a very significant contribution. Compilations of tables of structural details facilitate access to the data.

In the following chapter, *Order–Disorder in Clay Mineral Structures*, G. W. Brindley considers the entire range of clay minerals from the point of view of order–disorder phenomena. Attention is focused mainly on the effect of crystal size (small crystal size being treated as a structural disorder), on stacking faults and layer curvature. Ordering of cations in octahedral and tetrahedral sheets and in the interlayers receives little attention. Information about individual layer silicates is dispersed in chapter 1 and about interlayer cations in chapter 3, but I would have appreciated a more general discussion, comprising results obtained by methods other than X-ray diffraction.

In the third chapter, *Interlayer and Intercalation Complexes of Clay Minerals*, D. M. C. MacEwan and M. J. Wilson review aqueous and organic complexes of clay minerals and their use for mineral identification. The survey of clay–organic associations is necessarily very condensed. There are relatively few references to recent publications (eight covering the period 1972–1975, none later). The literature up to 1972 was extensively covered in the book *The Chemistry of Clay–Organic Reactions* by B. K. G. Theng (published by Adam Hilger, 1974). It might, therefore, have been preferable to restrict the discussion to clay–organic systems used for identification of clay minerals. The subject of demixing of cations, somewhat misplaced under the heading *Organic Complexes with 2:1 Clay Minerals*, also receives cursory treatment.

Chapter 4, *Interstratified Clay Minerals*, by R. C. Reynolds will, no doubt, prove to be invaluable to anyone dealing with clay minerals. Many of the clay-mineral assemblages we encounter are at least partly composed of interstratified material. The theoretical discussion of mixed-layer systems, the calculated diffraction profiles, some especially prepared for this book, as well as the numerous tables will surely have an immediate impact on the quality of many clay-mineral identifications.

Chapter 5, in which G. Brown and G. W. Brindley give the reader the benefit of their long years of experience of *X-ray Diffraction Procedures for Clay Mineral Identification* is a useful guide for the beginner and also contains much that is of interest to the veteran researcher. Methods of identification reported in the literature are critically discussed and diagnostic criteria are compiled in numerous informative tables.

In Chapter 6, *Associated Minerals*, G. Brown conveniently summarizes the X-ray diffraction patterns of minerals commonly associated with clays and discusses some of their relevant structural characteristics.

Chapter 7, by G. W. Brindley, deals with *Quantitative X-ray Mineral Analysis of Clays*. Although the emphasis is on the problem of clay-mineral analysis in particular, the author presents a very clear and concise account of methods of quantitative X-ray analysis in general.

Finally there are 35 pages of tables relating d in Å to 2θ for unresolved $K\alpha$ and $K\beta$ radiation from Cu, Co and Fe anodes, to an accuracy of 0.02° 2θ for $K\alpha$ and 0.05° 2θ for $K\beta$ radiation.

Crystal Structures of Clay Minerals and their X-ray Identification is not only a summary of the 'state of the art'. It is a major contribution to its advancement. This book is beautifully produced and illustrated and contains a wealth of information. It is indispensable to anyone concerned with clay minerals. Despite the price, many researchers will not be