

08.4-2 HRTEM STRUCTURE MODEL OF SERPENTINE-LIKE PHASES. M.Mellini (a), G.Ferraris (b) & R.Compagnoni (c) (a) C.N.R., via S. Maria 53, 56100 Pisa (b) Università di Torino, via S. Massimo 22, 10123 Torino (c) Università della Calabria, 87030 Cosenza, Italy.

A new asbestiform mineral from Varaita Valley (Italy) has been submitted by the authors to I.M.A. for approval. Its ideal composition is  $M_{21} [T_{12}O_{28}(OH)_4] (OH)_{30} \cdot H_2O$  (M and T being octahedral (Mg, Fe) and tetrahedral (Si, Al) cations, respectively) and it can be considered a water and Mg rich, Si poor serpentine-like phase. By TEM techniques not only the fiber texture, which consists of randomly rotated fibers about  $0.1\mu$  in cross section and intermixed with smaller chrysotile fibers, was elucidated but also the unit cell was found ( $a=36.70$ ,  $b=9.45$ ,  $c=7.291\text{\AA}$ ,  $\beta=101.1^\circ$ ) and a reliable structural model with Cm symmetry was derived.

The model is based on the general arrangement of serpentine, from which the new mineral differs for the presence of infinite [010] rows of vacancies in tetrahedral sites. As a result, it comes out to be a chain silicate characterized by the presence of triple chains which are formed by connection of the single crankshaft chains of haradaite. This model explains observed properties and is supported by agreement between observed and calculated HRTEM images. Starting from it, a comprehensive discussion of possible derivative phases is given; they are based on P or C lattices where  $a$  can be, respectively, any or only odd integer multiples of the  $a$  parameter of serpentine. A few of these phases are actually observed as fault structures within samples of the new mineral.

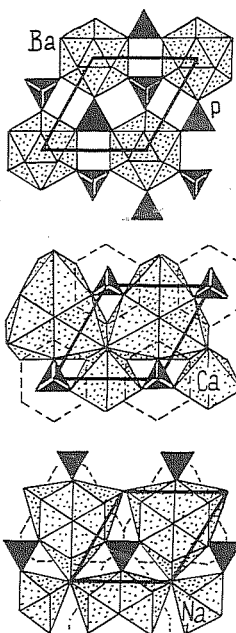
08.4-3 TOWARDS A STRUCTURAL CLASSIFICATION OF MINERALS. By F. C. Hawthorne, Dept. of Earth Sciences, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2.

It is proposed that structures may be classified according to the polymerization of those coordination polyhedra with higher bond-valences. The most strongly bonded cluster of coordination polyhedra (a homo- or heteropolyhedral cluster) is the fundamental building block of a structure. This is repeated (often polymerized) by translational symmetry operators to form the module of the structure, an anionic polyhedral array whose excess charge is balanced by the presence of large weakly-bonded cations, usually high coordination alkali and alkaline earth cations. Minerals may be divided into different groups according to their cation coordination numbers and cation stoichiometry; within a specific group, minerals are classified by their fundamental (usually hetero-) polyhedral cluster and by the way this cluster polymerizes to form a three-dimensional structure: unconnected polyhedra, finite clusters, chains, sheets and frameworks.

This approach provides some insight into the factors affecting the weakly bonded parts of the structure. The structure module is considered as a (very complex) oxy-anion whose Lewis basicity may be calculated and, via the valence-matching principle, used to predict the large cation Lewis acidity. Water of hydration in a structure acts as a bond-valence transformer, decreasing the effective Lewis acidity of a large cation to better match it with the module basicity. These ideas provide both a rationale and a predictive capability for the large cation identities and observed coordination numbers in minerals, and an explanation for why some minerals are hydrated and others are not. Predicted values are in fairly good agreement with observed values for a number of complex sulphates, phosphates and silicates.

08.4-4 KINDRED RELATIONSHIPS OF STRUCTURAL TYPES ON THE EXAMPLE OF ARCTITE-, ALUNITE- AND SULPHOHALITE-LIKE STRUCTURES. By Yu.K. Egorov-Tismenko, E.V. Sokolova and N.L. Smirnova, Geological Department, Moscow State University, Moscow, USSR.

Crystal chemical comparison of a number of structures kindred to a new arctite mineral  $(Na_5Ca)Ca_6Ba[PO_4]_6F_3$  ( $a=7,094$ ,  $c=41,320\text{\AA}$ ,  $R\bar{3}m$ ,  $Z=3$ ) (E.V. Sokolova et al., DAN SSSR (1984), n°1, 78) is given. Regular alternation of three original O-layers (Fig.) (IBa-P, IICa-P, IIINa-P) leads to the 15-layered structure of the mineral. Such layers are singled out in alunite  $KAl_3[SO_4]_2(OH)_6$ - and sulphohalite  $Na_6[SO_4]_2(Cl,F)$ -like structures: the structure of alunite is composed of layers I and II, of sulphohalite - only of layer III. The regular interrelation between the parameters of all the structures has been established.



08.4-5 THE MECHANICS OF KAOLINITE REACTION WITH ACID ORTHOPHOSPHATE. By Salah A. Tahoun, Scil Science Department, Zagazig University, Zagazig, Egypt.

Kaolinite was treated with an aqueous solution of monocalcium phosphate which is a common phosphate fertilizer. The reaction was allowed to proceed at  $50^\circ\text{C}$  for 10 weeks during which the products were examined at intervals. X-Ray diffraction analysis indicates that kaolinite decomposes into amorphous silicates, and orthophosphate is transformed into monetite. A well crystallized metavariscite was detected by electron microscopy. It is believed that the reaction is initiated by protonation of the hydroxyl groups which are covalently bound to structural aluminum of kaolinite. The resultant water molecules are then displaced by phosphate ions to form a kaolinite-phosphate complex. When the proportion of phosphate in the complex exceeds a certain limit, metavariscite is separated leaving a residue of amorphous silicate relics.