

08.2-52 NEW TYPE OF $[\text{Si}_3\text{O}_8]$ LAYERS IN $\text{K}_8\text{Yb}_3[\text{Si}_6\text{O}_{16}]_2(\text{OH})$. By N.V. Belov, A.M. Dago, E.A. Pobodinskaya, D.Yu. Pucharovsky, E.E. Strelkova, Faculty of Geology, Moscow State University, USSR.

Compound $\text{K}_8\text{Yb}_3[\text{Si}_6\text{O}_{16}]_2(\text{OH})$ was synthesized in hydrothermal system $\text{K}_2\text{CO}_3\text{-Yb}_2\text{O}_3\text{-SiO}_2\text{-H}_2\text{O}$ ($T=450^\circ\text{C}$, $P=950\text{atm.}$, $c\ \text{K}_2\text{CO}_3=15\text{-}45\%$, $\text{Yb}_2\text{O}_3/\text{SiO}_2=1:1$). The triclinic cell parameters of $\text{K}_8\text{Yb}_3[\text{Si}_6\text{O}_{16}]_2(\text{OH})$: $a=6,868(2)$, $b=11,434(6)$, $c=11,449(8)\text{\AA}$, $\alpha=88,52(5)$, $\beta=90,91(5)$, $\gamma=100,10(4)^\circ$, sp.gr. $P\bar{1}$, $Z=1$. The structure has been refined anisotropically up to $R=0,060$. A new type of layers $[\text{Si}_3\text{O}_8]$, formed by 6-, 8- and 10-membered rings, was found in the structure of K,Yb-silicate (Fig.). These layers are connected by Yb-octahedra into 3-dimensional framework. The large K-cations and (OH)-groups occupy the spaces inside the framework. The comparison of 1- and 2-dimensional tetrahedral $[\text{Si}_3\text{O}_8]$ motifs indicates the possibility of the formation of layers in structures with "hard" cations (Zn, Cu, Yb) and bands in structures with "soft cations" (Ca, Na, Ba). The tetrahedral bands can also be formed in the structures with high concentration of "hard" cations, and this is probably the reason for the entrance of additional anionic groups (OH).

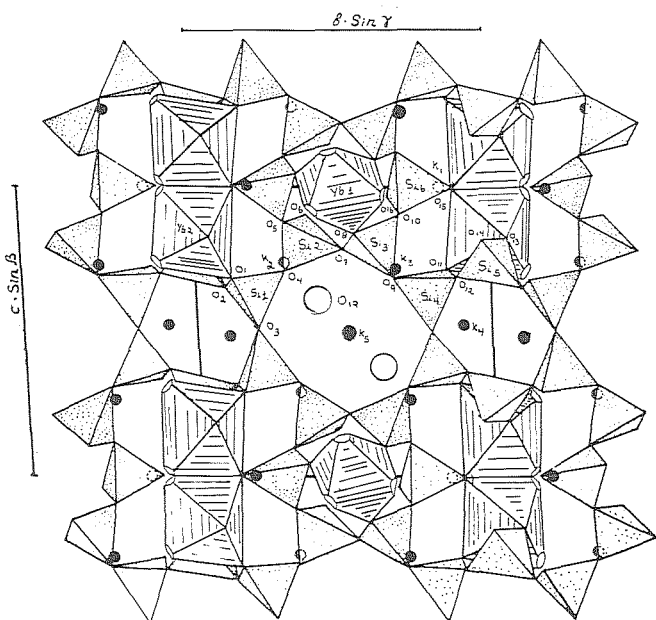


Fig. Projection of $\text{K}_8\text{Yb}_3[\text{Si}_6\text{O}_{16}]_2(\text{OH})$ along the a-axis.

08.2-53 CRYSTAL STRUCTURES OF THE GROUP OF Cd, Li, AND Li,Cd-BORATES. By E.V. Sokolova, Yu.K. Egorov-Tismenko, M.A. Simonov, N.V. Belov, Geological Department, Moscow State University, Moscow, USSR.

The crystal structures of a series of Cd-, Li- and Li,Cd-borates synthesized in the course of the investigation of hydrothermal crystallization in the $\text{Li}_2\text{O}(\text{Na}_2\text{O})\text{CdO-B}_2\text{O}_3\text{-H}_2\text{O}$ systems have been determined as a further advance in the development of crystal chemistry of Cd-compounds.

Analyses of this series of compounds revealed the dependence of the character of crystal structures on the relative boron content. In $\text{Cd}_4[\text{B}_3\text{O}_3]_2(\text{OH})_2$ each of two types of clusters forms its own original framework of Cd-octahedra, and the isolated B-triangles give the structure an additional rigidity. Each of the B-triangles belongs to both types of clusters. In the hexagonal $\text{LiCd}[\text{B}_3\text{O}_3]$ - (I) modification the columns of Cd-hemi-octahedra, placed edgewise, alternate with meta-chains of Li-tetrahedra along the c-axis. On the L_3 axis itself are threaded BO_3 -triangles making the Cd,Li-framework more rigid. The two-layer closest packing of O atoms whose tetrahedral holes are filled with Cd,Li- and B cations, constitutes the basis of the triclinic $\text{LiCd}[\text{B}_3\text{O}_3]$ - (II) modification. It is of interest that the Cd atoms attached to one of the faces of a tetrahedron attract the fifth O, resulting in the formation of a trigonal prism. B atoms are situated in triangles on the face of a closed-packed layer. In the $\text{Cd}_2[\text{B}_2\text{O}_5]$ structure infinite chains, each of four Cd-octahedra in width, are separated by chains of empty octahedra. The $[\text{B}_2\text{O}_5]$ pyro-groups linking together the discrete Cd-chains are located both above and under the empty octahedra. In the structure of the orthorhombic $\text{Li}_3[\text{B}_5\text{O}_8(\text{OH})_2]$ - (II) modification, BO_4 -tetrahedra and BO_3 -triangles form corrugated layers linked with each other by Li-tetrahedra paired along common edges as well as by hydrogen bonds. In the tetragonal $\text{Li}_3[\text{B}_5\text{O}_8(\text{OH})_2]$ - (I) modification the chains of $[\text{LiO}_4]$ tetrahedra pierce the B-O framework of spiral-like $[\text{B}_3\text{O}_7]$ chains.

Thus the boron-oxygen units are predominant when the content of B atoms is the largest. The cations play the subordinate role. When the content of B is relatively small, the BO_3 -triangles serve only as connecting links for Cd,Li-units. The unusual coordination number 5 in two LiCd BO_3 modifications is associated with the requirements of commensurability of B-O-radicals and cations as well as of the balance of valency of anions.