A structure analysis of AgClO$_4$·H$_2$O and AgBF$_4$·H$_2$O using powder data showed that both compounds crystallize orthorhombic with lattice constants $a = 8.123$, $b = 7.839$, $c = 13.562$ and $a = 7.966$, $b = 7.794$, $c = 13.416$ Å resp., probably being isomorphous to CaClO$_4$·H$_2$O, space group Pnma, $Z=8$. Upon obtaining single crystals, structure refinements with three dimensional X-ray intensity data were carried out yielding $R = 0.06$ and 0.05 resp., and confirming the original assumption on the structure type. Like CaClO$_4$·H$_2$O (O. Bars et al., Acta Cryst. (1977) B33, 3751) the structure of the title compounds of general formula ABX$_4$·H$_2$O is built up of BX$_4$ tetrahedra and irregularly shaped AX$_6$O$_2$ polyhedra, which share corners and edges. The water molecule is coordinated by two A-cations and the A-cation by two water molecules. However, in contrast to CaClO$_4$·H$_2$O the A-O distances in the silver compounds are distinctly shorter than the A-X distances. This difference leads to a new description of the structure: There are zigzag chains of Ag-O-Ag-O-Ag-lying parallel to [010].

Regarding them as cylinders they form a pseudotetragonal packing with the chain axis corresponding to $c_{str.'}$ of str. parallel to [011] and $c_{str.}$, parallel to [011]. The BX$_4$ tetrahedra fill the empty channels of the packing (1/2 1/2 z in the pseudotetragonal cell), thus completing the coordination of the Ag atoms. An exact description of the structure (shape and connection of the polyhedra, hydrogen bonds and other aspects) will be given. Also some problems, which arise in the structure determination (realised by means of Patterson synthesis and direct methods) as well as in the refinement process, will be discussed.

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**08.2-2 THE CRYSTAL STRUCTURE OF COPPER(II) SULFATE Cu$_2$SO$_4$.** By H.J. Berthold and J. Born, Institut für Anorganische Chemie der Universität, Callinstr. 9, D-3000 Hannover, Germany.

The crystal structure of Cu$_2$SO$_4$ has been investigated using X-ray powder diffraction data. Cu$_2$SO$_4$ crystallizes in the orthorhombic space group Pm2a (2=8) with $a = 474.6(3)$ Å, $b = 1396(1)$ Å, and $c = 1086(2)$ Å. Least squares refinement using 21 well resolved reflections yielded $R = 6.4$%. Although Ag$_2$SO$_4$ also crystallizes in the space group Pm2a, there is a remarkable difference between the structures of Cu$_2$SO$_4$ and Ag$_2$SO$_4$. Due to the strong tendency of Cu(II) to form two collinear sp bonds to oxygen the structure contains short Cu-O distances (291 pm). In Ag$_2$SO$_4$ the corresponding O-Ag-O interactions are much more ionic and hence the Ag-O distance (241 pm) is much shorter than the Cu-O distance (291 pm). In Ag$_2$SO$_4$ each Ag$^+$ is surrounded by six oxygen atoms at 241, 243, and 269 pm in a strongly distorted octahedral arrangement, while the coordination sphere of Cu$^+$ contains only four oxygen atoms at 246 and 250 pm and in addition two copper atoms at 291 pm. The structure of Cu$_2$SO$_4$ can best be described as being built up of layers of composition Cu$_2$SO$_4$ parallel to (0 0 1), in which the four oxygen atoms of each SO$_4$ group are bonded to four other SO$_4$ groups of the same layer via O-Cu-O bridges. The structure of the layers in Cu$_2$SO$_4$ is different from that of the layers in Ag$_2$SO$_4$ parallel to (0 0 1) described by Mahut et al. (N. Jahrbuch Mineralogie, Monatshefte 1978, 409). With respect to the bonding between different SO$_4$ groups the structure of Cu$_2$SO$_4$ is closely related to that of crystalline H$_2$SO$_4$ where, in layers of composition H$_2$SO$_4$, each SO$_4$ group is bonded to four SO$_4$ groups of the same layer via O-H···O hydrogen bridges with O···O = 262 pm. To compensate for the denser packing of the SO$_4$ groups the stacking of the layers differs from that in Cu$_2$SO$_4$ leading to the lower monoclinic symmetry of crystalline H$_2$SO$_4$ (space group C2/c, Z=4) (Yu and Nak, J. Cryst. Mol. Struct. 8, 193 (1979)). The structure of Cu$_2$SO$_4$ can be regarded as being intermediate between the structures of Ag$_2$SO$_4$ and H$_2$SO$_4$. 