

Poster Presentation

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Crystal Chemistry of Some Natural Phosphates Containing Mixed Anionic Radicals

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Sulfates and phosphates consisting of mixed anionic radicals (or heteropolyhedral units) constitute a large group of mineral species. In this contribution, we will summarize our recent results on some novel or poorly studied minerals, whose structures are based upon octahedral-tetrahedral structural units. During investigations of secondary pegmatite phosphates from Hagendorf (Germany), we have located a new whiteite-jahnsite-group mineral that was named whiteite-(CaMnMn). Its structure is formed by alternating anionic layers composed from MO_6 octahedra and PO_4 tetrahedra, and linked together through M(2) cations and water molecules. The crystal structure of bonshtedtite, $\text{Na}_3\text{Fe}(\text{PO}_4)(\text{CO}_3)$, is similar to that of the other minerals of the bradleyite group. It is based upon the $[\text{Fe}(\text{PO}_4)(\text{CO}_3)]^{3-}$ layers oriented parallel to (001). Refinement of the crystal structure of girvasite at 110 K allowed to determine positions of H atoms and to reveal the hydrogen bonding scheme. The refinement confirmed that the proper chemical formula of the mineral should be written as $\text{NaCa}_2\text{Mg}_3(\text{PO}_4)_4(\text{CO}_3)(\text{H}_2\text{O})_6$, in contrast to the formula $\text{NaCa}_2\text{Mg}_3(\text{PO}_4)_2[\text{PO}_2(\text{OH})_2](\text{CO}_3)(\text{OH})_2(\text{H}_2\text{O})_4$ proposed in the original works. The crystal structure of cattite, $\text{Mg}_3(\text{PO}_4)_2(\text{H}_2\text{O})_{22}$ contains two symmetrically independent Mg sites, tetrahedrally coordinated by water molecules to form octahedral complexes $[\text{Mg}(\text{H}_2\text{O})_6]$. The crystal structure of vendidaite, $\text{Al}_2(\text{SO}_4)(\text{OH})_3\text{Cl}(\text{H}_2\text{O})_6$, contains one symmetrically independent Al site coordinated by three OH groups and three H₂O molecules. Together with the $[\text{Al}_2(\text{OH})_3(\text{H}_2\text{O})_6]^{3+}$ chains, Cl⁻ anions and $(\text{SO}_4)^{2-}$ groups form pseudo-layers parallel to (010). Steklite, $\text{KAl}(\text{SO}_4)_2$, was first described as a technogenic phase in products of burning coal dumps (Chelyabinsk region, Russia). Steklite of natural origin was found in sublimes of the Yadovitaya (Poisonous) fumarole of the Second scoria cone of the Northern Breakthrough of the Great Tolbachik Fissure Eruption, Kamchatka, Russia.

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