Oral presentation

Discovery and characterization of a new aluminium phosphate sulfate mineral

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A new mineral with the composition $Al_2(PO_4)(SO_4)(OH,F)(H_2O).6H_2O$ was found on the dump of the Lichtenberg open cast, Ronneburg, Thuringia, Germany. In the open cast and surrounding mines uranium bearing alumn shale was mined from 1950"s to 1990"s. The Ronneburg mining area was one of the largest uranium producers in Europe. The new mineral is an alteration product and was formed on the mine dump. It forms white aggregates of irregular intergrown, tiny acicular crystals of less than 0.1 mm in length. Despite that it was found only in small amounts, the crystal structure could be determined from laboratory powder diffraction data. This new mineral exhibits *P*-1 symmetry and lattice parameters a = 6.129 Å, b = 9.856 Å, c = 11.433 Å, α=70.284°, β=85.84°, γ=82.557° and V = 644.36 Å^3. For Z = 2, the calculated density is 2.09 g/cm^3. It is structurally related to sanjuanite, $Al_2(PO_4)(SO_4)(OH).9H_2O$ [1], and arangasite, $Al_2(PO_4)(SO_4)F.9H_2O$ [2]. However, despite very similar chemical formulae, this new mineral is not isotypic with those related minerals. The crystal structure is shown in Fig. 1 and it displays a layered structure of chains of AlO_6 octahedra and PO_4 tetrahedra. These units forming channels parallel to the a axis. The SO_4 tetrahedra are situated close to the chains but probably linked to it only by hydrogen bonds. There are 6 molecules of crystallization water and one water molecule per formula unit is occupying the channels in the structure. The 2 different types of water are further confirmed by DSC/TGA measurements. Very similar aluminophosphate chains were found in sanjuanite [1].

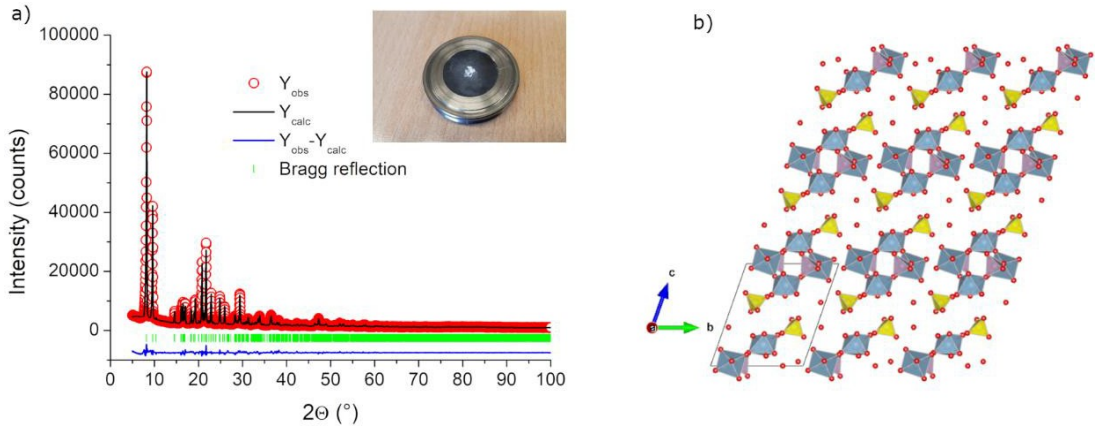

Figure 1. a) Rietveld refinement of $Al_2(PO_4)(SO_4)(OH,F)(H_2O).6H_2O$ (Rwp = 5.3%, the inset shows the low amount of sample loaded on a zero background holder) and b) the corresponding crystal structure projected along the a axis.

[1] Colombo, F., Rius, J., Pannunzio-Miner, E.V., Pedregosa, J.C., Camí, G.E., Carbonio, R.E. (2011) *The Canadian Mineralogist* **49**, 835.

[2] Yakubovich, O. V., Steele, I. M., Chernyshev, V. V., Zayakina, N. V., Gamyanin, G. N., Karimova, O. V. (2014) *Mineralogical Magazine* **78**, 889.