Poster Presentation

MS67.P06

A novel layered aluminophosphate with corner-sharing AlO_6 chains

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The synthesis, Raman spectroscopy and crystal structure of a novel layered aluminophosphate is described. The new phase was derived by the sol-gel method starting from a modified low hydrothermal ALPO4-34 zeolite synthesis procedure[1].The structure was solved by direct methods using single-crystal X-ray diffraction. The synthesized layered material, with composition $[AlPO_3(OH)F(H_2O)]$-(H_9C_4ON), crystallizes in the monoclinic space group $P2_1/a$ with a = 9.2282(5) Å, b = 6.9152(4) Å, c = 14.4615(9) Å, β = 101.57(1)°. Layered aluminophosphates with AlO_6 polyhedra have been previously described [2], although in these compounds Al octahedral share edges. The novel compound has corner sharing $AlO_4F(H_2O)$ chains along [010], where fluorine is at the shared apex, four oxygen atoms are shared with PO_4 tetrahedra and the fifth oxygen is a H_2O group. This kind of aluminophosphate chains is found in nature in tancoite [3]. Chains are linked along [100] through corner sharing with a PO_4 group of the adjacent chain plus hydrogen bonding of the H_2O group. Layers are stacked along c* through hydrogen bonding with a double layer of morpholine (H_9C_4ON) molecules. The chemical stability field of the novel materialis strongly dependent from the fluorine/aluminum ratio of the starting gel. At lower fluorine concentrations only ALPO4-34 and/or $AlPO_4$ (berlinite) are stable depending on the morpholine content. Crystals growth morphology depends on the supersaturation conditions of the starting gel: at low concentrations crystals are well developed hexagonal like plate shaped and are very thin. At higher concentrations they show a more elongated morphology. A treatment with H_2CO_3 leads to a complete morpholine removal, as shown by in situ Raman spectroscopy. Powder X-ray diffraction reveals that after morpholine extraction, the material diffract still coherently in two dimensions while a strong broadening is shown for basal planes.

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Keywords: aluminophosphate, morpholine, crystal-structure