

Rossiantonite, $\text{Al}_3(\text{PO}_4)(\text{SO}_4)_2(\text{OH})_2(\text{H}_2\text{O})_{10} \cdot 4\text{H}_2\text{O}$, a new hydrated aluminum phosphate-sulfate mineral from Chimanta massif, Venezuela: Description and crystal structure

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ABSTRACT

Rossiantonite, ideally $\text{Al}_3(\text{PO}_4)(\text{SO}_4)_2(\text{OH})_2(\text{H}_2\text{O})_{10} \cdot 4\text{H}_2\text{O}$, triclinic (space group $P\bar{1}$), $a = 10.3410(5)$, $b = 10.9600(5)$, $c = 11.1446(5)$ Å, $\alpha = 86.985(2)$, $\beta = 65.727(2)$, $\gamma = 75.064(2)^\circ$, $V = 1110.5(1)$ Å³, $Z = 2$, is a new mineral from the Akopan-Dal Cin cave system in the Chimanta massif (Guyana Shield, Venezuela). The mineral occurs as small (≤ 0.15 mm) and transparent crystals in a white to slightly pink fine-grained sand, filling spaces between boulders of weathered quartz sandstone. Associated phases are gypsum, sanjuanite, rare alunite, quartz and micro-spherules of amorphous silica.

Rossiantonite is colorless with a white streak and vitreous luster. The mineral is brittle with irregular to sub-conchoidal fracture and it shows a poorly developed cleavage. Rossiantonite is biaxial and not pleochroic, with mean refractive index of 1.504.

The calculated density is 1.958 g/cm³. Electron microprobe analyses, with H₂O measured by thermogravimetric analysis, provided the following empirical formula based on 28 O apfu: $\text{Al}_{2.96}\text{Fe}_{0.03}\text{P}_{1.01}\text{S}_2\text{H}_{30.02}\text{O}_{28}$. The five strongest lines in the X-ray powder diffraction pattern, expressed as d (Å), I , (hkl) are: 4.647, 100, (210); 9.12, 56, (100); 4.006, 53, (220); 8.02, 40, (110); 7.12, 33, (011).

The crystal structure, refined using 3550 unique reflections to $R = 0.0292$, is built of PO_4 and AlO_6 polyhedral rings, creating complex chains parallel **b** by sharing the OH-OH edge belonging to the $\text{Al}(3)$ polyhedron. Three symmetrically independent Al sites can be identified, namely: $\text{Al}(1)$, $\text{Al}(2)$, and $\text{Al}(3)$. Tetrahedral sites, occupied by P, share all their apexes with AlO_6 octahedra. Unshared octahedral apexes are occupied by water molecules. Four additional water molecules are placed in between the previously identified chains. Two oxygen tetrahedra, occupied by S atoms, are connected along the chains by means of weak hydrogen bonding. The rossiantonite structure shows similarities with minerals belonging to the sanjuanite-destinezite group.

Keywords: Rossiantonite, aluminum-phosphate-sulfate, Chimanta massif, crystal chemistry, crystal structure