

Plumbophyllite, a new species from the Blue Bell claims near Baker, San Bernardino County, California

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ABSTRACT

The new mineral plumbophyllite, $\text{Pb}_2\text{Si}_4\text{O}_{10}\cdot\text{H}_2\text{O}$, is orthorhombic with space group *Pbcn* and cell parameters $a = 13.2083(4)$, $b = 9.7832(3)$, $c = 8.6545(2)$ Å, $V = 1118.33(5)$ Å³, and $Z = 4$. It occurs as colorless to pale blue prismatic crystals to 3 mm, with wedge-shaped terminations at the Blue Bell claims, about 11 km west of Baker, San Bernardino County, California. It is found in narrow veins in a highly siliceous hornfels in association with cerussite, chrysocolla, fluorite, goethite, gypsum, mimetite, opal, plumbotsumite, quartz, sepiolite, and wulfenite. The streak is white, the luster is vitreous, the Mohs hardness is about 5, and there is one perfect cleavage, {100}. The measured density is 3.96(5) g/cm³ and the calculated density is 3.940 g/cm³. Optical properties (589 nm): biaxial (+), $\alpha = 1.674(2)$, $\beta = 1.684(2)$, $\gamma = 1.708(2)$, $2V = 66(2)^\circ$, dispersion $r > v$ (strong); $X = b$, $Y = c$, $Z = a$. Electron microprobe analysis provided PbO 60.25, CuO 0.23, SiO₂ 36.22 wt%, and CHN analysis provided H₂O 3.29 wt% for a total of 99.99 wt%. Powder IR spectroscopy confirmed the presence of H₂O and single-crystal IR spectroscopy indicated the H₂O to be oriented perpendicular to the *b* axis. Raman spectra were also obtained. The strongest powder X-ray diffraction lines are [*d* (*hkl*) *J*]: 7.88(110)97, 6.63(200)35, 4.90(020)38, 3.623(202)100, 3.166(130)45, 2.938(312/411/222)57, 2.555(132/213)51, and 2.243(521/332)50. The atomic structure ($R_1 = 2.04\%$) consists of undulating sheets of silicate tetrahedra between which are located Pb atoms and channels containing H₂O (and Pb²⁺ lone-pair electrons). The silicate sheets can be described as consisting of zigzag pyroxene-like (SiO₃)_n chains joined laterally into sheets with the unshared tetrahedral apices in successive chains pointed alternately up and down, a configuration also found in pentagonite.

Keywords: Plumbophyllite, new mineral, phyllosilicate, crystal structure, Blue Bell claims, California, IR spectroscopy, Raman spectroscopy