

Pomite and pseudopomite, two new carbonate-encapsulating mixed-valence polyoxovanadate minerals

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ABSTRACT

Pomite (IMA2021-063), ideally $\text{Ca}_3[\text{V}_5^{4+}\text{V}_{10}^{5+}\text{O}_{37}(\text{CO}_3)] \cdot 37\text{H}_2\text{O}$, and pseudopomite (IMA2021-064), ideally $\text{Ca}_{3.5}[\text{V}_6^{4+}\text{V}_9^{5+}\text{O}_{37}(\text{CO}_3)] \cdot 32\text{H}_2\text{O}$, are two new polyoxometalate minerals from the Blue Streak mine, Bull Canyon, Montrose County, Colorado, U.S.A. Pomite properties: striated blades up to ~1 mm long; very dark green-blue color; green-blue streak; vitreous luster; brittle; Mohs hardness ≈ 2 ; irregular, splintery fracture; good cleavages on {010} and {001}; 2.19(2) g/cm⁻³ density; refractive indices in the vicinity of 1.70; weakly birefringent with little or no pleochroism. Pseudopomite properties: striated prisms and blades up to ~1 mm; very dark blue-green color; blue-green streak; vitreous luster; brittle; Mohs hardness ≈ 2 ; curved, irregular fracture; probably two fair cleavages, {100} and {001}; 2.40(2) g/cm⁻³ density; refractive indices in the vicinity of 1.72; no discernable birefringence or pleochroism. Electron microprobe analyses provided the empirical formulas $\text{Ca}_{3.11}[\text{V}_{3.23}^{4+}\text{V}_{9.77}^{5+}\text{O}_{37}(\text{CO}_3)] \cdot 37\text{H}_2\text{O}$ and $\text{Ca}_{3.49}[\text{V}_{3.98}^{4+}\text{V}_{9.02}^{5+}\text{O}_{37}(\text{CO}_3)] \cdot 29\text{H}_2\text{O}$ for pomite and pseudopomite, respectively. Pomite is triclinic, $P\bar{1}$, with $a = 12.3668(10)$, $b = 12.9692(12)$, $c = 22.068(2)$ Å, $\alpha = 99.038(7)$, $\beta = 95.689(7)$, $\gamma = 103.249(7)^\circ$, $V = 3368.7(5)$ Å³, and $Z = 2$. Pseudopomite is triclinic, $P\bar{1}$, with $a = 12.2910(18)$, $b = 12.6205(15)$, $c = 20.917(3)$ Å, $\alpha = 77.381(6)$, $\beta = 85.965(5)$, $\gamma = 64.367(7)^\circ$, $V = 2853.6(7)$ Å³, and $Z = 2$. The crystal structures of both minerals (pomite, $R_1 = 0.103$; pseudopomite, $R_1 = 0.116$) contain a novel $[\text{V}_x^{4+}\text{V}_{15-x}^{5+}\text{O}_{37}(\text{CO}_3)]^{(1+x)-}$ heteropolyanion, which is unique in natural and synthetic materials but has similarities to the $[\text{V}_8^{4+}\text{V}_7^{5+}\text{O}_{36}(\text{CO}_3)]^{7-}$ and $[\text{H}_8\text{V}_{15}^{4+}\text{O}_{36}(\text{CO}_3)]^{6-}$ heteropolyanions reported in synthetic phases.

Keywords: Pomite, pseudopomite, new mineral, crystal structure, polyoxometalate, vanadate, carbonate encapsulation, Blue Streak mine, Montrose County, Colorado, U.S.A.