

Hoperanchite, $(\text{NH}_4)_2(\text{S}_2\text{O}_3)$, a new mineral from an active vent in a burning bituminous shale

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ABSTRACT

Hoperanchite (IMA2024-017), $(\text{NH}_4)_2(\text{S}_2\text{O}_3)$, is a newly approved mineral species from an active vent in a burning bituminous shale at Hope Ranch, Santa Barbara County, California, U.S.A. Hoperanchite occurs as tabular crystals up to about 0.3 mm in diameter. Tablets are flattened on $\{001\}$ and exhibit the forms $\{100\}$, $\{010\}$, $\{0\bar{1}0\}$, $\{110\}$, and $\{\bar{1}\bar{1}0\}$. The mineral is colorless and transparent with a vitreous luster and white streak. The Mohs hardness is $\sim 2\frac{1}{2}$. The mineral has brittle tenacity, irregular fracture, and one good cleavage on $\{001\}$. The measured density is $1.68(2) \text{ g}\cdot\text{cm}^{-3}$. The mineral dissolves instantly in H_2O at room temperature. The mineral is optically biaxial (+), $\alpha = 1.602(2)$, $\beta = 1.616(2)$, $\gamma = 1.634(2)$ (white light); $2V_{\text{meas}} = 84(2)^\circ$; orientation $Y = \mathbf{b}$, $X \wedge \mathbf{a} = 20^\circ$ in obtuse β ; nonpleochroic. Electron microprobe analysis provided the empirical formula $\text{N}_{1.89}\text{H}_{7.40}\text{S}_{1.97}\text{O}_3$. Hoperanchite is monoclinic, $C2$, $a = 10.2313(5)$, $b = 6.4998(3)$, $c = 8.8098(6) \text{ \AA}$, $\beta = 94.611(7)^\circ$, $V = 583.97(6) \text{ \AA}^3$, and $Z = 4$. The crystal structure ($R_1 = 0.0325$ for 1176 $I > 2\sigma_I$ reflections) is the same as that of synthetic $(\text{NH}_4)_2(\text{S}_2\text{O}_3)$. Hoperanchite is the first thiosulfate mineral that does not contain essential Pb.

Keywords: Hoperanchite, new mineral, thiosulfate, crystal structure, Raman spectroscopy, infrared spectroscopy, Hope Ranch, Santa Barbara County, California