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Lead-tellurium oxysalts from Otto Mountain near Baker, California: VI. Telluroperite, $Pb_3Te^{4+}O_4Cl_2$, the Te analog of perite and nadorite

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Abstract

Telluroperite, $Pb_3Te^{4+}O_4Cl_2$, is a new tellurite from Otto Mountain near Baker, California. The new mineral occurs on fracture surfaces and in small vugs in brecciated quartz veins in direct association with acanthite, bromine-rich chlorargyrite, caledonite, cerussite, galena, goethite, and linarite. Various other secondary minerals occur in the veins, including six new tellurates, housleyite, markcooperite, paratimroseite, ottoite, thorneite, and timroseite. Telluroperite is orthorhombic, space group *Bmmb*, a = 5.5649(6), b = 5.5565(6), c = 12.4750(14) Å, V = 386.37(7) Å^3, and Z = 2. The new mineral occurs as rounded square tablets and flakes up to 0.25 mm on edge and 0.02 mm thick. The form {001} is prominent and is probably bounded by {100}, {010}, and {110}. It is bluish-green and transparent, with a pale bluish-green streak and adamantine luster. The mineral is non-fluorescent. Mohs hardness is estimated to be between 2 and 3. The mineral is brittle, with a curved fracture and perfect {001} cleavage. The calculated density based on the empirical formula is 7.323 g/cm^3. Telluroperite is biaxial (–), with very small $2V$ (~10°). The average index of refraction is 2.219 calculated by the Gladstone-Dale relationship. The optical orientation is X = **c** and the mineral exhibits moderate bluish-green pleochrosim; absorption: $X < Y = Z$. Electron microprobe analysis provided PbO 72.70, TeO_2 19.26, Cl 9.44, O≡Cl –2.31, total 99.27 wt%. The empirical formula (based on O+Cl = 6) is $Pb_{2.79}Te^{4+}_{1.03}O_{3.72}Cl_{2.28}$. The six strongest powder X-ray diffraction lines are [d_{obs} in Å (*hkl*) I]: 3.750 (111) 58, 2.857 (113) 100, 2.781 (020, 200) 43, 2.075 (024, 204) 31, 1.966 (220) 30, and 1.620 (117, 313, 133) 52. The crystal structure (R_1 = 0.056) is based on the Sillén X_1 structure-type and consists of a three-dimensional structural topology with lead-oxide halide polyhedra linked to tellurium/lead oxide groups. The mineral is named for the relationship to perite and the dominance of Te (with Pb) in the Bi site of perite.

Keywords: Telluroperite, new mineral, tellurite, crystal structure, perite, nadorite, Sillén X_1, Otto Mountain, California