Lead-tellurium oxysalts from Otto Mountain near Baker, California: II. Housleyite, Pb₆CuTe₄O₁₈(OH)₂, a new mineral with Cu-Te octahedral sheets

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ABSTRACT

Housleyite, Pb₆CuTe₄O₁₈(OH)₂, is a new tellurate from Otto Mountain near Baker, California, named in honor of Robert M. Housley. The new mineral occurs on fracture surfaces and in small vugs in brecciated quartz veins. Housleyite is directly associated with acanthite, cerussite, gold, iodargyrite, khinite-4O, wulfenite, and three other new tellurates: markcooperite, ottoite, and thorneite. A variety of other secondary minerals occur in the veins, including three other new secondary tellurium minerals, paratimroseite, telluroperite, and timroseite. Housleyite is monoclinic, space group P2₁/n, a = 7.8552(5), b = 10.4836(7), c = 11.0426(8) Å, β = 95.547(2)°, and Z = 2. Crystals are prismatic to bladed with elongation parallel to b and typically occur in bow tie-like aggregates, dusty balls, and irregular sprays. It is pale to medium greenish blue and transparent, with pale blue streak and adamantine luster. Mohs hardness is estimated at 3. The mineral is brittle, with an irregular fracture. Cleavage was not observed, but is likely on {10T}. The calculated density is 7.845(1) g/cm³. Housleyite is biaxial (+), with 2V = 50° to 60° and strong inclined dispersion, r > v, but indices of refraction are too high to be measured. The optic orientation is Y = b, Z = c = 40° in obtuse β and pleochroism is Y (medium green-blue) > Z (light green-blue) > X. Energy dispersive spectroscopy provided PbO 62.53, CuO 3.77, TeO₂ 32.85, H₂O 0.84 (structure), total 99.99 wt%; the empirical formula (based on O = 20) is Pb₆Cu₆Te₄O₁₈(OH)₂. The strongest powder X-ray diffraction lines are [d(obs) in Å (hkl) I]: 3.336 (202, 031, 122) 69, 3.292 (113) 50, 3.195 (130, 103) 100, 3.068 (221, 202) 47, 3.007 (023) 49, 2.942 (032, 212) 80, 2.723 (132, 132) 29, 2.580 (230, 301, 231) 38. The crystal structure (R₁ = 0.028) consists of corner-sharing chains of Te₆O₁₈ octahedra along [101] linked into slabs parallel to {10T} by sharing edges and corners with strongly Jahn-Teller (4+2) distorted and severely skewed CuO₆ octahedra. Lead (Pb) atoms in lopsided nine- and elevenfold coordinations form additional links within and between the octahedral sheets.

Keywords: Housleyite, new mineral, tellurate, crystal structure, Otto Mountain, California

INTRODUCTION

Housleyite, Pb₆CuTe₄O₁₈(OH)₂, is one of seven new secondary tellurium minerals discovered recently at Otto Mountain near Baker, California. Detailed information on the mining history, geology, mineralogy, and mineral paragenesis of the deposit, as well as the discovery of the new minerals, is provided in Kampf et al. (2010b).

Housleyite is named in honor of Robert M. Housley (b. 1934), Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California, U.S.A. Robert Housley’s scientific career in experimental solid-state physics and materials characterization has spanned nearly five decades. While much of his professional work has focused on planetary/meteoritic materials, he has always had a strong interest in terrestrial mineralogy. In recent years, his personal mineral collecting efforts have brought to light many unusual occurrences of rare minerals in southern California and surrounding areas. His chemical analytical work has served to identify and characterize several new minerals. He has been very involved in work on the unusual secondary tellurium mineral assemblages in the mine workings on Otto Mountain near Baker, California. Robert Housley has agreed to the naming of the mineral in his honor. The new mineral and name have been approved by the Commission on New Minerals, Nomenclature and Classification of the International Mineralogical Association (IMA 2009-024). Three cotype specimens are deposited in the Natural History Museum of Los Angeles County, catalog numbers 62261, 62262, and 62263.

OCCURRENCE

Housleyite was found at the Aga mine, (35° 16.399′N 116° 05.665′W) on Otto Mountain, ~2 km northwest of Baker, San Bernardino County, California, U.S.A., and in the Bird Nest drift on the southwest flank of Otto Mountain 0.7 km northwest of the Aga mine (35° 16.606′N 116° 05.956′W).