

# Hydrotungstite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . Platy crystals bounded by {210}, {100}, and {010}, to 75  $\mu\text{m}$ , in fine reticulated intergrowths. *Twinning:* On {210}, polysynthetic, may be gridlike, universal.

**Physical Properties:** *Cleavage:* {010}, imperfect. Hardness = 2  $D(\text{meas.}) = 4.60$   
 $D(\text{calc.}) = [4.66]$

**Optical Properties:** Semitransparent. *Color:* Dark green, becoming yellowish on exposure to air. *Luster:* Vitreous to dull.

*Optical Class:* Biaxial (-). *Pleochroism:*  $X$  = colorless;  $Y$  = yellow-green;  $Z$  = dark green. *Orientation:*  $Y = b$ ;  $X \wedge c = 3^\circ$ . *Dispersion:*  $r < v$ . *Absorption:*  $Z > Y > X$ .  $\alpha = 1.70(2)$   
 $\beta = 1.95(2)$   $\gamma = 2.04(2)$   $2V(\text{meas.}) = \sim 52^\circ$

**Cell Data:** *Space Group:*  $P2_1/m$  (probable).  $a = 7.379(5)$   $b = 6.901(5)$   $c = 3.748(5)$   
 $\beta = 90^\circ 22(10)'$   $Z = 2$

**X-ray Powder Pattern:** San Antonio mine, Bolivia.  
6.95 (vvs), 3.27 (vs), 3.73 (s), 3.46 (ms), 1.96 (ms), 2.63 (m), 2.54 (m)

| Chemistry:                     | (1)   | (2)      | (3)    |
|--------------------------------|-------|----------|--------|
| WO <sub>3</sub>                | 80.31 | 86.47    | 86.55  |
| SiO <sub>2</sub>               | 6.65  |          |        |
| Fe <sub>2</sub> O <sub>3</sub> | 0.08  |          |        |
| H <sub>2</sub> O               | 12.52 | 13.53    | 13.45  |
| Total                          | 99.56 | [100.00] | 100.00 |

(1) Calacalani mine, Bolivia. (2) Analysis (1), recalculated to 100% after deduction of ferberite and quartz. (3)  $\text{WO}_2(\text{OH})_2 \cdot \text{H}_2\text{O}$ .

**Occurrence:** An alteration product of ferberite in the oxidized zone of a hydrothermal tungsten deposit, where it was an ore mineral (Calacalani mine, Bolivia).

**Association:** Ferberite, tungstite.

**Distribution:** In Bolivia, from the Oruro district, at the San Antonio de Calacalani mine, near Colquiri, and in the Juliani mine. At Panasqueira, Portugal. From the Grancarica scheelite deposit, southwest of Velingrad, Bulgaria.

**Name:** For its content of H<sub>2</sub>O and relation to *tungstite*.

**Type Material:** Harvard University, Cambridge, Massachusetts, 98896; National Museum of Natural History, Washington, D.C., USA, 104901.

**References:** (1) Kerr, P.F. and F. Young (1944) Hydrotungstite, a new mineral from Oruro, Bolivia. *Amer. Mineral.*, 29, 192–210. (2) Mitchell, R.S. (1963) X-ray data for hydrotungstite. *Amer. Mineral.*, 48, 935–939. (3) Sahama, T.G. and M. Lehtinen (1971) Refinement of the X-ray data for hydrotungstite from Calacalani, Bolivia. *Bull. Geol. Soc. Finland*, 43, 89–91. (4) Sahama, T.G. (1981) The secondary tungsten minerals, a review. *Mineral. Record*, 12, 81–87.