

Yttrotungstite-(Y)**YW₂O₆(OH)₃**

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Crystal Data: Monoclinic, pseudo-orthorhombic. *Point Group:* 2/*m*. Lathlike crystals, flattened on {100} and elongated along [001], with {110} and very rare {101}, to 0.2 mm, in druses; typically earthy. *Twining:* On {100}, probably universal, as contact twins.

Physical Properties: *Cleavage:* {010}, good; on {10 $\bar{1}$ }, probable, very poor. Hardness = n.d. D(meas.) = 5.96 D(calc.) = [5.98]

Optical Properties: Semitransparent. *Color:* Pale yellow.

Optical Class: Biaxial (-). *Pleochroism:* X = pale yellow; Y = Z = dark yellow. *Orientation:* Z = b; X $\wedge$ c = 26°. α = 1.89 β = 1.98 γ = 2.02 2V(meas.) = 68° 2V(calc.) = 65°

Cell Data: *Space Group:* P2₁/*m*. *a* = 6.954(6) *b* = 8.637(9) *c* = 5.771(6) β = 104°56(4)' Z = 2

X-ray Powder Pattern: Kramat Pulai mine, Malaysia.

4.69 (vvs), 3.26 (vvs), 2.028 (vs), 6.73 (ms), 3.36 (ms), 2.869 (ms), 2.790 (ms)

Chemistry:

	(1)	(2)	(3)
WO ₃	71.45	71.64	76.82
SiO ₂	0.37	0.34	
TiO ₂	0.01		
Al ₂ O ₃	0.87	0.90	
Y ₂ O ₃	10.29		18.70
RE ₂ O ₃	11.24	20.58	
Fe ₂ O ₃	0.36	0.09	
MgO	0.17	0.37	
CaO	0.32	0.77	
H ₂ O ⁺	4.96	4.88	4.48
H ₂ O ⁻	0.07	0.20	
Total	100.11	99.77	100.00

(1) Kramat Pulai mine, Malaysia; Y₂O₃ + RE₂O₃ normalized from a detailed analysis totaling 18.96% to the 21.53% total determined here, to give: La₂O₃ 0.28%, Ce₂O₃ 2.06%, Pr₂O₃ 0.33%, Nd₂O₃ 2.33%, Sm₂O₃ 0.76%, Gd₂O₃ 1.27%, Tb₂O₃ 0.23%, Dy₂O₃ 1.38%, Er₂O₃ 1.15%, Tm₂O₃ 0.14%, Yb₂O₃ 1.18%, Lu₂O₃ 0.13%; then corresponding to (Y_{0.55}RE_{0.38}Ca_{0.04}Mg_{0.02}) Σ =0.99 (W_{1.85}Al_{0.10}Si_{0.04}Fe_{0.03}) Σ =2.02O₆(OH)₃. (2) Do.; corresponding to (RE_{0.95}Ca_{0.08}Mg_{0.06}) Σ =1.09 (W_{1.87}Al_{0.10}Fe_{0.03}) Σ =2.00O_{5.72}(OH)_{3.28}. (3) YW₂O₆(OH)₃.

Occurrence: In eluvial cassiterite mines, probably altered from wolframite or scheelite.

Association: Kaolinite, quartz, muscovite, hydrobiotite, hematite, cassiterite, tourmaline, scheelite, rutile, stolzite, raspite, plagioclase, gypsum.

Distribution: From the Kramat Pulai mine and at Tapah, Kinta district, Perak, Malaysia.

Name: For YTTRIum and TUNGSTen in the composition.

Type Material: n.d.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 1097 [thorotungstite = yttrotungstite]. (2) Sahama, T.G., O. von Knorring, and M. Lehtinen (1970) Cerotungstite, a cerian analogue to yttrotungstite, from Uganda. Bull. Geol. Soc. Finland, 42, 223–228. (3) Davis, R.J. and G.W. Smith (1971) Yttrotungstite. Mineral. Mag., 38, 261–285.