Khinite $Cu^{2+}_3PbTe^{6+}O_6(OH)_2$

Crystal Data: Orthorhombic or hexagonal. *Point Group*: 2/m 2/m 2/m or 32. Crystals are dipyramidal to prismatic, to 0.5 mm. *Twinning*: Sectorial twinning observed in polarized light.

Physical Properties: *Cleavage*: On {001}, excellent. *Tenacity*: Brittle. Hardness = 3.5
D(meas.) = 6.5-7.0 D(calc.) = 6.29

Optical Properties: Translucent. *Color*: Dark green, bottle-green. *Streak*: Green. *Luster*: Vitreous.
Optical Class: Biaxial (+) [-4*O*]. $\alpha = 2.110(4)$ $\beta = 2.112(4)$ $\gamma = 2.165(4)$ 2V(meas.) = 20°
Pleochroism: *X* = emerald-green; *Y* = *Z* = yellowish green. *Absorption*: *Z* = *Y* > *X*.
Optical Class: Uniaxial (–) [-3*T*]. $\omega = 2.155$ $\varepsilon = 2.120$ *Dispersion*: Strong. *Absorption*: *O* > *E*.
Pleochroism: *O* = yellowish green; *E* = emerald-green.

Cell Data: *Space Group*: *Fdd*2. $a = 5.7491(10)$ $b = 10.0176(14)$ $c = 24.022(3)$ $Z = 8$
Space Group: *P*32. $a = 5.765(2)$ $c = 18.001(9)$ $Z = 3$

X-ray Powder Pattern: Tombstone, Arizona, USA.
2.491 (10), 3.451 (9), 4.866 (8), 2.996 (7), 2.204 (7), 2.818 (6), 1.916 (6) [-4*O*]
3.336 (10), 2.490 (10), 4.800 (8), 1.558 (8), 2.913 (7), 2.245 (6), 1.997 (5) [-3*T*]

Chemistry:

	(1)	(2)	(3)
TeO_3	24.5	26.4	26.79
CuO	33.2	35.8	36.41
PbO	32.4	35.0	34.05
H_2O		[2.75]	2.75
Total		[100.0]	100.00

(1) Tombstone, Arizona, USA; insoluble quartz and chlorargyrite present but in an amount too small to be weighed. (2) Analysis (1) recalculated to 100.0% with theoretical H_2O as determined by crystal-structure analysis; corresponding to $Pb_{1.04}Cu_{3.00}Te_{1.00}O_6(OH)_2$. (3) $PbCu_3TeO_6(OH)_2$.

Polymorphism & Series: Polytypes -4*O* and -3*T* [formerly parakhinite].

Occurrence: A very rare secondary mineral formed under acid oxidizing conditions from gold-telluride ores in massive vein quartz.

Association: Chlorargyrite, dugganite, quetzalcoatlite, tlapallite, gold, chrysocolla, tenorite, quartz (Tombstone); mojaveite, cerussite, chrysocolla, perite, quartz (Aga mine); mojaveite, andradite, chrysocolla, cerussite, burckhardtite, galena, goethite, mcalpineite, thorneite, timroseite, paratimroseite, quartz, wulfenite (Bird Nest drift); acanthite, cerussite, gold, iodargyrite, wulfenite, markcooperite, ottoite, thorneite (Otto Mountain).

Distribution: From the dump of the Old Guard mine, and at the Lucky Cuss, Emerald, and Empire mines, Tombstone, Cochise Co., Arizona, and at the Aga mine and the Bird Nest drift, Mojave Desert, and at Otto Mountain, near Baker, California, USA.

Name: Honors BaSaw Khin (b. 1931), Burmese-American mineralogist, Phelps Dodge Corporation.

Type Material: The Natural History Museum, London, England, 1980,541 and 1980,543; National Museum of Natural History, Washington, D.C., USA, 164352.

References: (1) Williams, S.A. (1978) Khinite, parakhinite, and dugganite, three new tellurates from Tombstone, Arizona. Amer. Mineral., 63, 1016-1019. (2) Hawthorne, F.C., M.A. Cooper, and M.E. Back (2009) Khinite-4*O* [= khinite] and khinite-3*T* [= parakhinite]. Can. Mineral., 47, 473-476. (3) Cooper, M.A., F.C. Hawthorne, and M.E. Back (2008) The crystal structure of khinite and polytypism in khinite and parakhinite. Mineral. Mag., 72, 763-770. (4) Mills, S.J., A.R. Kampf, A.G. Christy, R.M. Housley, G.R. Rossman, R.E. Reynolds and J. Marty (2014) Bluebellite and mojaveite, two new minerals from the central Mojave Desert, California, USA. Mineral., Mag., 78(5), 1325-1340 [khinite locality]. (5) Kampf, A.R., J. Marty, and B. Thorne (2010) Lead-tellurium

oxysalts from Otto Mountain near Baker, California: II. Housleyite, $Pb_6CuTe_4O_{18}(OH)_2$, a new mineral with Cu-Te octahedral sheets. Amer. Mineral., 95(8-9), 1337-1342 [khinite locality].