Paratimroseite $Pb_2Cu_4(TeO_6)_2(H_2O)_2$

Crystal Data: Orthorhombic. *Point Group*: 222. As blades elongated along [100], flattened on {001}, to 0.1 mm, that exhibit {001}, {010}, {120}, and {100}. Typically, intergrown in irregular clusters or botryoids to 0.2 mm.

Physical Properties: *Cleavage*: Good on {001}. *Tenacity*: Brittle. *Fracture*: Irregular. Hardness = ~3 D(meas.) = n.d. D(calc.) = 6.557

Optical Properties: Transparent. *Color*: Vibrant "neon" green. *Streak*: Very pale green. *Luster*: Dull (botryroids) to adamantine (crystals).
Optical Class: Biaxial (-). Indices of refraction > 2. 2V = Large. *Orientation*: *X* = *c*, *Y* = *b*, *Z* = a. *Pleochroism*: *X* = light green, *Y* = green, *Z* = green. *Absorption*: *Y* = *Z* >> *X*.

Cell Data: *Space Group*: $P2_12_12_1$. a = 5.1943(4) b = 9.6198(10) c = 11.6746(11) Z = 2

X-ray Powder Pattern: Aga mine, Otto Mountain, San Bernardino County, California, USA. 3.029 (100), 4.771 (76), 2.973 (48), 3.544 (44), 2.665 (41), 2.469 (40), 2.246 (34)

Chemistry:

	(1)	(2)
PbO	36.11	38.76
CuO	26.27	27.62
TeO_3	29.80	30.49
Cl	0.04	
H_2O	[3.01]	3.13
- O = Cl	0.01	.
Total	95.22	100.00

(1) Aga mine, Otto Mountain, San Bernardino County, California, USA; average of 4 electron microprobe analyses, H_2O calculated from stoichiometry; corresponds to $Pb_{1.94}Cu^{2+}_{3.96}Te^{6+}_{2.03}O_{12}(H_2O)_{1.99}Cl_{0.01}$. (2) $Pb_2Cu^{2+}_4(Te^{6+}O_6)_2(H_2O)_2$.

Occurrence: A secondary phase on fracture surfaces and in small vugs in quartz veins. Formed from the partial oxidation of primary sulfides (e.g., galena) and tellurides (e.g., hessite) during or following brecciation of the quartz veins. The Cl may be sourced in part from primary phases; however, it is most likely from salty brines interacting with primary tellurides.

Association: Calcite, cerussite, housleyite, khinite-4*O*, markcooperite, timroseite.

Distribution: From the Aga mine, Otto Mountain, ~2 km northwest of Baker, San Bernardino County, California, USA.

Name: A prefix, *para*, for its relationship to *roseite* which honors Timothy (Tim) P. Rose (b. 1960) geochemist at Lawrence Livermore National Laboratory. An avid mineral collector, he collected and provided two of the studied specimens.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (62263 and 62534).

References: (1) Kampf, A.R., S.J. Mills, R.M. Housley, J. Marty, and B. Thorne (2010) Lead-tellurium oxysalts from Otto Mountain near Baker, California: V. Timroseite, $Pb_2Cu^{2+}_5(Te^{6+}O_6)_2(OH)_2$, and paratimroseite, $Pb_2Cu^{2+}_4(Te^{6+}O_6)_2(H_2O)_2$, two new tellurates with Te-Cu polyhedral sheets. Amer. Mineral., 95, 1560-1568.