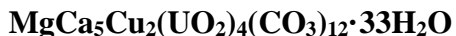


**Paddlewheelite**

**Crystal Data:** Monoclinic. *Point Group:* *m*. As thin tabular crystals flattened on {100}, massive.

**Physical Properties:** *Cleavage:* At least one perfect on {100}. *Fracture:* n.d. *Tenacity:* Brittle. Hardness = ~2 D(meas.) = n.d. D(calc.) = 2.497 Soluble with effervescence in dilute HCl.

**Optical Properties:** Transparent. *Color:* Blue-green. *Streak:* Very pale blue-green.

*Luster:* Sub-adamantine.

*Optical Class:* Biaxial (+).  $\alpha = 1.520(2)$   $\beta = 1.527(2)$   $\gamma = 1.540(2)$   $2V(\text{meas.}) = 72(1)^\circ$

*Pleochroism:*  $X \approx Y =$  blue green,  $Z =$  pale yellow. *Absorption:*  $X \approx Y \gg Z$ .

*Orientation:*  $Z \parallel b$ ,  $X = a$ ,  $Y = c$ . *Dispersion:* Weak,  $r < v$ .

**Cell Data:** Space Group: *Pc*.  $a = 22.052(4)$   $b = 17.118(3)$   $c = 19.354(3)$   $\beta = 90.474(2)^\circ$   $Z = 4$

**X-ray Powder Pattern:** Prokop vein, Svornost mine, Jáchymov District, Bohemia, Czech Republic. 11.12 (100), 7.33 (46), 4.642 (38), 5.54 (37), 4.215 (34), 4.823 (33), 3.717 (33)

<b>Chemistry:</b>	(1)	(2)	(3)
CaO	12.47	10.74	10.21
CuO	2.65	2.28	5.80
FeO	0.01	0.01	
MgO	1.7	1.47	1.47
SiO <sub>2</sub>	0.42	0.36	
UO <sub>3</sub>	49.38	42.97	41.65
CO <sub>2</sub>	[22.8]	19.84	19.23
H <sub>2</sub> O	[25.66]	22.33	21.64
Total	115.09	100.00	100.00

(1) Prokop vein, Svornost mine, Jáchymov District, Bohemia, Czech Republic; average of 6 electron microprobe analyses supplemented by Raman spectroscopy and laser-ablation inductively-coupled-plasma mass spectrometry, CO<sub>2</sub> and H<sub>2</sub>O calculated from structure. (2) Do. Normalized; corresponds to Mg<sub>0.98</sub>Ca<sub>5.16</sub>Cu<sub>0.77</sub>Si<sub>0.16</sub>(UO<sub>2</sub>)<sub>4</sub>(CO<sub>3</sub>)<sub>12</sub>(H<sub>2</sub>O)<sub>33</sub>. (3) MgCa<sub>5</sub>Cu<sub>2</sub>(UO<sub>2</sub>)<sub>4</sub>(CO<sub>3</sub>)<sub>12</sub>·33H<sub>2</sub>O.

**Occurrence:** A secondary oxidation product of uraninite, formed by concomitant dissolution of uraninite, calcite, dolomite, chalcopyrite, and andersonite, in a weathered hydrothermal Ag-Co-Ni-Bi-As±U (five-element vein type) ore deposit.

**Association:** Calcite, dolomite, chalcopyrite, andersonite, uraninite, quartz, hematite, goethite (var. “sammetblende”).

**Distribution:** From the Prokop vein on the 5th level, Svornost (Concord) mine, Jáchymov District, Bohemia, Czech Republic.

**Name:** Alludes to the geometry of uranyl tricarbonate units in the atomic structure, which resemble steamboat “paddle-wheels”.

**Type Material:** Natural History Museum of Los Angeles County, Los Angeles, California, USA (66696).

**References:** (1) Olds, T.A., J. Plášil, A.R. Kampf, F. Dal Bo, and P.C. Burns (2018) Paddlewheelite, a new uranyl carbonate from the Jáchymov District, Bohemia, Czech Republic. *Minerals*, 8(11), 511. (2) (2020) *Amer. Mineral.*, 105(8), 1280-1281 (abs. ref. 1).