

**Althupite****ThAl(UO<sub>2</sub>)<sub>7</sub>O<sub>2</sub>(PO<sub>4</sub>)<sub>4</sub>(OH)<sub>5</sub>•15H<sub>2</sub>O**

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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . As thin tabular crystals, flattened on {100} and terminated by {011} and {021}, to 0.1 mm, and in parallel groups.

**Physical Properties:** Hardness = n.d. D(meas.) = 3.9(1) D(calc.) = 3.98 Radioactive.

**Optical Properties:** Transparent. *Color:* Yellow. *Luster:* Vitreous.

*Optical Class:* Biaxial (-). *Pleochroism:* X = very pale yellow; Y = Z = darker yellow.

*Orientation:* X  $\simeq$  a; Z  $\wedge$  c = 15°. *Dispersion:* r < v, strong.  $\alpha = 1.620(3)$   $\beta = 1.661(2)$   
 $\gamma = 1.665(2)$  2V(meas.) = 31(3)° 2V(calc.) = 34°

**Cell Data:** *Space Group:*  $P\bar{1}$ . a = 10.953(3) b = 18.567(4) c = 13.504(3)  $\alpha = 72.64(2)^\circ$   
 $\beta = 68.20(2)^\circ$   $\gamma = 84.21(2)^\circ$  Z = 2

**X-ray Powder Pattern:** Kobokobo pegmatite, Congo.

10.2 (100), 5.09 (70), 5.80 (50), 4.41 (50), 2.896 (50), 6.67 (40), 4.91 (40)

**Chemistry:**

	(1)	(2)
UO <sub>3</sub>	68.22	68.66
P <sub>2</sub> O <sub>5</sub>	9.86	9.73
ThO <sub>2</sub>	10.25	9.05
Al <sub>2</sub> O <sub>3</sub>	1.75	1.75
H <sub>2</sub> O	[9.92]	10.81
Total	[100.00]	100.00

(1) Kobokobo pegmatite, Congo; by electron microprobe, average of 10 analyses, H<sub>2</sub>O by difference; corresponds to Th<sub>1.16</sub>Al<sub>0.88</sub>(UO<sub>2</sub>)<sub>7.12</sub>O<sub>2</sub>(P<sub>1.07</sub>O<sub>4</sub>)<sub>4</sub>(OH)<sub>5</sub>•15H<sub>2</sub>O.

(2) ThAl(UO<sub>2</sub>)<sub>7</sub>O<sub>2</sub>(PO<sub>4</sub>)<sub>4</sub>(OH)<sub>5</sub>•15H<sub>2</sub>O.

**Occurrence:** A secondary mineral in the uraniferous zone of an altered granite pegmatite.

**Association:** Beryl, columbite, ranunculite, upalite, phuralumite, threadgoldite, mundite, triangulite, meta-autunite.

**Distribution:** At the Kobokobo pegmatite, Lusungu River district, Kivu Province, Congo (Zaire).

**Name:** For the major cations in the composition, ALuminum, THorium, Uranium, Phosphorus.

**Type Material:** Royal Museum of Central Africa, Tervuren, Belgium, RMG6178.

**References:** (1) Piret, P. and M. Deliens (1987) Les phosphates d'uranyle et d'aluminium de Kobokobo IX. L'althupite AlTh(UO<sub>2</sub>)[(UO<sub>2</sub>)<sub>3</sub>O(OH)(PO<sub>4</sub>)<sub>2</sub>]<sub>2</sub>(OH)<sub>3</sub>•15H<sub>2</sub>O, nouveau minéral; propriétés et structure cristalline. Bull. Minéral., 110, 65-72 (in French with English abs.).

(2) (1988) Amer. Mineral., 73, 189-190 (abs. ref. 1).