

Althupite**ThAl(UO₂)₇O₂(PO₄)₄(OH)₅•15H₂O**

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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 ₃ | 68.22 | 68.66 |
| P ₂ O ₅ | 9.86 | 9.73 |
| ThO ₂ | 10.25 | 9.05 |
| Al ₂ O ₃ | 1.75 | 1.75 |
| H ₂ O | [9.92] | 10.81 |
| Total | [100.00] | 100.00 |

(1) Kobokobo pegmatite, Congo; by electron microprobe, average of 10 analyses, H₂O by difference; corresponds to Th_{1.16}Al_{0.88}(UO₂)_{7.12}O₂(P_{1.07}O₄)₄(OH)₅•15H₂O.

(2) ThAl(UO₂)₇O₂(PO₄)₄(OH)₅•15H₂O.

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(UO₂)[(UO₂)₃O(OH)(PO₄)₂]₂(OH)₃•15H₂O, 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).