Uranophane-beta $Ca(UO_2)_2(SiO_3OH)_2 \cdot 5H_2O$

Crystal Data: Monoclinic. *Point Group:* $2/m$. Crystals prismatic by extension on [100], to 5 mm, with square cross sections or flattened on {010}, terminated by large {001}. As subradial to fanlike aggregates, or velvety or bristly coatings. *Twinning:* Common on {001}, contact and penetration.

Physical Properties: *Cleavage:* Perfect on {010}; reported on {001}. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 2.5–3 D(meas.) = 3.90–3.95 D(calc.) = [4.11] Fluoresces faint green under UV; radioactive.

Optical Properties: Transparent to translucent. *Color:* Yellowish green to citron-yellow. *Luster:* Vitreous; also silky, greasy, waxy in aggregates.
Optical Class: Biaxial (–). *Pleochroism:* X = colorless; $Y = Z$ = lemon-yellow. *Orientation:* $X = b$; $Z \wedge c = 26°$. *Dispersion:* $r > v$, strong, crossed. *Absorption:* $Y = Z > X$.
$\alpha = 1.660–1.678$ $\beta = 1.682–1.723$ $\gamma = 1.689–1.730$ 2V(meas.) = 35°–71°

Cell Data: *Space Group:* $P2_1/a$. $a = 13.966(2)$ $b = 15.443(4)$ $c = 6.632(1)$
$\beta = 91.38(2)°$ Z = [4]

X-ray Powder Pattern: Jáchymov, Czech Republic; may convert to uranophane on crushing.
7.83 (100), 3.90 (90), 3.51 (60), 3.19 (50), 2.59 (50), 6.66 (40), 6.15 (40)

Chemistry:

	(1)	(2)
SiO_2	13.11	14.03
UO_3	66.29	66.80
CaO	7.32	6.55
H_2O	12.87	12.62
Total	99.59	100.00

(1) Jáchymov, Czech Republic. (2) $Ca(UO_2)_2(SiO_3OH)_2 \cdot 5H_2O$.

Polymorphism & Series: Dimorphous with uranophane.

Occurrence: A secondary mineral, altering from other uranium minerals under oxidizing conditions.

Association: Uraninite, uranophane.

Distribution: Now known from numerous localities; some for well-characterized material follow. From Jáchymov (Joachimsthal), Czech Republic. At Wölsendorf, Bavaria, Germany. From Bigay and La Crouzille, Puy-de-Dôme, France. At Sankra, near Nellore, Andhra Pradesh, India. In the USA, from Bedford, Westchester Co., New York; at Newry, Oxford Co., Maine; large crystals in the Ruggles mine, Grafton, and the Palermo mine, near North Groton, Grafton Co., New Hampshire; from near Spruce Pine and Deer Park, Mitchell Co., North Carolina; abundant in the Grants district, McKinley Co., New Mexico; in the Freedom No. 2 mine, Marysvale, Piute Co., Utah. In Canada, at Theano Point, Lake Superior, and in the Faraday mine, Bancroft district, Ontario. From Rössing, Namibia.

Name: In allusion to its dimorphous relation to *uranophane*.

Type Material: Natural History Museum, Vienna, Austria, J3747.

References: (1) Nováček, R. (1935) Study of some secondary uranium minerals. Věstníku Královské České Společnosti Nauk, 2, 15–16 (in English). (2) (1935) Amer. Mineral., 20, 813 (abs. ref. 1). (3) Steinacher, V. and R. Novacek (1939) On β-uranotile. Amer. Mineral., 24, 324–338. (4) Frondel, C. (1958) Systematic mineralogy of uranium and thorium. U.S. Geol. Sur. Bull. 1064, 307–309. (5) Viswanathan, K. and O. Harneit (1986) Refined crystal structure of beta-uranophane, $Ca(UO_2)_2(SiO_3OH)_2 \cdot 5H_2O$. Amer. Mineral., 71, 1489–1493.