## Protasite $Ba(UO_2)_3O_3(OH)_2 \cdot 3H_2O$



**Crystal Data:** Monoclinic. *Point Group:* $m$. As thin pseudohexagonal platelets, flattened on {010}, to 0.5 mm; spherulitic, massive. *Twinning:* By 60° rotation about [010], yielding sector twinning, universal.

**Physical Properties:** *Cleavage:* Good on {010}. *Fracture:* Hackly. *Tenacity:* Brittle. Hardness = n.d. D(meas.) = 5.39(5) D(calc.) = 5.827(3) Radioactive.

**Optical Properties:** Transparent. *Color:* Bright orange. *Luster:* Subadamantine. *Optical Class:* Biaxial (–). $\alpha = 1.78$ $\beta = 1.80$–$1.83$ $\gamma = 1.82$–$1.83$ 2V(meas.) = 60°–81°

**Cell Data:** *Space Group:* $Pn$. $a = 12.2949(16)$ $b = 7.2206(10)$ $c = 6.9558(8)$ $\beta = 90.401(15)°$ Z = 2

**X-ray Powder Pattern:** Shinkolobwe, Congo.
3.14 (100), 7.06 (50), 3.58 (35), 3.11 (35), 2.496 (35), 2.395 (25), 1.976 (25)

**Chemistry:**

| | (1) | (2) | (3) |
|---|---|---|---|
| $UO_3$ | 78.0 | 78.22 | 79.20 |
| $SiO_2$ | | 0.32 | |
| PbO | | 2.63 | |
| CaO | | 0.67 | |
| BaO | 15.0 | 9.48 | 14.15 |
| $K_2O$ | | 0.39 | |
| $H_2O$ | [7.0] | [8.29] | 6.65 |
| Total | [100.0] | [100.00] | 100.00 |

(1) Shinkolobwe, Congo; by electron microprobe, $H_2O$ by difference, presence confirmed by crystal-structure analysis; corresponding to $Ba_{1.08}(UO_2)_{3.00}O_3(OH)_2 \cdot 2.27H_2O$. (2) Russia; by electron microprobe, corresponding to $(Ba_{0.70}Ca_{0.13}Pb_{0.13}K_{0.04})_{\Sigma=1.00} \cdot (UO_2)_3O_3(OH)_2 \cdot 3H_2O$. (3) $Ba(UO_2)_3O_3(OH)_2 \cdot 3H_2O$.

**Occurrence:** In the oxidized zone of uranium-bearing mineral deposits.

**Association:** Uraninite, uranophane (Shinkolobwe, Congo); bauranoite, metacalciouranoite (Russia).

**Distribution:** From Shinkolobwe, Katanga Province, Congo (Shaba Province, Zaire). At an undisclosed locality [Streltsovskoe U–Mo deposit, eastern Transbaikal] in Russia.

**Name:** To honor Professor Jean Protas (1932– ), French mineralogist, University of Nancy, Nancy, France, who first synthesized the compound, and for his work with uranium oxide minerals.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 150732.

**References:** (1) Pagoaga, M.K., D.E. Appleman, and J.M. Stewart (1986) A new barium uranyl oxide hydrate mineral, protasite. Mineral. Mag., 50, 125–128. (2) (1987) Amer. Mineral., 72, 224 (abs. ref. 1). (3) Pagoaga, M.K., D.E. Appleman, and J.M. Stewart (1987) Crystal structures and crystal chemistry of the uranyl oxide hydrates becquerelite, billietite, and protasite. Amer. Mineral., 72, 1230–1238. (4) Belova, L.N. and V.P. Rogova (1988) First protasite find in the USSR. Doklady Acad. Nauk SSSR, 303, 1200–1202 (in Russian).