

## Parafransoletite

## $\text{Ca}_3\text{Be}_2(\text{PO}_4)_2(\text{PO}_3\text{OH})_2 \cdot 4\text{H}_2\text{O}$

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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Individual crystals are spearhead-shaped, flattened on {010}, elongated along [100], showing prominent {010}, {011}, {13 $\bar{1}$ }, { $\bar{1}$ 31}, {14 $\bar{4}$ }, to 0.4 mm. Generally as doubly-terminated crystals, sheaf- and bow-tielike, and radial aggregates. *Twining:* Common on {010}.

**Physical Properties:** *Fracture:* Even to uneven. *Tenacity:* Brittle. Hardness =  $\sim 2.5$   
D(meas.) = 2.54(1) D(calc.) = 2.56

**Optical Properties:** Transparent to translucent. *Color:* Colorless, white. *Luster:* Vitreous, silky in aggregates.

*Optical Class:* Biaxial (+). *Orientation:*  $\theta = 85^\circ$ ;  $\psi = -13^\circ$ ;  $\phi = 98^\circ$ .  $\alpha = 1.562(2)$   
 $\beta = 1.564(2)$   $\gamma = 1.588(2)$  2V(meas.) = n.d. 2V(calc.) =  $33^\circ$

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 7.3275(13)$   $b = 7.6959(13)$   $c = 7.0606(13)$   
 $\alpha = 94.903(5)^\circ$   $\beta = 96.820(5)^\circ$   $\gamma = 101.865(5)^\circ$   $Z = 1$

**X-ray Powder Pattern:** Tip Top mine, South Dakota, USA.

3.032 (100), 3.619 (80), 2.595 (60), 7.52 (50), 2.334 (40), 2.485 (25), 1.870 (25)

### Chemistry:

|                               | (1)  | (2)    |
|-------------------------------|------|--------|
| P <sub>2</sub> O <sub>5</sub> | 47.9 | 47.93  |
| BeO                           | 7.7  | 8.45   |
| CaO                           | 28.2 | 28.41  |
| H <sub>2</sub> O              | 15.1 | 15.21  |
| Total                         | 98.9 | 100.00 |

(1) Tip Top mine, South Dakota, USA; by electron microprobe, H<sub>2</sub>O by Karl Fischer titration; corresponds to  $\text{Ca}_{3.02}\text{Be}_{1.85}(\text{PO}_4)_{4.05}(\text{OH})_{2.05} \cdot 4\text{H}_2\text{O}$ . (2)  $\text{Ca}_3\text{Be}_2(\text{PO}_4)_2(\text{PO}_3\text{OH})_2 \cdot 4\text{H}_2\text{O}$ .

**Polymorphism & Series:** Dimorphous with fransoletite.

**Occurrence:** A rare secondary hydrothermal mineral on fracture surfaces in beryl in a complex granite pegmatite.

**Association:** Beryl, mitridatite, whitlockite, hurlbutite, roscherite, montgomeryite, englishite, robertsite.

**Distribution:** From the Tip Top mine, 8.5 km southwest of Custer, Custer Co., South Dakota, USA.

**Name:** From the Greek *para*, for *near*, and its dimorphous relation to *fransoletite*.

**Type Material:** Natural History Museum, Los Angeles, California, 35696; National Museum of Natural History, Washington, D.C., USA, 168432.

**References:** (1) Kampf, A.R., P.J. Dunn, and E.E. Foord (1992) Parafransoletite, a new dimorph of fransoletite from the Tip Top Pegmatite, Custer, South Dakota. *Amer. Mineral.*, 77, 843–847. (2) Kampf, A.R. (1992) Berylllophosphate chains in the structures of fransoletite, parafransoletite, and ehrleite and some general comments on berylllophosphate linkages. *Amer. Mineral.*, 77, 848–856.