## Hydroxylherderite $CaBe(PO_4)(OH)$



**Crystal Data:** Monoclinic, pseudo-orthorhombic or pseudohexagonal. *Point Group:* $2/m$. As stout prismatic crystals, elongated along [001] or [100], may be thick tabular {001}, typically with complex but rounded form development, to 17 cm; botryoidal to spherical, radial fibrous, in aggregates. *Twinning:* On {100} or {001} or both, as "fishtail" contact twins, common.

**Physical Properties:** *Cleavage:* On {110}, irregular. *Fracture:* Subconchoidal. Hardness = 5–5.5 D(meas.) = 2.95 D(calc.) = 2.94–2.97 May fluoresce weak yellow under SW UV, perhaps with bright yellow-orange phosphorescence.

**Optical Properties:** Transparent to translucent. *Color:* Colorless, gray, brown, pale yellow, greenish white, light blue, purple; colorless in transmitted light; may be blue-green or blue in daylight, lavender or light violet in incandescent light. *Luster:* Vitreous to subvitreous, resinous. *Optical Class:* Biaxial (–). *Orientation:* $Y = b$; $X \wedge c \simeq 87°$; $Z \wedge c \simeq -3°$. *Dispersion:* $r > v$, inclined. $\alpha = 1.59–1.615$ $\beta = 1.61–1.634$ $\gamma = 1.62–1.643$ 2V(meas.) = 70°–77°

**Cell Data:** *Space Group:* $P2_1/a$. $a = 9.789(2)$ $b = 7.661(1)$ $c = 4.804(1)$ $\beta = 90.02(1)°$ Z = 4

**X-ray Powder Pattern:** Palermo #1 mine, New Hampshire, USA; cannot be distinguished from herderite, and very similar to datolite. (ICDD 29-1403).
3.132 (100), 2.865 (70), 2.208 (60), 2.994 (50), 3.43 (40), 2.551 (30), 1.880 (25)

| **Chemistry:** | (1) | (2) | (3) | | (1) | (2) | (3) |
|---|---|---|---|---|---|---|---|
| $P_2O_5$ | 44.05 | 44.14 | 43.80 | $H_2O$ | 5.85 | 3.22 | 2.78 |
| BeO | 16.13 | [15.45] | 15.43 | $-O = F_2$ | | 2.34 | 2.47 |
| CaO | 34.04 | 34.25 | 34.60 | insol. | 0.44 | | |
| F | trace | 5.31 | 5.86 | Total | 100.51 | [100.03] | 100.00 |

(1) Paris, Maine, USA. (2) Virgem da Lapa, Brazil; by electron microprobe, $H_2O$ by the Penfield method, BeO calculated from stoichiometry. (3) $CaBe(PO_4)(OH, F)$ with OH:F = 1:1.

**Polymorphism & Series:** Forms a series with herderite.

**Occurrence:** A late-stage mineral in miarolitic cavities in complex granite pegmatites, of hydrothermal or probable pneumatolytic origin; may form from the alteration of beryl or beryllonite.

**Association:** Elbaite, topaz, cassiterite, albite, microcline, muscovite, lepidolite, quartz.

**Distribution:** Many localities, but uncommon at most. Some for analyzed material include: in the USA, in Maine, at Paris, Hebron, Greenwood, Stoneham, and Newry, Oxford Co., at Topsham, Sagadahoc Co., Poland and Auburn, Androscoggin Co., and elsewhere; in the Fletcher and Palermo #1 mines, near North Groton, Grafton Co., and at the Keyes mine, Orange, Grafton Co., New Hampshire; from the Blue Chihuahua pegmatite, near Oak Grove, San Diego Co., California. In Germany, at the Epprechtstein and Waldheim quarries, Fichtelgebirge, Bavaria. In the Viitaniemi pegmatite, near Eräjärvi, Finland. From Mursinsk, Ural Mountains, Russia. At Ungursuay, Kazakhstan. In Brazil, large crystals from the Xandá mine, Virgem da Lapa, and at the Golconda mine, near Governador Valadares, Minas Gerais.

**Name:** For predominance of *hydroxyl* over fluorine in its composition and relation to *herderite*.

**Type Material:** Yale University, New Haven, Connecticut, USA, Brush 1971, 1972, 1974, 1975.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 820–822. (2) Leavens, P.B., P.J. Dunn, and R.V. Gaines (1978) Composition and refractive index variations of the herderite – hydroxyl-herderite series. Amer. Mineral., 63, 913–917. (3) Dunn, P.J., C.W. Wolfe, P.B. Leavens, and W.E. Wilson (1979) Hydroxyl-herderite from Brazil and a guide to species nomenclature for the herderite/hydroxyl-herderite series. Mineral. Record, 10, 5–11. (4) Lager, G.A. and G.V. Gibbs (1974) A refinement of the crystal structure of herderite, $CaBePO_4OH$. Amer. Mineral., 59, 919–925.