

**Crystal Data:** Orthorhombic. *Point Group:*  $2/m\ 2/m\ 2/m$ . Crystals prismatic along [001] or tabular on {010}, showing {010}, {110}, {031}, {131}, to 6 mm; in divergent aggregates or as crusts; compact reniform.

**Physical Properties:** *Cleavage:* Perfect on {010}; good on {100}; poor on {001}.  
*Fracture:* Uneven. *Tenacity:* Brittle. *Hardness* = 3.5 *D*(meas.) = 3.05–3.065  
*D*(calc.) = 3.116

**Optical Properties:** Transparent to translucent. *Color:* Colorless, grayish white, pale yellow; colorless in transmitted light. *Streak:* White. *Luster:* Vitreous, pearly on {010} cleavages.  
*Optical Class:* Biaxial (–); sections  $\parallel$  {100} are optically sectorially zoned. *Orientation:*  
 $X = a$ ;  $Y = c$ ;  $Z = b$ . *Dispersion:*  $r < v$ , perceptible.  $\alpha = 1.574\text{--}1.589$   $\beta = 1.582\text{--}1.598$   
 $\gamma = 1.582\text{--}1.599$   $2V(\text{meas.}) = 37^\circ$

**Cell Data:** *Space Group:*  $Pnma$ .  $a = 10.597(3)$   $b = 18.318(8)$   $c = 5.031(1)$   $Z = 4$

**X-ray Powder Pattern:** Kabwe, Zambia. (ICDD 37-465).  
 4.568 (100), 2.853 (65), 9.12 (60), 3.460 (25), 3.388 (25), 4.410 (20), 1.939 (19)

**Chemistry:**

	(1)	(2)
$\text{P}_2\text{O}_5$	31.8	30.98
$\text{ZnO}$	52.1	53.29
$\text{H}_2\text{O}$	16.1	15.73
Total	100.0	100.00

(1) Kabwe, Zambia. (2)  $\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ .

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

**Occurrence:** A rare, late-stage mineral in some hydrothermal zinc deposits and complex granite pegmatites; incrusting bone breccia in a limestone cave.

**Association:** Tarbuttite, hemimorphite, spencerite, smithsonite, vanadinite (Kabwe, Zambia); triphylite, ferrisicklerite, leucophosphite, laueite, robertsite, hydroxylapatite, sphalerite (Tip Top mine, South Dakota, USA).

**Distribution:** Found at Vieille Montagne (Altenberg), Moresnet district, Belgium. In Germany, at Bad Ems, Rhineland-Palatinate; from Hagendorf, Bavaria; and at Oberschulenberg, Harz Mountains. Large crystals at Kabwe (Broken Hill), Zambia. From the Hudson Bay mine, about eight km southeast of Salmo, British Columbia, Canada. In the USA, at the Tip Top mine, 8.5 km southwest of Custer, Custer Co., South Dakota; from the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire; and in the Iron Cap Pb–Zn mine, near Aravaipa, Graham Co., Arizona.

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**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 734–737. (2) Hill, R.J. and J.B. Jones (1976) The crystal structure of hopeite. *Amer. Mineral.*, 61, 987–995.