

**Ehrleite****Ca<sub>2</sub>ZnBe(PO<sub>4</sub>)<sub>2</sub>(PO<sub>3</sub>OH)•4H<sub>2</sub>O**

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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Thick tabular crystals, showing {100}, {010}, and {001}, to 2 mm. *Twinning:* Contact twins, by reflection on {001}, universal.

**Physical Properties:** *Cleavage:* Parting on {001}. *Fracture:* Uneven to subconchoidal. *Tenacity:* Brittle. Hardness =  $\sim 3.5$  D(meas.) = 2.64(2) D(calc.) = [2.66]

**Optical Properties:** Transparent. *Color:* Milky white to colorless. *Streak:* White. *Luster:* Vitreous.

*Optical Class:* Biaxial (+). *Orientation:*  $X = c^*$ ;  $Y \wedge b = 18^\circ$ ;  $Z \wedge a = 9^\circ$ .  $\alpha = 1.556(2)$   
 $\beta = 1.560(1)$   $\gamma = 1.580(1)$   $2V(\text{meas.}) = 62^\circ$   $2V(\text{calc.}) = 49^\circ$

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 7.130(4)$   $b = 7.430(4)$   $c = 12.479(9)$   $\alpha = 94.31(5)^\circ$   
 $\beta = 102.07(4)^\circ$   $\gamma = 82.65(4)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Tip Top mine, South Dakota, USA.  
3.161 (10), 12.41 (7), 2.723 (6), 6.95 (5), 4.31 (4), 6.58 (3), 3.014 (3)

**Chemistry:**

|                               | (1)     | (2)    |
|-------------------------------|---------|--------|
| P <sub>2</sub> O <sub>5</sub> | 40.5    | 41.54  |
| ZnO                           | 14.8    | 15.88  |
| BeO                           | 7.9     | 4.88   |
| CaO                           | 20.9    | 21.88  |
| H <sub>2</sub> O              | [15.9]  | 15.82  |
| Total                         | [100.0] | 100.00 |

(1) Tip Top mine, South Dakota, USA; by electron microprobe, Be by ion microprobe, thought to be in excess, H<sub>2</sub>O by difference, presence of H confirmed by ion probe; corresponds to Ca<sub>1.96</sub>Zn<sub>0.96</sub>Be<sub>1.66</sub>O<sub>0.58</sub>(PO<sub>4</sub>)<sub>2</sub>(PO<sub>3</sub>OH)•4.08H<sub>2</sub>O. (2) Ca<sub>2</sub>ZnBe(PO<sub>4</sub>)<sub>2</sub>(PO<sub>3</sub>OH)•4H<sub>2</sub>O as determined from crystal-structure analysis.

**Occurrence:** A very rare mineral with other secondary phosphates, in the outer to intermediate zone of a complex granite pegmatite.

**Association:** Apatite, mitridatite, roscherite, hydroxyl-herderite, goyazite–crandallite, parascholzite, manganese oxides, beryl, quartz.

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

**Name:** In honor of Howard Ehrle, Miles City, Montana, USA, who discovered the mineral.

**Type Material:** Canadian Museum of Nature, Ottawa, Canada, 49289; South Dakota School of Mines and Technology, Rapid City, South Dakota, 2958; National Museum of Natural History, Washington, D.C., USA, 160381.

**References:** (1) Robinson, G.W., J.D. Grice, and J. Van Velthuisen (1985) Ehrleite, a new calcium beryllium zinc phosphate hydrate from the Tip Top pegmatite, Custer, South Dakota. Can. Mineral., 23, 507–510. (2) (1986) Amer. Mineral., 71, 1544 (abs. ref. 1). (3) Hawthorne, F.C. and J.D. Grice (1987) The crystal structure of ehrleite, a tetrahedral sheet structure. Can. Mineral., 25, 767–774.