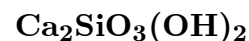


# Hillebrandite



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**Crystal Data:** Monoclinic (?), pseudo-orthorhombic. *Point Group:*  $2/m$ . Acicular fibrous crystals, to 0.5 mm; radial spherulitic.

**Physical Properties:** *Cleavage:* {010}. *Hardness* = 5–6 *D*(meas.) = 2.66–2.69  
*D*(calc.) = [2.65]

**Optical Properties:** Transparent to translucent. *Color:* White, colorless, pale greenish; colorless in thin section.

*Optical Class:* Biaxial (-). *Orientation:*  $Z = c$ . *Dispersion:*  $r < v$ , strong, producing characteristic abnormal blue interference colors.  $\alpha = 1.605(5)$   $\beta = \sim 1.61$   $\gamma = 1.612(3)$   
 $2V$ (meas.) =  $60^\circ$ – $80^\circ$

**Cell Data:** *Space Group:*  $P2_1/a$  (?).  $a = 16.60$   $b = 7.26$   $c = 11.85$   $\beta = 90^\circ$   $Z = 12$

**X-ray Powder Pattern:** Velardeña, Mexico.  
2.92 (vvs), 4.76 (vs), 3.33 (vs), 3.02 (s), 2.82 (s), 2.76 (s), 2.37 (s)

## Chemistry:

|                                | (1)    | (2)    |
|--------------------------------|--------|--------|
| SiO <sub>2</sub>               | 32.59  | 31.58  |
| TiO <sub>2</sub>               | 0.02   |        |
| Al <sub>2</sub> O <sub>3</sub> | 0.23   |        |
| Fe <sub>2</sub> O <sub>3</sub> | 0.15   |        |
| MnO                            | 0.01   |        |
| MgO                            | 0.04   |        |
| CaO                            | 57.76  | 58.95  |
| Na <sub>2</sub> O              | 0.03   |        |
| K <sub>2</sub> O               | 0.05   |        |
| F                              | 0.00   |        |
| H <sub>2</sub> O               | 9.36   | 9.47   |
| CO <sub>2</sub>                | 0.00   |        |
| Total                          | 100.24 | 100.00 |

(1) Velardeña, Mexico; total Fe as Fe<sub>2</sub>O<sub>3</sub>. (2) Ca<sub>2</sub>SiO<sub>3</sub>(OH)<sub>2</sub>.

**Occurrence:** In limestone affected by high-grade contact metamorphism.

**Association:** Wollastonite, garnet (Velardeña, Mexico); calcite, vesuvianite, grossular (Carlingford, Ireland); foshagite (Crestmore, California, USA).

**Distribution:** In the Terneras mine, Velardeña, Durango, Mexico. In the USA, from Crestmore, Riverside Co., California. At Carlingford, Co. Louth, Ireland. In the Güneyce-İkizdere area, Trabzon Province, Turkey. From Mt. Chapchachi, north of the Caspian Sea, Kazakhstan. At Nugrah, Saudi Arabia. In the Hatrurim Formation, Israel. From Kushiro, Hiroshima Prefecture, and in the Mihari mine and at Fuka, near Bicchu, Okayama Prefecture, Japan.

**Name:** For William Francis Hillebrand (1853–1925), American geochemist and analytical chemist.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 86531.

**References:** (1) Dana, E.S. and W.E. Ford (1909) Dana's system of mineralogy, (6th edition), app. II, 52. (2) Heller, L. and H.F.W. Taylor (1956) Crystallographic data for the calcium silicates. H.M. Stationary Office, London, 59–62. (3) Mamedov, K.H. and N.V. Belov (1958) Crystal structure of hillebrandite. Doklady Acad. Nauk SSSR, 123, 741–743 (in Russian).

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