# Brewsterite $(Sr, Ba, Ca)Al_2Si_6O_{16} \cdot 5H_2O$



**Crystal Data:** Monoclinic. *Point Group:* $2/m$. Crystals commonly equant or prismatic, striated and elongated along [100], to 1.5 cm. Platy, radial fibrous, and in granular aggregates. *Twinning:* Lamellar ∥ {010}.

**Physical Properties:** *Cleavage:* {010}, perfect. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 5–5.5 D(meas.) = 2.45 D(calc.) = [2.42]

**Optical Properties:** Transparent. *Color:* White, colorless, yellowish, gray, greenish; colorless in thin section. *Streak:* White. *Luster:* Vitreous to pearly on {010}. *Optical Class:* Biaxial (+). *Orientation:* $Z \perp (010)$; $X \wedge c = 19°–34°$ in various sectors of the crystal. *Dispersion:* $r > v$, weak, crossed. $\alpha = 1.510$ $\beta = 1.512$ $\gamma = 1.523$ 2V(meas.) = 65°

**Cell Data:** *Space Group:* $P2_1/m$. $a = 6.793(2)$ $b = 17.573(6)$ $c = 7.759(2)$ $\beta = 94.54(3)°$ Z = 2

**X-ray Powder Pattern:** Strontian, Scotland.
4.53 (10), 6.15 (9), 2.885 (9), 3.209 (8), 3.867 (7), 4.98 (4), 1.989 (4)

**Chemistry:**

| | (1) | (2) |
|---|---|---|
| $SiO_2$ | 54.42 | 54.02 |
| $Al_2O_3$ | 15.25 | 15.86 |
| $Fe_2O_3$ | 0.08 | 0.11 |
| CaO | 1.19 | 0.80 |
| SrO | 8.99 | 11.80 |
| BaO | 6.80 | 3.01 |
| $Na_2O$ | | 0.21 |
| $K_2O$ | | 0.14 |
| $H_2O$ | 13.22 | 13.72 |
| Total | 99.95 | 99.67 |

(1) Strontian, Scotland; corresponds to $(Sr_{0.58}Ba_{0.30}Ca_{0.14})_{\Sigma=1.02}Al_{1.98}Si_{6.00}O_{16} \cdot 4.86H_2O$.
(2) Burpala massif, Russia; corresponds to $(Sr_{0.76}Ba_{0.13}Ca_{0.10}Na_{0.04}K_{0.02}Fe_{0.01})_{\Sigma=1.06}Al_{2.06}Si_{5.94}O_{16} \cdot 4.86H_2O$.

**Mineral Group:** Zeolite group.

**Occurrence:** Hydrothermally deposited in druses lining cavities in basalts and schists; more rarely in ore deposits.

**Association:** Zeolites, calcite, quartz.

**Distribution:** From Strontian, Argyllshire, Scotland. At St. Christophe, Bourg d'Oisans, Isère, and around Barèges, Hautes-Pyrénées, France. In the Burpala massif, about 120 km north of Lake Baikal, eastern Siberia, Russia. At Yellow Lake, near Olalla, British Columbia, Canada. Other localities are reported but require confirmation.

**Name:** Honoring Sir David Brewster (1781–1868), Scottish mineralogist.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 576–577. (2) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 206–207. (3) Gottardi, G. and E. Galli (1985) Natural zeolites. Springer, 300–305. (4) Strunz, H. and C. Tennyson (1956) "Polymorphie" in der Gruppe der Blätterzeolithe (Heulandit-Stilbit-Epistilbit: Brewsterit). Neues Jahrb. Mineral., Monatsh., 11, 1–9 (in German). (5) Schlenker, J.L., J.J. Pluth, and J.V. Smith (1977) Refinement of the crystal structure of brewsterite, $Ba_{0.5}Sr_{1.5}Al_4Si_{12}O_{32} \cdot 10H_2O$. Acta Cryst., 33, 2907–2910. (6) Akizuki, M. (1987) Crystal symmetry and order-disorder structure of brewsterite. Amer. Mineral., 72, 645–648. (7) Nawaz, R. (1990) Brewsterite: re-investigation of morphology and elongation. Mineral. Mag., 54, 654–656.