

Crystal Data: Monoclinic, pseudo-orthorhombic, or orthorhombic. *Point Group:* $2/m$, 2, or 222. Crystals are thin tapering blades elongated along [010], to 2 μm , aggregated in rosettes.

Physical Properties: *Cleavage:* On {100}, perfect; another perpendicular, probably on {001}. Hardness = n.d. $D(\text{meas.}) = 3.93\text{--}4.09$ $D(\text{calc.}) = 4.11$

Optical Properties: Semitransparent. *Color:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (+) (probable). $\alpha = 1.635$ $\beta = 1.650$ $\gamma = \text{n.d.}$ $2V(\text{meas.}) = \text{n.d.}$

Cell Data: *Space Group:* $P2_1/m$, $P2_1$, or $P222_1$. $a = 15.724(3)$ $b = 6.256(5)$ $c = 5.427(5)$ $\beta = \sim 90^\circ$ $Z = 4$

X-ray Powder Pattern: Brownley Hill mine, England. 15.44 (100), 7.88 (100), 2.714 (40), 1.565 (30b), 5.25 (20), 2.577 (20), 2.397 (20)

Chemistry:	(1)	(2)
SO_3	6.62	6.01
CO_2	9.90	9.91
ZnO	71.47	73.27
H_2O^+	10.70	10.81
Total	98.69	100.00

(1) Brownley Hill mine, England; ZnO by ICP/OES and XRF, SO_3 by ICP/OES, H_2O by CHN analyzer; corresponding to $\text{Zn}_{2.93}[(\text{CO}_3)_{0.75}(\text{SO}_4)_{0.28}]_{\Sigma=1.03}(\text{OH})_{3.97}$. (2) $\text{Zn}_3(\text{CO}_3, \text{SO}_4)(\text{OH})_4$ with $\text{CO}_3:\text{SO}_4 = 3:1$.

Occurrence: A rare secondary post-mine mineral in limestone-hosted oxidized Pb–Zn ores (Brownley Hill mine, England).

Association: Gypsum, smithsonite, pyrite, goethite (Brownley Hill mine, England).

Distribution: From England, at the Brownley Hill mine, near Alston, and the Smallcleugh mine, Nenthead, Cumbria. In Belgium, at Altenberg, near Aachen. In Germany, at the Alexander and Bastenberg mines, Ramsbeck, Sauerland; in the Marie mine, Wilnsdorf, Siegerland; at the Friedrichsseggen mine, near Bad Ems, and in the Katzenthal area, near Nothweiler, Rhineland-Palatinate; from the Neue Fröhlichkeit mine, near St. Andreasberg, Harz Mountains; from the mines Gelbe Birke, near Schwartzemberg, Langenau, near Brand-Erbisdorf, Fortuna, near Breitenbrunn, and Reiche Zeiche, Freiberg, Saxony; from Wittmansgereuth, near Saalfeld, Thuringia; and elsewhere. Found at Laurium, Greece. From Broken Hill, New South Wales, Australia.

Name: Honors Brian Young (1947–), field geologist and mineralogist of the British Geological Survey, who provided the first specimens.

Type Material: Royal Museum of Scotland, Edinburgh, Scotland, 1992.17.1–8.

References: (1) Livingstone, A. and P.E. Champness (1993) Brianyoungite, a new mineral related to hydrozincite, from the north of England orefield. *Mineral. Mag.*, 57, 665–670. (2) (1994) *Amer. Mineral.*, 79, 1009 (abs. ref. 1).