Bridgesite-(Ce) $CaCe_2Cu_6(SO_4)_4(OH)_{12}\cdot 8H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As thin (to 2 μm) lath-like to acicular crystals to ~200 μm, aggregated into thin crusts. Some crystals slightly curved.

Physical Properties: *Cleavage*: n.d. *Tenacity*: Brittle. *Fracture*: Splintery. Hardness = n.d. D(meas.) = n.d. D(calc.) = 2.847

Optical Properties: Translucent. *Color*: Teal to sky-blue. *Streak*: Pale blue. *Luster*: n.d. *Optical Class*: Biaxial (-). $\alpha = 1.526(2)$ $\beta = 1.564(2)$ $\gamma = 1.572(2)$ 2V(meas.) = 53.0(10)° 2V(calc.) = 48.3° Non-pleochroic.

Cell Data: *Space Group: C*2/*m*. $a = 24.801(5)$ $b = 6.352(1)$ $c = 11.245(2)$ $\beta = 114.51(3)°$ Z = 2

X-Ray Diffraction Pattern: Tynebottom Mine, Garrigill, Cumbria, United Kingdom. 11.300 (100), 6.391 (15), 2.770 (8), 3.194 (6), 4.858 (5), 6.141 (4), 5.646 (4)

Chemistry:

	(1)	(2)
SiO_2	0.21	
Al_2O_3	0.23	
P_2O_5	0.10	
SO_3	21.83	22.33
CaO	3.28	3.91
CuO	32.36	33.28
La_2O_3	2.92	
Ce_2O_3	8.66	22.89
Y_2O_3	0.59	
Pr_2O_3	1.27	
Nd_2O_3	6.11	
Sm_2O_3	1.48	
Gd_2O_3	1.18	
Dy_2O_3	0.30	
ΣREE_2O_3	22.52	
H_2O	[17.28]	17.59
Total	97.80	100.00

(1) Tynebottom Mine, Garrigill, Cumbria, United Kingdom; average electron microprobe and FTIR spectroscopic analyses, H_2O calculated from structure; corresponds to $Ca_{0.86}REE_{\Sigma=1.99}Al_{0.07}Cu_{5.95}(SO_4)_{3.99}(SiO_4)_{0.05}(PO_4)_{0.02}(OH)_{11.52}\cdot 8H_2O$. (2) $CaCe_2Cu_6(SO_4)_4(OH)_{12}\cdot 8H_2O$.

Occurrence: Secondary, the product of water percolating through sulfide-bearing orebodies and dripping onto waste limestone in a humid mine environment.

Association: Brochantite, malachite, serpierite, devilline, gypsum, aragonite, jarosite, pyrite, lanthanite-(Ce), undifferentiated iron oxyhydroxides.

Distribution From the Tynebottom Mine, Garrigill, Cumbria, United Kingdom.

Name: Honors Trevor *Bridges* (1935-2015), chemist, amateur geologist, mineral collector, mountaineer, munroist, founding member of the Russell Society's northern branch in 1984, and author of many papers on mineralogy and geochemistry in the British Isles. The suffix identifies the dominant rare earth element.

Type Material: Natural History Museum, London, England (BM2007,81 holotype; BM2007,82 and BM2007,83 cotypes).

References: (1) Rumsey, M.S., F.C. Hawthorne, J. Spratt, J. Najorka, and W. Montgomery (2022) Bridgesite-(Ce), a new rare earth element sulfate, with a unique crystal structure, from Tynebottom Mine, Cumbria, United Kingdom. Mineral. Mag., 86, 570-576.