Nakauriite $Cu_8(SO_4)_4(CO_3)(OH)_6 \cdot 48H_2O$

Crystal Data: Orthorhombic. *Point Group:* n.d. Crystals are fibers, to 3 mm, in sprays and aggregates.

Physical Properties: Hardness = n.d. D(meas.) = 2.39(2) D(calc.) = 2.35

Optical Properties: Semitransparent. *Color:* Sky-blue.
Optical Class: Biaxial (–). *Pleochroism:* X = colorless; Y = pale greenish blue; Z = pale sky-blue to very pale blue. *Orientation:* Positive elongation, parallel extinction. *Dispersion:* $r < v$. $\alpha = 1.585$–1.597 $\beta = 1.604$–1.612 $\gamma = 1.612$–1.618 2V(meas.) = 60°–70° 2V(calc.) = 65.3°

Cell Data: *Space Group:* n.d. $a = 14.585$ $b = 11.47$ $c = 16.22$ Z = 2

X-ray Powder Pattern: Nakauri, Japan.
7.31 (100), 3.652 (20), 2.367 (16), 1.9148 (16), 4.840 (14), 3.936 (14), 2.397 (14)

Chemistry:

	(1)
SO_3	16.23
CO_2	2.28
Fe_2O_3	0.06
MnO	0.09
NiO	0.88
CuO	32.12
ZnO	0.03
H_2O^+	45.31
H_2O^-	3.01
Total	[100.01]

(1) Nakauri, Japan; by AA, CO_2 by volumetric analysis; after deduction of estimated 67% chrysotile, corresponds to $(Cu_{7.77}Ni_{0.23}Mn_{0.02})_{\Sigma=8.01}(SO_4)_{3.90}(CO_3)_{1.00}(OH)_{6.23} \cdot 48.4H_2O$.
(2) Material from Gabbs, Nevada and the Cedar Hill quarry, Pennsylvania, USA, and the Hagdale quarry, Scotland, contains only traces to no detectable SO_4.

Occurrence: As fracture fillings in serpentinite (Nakauri, Japan); on chromatite from serpentinite (Hagdale quarry, Scotland).

Association: Chrysotile, magnetite, artinite, pyroaurite, brochantite, malachite (Nakauri, Japan); callaghanite, hydromagnesite (Gabbs, Nevada, USA); antigorite, magnesite, talc, quartz (Cedar Hill quarry, Pennsylvania, USA); chrysotile, theophrastite, pentlandite, heazlewoodite (Hagdale quarry, Scotland).

Distribution: From an abandoned mine at Nakauri, about 6 km southeast of Shinshiro, Aichi Prefecture, Japan. In the USA, good crystals at the Gabbs mine, Gabbs district, Nye Co., Nevada; from the Cedar Hill quarry, Lancaster Co., Pennsylvania. In the Hagdale quarry, Unst, Shetland Islands, Scotland.

Name: For the original material found at Nakauri, Japan.

Type Material: National Science Museum, Tokyo, Japan, M-24586; National Museum of Natural History, Washington, D.C., USA, 136584.

References: (1) Suzuki, J., M. Ito, and T. Sugiura (1976) A new copper sulfate-carbonate hydroxide hydrate mineral, $(Mn, Ni, Cu)_8(SO_4)_4(CO_3)(OH)_6 \cdot 48H_2O$, from Nakauri, Aichi Prefecture, Japan. J. Japan. Assoc. Mineral. Petrol. Econ. Geol., 71(7), 183–192 (in English). (2) (1977) Amer. Mineral., 62, 594 (abs. ref. 1). (3) Braithwaite, R.S.W. and P. Pritchard (1983) Nakauriite from Unst, Shetland. Mineral. Mag., 47, 84-85. (4) Foord, E.E., R.B. Finkelman, A.H. Feinberg, I. O'Neill, A.V. Heyl, D.K. Smith, and B. Brookmyer (1985) Nakauriite from Cedar Hill quarry, Lancaster County: a new mineral for Pennsylvania. Friends of Mineralogy, Pennsylvania Chapter, Newsletter 13(4), 4–12.