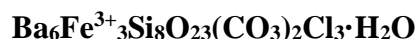


**Fencooperite**

**Crystal Data:** Hexagonal. *Point Group:* 3m. As anhedral to platy grains, to 100 μm, that form aggregates to 2 mm.

**Physical Properties:** *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* Uneven to subconchoidal. VHN = 269-367, 321 average (10 g load). Hardness = 4.5-5 D(meas.) = n.d. D(calc.) = 4.338 Nonfluorescent.

**Optical Properties:** Opaque except at thin edges. *Color:* Jet-black to gray-brown. *Streak:* Grayish black. *Luster:* Vitreous to adamantine. *Optical Class:* Uniaxial (-).  $\omega = 1.723(4)$   $\epsilon = 1.711(2)$  *Pleochroism:* Very strong; *O* = blue black, *E* = light greenish gray. *Absorption:*  $O \gg E$ .

**Cell Data:** *Space Group:* P3m1.  $a = 10.7409(5)$   $c = 7.0955(4)$   $Z = 1$

**X-ray Powder Pattern:** Trumbull Peak, Mariposa County, California, USA. 3.892 (100), 2.820 (90), 2.685 (80), 3.148 (40), 2.208 (40), 2.136 (40), 1.705 (35)

Chemistry:	(1)	(2)
BaO	50.51	50.31
Fe <sub>2</sub> O <sub>3</sub>	12.77	13.10
MnO	0.15	
Al <sub>2</sub> O <sub>3</sub>	1.35	
SiO <sub>2</sub>	27.38	26.29
P <sub>2</sub> O <sub>5</sub>	0.16	
Cl	3.23	5.82
CO <sub>2</sub>	[4.81]	4.81
H <sub>2</sub> O	[0.98]	0.98
-O = Cl	0.73	1.31
Total	100.61	100.00

(1) Trumbull Peak, Mariposa County, California, USA; average electron microprobe analysis, H<sub>2</sub>O and CO<sub>2</sub> calculated from structure; corresponds to Ba<sub>5.89</sub>(Fe<sup>3+</sup><sub>2.86</sub>Mn<sup>2+</sup><sub>0.04</sub>)<sub>Σ=2.90</sub>(Si<sub>8.14</sub>Al<sub>0.47</sub>P<sub>0.04</sub>)<sub>Σ=8.65</sub>O<sub>23.18</sub>(CO<sub>3</sub>)<sub>1.95</sub>(Cl<sub>1.63</sub>O<sub>1.37</sub>)<sub>Σ=3.00</sub>·0.97H<sub>2</sub>O. (2) Ba<sub>6</sub>Fe<sup>3+</sup><sub>3</sub>Si<sub>8</sub>O<sub>23</sub>(CO<sub>3</sub>)<sub>2</sub>Cl<sub>3</sub>·H<sub>2</sub>O.

**Occurrence:** In gillespite-rich zones in sanbornite-quartz lenses in low-grade metasedimentary rocks.

**Association:** Titantaramellite, anandite, kinoshitalite, celsian, alforsite, barite, diopside, pyrrhotite.

**Distribution:** At Trumbull Peak, near El Portal, Mariposa County and at the Esquire no. 7 claim, Fresno County, California, USA.

**Name:** Honors mineral collector Joseph Fenimore ("Fen") Cooper, Jr. (b. 1937), of Santa Cruz, California, USA, who helped collect the samples in which the new phase was identified.

**Type Material:** National Mineral Collection, Geological Survey of Canada, Ottawa, Ontario (NMCC 68089).

**References:** (1) Roberts, A.C., J.D. Grice, G.E. Dunning, and K.E. Venance (2001) Fencooperite, Ba<sub>6</sub>Fe<sup>3+</sup><sub>3</sub>Si<sub>8</sub>O<sub>23</sub>(CO<sub>3</sub>)<sub>2</sub>Cl<sub>3</sub>·H<sub>2</sub>O, a new mineral species from Trumbull Peak, Mariposa County, California. *Can. Mineral.*, 39, 1059-1064. (2) Grice, J.D. (2001) The crystal structure of fencooperite: unique [Fe<sup>3+</sup><sub>3</sub>O<sub>13</sub>] pinwheels cross-connected by [Si<sub>8</sub>O<sub>22</sub>] islands. *Can. Mineral.*, 39, 1065-1071. (3) (2002) *Amer. Mineral.*, 87, 765-766 (abs. refs. 1 and 2).