

**Munakataite****Pb<sub>2</sub>Cu<sub>2</sub>(Se<sup>4+</sup>O<sub>3</sub>)(SO<sub>4</sub>)(OH)<sub>4</sub>**

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As fibrous aggregates, to 0.03 mm.

**Physical Properties:** *Cleavage:* Perfect {010}. *Tenacity:* Brittle. *Fracture:* None. Hardness = < 2 D(meas.) = n.d. D(calc.) = 5.526

**Optical Properties:** Transparent. *Color:* Light blue. *Streak:* Bluish white. *Luster:* Vitreous, pearly on cleavage surfaces. Easily mistaken visually for linarite. *Optical Class:* n.d.  $n = 1.891$  (calculated). *Pleochroism:* Weak, colorless to pale blue.

**Cell Data:** *Space Group:* P2<sub>1</sub>/m.  $a = 9.766(8)$   $b = 5.666(5)$   $c = 9.291(10)$   $\beta = 102.40(8)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Kato mine, Fukuoka Prefecture, Japan. 3.18 (100), 3.14 (68), 4.77 (57), 4.86 (44), 3.53 (39), 2.72 (22), 1.813 (19)

<b>Chemistry:</b>	(1)	(2)
PbO	53.71	53.62
CuO	18.33	19.11
CaO	0.04	
SO <sub>3</sub>	9.73	9.62
SeO <sub>2</sub>	13.19	13.32
H <sub>2</sub> O	4.19	4.33
Total	99.19	100.00

(1) Kato mine, Fukuoka Prefecture, Japan; average of 7 EDS analyses, H<sub>2</sub>O calculated, complex anions and OH confirmed by FT-IR, corresponding to Pb<sub>2.03</sub>(Cu<sub>1.94</sub>Ca<sub>0.01</sub>)<sub>Σ=1.95</sub>(Se<sup>4+</sup>O<sub>3</sub>)<sub>1.00</sub>(SO<sub>4</sub>)<sub>1.02</sub>(OH)<sub>3.92</sub>. (2) Pb<sub>2</sub>Cu<sub>2</sub>(Se<sup>4+</sup>O<sub>3</sub>)(SO<sub>4</sub>)(OH)<sub>4</sub>.

**Occurrence:** A secondary mineral in the weathering zone of a polymetallic sulfide deposit.

**Association:** Malachite.

**Distribution:** Dumps of the Kato mine, Fukuoka Prefecture and at the Kismori mine, Akita Prefecture, Japan.

**Name:** For the city of Munakata, where the Kato mine, source of the first specimens, is located.

**Type Material:** National Museum of Nature and Science, Tokyo, Japan (NSM-M28982).

**References:** (1) Matsubara, S., T. Mouri, R. Miyawaki, K. Yokoyama, and M. Nakahara (2008) Munakataite, a new mineral from the Kato mine, Fukuoka, Japan. *J. Mineral. Petrol. Sci.*, 103, 327–332. (2) (2009) *Amer. Mineral.*, 94, 1079–1080 (abs. ref. 1).