Munakataite $Pb_2Cu_2(Se^{4+}O_3)(SO_4)(OH)_4$

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*: $P2_1/m$. a = 9.766(8) b = 5.666(5) c = 9.291(10) β = 102.40(8)°
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)

Chemistry:

	(1)	(2)
PbO	53.71	53.62
CuO	18.33	19.11
CaO	0.04	
SO_3	9.73	9.62
SeO_2	13.19	13.32
H_2O	4.19	4.33
Total	99.19	100.00

(1) Kato mine, Fukuoka Prefecture, Japan; average of 7 EDS analyses, H_2O calculated, complex anions and OH confirmed by FT-IR, corresponding to $Pb_{2.03}(Cu_{1.94}Ca_{0.01})_{\Sigma=1.95}(Se^{4+}O_3)_{1.00}(SO_4)_{1.02}(OH)_{3.92}$. (2) $Pb_2Cu_2(Se^{4+}O_3)(SO_4)(OH)_4$.

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 Kisamori 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).