

Crystal Data: Monoclinic. *Point Group:* 2/m. As acicular crystals, to 2 mm, the faces of which are irregularly streaked parallel to the axis of elongation; also as small anhedral grains. *Twinning:* Polysynthetic twinning on {100}, common in polished section.

Physical Properties: *Cleavage:* Perfect on {001}. *Fracture:* Conchoidal. *Tenacity:* Very brittle. Hardness = n.d. VHN = 180–197 (50 g load). D(meas.) = 5.26 D(calc.) = 5.39

Optical Properties: Opaque. *Color:* Grayish black; in polished section, white with reddish internal reflections. *Luster:* Metallic. *Pleochroism:* Relatively strong.

R₁–R₂: (470) 37.6–42.6, (546) 36.1–41.2, (589) 34.8–39.3, (650) 32.8–36.7

Cell Data: *Space Group:* P2₁/a. *a* = 20.05(5) *b* = 7.95(2) *c* = 8.44(2) *β* = 101°46(10)'
Z = 8

X-ray Powder Pattern: Madoc, Canada.

3.52 (100), 2.795 (90), 4.19 (50), 3.90 (50), 2.670 (50), 2.653 (50), 2.335 (40)

Chemistry:

	(1)	(2)	(3)
Pb	38.8	38.50	38.94
Cu		0.49	
Sb	24.1	23.57	22.88
As	12.2	13.61	14.08
S	24.1	23.46	24.10
Total	99.2	99.63	100.00

(1) Madoc, Canada; by electron microprobe, corresponding to Pb_{1.01}(Sb_{1.07}As_{0.88})_{Σ=1.95}S_{4.05}.

(2) Pitone quarry, Italy; by electron microprobe; corresponding to Pb_{1.04}Cu_{0.04}

(Sb_{1.00}As_{0.94})_{Σ=1.94}S_{3.78}. (3) Pb(Sb, As)₂S₄ with Sb:As = 1:1.

Polymorphism & Series: Dimorphous with twinnite.

Occurrence: Of low-temperature hydrothermal origin, in marbles (Madoc, Canada; Seravezza, Italy).

Association: Pyrite, sphalerite, wurtzite, galena, stibnite, orpiment, realgar, enargite, tetrahedrite, zinkenite, jordanite, bournonite, sterryite, boulangerite, jamesonite, sartorite (Madoc, Canada); zinkenite, boulangerite, semseyite, jordanite, enargite (Silverton, Colorado, USA).

Distribution: From Madoc, Ontario, Canada [TL]. At the Brobdingnag mine, near Silverton, San Juan Co., Colorado, USA. In the Jas Roux deposit, 10 km east of Chapelle-en-Valgaudemar, Hautes-Alpes, France. At the Pitone, Tognetti, and Ceragiola marble quarries, near Seravezza, Tuscany, Italy. From Novoye, Khaydarkan, Fergana Valley, Alai Range, Kyrgyzstan.

Name: Honors Jean Etienne Guettard (1715–1786), French mineralogist and geologist.

Type Material: Canadian Geological Survey, Ottawa, 12167; Royal Ontario Museum, Toronto, Canada.

References: (1) Jambor, J.L. (1967) New lead sulfantimonides from Madoc, Ontario. Part 2 – Mineral descriptions. *Can. Mineral.*, 9, 191–213. (2) (1968) *Amer. Mineral.*, 53, 1425 (abs. ref. 1). (3) Bracci, G., D. Dalena, P. Orlandi, G. Duchi, and G. Vezzalini (1980) Guettardite from Tuscany, Italy: a second occurrence. *Can. Mineral.*, 18, 13–15. (4) Mozgova, N.N., N.S. Bortnikov, Y.S. Borodaev, and A.I. Tzépine (1982) Sur la non-stoechiométrie des sulfosels antimonieux arséniques de plomb. *Bull. Minéral.*, 105, 3–10 (in French with English abs.). (5) Jambor, J.L., J.H.G. Laflamme, and D.A. Walker (1982) A re-examination of the Madoc sulfosalts. *Mineral. Record*, 13, 93–100.

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