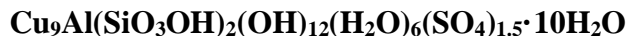


**Tiberiobardiite**

**Crystal Data:** Hexagonal. *Point Group:*  $\bar{3}$ . As thin crystals, tabular on {001}, to 200  $\mu\text{m}$ , with a pseudo-hexagonal outline.

**Physical Properties:** *Cleavage:* Perfect on {001}. *Fracture:* Irregular. *Tenacity:* Brittle. Hardness = n.d.  $D(\text{calc.}) = 2.528$

**Optical Properties:** Transparent. *Color:* Green. *Streak:* Pale green. *Luster:* Vitreous. *Optical Class:* n.d.  $n(\text{calc.}) = 1.568$

**Cell Data:** Space Group:  $R\bar{3}$ .  $a = 10.6860(4)$   $c = 28.3239(10)$   $Z = 3$

**X-ray Powder Pattern:** Cretaio Cu prospect, Massa Marittima, Grosseto, Tuscany, Italy. 9.4 (s), 4.67 (s), 2.576 (m), 2.330 (m), 2.041 (mw), 2.68(w), 1.548 (w)

<b>Chemistry:</b>	(1)	(2)
SO <sub>3</sub>	10.37	8.45
P <sub>2</sub> O <sub>5</sub>	3.41	
As <sub>2</sub> O <sub>5</sub>	0.05	
SiO <sub>2</sub>	8.13	8.45
Al <sub>2</sub> O <sub>3</sub>	5.54	3.59
Fe <sub>2</sub> O <sub>3</sub>	0.74	
CuO	62.05	50.36
ZnO	0.03	
<u>H<sub>2</sub>O</u>		<u>29.15</u>
Total	90.32	100.00

(1) Cretaio Cu prospect, Massa Marittima, Grosseto, Tuscany, Italy; average of 5 electron microprobe analyses supplemented by Raman spectroscopy; corresponds to

$(\text{Cu}^{2+}_{8.69}\text{Al}_{0.21}\text{Fe}^{3+}_{0.10})_{\Sigma=9.00}\text{Al}_{1.00}(\text{Si}_{1.51}\text{P}_{0.54})_{\Sigma=2.05}\text{S}_{1.44}\text{O}_{12.53}(\text{OH})_{13.47} \cdot 16\text{H}_2\text{O}$ .

(2)  $\text{Cu}_9\text{Al}(\text{SiO}_3\text{OH})_2(\text{OH})_{12}(\text{H}_2\text{O})_6(\text{SO}_4)_{1.5} \cdot 10\text{H}_2\text{O}$ .

**Occurrence:** The product of supergene alteration of Cu sulfide minerals (bornite, chalcocite, and covellite) in stockwork veins in deformed gabbro, in an oxidizing and hydrous low-temperature environment.

**Association:** Brochantite.

**Distribution:** From the Cretaio Cu prospect, near Prata, Massa Marittima, Grosseto, Tuscany, Italy.

**Name:** Honors mineral collector *Tiberio Bardi* (b.1960), for his contributions to the study of Tuscan mineralogy and for collecting the first specimens of this new mineral.

**Type Material:** Natural History Museum, University of Pisa, Italy (19900).

**References:** (1) Biagioni, C., M. Pasero, and F. Zaccarini (2018) Tiberiobardiite,  $\text{Cu}_9\text{Al}(\text{SiO}_3\text{OH})_2(\text{OH})_{12}(\text{H}_2\text{O})_6(\text{SO}_4)_{1.5} \cdot 10\text{H}_2\text{O}$ , a new mineral related to chalcophyllite from the Cretaio Cu prospect, Massa Marittima, Grosseto (Tuscany, Italy): occurrence and crystal structure. *Minerals*, 8(4), 152. (2) (2020) *Amer. Mineral.*, 105(8), 1284 (abs. ref. 1).