

**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . Prismatic crystals to 1 mm, display  $\{13\bar{1}\}$ ,  $\{10\bar{1}\}$ ,  $\{001\}$ , and  $\{021\}$ .

**Physical Properties:** *Cleavage:* Perfect on  $\{100\}$ . *Tenacity:* Brittle. *Fracture:* Irregular. Hardness = 4.5 D(meas.) = 4.05(1) D(calc.) = 4.084

**Optical Properties:** Opaque. *Color:* Greenish black. *Streak:* Dark grayish green.

*Luster:* Vitreous, greasy to subadamantine.

*Optical Class:* Biaxial (-).  $\alpha = 1.817(3)$   $\beta = 1.829(6)$   $\gamma = 1.837(3)$   $2V(\text{meas.}) = 80-85(5)^\circ$

$2V(\text{calc.}) = 78.0^\circ$  *Pleochroism:* Strong,  $X =$  bluish green,  $Y =$  dark brownish green,  $Z =$  brownish.

*Absorption:*  $Y > X \geq Z$ . *Orientation:*  $Z = b$ . *Dispersion:* Strong, (probably)  $r \ll v$ .

**Cell Data:** *Space Group:*  $P2_1/m$ .  $a = 9.199(9)$   $b = 12.359(8)$   $c = 5.004(2)$   $\beta = 100.19(6)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Spring Creek mine, near Wilmington, South Australia, Australia.

3.159 (100), 2.983 (50), 2.749 (50b), 4.573 (40), 3.091 (40)

<b>Chemistry:</b>	(1)
BaO	21.96
FeO	13.34
CaO	3.28
MnO	2.67
Na <sub>2</sub> O	0.07
MgO	0.05
CuO	0.07
ZnO	0.06
Fe <sub>2</sub> O <sub>3</sub>	22.62
Al <sub>2</sub> O <sub>3</sub>	0.25
P <sub>2</sub> O <sub>5</sub>	30.45
SiO <sub>2</sub>	0.13
F	0.36
H <sub>2</sub> O	[3.73]
- O = F	0.15
Total	98.89

(1) Spring Creek mine, near Wilmington, South Australia, Australia; average of 10 electron microprobe analyses, H<sub>2</sub>O calculated; corresponds to  $\text{Ba}_{1.00}(\text{Fe}^{2+}_{1.29}\text{Ca}_{0.41}\text{Mn}_{0.26}\text{Na}_{0.02}\text{Mg}_{0.01}\text{Cu}_{0.01}\text{Zn}_{0.01})_{\Sigma=2.01}(\text{Fe}^{3+}_{1.97}\text{Al}_{0.03})_{\Sigma=2.00}[(\text{P}_{2.98}\text{Si}_{0.02})\text{O}_4]_{3.00}[(\text{OH})_{2.85}\text{F}_{0.13}]_{\Sigma=2.98}$ .

**Mineral Group:** Bjarebyite group.

**Occurrence:** In a brecciated, low-temperature, hydrothermal vein.

**Association:** Quartz, libethenite, pseudomalachite, mitridatite, goethite, cuprite, copper.

**Distribution:** From the dumps of the Spring Creek copper mine near Wilmington, southern Flinders Ranges, South Australia, Australia.

**Name:** Honors Mr. John Toma (b. 1954), amateur mineralogist who first found the mineral.

**Type Material:** South Australian Museum, Adelaide, Australia.

**References:** (1) Kolitsch, U., A. Pring and E.R.T. Tiekink (2000) Johntomaite, a new member of the bjarebyite group of barium phosphates; description and structure refinement. *Mineralogy and Petrology*, 70(1-2), 1-14. (2) (2000) *Amer. Mineral.*, 86, 768 (abs. ref. 1).