

**Muirite****Ba<sub>10</sub>Ca<sub>2</sub>Mn<sup>2+</sup>TiSi<sub>10</sub>O<sub>30</sub>(OH, Cl, F)<sub>10</sub>**

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**Crystal Data:** Tetragonal. *Point Group:*  $4/m\ 2/m\ 2/m$ . Subhedral to euhedral crystals not uncommon, bounded principally by {100} and {001}, also {110} and {h0l} forms; in grains and aggregates, to 3 mm.

**Physical Properties:** *Cleavage:* Indistinct on {001} and {100}. *Hardness* =  $\sim 2.5$   
D(meas.) = 3.86(2) D(calc.) = 3.88

**Optical Properties:** Transparent to translucent. *Color:* Orange; anomalous purple-brown interference color. *Streak:* Pale orange. *Luster:* Subvitreous.

*Optical Class:* Uniaxial (+). *Pleochroism:* O = orange; E = colorless.  $\omega = 1.697(1)$   
 $\epsilon = 1.704(2)$

**Cell Data:** *Space Group:*  $P4/mmm$ .  $a = 14.000(3)$   $c = 5.625(2)$   $Z = 1$

**X-ray Powder Pattern:** Fresno Co., California, USA.

2.91 (100), 4.42 (75), 3.73 (60), 3.51 (60), 3.31 (60), 3.60 (50), 2.814 (40)

**Chemistry:**

	(1)		(1)
SiO <sub>2</sub>	22.15	SrO	0.13
TiO <sub>2</sub>	4.17	BaO	59.6
Al <sub>2</sub> O <sub>3</sub>	0.53	K <sub>2</sub> O	0.1
FeO	0.4	F	1.4
MnO	2.04	Cl	4.5
MgO	0.11	H <sub>2</sub> O	1.8
CaO	4.67	-O = (F, Cl) <sub>2</sub>	1.6
		Total	[100.0]

(1) Fresno Co., California, USA; by D-C emission arc spectrography, K and Cl by X-ray spectroscopy, stated to be recalculated to 100.0%; corresponds to (Ba<sub>9.82</sub>K<sub>0.05</sub>Sr<sub>0.03</sub>)<sub>Σ=9.90</sub>Ca<sub>2.10</sub>(Mn<sub>0.73</sub>Fe<sub>0.14</sub>Mg<sub>0.07</sub>)<sub>Σ=0.94</sub>Ti<sub>1.32</sub>(Si<sub>9.31</sub>Al<sub>0.26</sub>)<sub>Σ=9.57</sub>O<sub>29.52</sub>[(OH)<sub>5.05</sub>Cl<sub>3.21</sub>F<sub>1.86</sub>]<sub>Σ=10.12</sub>.

**Occurrence:** In sanbornite-quartz-bearing metamorphic rock (Fresno Co., California, USA).

**Association:** Sanbornite, verplanckite (Fresno Co., California, USA); gillespite, sanbornite, taramellite, fresnoite, pellyite, barite (Itsy Mountains, Yukon, Canada).

**Distribution:** On Big Creek and Rush Creek, Fresno Co., California, USA. From the Gunn claim, near Macmillan Pass, Itsy Mountains, Yukon Territory, Canada.

**Name:** For John Muir (1834–1914), American mountaineer, conservationist, and naturalist, whose name is intimately associated with the California Sierra Nevada.

**Type Material:** California Division of Mines & Geology, San Francisco, California, USA.

**References:** (1) Alfors, J.T., M.C. Stinson, R.A. Matthews, and A. Pabst (1965) Seven new barium minerals from eastern Fresno County, California. *Amer. Mineral.*, 50, 314–340. (2) Alfors, J.T. and G. Putman (1965) Revised chemical analyses of traskite, verplanckite and muirite from Fresno County, California. *Amer. Mineral.*, 50, 1500–1503. (3) Malinovskii, Y.A., E.A. Pobedinskaya, and N.V. Belov (1975) Crystal structure of muirite Ba<sub>9</sub>(Ca, Ba)(Ca, Ti)<sub>4</sub>(OH)<sub>8</sub>Si<sub>8</sub>O<sub>24</sub>(Cl, OH)<sub>8</sub>. *Doklady Acad. Nauk SSSR*, 221, 343–345 (in Russian). (4) (1981) *Mineral. Abs.*, 32, 247 (abs. ref. 3).