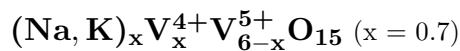


# Bannermanite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . As incrustations of subhedral to euhedral lathlike crystals, flattened on {001} and elongated along [010], up to 250  $\mu\text{m}$ .

**Physical Properties:** *Cleavage:* {100}, perfect; {010}, fair. *Tenacity:* Brittle. Hardness = n.d.  $D(\text{meas.}) = 3.5(2)$   $D(\text{calc.}) = 3.55$

**Optical Properties:** Opaque, transparent on thin edges. *Color:* Black; light brown on thin edges in transmitted light. *Streak:* Dark gray-black. *Luster:* Submetallic. *Optical Class:* Biaxial. *Orientation:* [010] || Y or Z; length-slow. *Absorption:*  $Y > X$  or  $Z > X$ .  $n = [2.2]$  (rule of Gladstone and Dale).

**Cell Data:** *Space Group:*  $C2/m$ .  $a = 15.413(7)$   $b = 3.615(2)$   $c = 10.066(8)$   
 $\beta = 109.29(8)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Izalco volcano, El Salvador. (ICDD 35-713).  
7.24 (100), 3.367 (100), 3.068 (80), 2.911 (80), 9.47 (70), 3.491 (70), 2.725 (60)

<b>Chemistry:</b>	(1)
$\text{V}_2\text{O}_5$	95.98
$\text{Na}_2\text{O}$	3.03
$\text{K}_2\text{O}$	1.26
Total	100.27

(1) Izalco volcano, El Salvador; by electron microprobe, average of six analyses,  $\text{V}^{4+}:\text{V}^{5+}$  from charge balance; corresponds to  $(\text{Na}_{0.56}\text{K}_{0.15})_{\Sigma=0.71} \text{V}_{0.71}^{4+} \text{V}_{5.29}^{5+} \text{O}_{15}$ .

**Occurrence:** In vanadium-bearing sublimates in fumaroles on a basaltic volcanic cone.

**Association:** Shcherbinaite, stoiberite, ziesite, fingerite, chalcocyanite, chalcanthite.

**Distribution:** From Izalco volcano, El Salvador.

**Name:** To honor Dr. Harold MacColl Bannerman (1897–1976), American economic geologist, U.S. Geological Survey and Dartmouth College, Hanover, New Hampshire, USA.

**Type Material:** Department of Earth Sciences, Dartmouth College, Hanover, New Hampshire; Harvard University, Cambridge, Massachusetts, 126482; National Museum of Natural History, Washington, D.C., USA, 148832, 160385.

**References:** (1) Hughes, J.M. and L.W. Finger (1983) Bannermanite, a new sodium-potassium vanadate isostructural with  $\beta\text{-Na}_x\text{V}_6\text{O}_{15}$ . *Amer. Mineral.*, 68, 634–641. (2) Evans, H.T., Jr. and J.M. Hughes (1990) Crystal chemistry of the natural vanadium bronzes. *Amer. Mineral.*, 75, 508–521, esp. 511–512, 519.