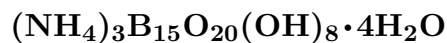


## Ammonioborite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . Microscopic plates, grouped in parallel; commonly as fine-grained granular masses.

**Physical Properties:** Hardness = n.d.  $D(\text{meas.}) = 1.765(4)$   $D(\text{calc.}) = 1.76$  Slowly soluble in  $\text{H}_2\text{O}$ .

**Optical Properties:** Semitransparent. *Color:* White; colorless in transmitted light. *Optical Class:* Biaxial (+). *Orientation:*  $Z \wedge$  elongation  $\simeq 7^\circ\text{--}13^\circ$ ;  $Y = b$ . *Dispersion:*  $r < v$ , slight.  $\alpha = 1.470$   $\beta = 1.487$   $\gamma = 1.540$   $2V(\text{meas.}) = \sim 60^\circ$

**Cell Data:** *Space Group:*  $C2/c$ .  $a = 25.27(5)$   $b = 9.65(3)$   $c = 11.56(3)$   $\beta = 94^\circ 17(5)'$   
 $Z = 4$

**X-ray Powder Pattern:** Synthetic.

3.16 (100), 3.09 (100), 5.70 (60), 2.876 (60), 3.01 (50), 8.98 (40), 5.44 (30).

**Chemistry:**

	(1)	(2)
$\text{B}_2\text{O}_3$	74.2	70.15
$(\text{NH}_4)_2\text{O}$	9.8	10.49
$\text{H}_2\text{O}$	[16.0]	19.36
Total	[100.0]	100.00

(1) Larderello, Italy;  $\text{H}_2\text{O}$  by difference. (2)  $(\text{NH}_4)_3\text{B}_{15}\text{O}_{20}(\text{OH})_8 \cdot 4\text{H}_2\text{O}$ .

**Occurrence:** In boric acid-rich fumarolic lagoons.

**Association:** Sassolite, larderellite.

**Distribution:** From Larderello, Val di Cecina, Tuscany, Italy.

**Name:** For its composition, *ammonium borate*.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 93756, 94172, R6167.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 366–367. (2) Clark, J.R. and C.L. Christ (1959) Studies of borate minerals (VII): X-ray studies of ammonioborite, larderellite, and the potassium and ammonium pentaborate tetrahydrates. *Amer. Mineral.*, 44, 1150–1158. (3) Merlino, S. and F. Sartori (1971) Ammonioborite: new borate polyion and its structure. *Science*, 171, 377–379.