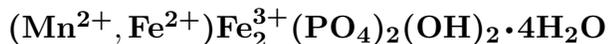


**Earlshannonite**

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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . As crystals, to 1 mm, prismatic, elongated along [001], showing {110}, {100}, {011}, commonly in parallel growth along [001], and in hemispherical radiating clusters. *Twining:* On {100}.

**Physical Properties:** *Cleavage:* Two, poor. *Fracture:* Even. *Tenacity:* Brittle. Hardness = 3–4 D(meas.) = 2.90(4) D(calc.) = 2.92

**Optical Properties:** Transparent. *Color:* Dark reddish brown, yellowish brown, yellow-orange, bright yellow. *Streak:* Pale brown. *Luster:* Vitreous.

*Optical Class:* Biaxial (-). *Pleochroism:* Moderate;  $X = Y$  = pale yellow-brown;  $Z$  = yellow-brown. *Orientation:*  $Z = c$ . *Absorption:*  $Z > X \simeq Y$ .  $\alpha = 1.696(4)$   $\beta = 1.745(4)$   $\gamma = 1.765(4)$   $2V(\text{meas.}) = 64(4)^\circ$

**Cell Data:** *Space Group:*  $P2_1/c$ .  $a = 9.910(13)$   $b = 9.669(8)$   $c = 5.455(9)$   $\beta = 93.95(9)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Foote mine, North Carolina, USA. 9.8 (100), 6.9 (80), 2.789 (70), 4.18 (60), 3.45 (60), 2.856 (60), 4.95 (40)

**Chemistry:**

	(1)	(2)
P <sub>2</sub> O <sub>5</sub>	30.0	31.0
Al <sub>2</sub> O <sub>3</sub>	0.1	0.3
Fe <sub>2</sub> O <sub>3</sub>	33.8	34.4
FeO	4.6	2.5
MnO	8.2	7.3
ZnO		0.3
MgO	0.8	2.3
CaO	0.6	
H <sub>2</sub> O	[21.9]	[21.9]
Total	[100.0]	[100.0]

(1) Foote mine, North Carolina, USA; by electron microprobe, Fe confirmed as dominantly Fe<sup>3+</sup> by microchemical tests and stoichiometry, H<sub>2</sub>O by difference; corresponds to  $(\text{Mn}_{0.55}^{2+}\text{Fe}_{0.30}^{2+}\text{Mg}_{0.09}\text{Ca}_{0.05})_{\Sigma=0.99}(\text{Fe}_{2.00}^{3+}\text{Al}_{0.01})_{\Sigma=2.01}(\text{PO}_4)_{2.00}(\text{OH})_{2.01} \cdot 4.75\text{H}_2\text{O}$ . (2) Hagendorf, Germany; by electron microprobe, corresponds to  $(\text{Mn}_{0.47}^{2+}\text{Mg}_{0.26}\text{Fe}_{0.16}\text{Zn}_{0.02})_{\Sigma=0.91}(\text{Fe}_{1.97}^{3+}\text{Al}_{0.03})_{\Sigma=2.00}(\text{PO}_4)_{2.00}(\text{OH})_{1.82} \cdot 4.66\text{H}_2\text{O}$ .

**Mineral Group:** Arthurite group.

**Occurrence:** A very late-stage secondary mineral in a lithium-rich granite pegmatite (Foote mine, North Carolina, USA).

**Association:** Jahnsite, laueite, mitridatite, rockbridgeite, manganese oxide, quartz (Foote mine, North Carolina, USA); rockbridgeite–frondelite (Hagendorf, Germany).

**Distribution:** In the USA, from the Foote mine, Kings Mountain, Cleveland Co., and at the LCA pegmatite, Bessemer City, Gaston Co., North Carolina; in Maine, in the Emmons quarry, Greenwood, and at the Dunton quarry, Newry, Oxford Co. From Hagendorf, Bavaria, Germany. At Dolní Bori, near Velké Meziříčí, Czech Republic.

**Name:** To honor Earl V. Shannon (1895–1981), American mineralogist and chemist, U.S. National Museum, Washington, D.C., USA.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 150168, R12832.

**References:** (1) Peacor, D.R., P.J. Dunn, and W.B. Simmons (1984) Earlshannonite, the Mn analogue of whitmoreite, from North Carolina. *Can. Mineral.*, 22, 471–474. (2) (1985) *Amer. Mineral.*, 70, 871–872 (abs. ref. 1).

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