

# Anthonyite

# $\text{Cu}(\text{OH}, \text{Cl})_2 \cdot 3\text{H}_2\text{O}$

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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . As prismatic crystals, commonly curved along [001], to 1 cm; as crusts.

**Physical Properties:** *Cleavage:* {100}, good. *Tenacity:* Sectile, crystals bending easily on the {100} cleavage. Hardness = 2 D(meas.) = n.d. D(calc.) = n.d.

**Optical Properties:** Semitransparent. *Color:* Lavender.

*Optical Class:* Biaxial (-). *Pleochroism:*  $X$  = rich lavender;  $Y = Z$  = deep smoky blue.

*Orientation:*  $Y = b$ ;  $Z \wedge b = 13^\circ$ . *Absorption:*  $Y = Z > X$ .  $\alpha = 1.526$   $\beta = 1.602$   $\gamma = 1.602$   $2V(\text{meas.}) = 3^\circ$

**Cell Data:** *Space Group:* n.d.  $a = \text{n.d.}$   $b = \text{n.d.}$   $c = \text{n.d.}$   $\beta = 112^\circ 38'$   $Z = \text{n.d.}$

**X-ray Powder Pattern:** Centennial mine, Michigan, USA.

5.84 (10), 4.14 (7), 3.99 (6), 3.44 (6), 2.87 (6), 3.18 (4), 3.07 (4)

## Chemistry:

	(1)
Cu	41.3
AgCl	0.24
Cl	6.3
$\text{H}_2\text{O}^+ + \text{OH}$	35.5
$\text{H}_2\text{O}^+$	16.4
Total	99.74

(1) Centennial mine, Michigan, USA; Cu by electrolysis,  $\text{H}_2\text{O}:\text{OH}$  from charge balance, corresponding to  $\text{Cu}_{1.00}[(\text{OH})_{1.72}\text{Cl}_{0.28}]_{\Sigma=2.00} \cdot 2.80\text{H}_2\text{O}$ .

**Occurrence:** In cavities and fractures in basalt, formed by the action of chlorine-bearing connate waters on copper (Centennial mine, Michigan, USA).

**Association:** Tremolite, quartz, epidote, monazite, copper, cuprite, paratacamite (Centennial mine, Michigan, USA).

**Distribution:** In the Centennial mine, Calumet, Houghton Co., Michigan and the Cole mine, Bisbee, Cochise Co., Arizona, USA. From Villa Hermosa, Sonora, Mexico. In Germany, at Richelsdorf, Hesse, in slag. From Laurium, Greece, in slag.

**Name:** For Professor John Williams Anthony (1920–1992), American mineralogist, University of Arizona, Tucson, Arizona, USA.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, 142653, 162617.

**References:** (1) Williams, S.A. (1963) Anthonyite and calumetite, two new minerals from the Michigan copper district. *Amer. Mineral.*, 48, 614–619.