

**Woodwardite**

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**Crystal Data:** Hexagonal. *Point Group:*  $\bar{3}2/m$  (probable). Fibrous, spherulitic.**Physical Properties:** Hardness = n.d. D(meas.) = 2.38 D(calc.) = n.d.**Optical Properties:** Translucent to transparent. *Color:* Rich turquoise-blue to greenish blue. *Optical Class:* Biaxial (+). *Orientation:* Parallel extinction.  $\alpha = 1.552-1.571$   $\beta = 1.555$   $\gamma = 1.565-1.576$  2V(meas.) = n.d.**Cell Data:** *Space Group:*  $R\bar{3}m$  (probable).  $a = 5.306(2)$   $c = 26.77(2)$   $Z = \text{n.d.}$ **X-ray Powder Pattern:** Cornwall, England.  
8.9 (100), 4.47 (90), 2.55 (60), 2.28 (50), 2.65 (30), 1.98 (30), 1.53 (30)

<b>Chemistry:</b>	(1)	(2)
$\text{SO}_4$	13.95	13.04
$\text{Al}_2\text{O}_3$	17.97	18.64
$\text{CuO}$	48.34	48.67
$\text{H}_2\text{O}$	18.48	[19.65]
Total	98.74	[100.00]

(1) Cornwall, England; corresponds to  $\text{Cu}_{3.49}\text{Al}_{2.02}(\text{SO}_4)_{1.00}(\text{OH})_{11.04}\cdot 0.36\text{H}_2\text{O}$ . (2) Do.;  $\text{H}_2\text{O}$  by difference, corresponds to  $\text{Cu}_{3.76}\text{Al}_{2.24}(\text{SO}_4)_{1.00}(\text{OH})_{12.24}\cdot 0.58\text{H}_2\text{O}$ . (3) Do.; by electron microprobe, analyses not given, Cu:Al ratios stated to fall between 1.73 and 2.03.

**Occurrence:** A rare secondary mineral in the oxidized zone of copper deposits.**Association:** n.d.**Distribution:** In England, from Cornwall, the original locality not known; at the South Caradon mine, St. Cleer, and from Wheals Cock and Hazard, and the Botallack mine, St. Just. At Klausen, Tirol, Italy. In the USA, from the Maid of Sunshine mine, Courtland, Cochise Co., Arizona, and at the Deer Trail mine, six km southwest of Marysvale, Paiute Co., Utah. From the Kabasaka and Nyukaku mines, Kyogo Prefecture, Japan. As the species definition is somewhat uncertain, all reported localities may need reassessment.**Name:** Honors Samuel Pickford Woodward (1821–1865), English geologist and naturalist.**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 962. (2) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 580. (3) Meixner, H. (1940) Über Woodwardit aus Cornwall und von Klausen (hier fälschlich "Langit" gennant) in Südtirol. Zentr. Miner. Abt. A, 11, 238–244. (4) Nickel, E. (1976) New data on woodwardite. Mineral. Mag., 43, 644–647. (5) Raade, G., C.J. Elliott, and V.K. Din (1985) New data on glaucocerinite. Mineral. Mag., 49, 583–590.