

# Halloysite



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**Crystal Data:** Monoclinic. *Point Group:* *m*. Massive, claylike. On a microscopic scale, tubular, average 0.04  $\mu\text{m}$ ; tubes split open and unroll to form laths or spatula shapes; spherical.

**Physical Properties:** *Cleavage:* {001}, probable. *Fracture:* Conchoidal. Hardness = 2–2.5  
D(meas.) = 2.55–2.565 D(calc.) = [2.57]

**Optical Properties:** Semitransparent. *Color:* White; gray, green, blue, yellow, red from included impurities. *Luster:* Pearly, waxy, or dull.  
*Optical Class:* Biaxial.  $n = 1.55\text{--}1.56$   $2V(\text{meas.}) = \text{n.d.}$

**Cell Data:** *Space Group:* *Cc*.  $a = 5.14(4)$   $b = 8.90(4)$   $c = 14.9(1)$   $\beta = 101.9^\circ$   $Z = [4]$

**X-ray Powder Pattern:** Indiana, USA. (ICDD 29-1489).  
10.0 (100), 4.36 (70), 3.35 (40), 2.54 (35), 1.480 (30), 1.672 (14), 1.281 (8)

<b>Chemistry:</b>	(1)	(2)	(1)	(2)	
SiO <sub>2</sub>	43.98	46.55	CaO	0.32	
TiO <sub>2</sub>	0.01		Na <sub>2</sub> O	0.14	
Al <sub>2</sub> O <sub>3</sub>	38.46	39.49	K <sub>2</sub> O	0.48	
FeO	0.03		H <sub>2</sub> O <sup>+</sup>	14.59	13.96
MgO	trace		H <sub>2</sub> O <sup>-</sup>	2.58	
			<hr/>		
			Total	100.59	100.00

(1) Eureka, Utah, USA. (2) Al<sub>2</sub>Si<sub>2</sub>O<sub>5</sub>(OH)<sub>4</sub>.

**Polymorphism & Series:** Dickite, kaolinite, and nacrite are polymorphs.

**Mineral Group:** Kaolinite-serpentine group; called endellite in European literature.

**Occurrence:** A product of hydrothermal alteration or surface weathering of aluminosilicate minerals, as feldspars. Formed by dehydration of endellite above 110 °C.

**Association:** Kaolinite, endellite, allophane, alunite.

**Distribution:** Undoubtedly widespread. Probably at Angleur, Liège, Belgium, the “type” locality, now inaccessible. From Valença, Portugal. At Bergnersreuth, near Wunsiedel, Bavaria, Germany. In the USA, from Wagon Wheel Gap, Mineral Co., Colorado; at Gonzales, Gonzales Co., Texas; near Bedford, Lawrence Co., Indiana; at Horse Cove, Hart Co., Kentucky; in the Corundum Hill mine, Macon Co., North Carolina. Also from the Dragon Consolidated iron mine, Eureka, Tintic district, Juab Co., Utah; in a number of porphyry copper deposits in Arizona, as at Ray, Pinal Co., Globe-Miami, Gila Co., and others.

**Name:** To honor Baron Omalius d’Halloy (1707–1789), who first observed the mineral.

**References:** (1) Dana, E.S. (1892) Dana’s system of mineralogy, (6th edition), 688–689. (2) Alexander, L.T., G.T. Faust, S.B. Hendricks, H. Insley, and H.F. McMurdie (1943) Relationship of the clay minerals halloysite and endellite. *Amer. Mineral.*, 28, 1–18. (3) Brindley, G.W. and K. Robinson, (1948) X-ray studies of halloysite and metahalloysite. *Mineral. Mag.*, 28, 392–428. (4) Bates, T.F., F.A. Hildebrand, and A. Swineford (1950) Morphology and structure of endellite and halloysite. *Amer. Mineral.*, 35, 463–484. (5) Grim, R.E. (1953) *Clay Mineralogy*, McGraw Hill, 370. (6) Faust, G.T. (1955) The endellite-halloysite nomenclature. *Amer. Mineral.*, 40, 1110–1118. (7) Deer, W.A., R.A. Howie, and J. Zussman (1963) *Rock-forming minerals*, v. 3, sheet silicates, 194–212. (8) Mitra, G.B. and S. Bhattacharjee (1975) The structure of halloysite. *Acta Cryst.*, 31, 2851–2857. (9) Kohyama, N., K. Fukushima, and A. Fukami (1978) Observation of the hydrated form of tubular halloysite by an electron microscope equipped with an environmental cell. *Clays and Clay Minerals*, 26, 25–40.

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