

Allophane



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Crystal Data: Amorphous (?). *Point Group:* n.d. Rarely observed as ring-shaped particles, with diameters of 50 Å, which in three dimensions may represent sections through hollow spherules or polyhedra. As hyaline crusts and masses; stalactites and flowstones.

Physical Properties: *Fracture:* Conchoidal to earthy. *Tenacity:* Brittle. Hardness = 3
D(meas.) = 2.75 D(calc.) = n.d.

Optical Properties: Translucent. *Color:* White, pale blue to sky-blue, green, brown.
Luster: Vitreous to earthy, waxy.
Optical Class: Isotropic. $n = 1.468\text{--}1.512$ (air-dried).

Cell Data: *Space Group:* n.d. $Z = \text{n.d.}$

X-ray Powder Pattern: n.d.

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO ₂	21.39	28.31	29.17	CaO	1.96	trace	trace
TiO ₂		0.40	0.42	Na ₂ O		1.91	1.48
Al ₂ O ₃	35.20	34.41	33.81	K ₂ O		0.29	0.16
Fe ₂ O ₃		0.56	0.56	H ₂ O ⁺	40.86	10.60	11.20
MgO		0.08	0.04	H ₂ O [−]		23.20	23.00
				Total	99.41	99.76	[99.84]

(1) Allentown, Lehigh Co., Pennsylvania, USA; CaO as (Ca,Mg)CO₃. (2) Iijima, Japan.
(3) Kanuma, Japan; original total given as 99.81%.

Occurrence: A weathering product of volcanic ash. In hydrothermally altered igneous rocks, from the breakdown of feldspars, and in hydrothermal veins, typically related to copper deposits. In sedimentary rocks, including chalk and coal beds.

Association: Quartz, cristobalite, imogolite, gibbsite, vermiculite, chrysocolla, “limonite”.

Distribution: Of widespread occurrence. From Gräfenenthal, near Saalfeld, Thuringia, and at Schneeberg and Schwarzenberg, Saxony, Germany. From Jáchymov (Joachimsthal), Czech Republic. In the Calabona mine, Alghero, and the Rosas mine, Sulsis, Sardinia, Italy. At Laurium, Greece. From near Woolwich, Kent, and Wheal Hamblyn, Devon, England. At the Chessy copper mine, near Lyons, Rhône, France. In the USA, from Bisbee, and the Maid of Sunshine mine, Gleeson, Cochise Co., Arizona; from Kelly, Socorro Co., New Mexico; at Cerro Gordo, Inyo Co., California; and at Friedensville, Lehigh Co. and Cornwall, Lebanon Co., Pennsylvania. In the Mbobbo Mkulu Cave, Transvaal, South Africa. From Japan, in the Misotsuchi volcanic ash bed at Iijima, Nagano Prefecture, and the Kanumatsuchi bed at Kanuma, Tochigi Prefecture. At Mt. Shank, South Australia.

Name: From the Greek for *other* and *to appear*, referring to a change of appearance under the blowpipe.

Type Material: Mining Academy, Freiberg, Germany, 26104.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 693–694.
(2) Kitagawa, Y. (1974) Dehydration of allophane and its structural formula. *Amer. Mineral.*, 59, 1094–1098. (3) Henmi, T. and K. Wada (1976) Morphology and composition of allophane. *Amer. Mineral.*, 61, 379–390. (4) Wada, S.I. and K. Wada (1977) Density and structure of allophane. *Clay Minerals Bull.*, 12, 289–298. (5) Bailey, S.W. (1980) Summary of recommendations of AIPEA nomenclature committee on clay minerals. *Amer. Mineral.*, 65, 1–7.
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