

# Kaolinite

# Al<sub>2</sub>Si<sub>2</sub>O<sub>5</sub>(OH)<sub>4</sub>

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**Crystal Data:** Triclinic. *Point Group:* 1. Rarely as crystals, thin platy or stacked, to 2 mm. More commonly as microscopic pseudo-hexagonal plates and clusters of plates, aggregated into compact, claylike masses.

**Physical Properties:** *Cleavage:* Perfect on {001}. *Tenacity:* Flexible but inelastic. Hardness = 2–2.5 D(meas.) = 2.61–2.68 D(calc.) = 2.63

**Optical Properties:** Transparent to translucent as single crystals. *Color:* White to tan, may be variously colored by impurities. *Luster:* Pearly to dull earthy.

*Optical Class:* Biaxial (-). *Orientation:*  $X \wedge c = -13^\circ$  to  $-10^\circ$ ;  $Y \wedge a = 1^\circ$ – $4^\circ$ .

*Dispersion:*  $r > v$ , weak.  $\alpha = 1.553$ – $1.565$   $\beta = 1.559$ – $1.569$   $\gamma = 1.560$ – $1.570$

$2V(\text{meas.}) = 24^\circ$ – $50^\circ$

**Cell Data:** *Space Group:*  $P1$ .  $a = 5.15$   $b = 8.95$   $c = 7.39$   $\alpha = 91.8^\circ$   
 $\beta = 104.5^\circ$ – $105.0^\circ$   $\gamma = 90^\circ$   $Z = [2]$

**X-ray Powder Pattern:** Scalby, Yorkshire, England (1A).

7.16 (vvs), 3.573 (vvs), 4.336 (vs), 2.491 (s), 2.289 (s), 2.558 (ms), 2.379 (ms)

## Chemistry:

	(1)
SiO <sub>2</sub>	45.80
Al <sub>2</sub> O <sub>3</sub>	39.55
Fe <sub>2</sub> O <sub>3</sub>	0.57
FeO	0.18
MgO	0.14
CaO	0.41
K <sub>2</sub> O	0.03
H <sub>2</sub> O <sup>+</sup>	13.92
H <sub>2</sub> O <sup>-</sup>	0.17
Total	100.77

(1) Mikawo mine, Niigata Prefecture, Japan; corresponds to  $(\text{Al}_{2.00}\text{Fe}_{0.02}^{3+}\text{Mg}_{0.01}\text{Ca}_{0.02})_{\Sigma=2.05}\text{Si}_2\text{O}_5(\text{OH})_{3.99}$ .

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

**Mineral Group:** Kaolinite-serpentine group.

**Occurrence:** Replaces other aluminosilicate minerals during hydrothermal alteration and weathering. A common constituent of the clay-size fraction of sediments, where it may be formed by direct precipitation.

**Association:** Quartz, feldspar, muscovite.

**Distribution:** Pure material from many localities, including: at Kauling, Kiangsi Province, China. In numerous china-clay pits in Cornwall and Devon, England. At Limoges, Haute-Vienne, France. Near Dresden, Kemmlitz, and Zettlitz, Saxony, and elsewhere in Germany. Large deposits in the Donets Basin, Ukraine. In the USA, at Macon, Bibb Co., Georgia; at the Dixie Clay Company mine, and in the Lamar Pit, near Bath, Aikin Co., South Carolina; near Webster, Jackson Co., North Carolina; near Murfreesboro, Pike Co., and at Greenwood, Sebastian Co., Arkansas; from Mesa Alta, Rio Arriba Co., New Mexico. At Huberdeau, Quebec, and near Walton, Nova Scotia, Canada.

**Name:** From a corruption of the Chinese *Kauling*, *high ridge*, for a Chinese occurrence. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of Mineral Data Publishing.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 684–687. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 3, sheet silicates, 194–212. (3) Brindley, G.W. and K. Robinson (1946) The structure of kaolinite. *Mineral. Mag.*, 27, 242–253. (4) Goodyear, J. and W.J. Duffin (1961) An X-ray examination of an exceptionally well crystallized kaolinite. *Mineral. Mag.*, 32, 902–907. (5) Young, R.A. and A.W. Hewat (1988) Verification of the triclinic crystal structure of kaolinite. *Clays and Clay Minerals*, 36, 225–232.