Kaolinite $Al_2Si_2O_5(OH)_4$

Crystal Data: Triclinic. *Point Group:* 1. Rarely as crystals, thin platy or stacked, to 2 mm. More commonly as microscopic pseudohexagonal 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:* $X \wedge c = -13°$ to $-10°$; $Y \wedge a = 1°$–$4°$.
Dispersion: $r > v$, weak. $\alpha = 1.553$–1.565 $\beta = 1.559$–1.569 $\gamma = 1.560$–1.570
2V(meas.) = 24°–50°

Cell Data: *Space Group:* $P1$. $a = 5.15$ $b = 8.95$ $c = 7.39$ $\alpha = 91.8°$ $\beta = 104.5°-105.0°$ $\gamma = 90°$ 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_2	45.80
Al_2O_3	39.55
Fe_2O_3	0.57
FeO	0.18
MgO	0.14
CaO	0.41
K_2O	0.03
H_2O^+	13.92
H_2O^-	0.17
Total	100.77

(1) Mikawo mine, Niigata Prefecture, Japan; corresponds to $(Al_{2.00}Fe^{3+}_{0.02}Mg_{0.01}Ca_{0.02})_{\Sigma=2.05}Si_2O_5(OH)_{3.99}$.

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.

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.