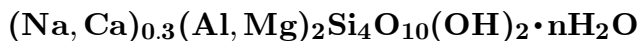


Montmorillonite



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Crystal Data: Monoclinic. *Point Group:* $2/m$. Tiny scaly crystals, tabular on {001}; as lamellar or globular microcrystalline aggregates; clayey, compact, massive.

Physical Properties: *Cleavage:* {001}, perfect. *Fracture:* Uneven. Hardness = 1–2
D(meas.) = 2–3 D(calc.) = n.d. Positive identification of minerals in the smectite group may need data from DTA curves, dehydration curves, and X-ray powder patterns before and after treatment by heating and with organic liquids.

Optical Properties: Translucent. *Color:* White, pale pink, buff, yellow, red, green.
Luster: Dull, earthy.

Optical Class: Biaxial (-). *Pleochroism:* X = colorless to pale brown, yellow-green; Y = dark brown to yellow-green, olive-green, pale yellow; Z = brown to olive-green, pale yellow.
Orientation: $X \simeq c$; $Y = b$; $Z \simeq a$. $\alpha = 1.492\text{--}1.503$ $\beta = 1.513\text{--}1.534$ $\gamma = 1.513\text{--}1.534$
 $2V(\text{meas.}) = 10^\circ\text{--}25^\circ$

Cell Data: *Space Group:* $C2/m$. $a = 5.17(2)$ $b = 8.94(2)$ $c = 9.95(6)$ $\beta = \text{n.d.}$ $Z = 1$

X-ray Powder Pattern: Chambers, Arizona, USA; Na and glycerol saturated.

17.6 (10), 4.49 (8), 1.50 (6), 9.00 (5), 3.58 (4), 2.57 (4b), 2.99 (3)

Chemistry:

	(1)
SiO ₂	51.14
Al ₂ O ₃	19.76
Fe ₂ O ₃	0.83
MgO	3.22
CaO	1.62
Na ₂ O	0.11
K ₂ O	0.04
H ₂ O ⁺	7.99
H ₂ O ⁻	14.81
Total	99.52

(1) Montmorillon, France; corresponds to $(\text{Ca}_{0.14}\text{Na}_{0.02})_{\Sigma=0.16}(\text{Al}_{1.68}\text{Mg}_{0.36}\text{Fe}_{0.04})_{\Sigma=2.08}$
 $(\text{Si}_{3.90}\text{Al}_{0.10})_{\Sigma=4.00}\text{O}_{10}(\text{OH})_2 \cdot 1.02\text{H}_2\text{O}$.

Polymorphism & Series: Interstratifies with chlorite, muscovite, illite, cookeite, kaolinite.

Mineral Group: Smectite group.

Occurrence: An alteration product of volcanic tuff and ash, forming bentonite beds, and of pegmatite dikes and wall rocks bordering hydrothermal mineral deposits. Forms under alkaline conditions of poor drainage, with Mg, Ca, Na, and K remaining in the soil.

Association: Cristobalite, zeolites, biotite, quartz, orthoclase, dolomite, amphiboles, pyroxenes, olivine, calcite, gypsum, pyrite, "limonite".

Distribution: A common clay mineral, with numerous localities worldwide. From Montmorillon, Vienne, France. In the USA, material considered as standards from Bayard and Santa Rita, Grant Co., New Mexico; near Chambers, Apache Co., Arizona; at Belle Fourche, Butte Co., South Dakota; in Wyoming, on the John C. Lane tract, Upton, Weston Co., at Clay Spur, near Newcastle, Crook Co., and elsewhere. In the Itawamba mine, Itawamba Co., and in mines around Polkville, Simpson Co., Mississippi; at Strasburg, Shenandoah Co., Virginia.

Name: After the occurrence at Montmorillon, France.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 690–691, 695–697. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 3, sheet silicates, 226–245. (3) Early, J.W., B.B. Osthaus, and I.H. Milne (1953) Purification and properties of montmorillonite. Amer. Mineral., 38, 707–724.

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