Beidellite $(Ca_{0.5}, Na)_{0.3}Al_2(Si, Al)_4O_{10}(OH)_2 \cdot nH_2O$

Crystal Data: Monoclinic, pseudohexagonal. *Point Group:* $2/m$. As thin plates, laths, and ribbons, to 30 μm; in veinlets filling fractures and as claylike masses.

Physical Properties: *Cleavage:* Perfect on {001}. Hardness = 1–2 D(meas.) = 2–3 depending on hydration. 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, reddish brown, brownish gray. *Luster:* Waxy to vitreous.
Optical Class: Biaxial (–). $\alpha = 1.494$ $\beta = 1.536$ $\gamma = 1.536$ 2V(meas.) = 9°–16°

Cell Data: *Space Group:* $C2/m$. $a = 5.179$ $b = 8.970$ $c = 17.57$ $\beta =$ [$\sim 90°$]
Z = n.d.

X-ray Powder Pattern: Black Jack mine, Idaho, USA; glycolated, diffuse pattern.
17.6 (100), 4.42 (100), 3.95 (100), 3.54 (100), 2.50 (100), 1.498 (100), 2.57 (80)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	45.32	45.83	CaO	2.76	1.41
TiO_2		0.46	Na_2O	0.10	0.16
Al_2O_3	27.84	22.79	K_2O	0.12	0.09
Fe_2O_3	0.70	5.71	H_2O^+	14.48	9.79
FeO		0.28	H_2O^-	8.16	12.55
MgO	0.16	0.86	Total	99.64	99.93

(1) Black Jack mine, Idaho, USA; corresponds to $(Ca_{0.23}Na_{0.02}K_{0.01})_{\Sigma=0.26}(Al_{1.96}Fe^{3+}_{0.04}Mg_{0.02})_{\Sigma=2.02}(Si_{3.46}Al_{0.54})_{\Sigma=4.00}O_{10}(OH)_2$. (2) Velka Kopan, Ukraine; corresponds to $(Ca_{0.12}Na_{0.02}K_{0.01})_{\Sigma=0.15}(Al_{1.62}Fe^{3+}_{0.33}Mg_{0.10}Ti_{0.03}Fe^{2+}_{0.02})_{\Sigma=2.10}(Si_{3.54}Al_{0.46})_{\Sigma=4.00}O_{10}(OH)_2$.

Mineral Group: Smectite group.

Occurrence: A constituent of bentonitic clays; an alteration product in hydrothermal mineral deposits, especially porphyry Cu-Mo systems; in soils derived from mafic rocks.

Association: Plagioclase, quartz, orthoclase, montmorillonite, kaolin, allophane, muscovite.

Distribution: Of worldwide occurrence, but pure and well-characterized materials are uncommon. In the USA, from Beidell, Saguache Co., and at Wagon Wheel Gap, Mineral Co., Colorado; in the Black Jack mine, Carson district, Owyhee Co., Idaho; from Arizona, at Morenci, Greenlee Co., Ajo, Pima Co., in the San Manuel mine, Pinal Co., and in the Globe-Miami district, Gila Co.; at Boron, Kern Co., California. In the Princess mine, Namiquipa, Chihuahua, Mexico. From Sibert, Rhône, France. At Unterrupsroth, Bavaria, Germany. From Velka Kopan, Khust, Ukraine.

Name: For Beidell, Colorado, USA.

Type Material: National Museum of Natural History, Washington, D.C., USA, R4762 (Black Jack mine, Idaho, USA); R4761 (Beidell, Colorado, USA, material determined to be a mixture in part).

References: (1) Larsen, E.S. and E.T. Wherry (1925) Beidellite, a new mineral name. J. Wash. Acad. Sci., 15, 465–466. (2) Ross, C.S. and E.V. Shannon (1925) The chemical and optical properties of beidellite. J. Wash. Acad. Sci., 15, 467–468. (3) (1926) Amer. Mineral., 11, 167 (abs. refs. 1 and 2). (4) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 3, sheet silicates, 226–245. (5) Weir, A.H. and R. Greene-Kelly (1962) Beidellite. Amer. Mineral., 47, 137–146.