Banalsite $Na_2BaAl_4Si_4O_{16}$

Crystal Data: Orthorhombic. *Point Group*: *mm*2. Very rarely showing traces of crystal faces; coarsely crystalline to compact, granular to 5 mm, massive.

Physical Properties: *Cleavage*: Good on {110} and {001}. Hardness = 6.5 D(meas.) = 3.065 D(calc.) = 3.05-308

Optical Properties: Translucent to transparent in thin flakes. *Color*: White.
Luster: Vitreous, pearly on cleavage.
Optical Class: Biaxial (+). *Orientation*: $X = c$, $Y = a$, $Z = b$. α = 1.5695 β = 1.5710 γ = 1.5775
2V(meas.) = 41(3)°

Cell Data: *Space Group*: *Iba*2. a = 8.5400(7) b = 10.0127(9) c = 16.7897(14) Z = 4

X-ray Powder Pattern: Benallt mine, Wales; close to stronalsite.
3.53 (100), 5.20 (90), 8.50 (80), 3.21 (80), 2.90 (80), 2.09 (80), 3.77 (70)

Chemistry:

	(1)	(2)
SiO_2	34.74	36.44
Al_2O_3	31.20	30.92
MnO	0.03	
MgO	1.00	
CaO	0.81	
BaO	21.99	23.25
Na_2O	8.43	9.40
K_2O	0.66	
H_2O	1.08	.
Total	99.94	100.00

(1) Benallt mine, Wales. (2) $Na_2BaAl_4Si_4O_{16}$.

Polymorphism & Series: Forms a series with stronalsite.

Mineral Group: Feldspar group.

Occurrence: In veinlets through manganese ore and in lenses in metamorphosed mudstone (Benallt mine, Wales). From altered ultramafic xenoliths in alkaline rocks (nepheline syenite, jacupirangite), alkaline ultramafic rocks (nepheline melilitolite), rodingite and jadeitite, and from metasomatic rocks enriched in Fe-Mn oxides and carbonates.

Association: Calcite, natrolite, tephroite, jacobsite, alleghanyite, pyrophanite, Mn-rich biotite, andradite, harmotome, apatite (Benallt mine, Wales); magnetoplumbite, macedonite, roeblingite, natrolite, Na-Ca zeolites (Långban, Sweden).

Distribution: In the Benallt mine, Rhiw, Lleyn Peninsula, Wales. At Långban, Värmland, Sweden. From the Kalahari manganese field, Cape Province and the Pilansberg peralkaline complex, South Africa. In the Prairie Lake complex, Superior Alkaline Province, northwestern Ontario, Canada. From the Sakharjok alkaline complex, the Turiy Mys complex of ultramafic-alkaline rocks and carbonatites, and the peralkaline Gremyakha-Vyrmes complex, Kola Alkaline Province, Russia. From the Zhidoy massif, Eastern Sayan, Siberia, Russia.

Name: Derived from the chemical symbols for the major constituents, *Ba*, *Na*, *Al*, *Si*.

Type Material: National School of Mines, Paris, France; The Natural History Museum, London, England, 1944,420-423; Harvard University, Cambridge, Massachusetts, 108656; National Museum of Natural History, Washington, D.C., USA, 105854.

References: (1) Campbell Smith, W., F.A. Bannister, and M.H. Hey (1944) A new barium-feldspar from Wales. Nature, 154, 336-337. (2) (1945) Amer. Mineral., 30, 85 (abs. ref. 1). (3) Campbell Smith, W., F.A. Bannister, and M.H. Hey (1944) Banalsite, a new barium-feldspar from Wales.

Mineral. Mag., 27, 33-47. (4) Haga, N. (1973) The crystal structure of banalsite, $BaNa_2Al_4Si_4O_{16}$, and its relation to the feldspar structure. Mineral. J. (Japan), 7, 262-281. (5) Welin, E. (1968) X-ray powder data for minerals from Långban and the related mineral deposits of Central Sweden. Arkiv Mineral. Geol., 4(30), 499-541. (6) Liferovich, R.P., A.J. Locock, R.H. Mitchell, and A.K. Shpachenko (2006) The crystal structure of stronalsite and a redetermination of the structure of banalsite. Can. Mineral., 44, 533-546. (7) (2006) Amer. Mineral., 91(11), 1954 (abs. ref. 6). (8) Liferovich R.P., R.H. Mitchell, D.R. Zozulya, and A.K. Shpachenko (2006) Paragenesis and composition of banalsite, stronalsite, and their solid solution in nepheline syenite and ultramafic alkaline rocks. Can. Mineral., 44, 929-942.