

Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. Equant subhedral crystals, to 1 mm, typically granular.

Physical Properties: *Cleavage:* On {201}, a parting. *Fracture:* Subconchoidal. Hardness = 7.5 D(meas.) = 3.37–3.45 D(calc.) = 3.437 Blue fluorescence under SW UV, with weak phosphorescence.

Optical Properties: Transparent to translucent. *Color:* Colorless, white, pale yellow. *Luster:* Vitreous.

Optical Class: Biaxial (+). *Orientation:* $X = a$; $Y = c$; $Z = b$. *Dispersion:* $r > v$, strong. $\alpha = 1.712$ – 1.717 $\beta = 1.717$ – 1.720 $\gamma = 1.724$ – 1.729 $2V(\text{meas.}) = 70(2)^\circ$ $2V(\text{calc.}) = 72^\circ$

Cell Data: *Space Group:* $Cmma$. $a = 7.968(1)$ $b = 11.724(1)$ $c = 4.374(1)$ $Z = 4$

X-ray Powder Pattern: Johachido district, North Korea.

2.632 (100), 1.964 (49), 1.820 (27), 2.434 (25), 2.001 (25), 1.754 (21), 3.506 (18)

Chemistry:	(1)	(2)
P ₂ O ₅	0.03	
SiO ₂	0.34	
B ₂ O ₃	24.21	49.38
Al ₂ O ₃	28.34	24.11
Fe ₂ O ₃	0.09	
MnO	0.23	
CaO	24.77	26.51
Na ₂ O	8.27	
F	12.21	
H ₂ O ⁺	6.52	
H ₂ O ⁻	0.07	
–O = F ₂	5.14	
Total	99.94	100.00

(1) Johachido district, North Korea; apparently of a mixture. (2) CaAlB₃O₇, established by crystal-structure analysis and presence of Ca and Al with absence of F by electron microprobe.

Occurrence: In a nepheline dike cutting limestone (Johachido district, North Korea).

Association: Scapolite, diopside, albite, nepheline, apatite, phlogopite (Johachido district, North Korea).

Distribution: From the Johachido district, Kankyo Hodu Prefecture, North Korea. A cut stone considered of natural origin is attributed to the Mogok region, Myanmar.

Name: For the Johachido district, North Korea, which produced the first specimens.

Type Material: Unknown; National Museum of Natural History, Washington, D.C., USA, 105479 was used for species redefinition.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 384. (2) Aristarain, L.F. and R.C. Erd (1977) Johachidolite redefined: a calcium aluminum borate. *Amer. Mineral.*, 62, 327–329. (3) Moore, P.B. and T. Araki (1972) Johachidolite, CaAl[B₃O₇], a borate with very dense atomic structure. *Nature*, 240, 63–65. (4) Harding, R.R., J.G. Francis, C.J.E. Oldershaw, and A.H. Rankin (1999) Johachidolite - a new gem. *J. Gemmology*, 26(5), 324–329.