

Baotite**Ba₄(Ti, Nb)₈Si₄O₂₈Cl**

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Crystal Data: Tetragonal. *Point Group:* 4/*m* As crystals, to 10 cm; as subhedral crystals and grains.

Physical Properties: *Cleavage:* Fair on {110}. *Fracture:* Hackly. *Tenacity:* Brittle. Hardness = 6 VHN = 769 D(meas.) = 4.42–4.71 D(calc.) = 4.69

Optical Properties: Translucent to transparent. *Color:* Light brown to black. *Luster:* Nearly semimetallic to vitreous.

Optical Class: Uniaxial (+). *Pleochroism:* Strong; *O* = colorless; *E* = dark brownish to light greenish yellow. *Absorption:* *E* > *O*. $\omega = 1.94$ $\epsilon = 2.16$

Cell Data: *Space Group:* *I*4₁/*a*. *a* = 19.2–20.022 *c* = 5.908–6.006 *Z* = 16

X-ray Powder Pattern: Ravalli Co., Montana, USA.

1.335 (100), 1.422 (25), 3.139 (10), 1.763 (9.5), 3.516 (9), 2.234 (9), 1.351 (9)

Chemistry:	(1)	(2)		(1)	(2)
SiO ₂	14.17	15.74	CaO	0.41	0.22
TiO ₂	29.33	41.48	BaO	37.55	40.21
Al ₂ O ₃	1.62	0.10	Na ₂ O	0.20	
Fe ₂ O ₃	3.07	0.22	K ₂ O	0.13	
Cr ₂ O ₃	0.05		Cl	2.01	1.69
Nb ₂ O ₅	11.50	0.07	H ₂ O	0.52	
MgO	0.20		–O = Cl ₂	0.45	
			Total	100.31	99.73

(1) Baiyun-Obo mine, China; corresponds to (Ba_{3.82}Ca_{0.11}) $\Sigma=3.93$ (Ti_{5.84}Nb_{1.35}Fe_{0.60}Al_{0.18}) $\Sigma=7.97$ (Si_{3.68}Al_{0.32}) $\Sigma=4.00$ O₂₈Cl_{0.88}. (2) Šebkovice, Czech Republic; by electron microprobe, corresponding to (Ba_{4.00}Ca_{0.06}) $\Sigma=4.06$ (Ti_{7.91}Fe_{0.04}Al_{0.02}Nb_{0.01}) $\Sigma=7.98$ (Si_{3.99}Al_{0.01}) $\Sigma=4.00$ O₂₈Cl_{0.73}.

Occurrence: In quartz veins cutting quartzite near alkaline granite and syenite (Baiyun-Obo mine, China); in a carbonate vein cutting “hornblende” gneiss intruded by diabase sills and small pegmatites (Ravalli Co., Montana, USA).

Association: Quartz, calcite, aegirine, galena, pyrite, alkaline amphiboles (Baiyun-Obo mine, China); calcite, dolomite, ancylite, aeschynite, monazite, sodic amphiboles, barite (Ravalli Co., Montana, USA); benitoite, bario-orthojoaquinite, fresnoite, natrolite (Gem mine, California, USA).

Distribution: In China, from the Baiyun-Obo mine, near Pao-t’ou, Inner Mongolia. In the USA, on Sheep Creek, Ravalli Co., Montana, and at the Gem mine, San Benito Co., California. From Šebkovice, Czech Republic. At Karlstein and Jarolden, Waldviertel region, Austria. In the Garaoulère mine, Pierrefitte, Hautes-Pyrénées, France.

Name: For the locality, Pao-t’ou (Baotou in Russian), China.

Type Material: National School of Mines, Paris, France.

References: (1) Peng Ch’i-Jui (1959) The discovery of several new minerals of rare elements. *Ti Chih K’o Hsueh*, 10, 289 (in Chinese). (2) (1960) *Amer. Mineral.*, 45, 754 (abs. ref. 1). (3) Semonov, V.I. (1960) Baotite, a mineral with a metasilicate ring (Si₄O₁₂). *Kristallografiya* (Sov. Phys. Crystal.), 5, 544–546 (in Russian). (4) Heinrich, E.W., W.H. Boyer, and F.A. Crowley (1962) Baotite (pao-t’ou-k’uang) from Ravalli County, Montana. *Amer. Mineral.*, 47, 987–993. (5) Nekrasov, Y.K., V.I. Ponomarev, V.I. Simonov, and D.M. Kheiker (1969) Refinement of the atomic structure of baotite and the isomorphic relationships in this mineral. *Kristallografiya* (Sov. Phys. Crystal.), 14, 602–609 (in Russian). (6) Vlasov, K.A., Ed. (1966) *Mineralogy of rare elements*, v. II, 566–567. (7) Němec, D. (1987) Baotite – a rock-forming mineral of Ba-rich hyperpotassic dyke rocks. *Neues Jahrb. Mineral., Monatsh.*, 31–42.

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