

Elbaite**Na(Al, Li)₃Al₆(BO₃)₃Si₆O₁₈(OH)₄**

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Crystal Data: Hexagonal. *Point Group:* 3*m*. Crystals prismatic to acicular, with prominent trigonal prism and pyramid, to 1.6 m, commonly hemimorphic, striated || [0001]. Also radial, fibrous, and massive. *Twinning:* Rare, on {10 $\bar{1}$ 1} or {40 $\bar{4}$ 1}.

Physical Properties: *Cleavage:* {11 $\bar{2}$ 0}, {10 $\bar{1}$ 1}, very poor. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 7 D(meas.) = 2.90–3.10 D(calc.) = 3.069 Pyroelectric and piezoelectric.

Optical Properties: Transparent to translucent. *Color:* Green, blue, red, orange, yellow, colorless, zoning common parallel to trigonal outline; colorless in thin section. *Luster:* Vitreous to resinous.

Optical Class: Uniaxial (-); under strain may show slight biaxiality. *Pleochroism:* *O* = pink, pale green, pale to deep blue; *E* = colorless, yellow, olive-green, purplish. *Absorption:* *O* > *E*. $\omega = 1.633\text{--}1.651$ $\epsilon = 1.615\text{--}1.630$

Cell Data: *Space Group:* *R*3*m*. *a* = 15.80–15.93 *c* = 7.09–7.13 *Z* = 3

X-ray Powder Pattern: Mt. Apatite, Auburn, Androscoggin Co., Maine, USA. (ICDD 26-964).

2.560 (100), 2.931 (90), 3.96 (80), 3.45 (70), 4.20 (60), 2.029 (50), 4.96 (35)

Chemistry:

	(1)		(1)
SiO ₂	37.89	CaO	0.07
TiO ₂	0.04	Li ₂ O	1.66
B ₂ O ₃	10.28	Na ₂ O	2.43
Al ₂ O ₃	43.85	F	0.10
FeO	0.11	H ₂ O ⁺	3.47
MnO	0.11	$-\text{O} = \text{F}_2$	0.04
		Total	99.97

(1) Elba, Italy; corresponds to (Na_{0.74}Ca_{0.01})_{Σ=0.75}(Al_{2.11}Li_{1.05}Fe_{0.01}²⁺Mn_{0.01})_{Σ=3.18}Al_{6.00}(B_{0.93}O₃)₃Si_{5.94}O₁₈[(OH)_{3.63}O_{0.32}F_{0.05}]_{Σ=4.00}.

Polymorphism & Series: Forms a series with dravite.

Mineral Group: Tourmaline group.

Occurrence: In granites, granite pegmatites, and some metamorphic rocks; in high-temperature hydrothermal veins; detrital in sediments.

Association: Quartz, albite, lepidolite, microcline, garnet, muscovite, beryl, apatite, spodumene.

Distribution: Many localities; some for exceptional specimens follow. In Italy, around San Piero in Campo, Elba. In the Yekaterinburg (Sverdlovsk) district, Ural Mountains, Russia. From Korgal and Mawi, Laghman Province, Afghanistan. In Pakistan, from around Gilgit and Stak Nala. At Ampantsikahitra, Anjanaboina, Antandrokomby, Maharitra on Mt. Bity, and elsewhere on Madagascar. In the Alto Ligonha district, Mozambique. At Karibib and Usakos, Namibia. In the USA, from Mt. Mica, near Paris, Newry, and elsewhere in Oxford Co., Maine; at Haddam, Middlesex Co., Connecticut; and from the Pala and Mesa Grande districts, San Diego Co., California. In Brazil, from a large district around Araçuaí-Itinga-Salinas, and the Itatiaia district, Governador Valadares, Minas Gerais; at São José da Batalha, Paraíba.

Name: From the occurrence on the Island of Elba, Italy.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 551–558 [tourmaline]. (2) Vernadsky [Vernadskii], V.I. (1913) Über die chemische Formel der Turmaline. Zeits. Krist., 53, 273–288 (in German). (3) Deer, W.A., R.A. Howie, and J. Zussman (1986) Rock-forming minerals, (2nd edition), v. 1B, disilicates and ring silicates, 559–602. (4) Donnay, G. and R. Barton, Jr. (1972) Refinement of the crystal structure of elbaite and the mechanism of tourmaline solid solution. Tschermarks Mineral. Petrog. Mitt., 18, 273–286.

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