

Crystal Data: Orthorhombic. *Point Group:* 2/m 2/m 2/m. Well-formed crystals common, typically morphologically complex, long to short prismatic, to 1.2 m. Prism faces commonly vertically striated, with etch and growth figures on non-prism faces; columnar, compact, massive.

Physical Properties: *Cleavage:* {001}, perfect. *Fracture:* Subconchoidal to uneven. *Tenacity:* Brittle. Hardness = 8 D(meas.) = 3.49–3.57 D(calc.) = 3.55

Optical Properties: Transparent to opaque with inclusions. *Color:* Colorless, yellow, pink, red, orange, brown, green, blue, violet; in transmitted light, colorless, thick sections yellow, red, or blue. *Luster:* Vitreous.

Optical Class: Biaxial (+). *Pleochroism:* In thick sections, X = yellow; Y = yellow, violet, reddish; Z = violet, bluish, yellow, pink. *Orientation:* X = a; Y = b; Z = c. *Dispersion:* r > v. $\alpha = 1.606\text{--}1.634$ $\beta = 1.609\text{--}1.637$ $\gamma = 1.616\text{--}1.644$ 2V(meas.) = 48°–68°

Cell Data: *Space Group:* Pbnm. a = 4.6499(3) b = 8.7968(6) c = 8.3909(5) Z = 4

X-ray Powder Pattern: Minas Gerais, Brazil; Durango, Mexico; Thomas Range, Utah, USA; average of three patterns. (ICDD 12-765). 2.937 (100), 3.195 (66), 3.693 (60), 2.3609 (45), 2.1049 (44), 3.037 (37), 1.6706 (27)

Chemistry:	(1)	(2)	(1)	(2)
SiO ₂	31.93	33.00	H ₂ O ⁺	0.19
Al ₂ O ₃	56.26	56.76	H ₂ O ⁻	0.04
F	20.37	13.23	-O = F ₂	8.58
			Total	100.17
				100.13

(1) Thomas Range, Utah, USA; corresponds to Al_{2.00}(Si_{0.98}Al_{0.02})_{Σ=1.00}O_{3.99}[F_{1.97}(OH)_{0.04}]_{Σ=2.01}. (2) Brewer mine, Chesterfield Co., South Carolina, USA.

Occurrence: In veins and cavities in granite, granite pegmatite, rhyolite, and in greisen, formed from high-temperature, volatile-rich pneumatolytic hydrothermal fluids. From high-grade metamorphism of aluminous, quartz-rich, and fluorine-bearing sediments. As a heavy detrital mineral.

Association: Tourmaline, beryl, microcline, albite, fluorite, cassiterite, zinnwaldite, quartz.

Distribution: Widespread; only a few localities for the finest specimens can be mentioned. In Russia, near Mursinka, Ural Mountains, and in the Adun-Chilon and Borshchovochnoi Mountains, Nerchinsk district, Siberia. At Schneckenstein, Saxony, Germany. At Xilingeleimeng, Inner Mongolia, China. On Ghundao Hill, near Katlang, Mardan district, and in the Skardu and Gilgit districts, Pakistan. From the Mogok district, Myanmar (Burma). At Tanokamiyama, Shiga Prefecture, and the Naegi district, Gifu Prefecture, Japan. From Ouro Preto and near Virgem da Lapa, Minas Gerais, Brazil. In the USA, at Devils Head, Douglas Co., Colorado; from the Thomas Range, Juab Co., Utah; Lord's Hill, Stoneham, Oxford Co., Maine; Baldface Mountain, Carroll Co., New Hampshire; from Ramona, San Diego Co., California; near Streeter, Mason Co., Texas. At Tepetate, San Luis Potosí, Mexico. In the St. Anne's mine, Miami district, Zimbabwe. From the Alto Ligonha district, Mozambique. At Klein Spitzkopje, Namibia. In the Jos district, Nigeria.

Name: From the Greek *topazion*, meaning *to seek*, apparently in allusion to the Island of Zabargad (Zabirget or St. Johns), in the Red Sea, Egypt; the location of which was long hidden, known for olivine ("peridot" and "chrysolite"), referred to since antiquity as *topaz*.

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 492–496. (2) Deer, W.A., R.A. Howie, and J. Zussman (1982) Rock-forming minerals, (2nd edition), v. 1A, orthosilicates, 801–815. (3) Pardee, J.T., J.J. Glass, and R.E. Stevens (1937) Massive low-fluorine topaz from the Brewer mine, South Carolina. *Amer. Mineral.*, 22, 1058–1064.

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