Goyazite **$SrAl_3(PO_4)(PO_3OH)(OH)_6$.**

Crystal Data: Hexagonal. *Point Group:* $\overline{3}\ 2/m$. Rhombohedral crystals, to 2 cm, pseudocubic or flattened on {0001}, with $\{10\overline{1}2\}$ striated $\perp$ [0001], $\{20\overline{2}1\}$, $\{01\overline{1}1\}$, small {0001}, may be composite; massive, in detrital pebbles and grains.

Physical Properties: *Cleavage:* Perfect on {0001}. Hardness = 4.5–5 D(meas.) = 3.26 D(calc.) = 3.29

Optical Properties: Transparent. *Color:* Colorless, pink, lilac, honey-yellow, orange; colorless in transmitted light. *Luster:* Greasy to resinous, pearly on cleavages.
Optical Class: Uniaxial (+), may be anomalously biaxial, sectored. *Pleochroism:* Weak in thick grains; O = light pink; E = yellowish or greenish. ω = 1.620–1.635 ϵ = 1.630–1.651 2V(meas.) = $\leq 30°$

Cell Data: *Space Group:* $R\overline{3}m$. a = 7.015(3) c = 16.558(6) Z = 3

X-ray Powder Pattern: Rapid Creek, Canada. (ICDD 34-152).
2.965 (100), 5.704 (65), 2.209 (45), 3.511 (40), 2.765 (20), 1.903 (20), 2.991 (13)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
P_2O_5	28.92	28.9	30.75	BaO	4.00	5.1	
SiO_2	0.96	0.2		Na_2O	0.40		
Al_2O_3	32.30	33.9	33.14	K_2O	0.34		
Fe_2O_3	0.90			F	1.93	2.8	
MgO		0.3		H_2O	12.00	[13.2]	13.66
CaO		2.0		$-O = F_2$	0.81	[1.2]	
SrO	18.43	14.8	22.45	Total	99.37	[100.0]	100.00

(1) Oxford Co., Maine, USA. (2) Alto Bernardino, Brazil; by electron microprobe, H_2O by difference. (3) $SrAl_3(PO_4)(PO_3OH)(OH)_6$.

Mineral Group: Crandallite group.

Occurrence: In granite pegmatites; from hydrothermal argillic alteration zones; in kaolinitic claystones derived from air-fall volcanic tuffs; in carbonatites; detrital.

Association: Herderite, apatite, quartz (Alto Bernardino, Brazil); monazite, sphalerite, pyrite, barite, quartz (Wigu carbonatite, Tanzania); kaolinite (alteration zones); diamonds (river sands; may be coincidental).

Distribution: In Brazil, from the Serra de Congonhas, near Diamantina, Minas Gerais, and at Alto Bernardino, about 20 km northwest of Picuí, Paraíba. In the USA, from the Palermo #1 mine, near North Groton, Grafton Co., New Hampshire; in Maine, in Oxford Co., in the Bennett quarry, Buckfield, the Harvard quarry, Greenwood, the Mt. Mica quarry, Paris, at Lord Hill, Stoneham, and elsewhere. In Colorado, along the Dakota hogback, from Turkey Creek, Jefferson Co., to Boxelder Creek, Larimer Co.; at the Apex mine, near St. George, Washington Co., Utah. Large crystals from the Rapid Creek-Big Fish River area, Yukon Territory, Canada. In Germany, large crystals from the Fuchsbau quarry, Fichtelgebirge, Bavaria; at Ehrenfriedersdorf, Saxony. In the Simplon Tunnel, and at Lengenbach, Binntal, Valais, Switzerland. From the Kobokobo pegmatite, Lusungu River district, Kivu Province, Congo (Zaire). In the Wigu carbonatite, about 64 km south of Morogoro, Tanzania. From near Myponga Beach, Fleurieu Peninsula, South Australia. Other localities are known but may require confirmation of composition.

Name: For Goiás [Goyaz] State, Brazil.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 834–835. (2) White, J.S. (1981) Barian goyazite from Brazil. Mineral. Record, 12, 379. (3) Kato, T. (1987) Further refinement of the goyazite structure. Mineral. J. (Japan), 13, 390–396.