

**Labradorite**

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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Crystals typically thin, tabular along [010], and rhombic in section, to 4 cm. Cleavable, granular, or massive. *Twining:* Common according to Albite, Pericline, Carlsbad, Baveno, or Manebach laws.

**Physical Properties:** *Cleavage:* Perfect on {001}, less perfect on {010}, intersecting at 90°; distinct on {110}. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 6–6.5 D(meas.) = 2.68–2.72 D(calc.) = 2.685–2.710

**Optical Properties:** Translucent to transparent. *Color:* Gray, brown, greenish, blue, yellow, colorless; commonly exhibits iridescence, especially on {010}; colorless in thin section. *Streak:* White. *Luster:* Vitreous; pearly on cleavages.

*Optical Class:* Biaxial (+). *Dispersion:*  $r > v$ , weak.  $\alpha = 1.555\text{--}1.565$   $\beta = 1.558\text{--}1.569$   $\gamma = 1.563\text{--}1.573$   $2V(\text{meas.}) = 78^\circ\text{--}87^\circ$  (low);  $80^\circ$  to  $-81^\circ$  (high).

**Cell Data:** *Space Group:*  $C\bar{1}$  (low).  $a = 8.1648$   $b = 12.8585$   $c = 7.0973$   $\alpha = 90^\circ 34'$   $\beta = 116^\circ 06'$   $\gamma = 89^\circ 47'$   $Z = 4$

**X-ray Powder Pattern:** Synthetic  $\text{Na}_{0.40}\text{Ca}_{0.60}\text{Al}_{1.60}\text{Si}_{2.40}\text{O}_8$  (high). 3.20 (100), 4.03 (80), 3.75 (80), 3.17 (80), 3.63 (70), 2.94 (70), 2.51 (70)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
SiO <sub>2</sub>	52.97	55.59	50.54	Na <sub>2</sub> O	3.97	5.73	3.40
Al <sub>2</sub> O <sub>3</sub>	29.41	28.30	31.70	K <sub>2</sub> O	0.26		
Fe <sub>2</sub> O <sub>3</sub>	0.76			H <sub>2</sub> O	0.22		
CaO	12.59	10.38	14.36				
				<b>Total</b>	<b>100.18</b>	<b>100.00</b>	<b>100.00</b>

(1) San Marcos Mountains, California, USA. (2)  $\text{Na}_{0.50}\text{Ca}_{0.50}\text{Al}_{1.50}\text{Si}_{2.50}\text{O}_8$ .

(3)  $\text{Na}_{0.30}\text{Ca}_{0.70}\text{Al}_{1.70}\text{Si}_{2.30}\text{O}_8$ .

**Polymorphism & Series:** High- and low-temperature structural varieties are recognized.

**Mineral Group:** Feldspar group, plagioclase series.

**Occurrence:** In mafic igneous rocks and anorthosites. Rarer in metamorphic rocks, as amphibolites. As detrital grains in sedimentary rocks.

**Association:** Olivine, pyroxenes, amphiboles, magnetite.

**Distribution:** Widespread. From Ford Harbour, Pauls Island, Labrador, Newfoundland; at Lake St. John, Quebec; and elsewhere in Canada. In the USA, especially in northern New York, forming the Adirondack Mountains; crystals from Sagebrush Flat, about 37 km north of Plush, Lake Co., Oregon; atop the San Marcos Mountains, San Diego Co., and in the western San Gabriel Mountains, Los Angeles Co., California. Abundant gem crystals in the Pinacate volcanic field, Sonora, Mexico. At Vesuvius, Campania, and on Mt. Etna, Sicily, Italy. From Ylämaa, near Lappeenranta, Finland. In the Langesundsfjord- Larvik-Tvedalen area, Norway. On Surtsey Island, south of Iceland.

**Name:** For the type locality on Pauls Island, off the coast of Labrador, Canada.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 325–327, 334–337. (2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 4, framework silicates, 94–165. (3) Phillips, W.R. and D.T. Griffen (1981) Optical mineralogy, 352–360. (4) Goodyear, J. and W.J. Duffin (1954) The identification and determination of plagioclase feldspars by the X-ray powder method. Mineral. Mag., 30, 306–326. (5) Stewart, D.B., G.W. Walker, T.L. Wright, and J.J. Fahey (1966) Physical properties of calcic labradorite from Lake County, Oregon. Amer. Mineral., 51, 177–197. (6) Wenk, H.-R., W. Joswig, T. Tagai, M. Korekawa, and B.K. Smith (1980) The average structure of An 62-66 labradorite. Amer. Mineral., 65, 81–95.

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