

# Andesine



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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Crystals rare, to 2 cm; commonly massive, cleavable, or granular. *Twinning:* Commonly twinned after Albite, Pericline, and Carlsbad laws. Also twinned after a law similar to the Manebach law.

**Physical Properties:** *Cleavage:* Perfect on {001}, less perfect on {010}; {110} also observed. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 6–6.5 D(meas.) = 2.66–2.68 D(calc.) = 2.68

**Optical Properties:** Transparent to translucent. *Color:* White, gray, green, yellow, flesh-red. *Streak:* White. *Luster:* Subvitreous to pearly. *Optical Class:* Biaxial (+). *Dispersion:*  $r > v$ , weak.  $\alpha = 1.545\text{--}1.556$   $\beta = 1.548\text{--}1.558$   $\gamma = 1.552\text{--}1.563$  2V(meas.) = 78°–90° (low); 73°–80° (high).

**Cell Data:** *Space Group:*  $P\bar{1}$ .  $a = 8.151(3)$   $b = 12.829(5)$   $c = 14.206(7)$   $\alpha = 93.62(3)^\circ$   $\beta = 116.21(2)^\circ$   $\gamma = 89.70(2)^\circ$   $Z = 8$

**X-ray Powder Pattern:** Crestmore, Riverside Co., California, USA (low).  
3.21 (100), 3.18 (90), 4.04 (80), 3.76 (70), 3.65 (70), 3.14 (70), 2.93 (70b)

<b>Chemistry:</b>	(1)	(2)	(3)		(1)	(2)	(3)
SiO <sub>2</sub>	57.59	60.76	55.59	Na <sub>2</sub> O	6.39	8.12	5.73
Al <sub>2</sub> O <sub>3</sub>	25.84	24.82	28.30	K <sub>2</sub> O	0.55		
Fe <sub>2</sub> O <sub>3</sub>	0.92			H <sub>2</sub> O <sup>+</sup>	0.32		
MgO	trace			H <sub>2</sub> O <sup>-</sup>	0.05		
CaO	8.45	6.30	10.38	Total	100.11	100.00	100.00

(1) Beaver Bay, Lake Co., Minnesota, USA. (2) Na<sub>0.70</sub>Ca<sub>0.30</sub>Al<sub>1.30</sub>Si<sub>2.70</sub>O<sub>8</sub>. (3) Na<sub>0.50</sub>Ca<sub>0.50</sub>Al<sub>1.50</sub>Si<sub>2.50</sub>O<sub>8</sub>.

**Polymorphism & Series:** Low and high temperature variants differing in structural detail are recognized.

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

**Occurrence:** Widespread in igneous rocks of intermediate silica content, as syenites and andesites. Characteristic of granulite to amphibolite facies metamorphism, commonly as antiperthite; as detrital grains in sedimentary rocks.

**Association:** Quartz, potassic feldspar, biotite, “hornblende,” magnetite.

**Distribution:** A widespread mineral, although crystals are not common. In the andesite lavas of the Andes Mountains, South America, as at Marmato, Columbia. Around St. Raphaël, Estérel Mountains, Var, and near Chagey, Haute-Saône, France. At Bodenmais, Bavaria, Germany. On Mt. Arcuentu, Sardinia, Italy. From Vapnefjord, Iceland. At Sannidal and Arendal, Norway. In the USA, at Sanford, York Co., Maine. In Japan, at Kaneda, Miyagi Prefecture; Naka, Iwojima Island; Kuzuhara, Toyama Prefecture; and a number of other places. From Minsen, Korea. At Cape Grant, Victoria, Australia.

**Name:** For the Andes Mountains of South America where it is abundant in the lavas.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 325–327, 333–334. (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) Steurer, W. and H. Jagodzinski (1988) The incommensurately modulated structure of an andesine. Acta Cryst., 44, 344–351.

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