

# Bytownite



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**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Crystals, flattened along [010], are rare, to 3 cm; commonly as cleavable masses or anhedral grains in massive aggregates. *Twinning:* Common after the Albite, Carlsbad, and Pericline laws, developed in simple to complex combinations.

**Physical Properties:** *Cleavage:* Perfect on {001}, good on {010}, imperfect on {110}. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 6–6.5 D(meas.) = 2.72–2.74 D(calc.) = 2.713–2.726

**Optical Properties:** Transparent to translucent. *Color:* Colorless, white, gray. *Streak:* White. *Luster:* Vitreous, pearly on cleavages. *Optical Class:* Biaxial (-). *Dispersion:*  $r < v$ , weak.  $\alpha = 1.565\text{--}1.573$   $\beta = 1.569\text{--}1.580$   $\gamma = 1.578\text{--}1.585$   $2V(\text{meas.}) = 87^\circ$  to  $-78^\circ$  (low);  $81^\circ$  to  $-83^\circ$  (high).

**Cell Data:** *Space Group:*  $P\bar{1}$  or  $I\bar{1}$  for certain compositions.  $a = 8.178$   $b = 12.870$   $c = 14.187$   $\alpha = 93.5^\circ$   $\beta = 115.9^\circ$   $\gamma = 90.63^\circ$   $Z = 8$

**X-ray Powder Pattern:** Rustenburg mine, Transvaal, South Africa. 3.20 (100), 4.03 (80), 3.75 (80), 3.17 (80), 3.62 (70), 2.94 (70b), 2.52 (70)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
SiO <sub>2</sub>	49.06	50.54	45.62	Na <sub>2</sub> O	2.57	3.40	1.12
Al <sub>2</sub> O <sub>3</sub>	32.14	31.70	35.02	K <sub>2</sub> O	0.17		
Fe <sub>2</sub> O <sub>3</sub>	0.27			H <sub>2</sub> O <sup>+</sup>	0.13		
MgO	0.20			H <sub>2</sub> O <sup>-</sup>	0.03		
CaO	15.38	14.36	18.24	Total	99.95	100.00	100.00

(1) Rustenburg mine, Transvaal, South Africa. (2) Na<sub>0.30</sub>Ca<sub>0.70</sub>Al<sub>1.70</sub>Si<sub>2.30</sub>O<sub>8</sub>.

(3) Na<sub>0.10</sub>Ca<sub>0.90</sub>Al<sub>1.90</sub>Si<sub>2.10</sub>O<sub>8</sub>.

**Polymorphism & Series:** Low- and high-temperature structural modifications are recognized.

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

**Occurrence:** A rock-forming mineral typical of mafic intrusive igneous rocks, as gabbros and anorthosites; as phenocrysts in basalts; rare in metamorphic rocks.

**Association:** Pyroxenes, olivine.

**Distribution:** One of the less frequently identified feldspars, although still very common. "Type" material from Ottawa, Ontario, Canada was later shown to be a mixture. Elsewhere in Canada, from the Shawmere anorthosite, Foley Township, Ontario, and on Yamaska Mountain, near Abbotsford, Quebec. On Rhum Island, Scotland. At Eycott Hill, near Keswick, Cumberland, England. From Närödal, Norway. In Greenland, from Fiskenaesset and Storo. In the Bushveld complex, Transvaal, South Africa. In the USA, in the Stillwater complex, Montana; from Cornwall, Lebanon Co., and Phoenixville, Chester Co., Pennsylvania; near Lakeview, Lake Co., Oregon; in the Lucky Cuss mine, Tombstone, Cochise Co., Arizona; and from the Grants district, McKinley Co., New Mexico. From Isa Valley, Western Australia.

**Name:** For the "type" locality, in Ottawa (formerly Bytown), Ontario, Canada.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 325–327, 334–335. (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) Fleet, S.G., S. Chandrasekhar, and H.D. Megaw (1966) The structure of bytownite ('body-centered anorthite'). Acta Cryst., 21, 782–801.

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