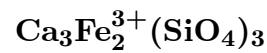


# Andradite



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**Crystal Data:** Cubic. *Point Group:*  $4/m\bar{3}2/m$ . Commonly well-crystallized dodecahedra, trapezohedra, or combinations, to 5 cm. Also granular to massive.

**Physical Properties:** *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 6.5–7  
D(meas.) = 3.8–3.9 D(calc.) = 3.859

**Optical Properties:** Transparent to translucent. *Color:* Yellow, greenish yellow to emerald-green, dark green; brown, brownish red, brownish yellow; grayish black, black; may be sectorized. *Streak:* White. *Luster:* Adamantine to resinous, dull.  
*Optical Class:* Isotropic; typically weakly anisotropic.  $n = 1.887$

**Cell Data:** *Space Group:*  $Ia\bar{3}d$ .  $a = 12.056$   $Z = 8$

**X-ray Powder Pattern:** Synthetic.

2.696 (100), 3.015 (60), 1.6112 (60), 2.462 (45), 1.9564 (25), 1.6728 (25), 1.1195 (25)

**Chemistry:**

	(1)	(2)
SiO <sub>2</sub>	34.91	35.47
TiO <sub>2</sub>	trace	
Al <sub>2</sub> O <sub>3</sub>	0.69	
Fe <sub>2</sub> O <sub>3</sub>	30.40	31.42
MgO	0.58	
CaO	33.20	33.11
H <sub>2</sub> O <sup>-</sup>	0.19	
Total	99.97	100.00

(1) Reškovic stream, Serbia, Yugoslavia; corresponds to  $(\text{Ca}_{3.01}\text{Mg}_{0.07})_{\Sigma=3.08}(\text{Fe}_{1.94}^{3+}\text{Al}_{0.02})_{\Sigma=1.96}(\text{Si}_{2.95}\text{Al}_{0.05})_{\Sigma=3.00}\text{O}_{12}$ . (2)  $\text{Ca}_3\text{Fe}_2(\text{SiO}_4)_3$ .

**Polymorphism & Series:** Forms two series, with grossular, and with schorlomite.

**Mineral Group:** Garnet group.

**Occurrence:** In skarns from contact metamorphosed impure limestones or calcic igneous rocks; in chlorite schists and serpentinites; in alkalic igneous rocks, then typically titaniferous.

**Association:** Vesuvianite, chlorite, epidote, spinel, calcite, dolomite, magnetite.

**Distribution:** Widespread; fine examples from; in Italy, at Frascati, Alban Hills, Lazio; the Val Malenco, Lombardy; the Ala Valley, Piedmont; and Larcinaz, Val d'Aosta. At Dognecea (Dognaczka) and Oravița (Oravicza), Banat, Romania. From Ocna de fier, Romania (Vaskö, Hungary). At Zermatt, Valais, Switzerland. From Arendal, Norway. In the Wessels mine, near Kuruman, Cape Province, South Africa. In Russia, gem crystals from the Bobrovka River, Nizhni Tagil district, and the Sissertsk district, Ural Mountains; at Sineretschenskoje, north of Vladivostock. In the USA, from Stanley Butte, Graham Co., Arizona; on Garnet Hill, Calaveras Co., and around the Gem mine, San Benito Co., California; at Franklin and Sterling Hill, Sussex Co., New Jersey; from Magnet Cove, Hot Spring Co., Arkansas; and on Prince of Wales Island, Alaska. In Mexico, found near Charco de Peña, about 75 km east of Lázaro Cárdenas, Chihuahua.

**Name:** After J.B. d'Andrada e Silva (1763–1838), Brazilian mineralogist who described a variety.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 437–447. (2) Deer, W.A., R.A. Howie, and J. Zussman (1982) Rock-forming minerals, (2nd edition), v. 1A, orthosilicates, 468–698, esp. 617–641. (3) Novak, G.A. and G.V. Gibbs (1971) The crystal chemistry of the silicate garnets. *Amer. Mineral.*, 56, 791–825. (4) (1960) NBS Circ. 539, 9, 22.

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