

**Dravite****NaMg<sub>3</sub>Al<sub>6</sub>(BO<sub>3</sub>)<sub>3</sub>Si<sub>6</sub>O<sub>18</sub>(OH)<sub>4</sub>**

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**Crystal Data:** Hexagonal. *Point Group:* 3*m*. Crystals equant or short to long prismatic, with dominant pyramid faces, to 20 cm. Striated || [0001], cross sections typically triangular with curved convex sides. Commonly radiating, granular, and massive. *Twining:* Rare, on {10 $\bar{1}$ 1} and {40 $\bar{4}$ 1}.

**Physical Properties:** *Cleavage:* {11 $\bar{2}$ 0}, {10 $\bar{1}$ 1}, very poor. *Fracture:* Uneven to conchoidal. *Tenacity:* Brittle. Hardness = 7 D(meas.) = 3.03–3.18 D(calc.) = 3.038 Pyroelectric and piezoelectric; may weakly fluoresce under SW UV.

**Optical Properties:** Transparent to translucent. *Color:* Brown to black, red, yellow, blue, green, colorless, white; colorless to yellow in thin section. *Streak:* Light brown, white. *Luster:* Vitreous to resinous. *Optical Class:* Uniaxial (-). *Pleochroism:* Very strong; *O* = pale yellow; *E* = colorless, yellowish, greenish, brownish. *Absorption:* *O* > *E*.  $\omega = 1.634\text{--}1.661$   $\epsilon = 1.612\text{--}1.632$

**Cell Data:** *Space Group:* R3*m*. *a* = 15.94–15.98 *c* = 7.19–7.23 *Z* = 3

**X-ray Powder Pattern:** Dobrawa, Slovenia.

2.576 (100), 3.99 (85), 2.961 (85), 4.22 (65), 3.48 (60), 2.040 (45), 1.920 (35)

**Chemistry:**

	(1)		(1)
SiO <sub>2</sub>	36.52	MgO	11.25
TiO <sub>2</sub>	0.17	CaO	0.42
B <sub>2</sub> O <sub>3</sub>	10.32	Na <sub>2</sub> O	2.34
Al <sub>2</sub> O <sub>3</sub>	33.41	K <sub>2</sub> O	0.57
FeO	0.30	F	0.12
MnO	0.57	H <sub>2</sub> O <sup>+</sup>	3.76
		<u>Total</u>	<u>99.75</u>

(1) Dobrawa, Slovenia; corresponds to (Na<sub>0.73</sub>K<sub>0.12</sub>Ca<sub>0.07</sub>)<sub>Σ=0.92</sub>(Mg<sub>2.70</sub>Al<sub>0.35</sub>Mn<sub>0.08</sub>Fe<sub>0.04</sub><sup>2+</sup>Ti<sub>0.02</sub>)<sub>Σ=3.19</sub>Al<sub>6.00</sub>(B<sub>0.96</sub>O<sub>3</sub>)<sub>3</sub>Si<sub>5.88</sub>O<sub>18</sub>[(OH)<sub>3.70</sub>O<sub>0.20</sub>F<sub>0.10</sub>]<sub>Σ=4.00</sub>.

**Polymorphism & Series:** Forms two series, with schorl, and with elbaite.

**Mineral Group:** Tourmaline group.

**Occurrence:** Commonly in metamorphosed limestones or mafic igneous rocks with metasomatically introduced boron; rarely in pegmatites; as authigenic overgrowths in sedimentary rocks.

**Association:** Quartz, calcite, dolomite, epidote, microcline, albite, muscovite, fluorite, titanite.

**Distribution:** Found around Dravograd (Unterdrauberg), Slovenia. From Beura, Val d'Ossola, Piedmont, Italy. At Arendal and Snarum, Norway. From Outokumpu, and Kaavi, Kuopio, Finland. In the USA, fine crystals from Gouverneur, Pierrepont, and Macomb, St. Lawrence Co., New York; at Franklin and Hamburg, Sussex Co., New Jersey; and Newry, Oxford Co., Maine. In Canada, in Hull Township, Quebec; at Wilberforce, Ontario; and many other places. From Brumado, Bahia, Brazil. Large crystals from Yinnietharra, 800 km north of Perth, Western Australia. At Osarara, Narok district, Kenya. From Gujarkot, Nepal. Increasingly distinguished from other tourmaline group members.

**Name:** For the district along the Drava (Drave) River in Austria and Slovenia.

**Type Material:** National Museum of Natural History, Washington, D.C., USA, R18133, R17274.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 551–558 [tourmaline]. (2) Deer, W.A., R.A. Howie, and J. Zussman (1986) Rock-forming minerals, (2nd edition), v. 1B, disilicates and ring silicates, 559–602. (3) (1964) NBS Mono. 25, 3, 47.

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