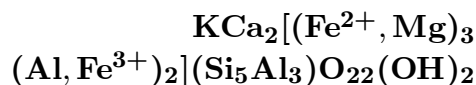


## Sadanagaite



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**Crystal Data:** Monoclinic. *Point Group:*  $m$ , 2, or  $2/m$ . Prismatic crystals, to 1 mm; as polycrystalline aggregates.

**Physical Properties:** *Cleavage:* Perfect on {110}. *Tenacity:* [Brittle.] *Hardness* =  $\sim 6$   
D(meas.) = n.d. D(calc.) = 3.30

**Optical Properties:** Semitransparent. *Color:* Dark brown to black; in thin section, paler with greater silicon content. *Streak:* Very light brown. *Luster:* Vitreous.  
*Optical Class:* Biaxial (+) or (-). *Pleochroism:* Strong;  $X$  = pale brown, grayish, or greenish yellow;  $Y$  = yellowish orange to light olive-brown;  $Z$  = greenish brown, light olive-brown to dark yellowish orange. *Orientation:*  $Z \wedge c = 28^\circ$ .  $\alpha = 1.673(2)$   $\beta = 1.684(2)$   $\gamma = 1.697(2)$   
 $2V(\text{meas.}) = 70^\circ\text{--}90^\circ$   $2V(\text{calc.}) = 86^\circ$

**Cell Data:** *Space Group:*  $C2$ ,  $Cm$ , or  $C2/m$ .  $a = 9.922(10)$   $b = 18.03(2)$   $c = 5.352(9)$   
 $\beta = 105.30(10)^\circ$   $Z = 2$

**X-ray Powder Pattern:** [Myojin Island, Japan; identical to magnesio-sadanagaite.]  
3.28 (100), 8.48 (80), 3.15 (70), 2.707 (60), 2.162 (55), 2.951 (50), 2.766 (45)

Chemistry:	(1)		(2)	
	SiO <sub>2</sub>	29.9	34.4	MgO
TiO <sub>2</sub>	4.3	3.15	CaO	11.9
Al <sub>2</sub> O <sub>3</sub>	22.6	18.4	Na <sub>2</sub> O	0.6
FeO	17.4	18.4	K <sub>2</sub> O	3.7
MnO	0.3	0.24		4.21
			Total	96.8
				97.5

(1) Yuge Island, Japan; by electron microprobe,  $\text{Fe}^{2+}:\text{Fe}^{3+}$  calculated from stoichiometry; corresponds to  $(\text{K}_{0.74}\text{Na}_{0.17})_{\Sigma=0.91}\text{Ca}_{1.99}(\text{Fe}_{1.63}^{2+}\text{Mg}_{1.41}\text{Al}_{0.81}\text{Fe}_{0.63}^{3+}\text{Ti}_{0.50})_{\Sigma=4.98}(\text{Si}_{4.66}\text{Al}_{3.34})_{\Sigma=8.00}\text{O}_{22}(\text{OH})_2$ . (2) Nogo-Hakusan area, Japan; by electron microprobe,  $\text{Fe}^{2+}:\text{Fe}^{3+}$  calculated from stoichiometry; corresponds to  $(\text{K}_{0.84}\text{Na}_{0.22})_{\Sigma=1.06}\text{Ca}_{1.99}(\text{Fe}_{2.17}^{2+}\text{Mg}_{1.42}\text{Al}_{0.74}\text{Ti}_{0.37}\text{Fe}_{0.23}^{3+}\text{Mn}_{0.03})_{\Sigma=4.96}(\text{Si}_{5.36}\text{Al}_{2.64})_{\Sigma=8.00}\text{O}_{22}(\text{OH})_2$ .

**Polymorphism & Series:** Forms a series with magnesio-sadanagaite.

**Mineral Group:** Amphibole (calcic) group:  $\text{Mg}/(\text{Mg} + \text{Fe}^{2+}) = 0.5$ ;  $\text{Fe}^{3+}/(\text{Fe}^{3+} + \text{Al}^{\text{vi}}) = 0.50$ ;  
 $(\text{Na} + \text{K})_{\text{A}} \geq 0.5$ ;  $\text{Na}_{\text{B}} < 0.67$ ;  $(\text{Ca} + \text{Na})_{\text{B}} \geq 1.34$ ;  $\text{Si} < 5.5$ ;  $\text{Ti} < 0.5$ .

**Occurrence:** By contact metamorphism, producing banded skarns, under amphibolite to pyroxene hornfels facies conditions; from eclogites.

**Association:** Vesuvianite, hercynite, sphene, ilmenite, apatite (Yuge Island, Japan); biotite, orthoclase, subsilicic ferroan pargasite (Nogo-Hakusan area, Japan).

**Distribution:** On Yuge Island, Ehime Prefecture, and in the Nogo-Hakusan area, Fukui Prefecture, Japan. At the Botallack mine, St. Just, Cornwall, England. In the Oetzal, Austria.

**Name:** To honor Professor Ryoichi Sadanaga of the Mineralogical Institute, University of Tokyo, Tokyo, Japan.

**Type Material:** University of Tokyo, Tokyo; National Science Museum, Tokyo, Japan, M23378.

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