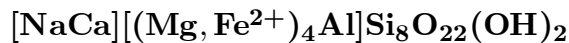


# Winchite



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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . In stout prismatic to acicular crystals, to 4 cm. As blades, fibers, and in rosettes or spherules.

**Physical Properties:** *Cleavage:* [Perfect on {110}, intersecting at  $\sim 56^\circ$  and  $\sim 124^\circ$ ; partings on {100}, {001}.] *Fracture:* [Uneven.] *Tenacity:* [Brittle.] *Hardness* = [5–6]  $D(\text{meas.}) = 2.97\text{--}3.175$   $D(\text{calc.}) = [3.02]$  Crystals are commonly strongly zoned chemically.

**Optical Properties:** Transparent to translucent. *Color:* Colorless, cobalt blue to bluish violet; colorless to pale blue in thin section. *Luster:* [Vitreous.] *Optical Class:* Biaxial (–). *Pleochroism:*  $X$  = colorless;  $Y$  = light blue-violet;  $Z$  = light blue. *Orientation:* [ $Z \wedge c = 16^\circ$ .] *Dispersion:*  $r > v$ , strong.  $\alpha = 1.629$   $\beta = 1.643$   $\gamma = 1.650$   $2V(\text{meas.}) = 64(2)^\circ$

**Cell Data:** *Space Group:*  $C2/m$ .  $a = 9.834$  (ICDD 20-1390).  $b = 18.062$   $c = 5.300$   $\beta = 104.449^\circ$   $Z = 2$

**X-ray Powder Pattern:** Kajlidongri mine, India. (ICDD 20-1390). 2.699 (100), 8.40 (90), 2.528 (90), 4.48 (70), 3.40 (70), 3.12 (50), 2.976 (40)

<b>Chemistry:</b>	(1)	(2)	(1)	(2)	(1)	(2)	
SiO <sub>2</sub>	56.08	54.41	FeO	6.09	Na <sub>2</sub> O	3.48	4.01
TiO <sub>2</sub>	0.00	0.20	MnO	0.67	K <sub>2</sub> O	0.55	0.16
Al <sub>2</sub> O <sub>3</sub>	1.91	7.00	MgO	20.66	Total	97.18	97.20
Fe <sub>2</sub> O <sub>3</sub>	5.27	4.72	CaO	8.56			

(1) Kajlidongri mine, India; by electron microprobe, total Fe as Fe<sub>2</sub>O<sub>3</sub>; corresponds to  $(\text{Ca}_{1.27}\text{Na}_{0.94}\text{K}_{0.10})_{\Sigma=2.31}(\text{Mg}_{4.27}\text{Fe}_{0.55}^{3+}\text{Al}_{0.09}\text{Mn}_{0.08})_{\Sigma=4.99}(\text{Si}_{7.78}\text{Al}_{0.22})_{\Sigma=8.00}\text{O}_{22}(\text{OH})_2$ .  
(2) Margarita Island, Venezuela; by electron microprobe, Fe<sup>2+</sup>:Fe<sup>3+</sup> calculated from stoichiometry; corresponds to  $(\text{Na}_{1.09}\text{Ca}_{0.95}\text{K}_{0.03})_{\Sigma=2.07}(\text{Mg}_{2.97}\text{Al}_{0.79}\text{Fe}_{0.71}^{2+}\text{Fe}_{0.50}^{3+}\text{Ti}_{0.02}\text{Mn}_{0.01})_{\Sigma=5.00}(\text{Si}_{7.63}\text{Al}_{0.37})_{\Sigma=8.00}\text{O}_{22}(\text{OH})_2$ .

**Polymorphism & Series:** Forms a series with ferrowinchite.

**Mineral Group:** Amphibole (sodic-calcic) group:  $\text{Mg}/(\text{Mg} + \text{Fe}^{2+}) \geq 0.5$ ;  $(\text{Na} + \text{K})_{\text{A}} < 0.5$ ;  $0.67 \text{ Na}_{\text{B}} \text{ 1.33}$ ;  $(\text{Ca} + \text{Na})_{\text{B}} \geq 1.34$ ;  $\text{Si} \geq 7.5$ .

**Occurrence:** In schists with low-grade metamorphosed manganese deposits; in metabasalts of the jadeite-glaucophane and amphibolite-eclogite facies; in manganeseiferous cherts that have undergone blueschist facies metamorphism.

**Association:** Calcite, microcline, diopside, plagioclase, apatite, tremolite (Kajlidongri mine, India); omphacite, garnet, rutile, quartz, actinolite, epidote, albite, titanite, apatite (Margarita Island, Venezuela); actinolite, glaucophane, albite, quartz (Ward Creek, California, USA).

**Distribution:** In the Kajlidongri mine, Jhabua district, Madhya Pradesh, India. From near El Valle del Espiritu Santo, Margarita Island, Venezuela. In the Praborna mine, near St. Marcel, Val d'Aosta, Italy. At Ward Creek, Cazadero, Sonoma Co., California, USA. From north of Kitami City, Hokkaido, Japan.

**Name:** For H.J. Winch, who first found the mineral.

**Type Material:** n.d.

**References:** (1) Ford, W.E. (1915) Dana's system of mineralogy, (6th edition), app. III, 4. (2) Nayak, V.K. and B.E. Leake (1975) On 'winchite' from the original locality at Kajlidongri, India. *Mineral. Mag.*, 40, 395–399. (3) Maresch, W.V., O. Medenbach, and A. Rudolph (1982) Winchite and the actinolite-glaucophane miscibility gap. *Nature*, 296, 731–732. (4) Leake, B.E., C.M. Farrow, F. Chao, and V.K. Nayak (1986) Winchite rediscovered from the type locality in India. *Mineral. Mag.*, 50, 173–175. (5) Liou, J.G. and S. Maruyama (1987) Parageneses and compositions of amphiboles from Franciscan jadeite-glaucophane type facies series metabasites at Cazadero, California. *J. Metamorphic Geol.*, 5, 371–395.

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