

Tuhualite**(Na, K)Fe²⁺Fe³⁺Si₆O₁₅**

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Crystal Data: Orthorhombic. *Point Group:* $2/m\ 2/m\ 2/m$. In well-formed tabular crystals, flattened on {100}, with pyramidal terminations, to 1.5 mm. Also as irregular mosslike aggregates.

Physical Properties: *Cleavage:* Three good, on {100}, {001}, and {010}. *Tenacity:* Very brittle. Hardness = 3–4 D(meas.) = 2.89(2) D(calc.) = 2.86

Optical Properties: Semitransparent. *Color:* Violet.

Optical Class: Biaxial (+). *Pleochroism:* Strong; X = colorless to very pale pink;

Y = violet or lavender; Z = intense purplish blue. *Orientation:* X = a; Y = b; Z = c.

Dispersion: $r < v$, strong. *Absorption:* $Z > Y \gg X$. $\alpha = 1.608(1)$ $\beta = 1.612$ $\gamma = 1.621(3)$
2V(meas.) = 70°–91°

Cell Data: *Space Group:* *Cmca*. $a = 14.31(3)$ $b = 17.28(3)$ $c = 10.11(3)$ $Z = 1$

X-ray Powder Pattern: Mayor Island, New Zealand.

7.16 (100), 2.766 (90), 3.18 (80), 8.62 (70), 5.515 (70), 4.85 (70), 4.35 (70)

Chemistry:	(1)	(2)	(3)	(1)	(2)	(3)
SiO ₂	62.93	67.2	66.37	CaO	trace	0.17
TiO ₂	0.42	0.04		Na ₂ O	7.11	6.3
ZrO ₂		0.03		K ₂ O	1.74	0.8
Al ₂ O ₃	0.63	0.22		F		< 0.1
Fe ₂ O ₃	14.09		14.70	Cl		< 0.05
FeO	9.58	24.0	13.22	H ₂ O ⁺	1.61	
MnO	0.81	0.55		H ₂ O ⁻	0.38	
MgO	0.42	trace		Total	99.72	99.3
						100.00

(1) Mayor Island, New Zealand. (2) Do.; by electron microprobe. (3) NaFe²⁺Fe³⁺Si₆O₁₅.

Occurrence: A primary igneous mineral and in vesicles of some silicic lavas, as comendites and pantellerites.

Association: Alkalic feldspar, quartz, aegirine, riebeckite, aenigmatite, arfvedsonite.

Distribution: From Mayor Island, near Opo Bay, New Zealand.

Name: For the type locality, Mayor Island, New Zealand, which is called *Tuhua* by the native Maori.

Type Material: Geological Survey of New Zealand, Lower Hutt, New Zealand, P2077; National Museum of Natural History, Washington, D.C., USA, 96879, 96880, 103053, 136507.

References: (1) Marshall, P. (1932) Notes on some volcanic rocks of the North Island of New Zealand. *New Zealand J. Sci. Tech.*, 13, 202. (2) (1933) *Amer. Mineral.*, 18, 180 (abs. ref. 1). (3) Hutton, C.O. (1956) Re-examination of the mineral tuhualite. *Mineral. Mag.*, 31, 96–106. (4) (1956) *Amer. Mineral.*, 41, 959 (abs. ref. 3). (5) Nicholls, J. and J.S.E. Carmichael (1969) Peralkaline acid liquids: a petrological study. *Contr. Mineral. Petrol.*, 20, 268–294. (6) Merlino, S. (1969) Tuhualite crystal structure. *Science*, 166, 1399–1401.