

Crystal Data: Tetragonal. *Point Group:* 4mm. As square tabular crystals to 0.12 mm.

Physical Properties: *Cleavage:* None. *Tenacity:* Brittle. *Fracture:* Uneven. Hardness = n.d. D(meas.) = n.d. D(calc.) = 3.74

Optical Properties: Transparent. *Color:* Yellowish green to bluish gray. *Streak:* White. *Luster:* Vitreous.

Optical Class: Anomalous biaxial (+). $\alpha(\text{calc.}) = 1.88$ $\beta(\text{calc.}) = 1.89$ $\gamma(\text{calc.}) = 1.96$

$2V(\text{calc.}) = 42.6^\circ$ *Pleochroism:* $X = \text{light orange}$, $Y = \text{light yellow}$, $Z = \text{red brown}$.

Absorption: $Y < X < Z$.

Cell Data: *Space Group:* $I4_1cd$. $a = 11.4626(16)$ $c = 12.584(3)$ $Z = 8$

X-Ray Diffraction Pattern: Old 25 Pipe, Kingsgate, Gough Co., New South Wales, Australia. 3.134 (100), 5.734 (70), 4.227 (52), 3.626 (44), 2.606 (19), 2.481 (17), 2.867 (11)

Chemistry:	(1)	(2)
ZrO ₂	23.09	26.49
UO ₂	1.14	
ThO ₂	0.76	
FeO	0.62	
MoO ₃	59.27	61.89
P ₂ O ₅	0.29	
SO ₃	1.25	
Cl	0.16	
H ₂ O	11.62	11.62
-O = Cl	0.04	
Total	98.16	100.00

(1) Old 25 Pipe, Kingsgate, Gough Co., New South Wales, Australia; average electron microprobe and FTIR spectroscopic analyses, H₂O calculated from structure; corresponds to $\text{Zr}_{0.88}\text{U}^{6+}_{0.02}\text{Th}_{0.01}\text{Fe}^{2+}_{0.04}\text{Mo}^{6+}_{1.94}\text{S}_{0.07}\text{P}_{0.02}\text{O}_{6.90}\text{Cl}_{0.02}\text{OH}_{2.08} \cdot 2.00\text{H}_2\text{O}$. (2) $\text{ZrMo}^{6+}_2\text{O}_7(\text{OH})_2 \cdot 2\text{H}_2\text{O}$.

Occurrence: Part of a suite of secondary bismuth, molybdate, tungstate, phosphate, and arsenate minerals from the weathering of native bismuth-bismuthinite-molybdenite-bearing quartz pipes contained in coarse, hornblende-biotite granite.

Association: Molybdenite, gelosait, mambertiite, quartz, muscovite.

Distribution From the Old 25 Pipe, Kingsgate, Gough Co., New South Wales, Australia.

Name: For the locality where the studied material was collected.

Type Material: South Australian Museum, Adelaide, South Australia, Australia (G34799).

References: (1) Elliott, P. and A.R. Kampf (2022) Kingsgateite, $\text{ZrMo}^{6+}_2\text{O}_7(\text{OH})_2 \cdot 2\text{H}_2\text{O}$, the first natural zirconium molybdate from Kingsgate, New South Wales, Australia. *Mineral. Mag.*, 86(3), 486-491.