

Putnisite

Crystal Data: Orthorhombic. *Point Group:* 2/m 2/m 2/m. As pseudocubic crystals to 0.5 mm.

Physical Properties: *Cleavage:* One excellent and two good parallel to {100}, {010}, and {001}. *Fracture:* Uneven. *Tenacity:* Brittle. *Hardness* = 1.5-2 *D(meas.)* = 2.20(3) *D(calc.)* = 2.23

Optical Properties: Translucent. *Color:* Pale to dark purple. *Streak:* Pink. *Luster:* Vitreous. *Optical Class:* Biaxial (-). $\alpha = 1.552(3)$ $\beta = 1.583(3)$ $\gamma = 1.599(3)$ *Orientation:* Uncertain. *Pleochroism:* Distinct, X = pale bluish gray, Y = pale purple, Z = pale purple.

Cell Data: *Space Group:* Pnma. $a = 15.351(3)$ $b = 20.421(4)$ $c = 18.270(4)$ $Z = 4$

X-ray Powder Pattern: Halls Knoll gossan, Western Australia, Australia. 13.58 (100), 7.66 (80), 6.67 (43), 5.084 (19), 3.689 (16), 4.901 (13), 7.09 (10)

Chemistry:	(1)
Na ₂ O	0.17
MgO	0.08
CaO	10.81
SrO	5.72
BaO	0.12
CuO	0.29
Cr ₂ O ₃	31.13
SO ₃	3.95
SiO ₂	0.08
Cl ⁻	0.28
CO ₂	[17.94]
H ₂ O	[30.30]
-O=Cl	0.06
Total	100.81

(1) Halls Knoll gossan, Western Australia, Australia; average of 11 electron microprobe analyses, CO₂ and H₂O calculated from crystal structure analysis and confirmed by infrared spectroscopy, OH⁻ calculated for charge balance; corresponding to Cr³⁺_{8.02}Ca_{3.78}Sr_{1.08}Na_{0.11}Cu²⁺_{0.07}Mg_{0.04}Ba_{0.02}[(SO₄)_{0.96}(SiO₄)_{0.03}]_{Σ=0.99}(CO₃)_{7.98}(OH)_{16.19}Cl_{0.15}·24.84H₂O.

Occurrence: A product of the oxidation of a massive nickel sulfide deposit in komatiitic/dioritic rocks.

Association: Quartz, a near-amorphous dark green mineral.

Distribution: From the Halls Knoll gossan, Polar Bear peninsula, Southern Lake Cowan, 40 km north of Norseman, Western Australia, Australia.

Name: Honors Australian mineralogists Christine and Andrew Putnis of the Institut für Mineralogie, Universität Münster, Germany, in recognition of their outstanding contributions to mineralogy.

Type Material: South Australian Museum, Adelaide, South Australia, (registration number G33429) and at the Canadian Museum of Nature, Ottawa, Canada (CMNMC 86133).

References: (1) Elliott, P., G. Giester, R. Rowe, and A. Pring (2014) Putnisite, SrCa₄Cr₈³⁺(CO₃)₈SO₄(OH)₁₆·25H₂O, a new mineral from Western Australia: description and crystal structure. *Mineral. Mag.*, 78(1), 131-144. (2) (2014) *Amer. Mineral.*, 99, 1810-1811 (abs. ref. 1).