Putnisite $SrCa_4Cr_8^{3+}(CO_3)_8SO_4(OH)_{16}\cdot 25H_2O$

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 (-). α =1.552(3) β = 1.583(3) γ = 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_2O	0.17
MgO	0.08
CaO	10.81
SrO	5.72
BaO	0.12
CuO	0.29
Cr_2O_3	31.13
SO_3	3.95
SiO_2	0.08
Cl^-	0.28
CO_2	[17.94]
H_2O	[30.30]
-O=Cl	0.06
Total	100.81

(1) Halls Knoll gossan, Western Australia, Australia; average of 11 electron microprobe analyses, CO_2 and H_2O calculated from crystal structure analysis and confirmed by infrared spectroscopy, OH^- calculated for charge balance; corresponding to $Cr^{3+}_{8.02}Ca_{3.78}Sr_{1.08}Na_{0.11}Cu^{2+}_{0.07}Mg_{0.04}Ba_{0.02}[(SO_4)_{0.96}(SiO_4)_{0.03}]_{\Sigma=0.99}(CO_3)_{7.98}(OH)_{16.19}Cl_{0.15}\cdot 24.84H_2O$.

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, Universtität 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, $SrCa_4Cr_8^{3+}(CO_3)_8SO_4(OH)_{16}\cdot 25H_2O$, 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).