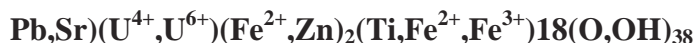


**Cleusonite**

**Crystal Data:** Hexagonal. *Point Group:*  $\bar{3}$ . As complexly-faceted, tabular crystals to 2.3 cm comprised of multiple rhombohedra and hexagonal prisms. *Twining:* On planes parallel to [0001]; interpenetration twins based on  $\sim 30^\circ$  rotations about [0001] common. Partly metamict.

**Physical Properties:** *Cleavage:* None. *Fracture:* Conchoidal. *Tenacity:* Brittle. *Hardness* = 6-7  
D(meas.) = 4.74(4) D(calc.) = 5.02-5.27 (unheated – heated) Paramagnetic.

**Optical Properties:** Opaque. *Color:* Black, light gray to white in reflected light. *Streak:* Black.  
*Luster:* Bright submetallic.

*Optical Class:* Isotropic, metamict.

*R:* (400) 21.2, (480) 18.3, (540) 17.5, (580) 17.4, (640) 17.4, (700) 17.3

**Cell Data:** *Space Group:*  $R\bar{3}$ .  $a = 10.576(3)$   $c = 21.325(5)$  (unheated)  $Z = \text{n.d.}$   
 $a = 10.385(2)$   $c = 20.900(7)$  (heated)  $Z = \text{n.d.}$

**X-ray Powder Pattern:** Cleuson, upper Val de Nendaz, Valais, Switzerland.

2.820 (100), 2.450 (38), 1.485 (33), 2.137 (21), 3.31 (19), 2.957 (16), 2.081 (15) (unheated)  
2.893 (100), 3.406 (96), 2.851 (69), 2.245 (55), 2.995 (53), 5.18 (52), 6.83 (51) (heated)

<b>Chemistry:</b>	(1)		(1)
Al <sub>2</sub> O <sub>3</sub>	0.16	SrO	0.6
TiO <sub>2</sub>	44.55	PbO	9.34
V <sub>2</sub> O <sub>5</sub>	0.83	UO <sub>2</sub>	10.07
MnO	0.28	UO <sub>3</sub>	4.12
FeO	18.13	<u>H<sub>2</sub>O</u>	<u>1.11</u>
Fe <sub>2</sub> O <sub>3</sub>	8.81	Total	98.33
ZnO	0.33		

(1) Cleuson, upper Val de Nendaz, Valais, Switzerland; average of “hundreds” of electron microprobe analyses supplemented by X-ray photoelectron spectroscopy, FTIR, TGA and wet spectro-colorimetry; corresponds to  $(\text{Pb}_{0.89}\text{Sr}_{0.12})_{\Sigma=1.01}(\text{U}^{4+}_{0.79}\text{U}^{6+}_{0.30})_{\Sigma=1.09}(\text{Fe}^{2+}_{1.91}\text{Zn}_{0.09})_{\Sigma=2.00}(\text{Ti}_{11.80}\text{Fe}^{2+}_{3.44}\text{Fe}^{3+}_{2.33}\text{V}^{5+}_{0.19}\text{Mn}_{0.08}\text{Al}_{0.07})_{\Sigma=17.90}[\text{O}_{35.37}(\text{OH})_{2.63}]_{\Sigma=38}$ .

**Mineral Group:** Crichtonite group.

**Occurrence:** In alpine-type cleft veins in greenschist facies metamorphic rocks.

**Association:** Clausthalite, chalcopyrite, uraninite, quartz, chlorite, calcite, albite, microcline, tourmaline, fluorapatite, zircon, ilmenite, hematite, titanite, pyrite, tennantite, rutile, crichtonite, monazite-(Ce), gold (Cleuson); quartz, albite, barite, chalcopyrite, uraninite, tennantite, pyrite, hematite, magnetite, cinnabar, malachite (Bella Tolla summit).

**Distribution:** From near Cleuson, upper Val de Nendaz, and near the Bella Tolla summit, St-Luc, Val d’Anniviers, Valais, Switzerland. The previously described “uranium-rich senaite” from Alinci, Macedonia and the “plumbodavidite” from Huanglongpu, China are also cleusonite.

**Name:** For the locality, *Cleuson*, Switzerland, that provided the specimens for complete description of the species.

**Type Material:** Geological Museum of Lausanne, Switzerland (MGL 65200 to 65205) and the National Museum of Natural History, Paris, France (MNHNP 203.64 to 203.66).

**References:** (1) Wülser, P.-A., N. Meisser, J. Brugger, K. Schenk, S. Ansermet, M. Bonin, and F. Bussy (2005) Cleusonite,  $(\text{Pb,Sr})(\text{U}^{4+}, \text{U}^{6+})(\text{Fe}^{2+}, \text{Zn})_2(\text{Ti}, \text{Fe}^{2+}, \text{Fe}^{3+})_{18}(\text{O}, \text{OH})_{38}$ , a new mineral species of the crichtonite group from the western Swiss Alps. *Eur. J. Mineral.*, 17, 933-942.  
(2) (2006) *Amer. Mineral.*, 91, 1202 (abs. ref. 1).