

**Ciprianiite****Ca<sub>4</sub>(Th, Ca)<sub>Σ=2</sub>Al(Be<sub>0.5</sub>□<sub>1.5</sub>)[B<sub>4</sub>Si<sub>4</sub>O<sub>22</sub>](OH)<sub>2</sub>**

**Crystal Data:** Monoclinic. *Point Group:* *2/m*. As crystals tabular on {010} to 0.5 mm.  
*Twinning:* Frequent on {100}.

**Physical Properties:** *Cleavage:* Fair to good on {100}. *Tenacity:* Brittle. *Fracture:* Conchoidal.  
Hardness = n.d. D(meas.) = n.d. D(calc.) = n.d.

**Optical Properties:** Transparent. *Color:* Brown. *Streak:* White. *Luster:* Vitreous.  
*Optical Class:* n.d. Properties not determinable.

**Cell Data:** *Space Group:* *P2/a*. *a* = 19.059(5) *b* = 4.729(1) *c* = 10.291(4) β = 111.33(2)° *Z* = 2

**X-ray Powder Pattern:** Calculated pattern.

2.846 (100), 3.089 (86), 2.634 (84), 2.653 (80), 3.454 (79), 2.648(79), 2.911 (74)

<b>Chemistry:</b>	(1)		(1)		(1)
SiO <sub>2</sub>	22.94	CaO	24.60	Dy <sub>2</sub> O <sub>3</sub>	0.049
B <sub>2</sub> O <sub>3</sub>	13.28	BaO	0.002	Er <sub>2</sub> O <sub>3</sub>	0.012
BeO	1.95	La <sub>2</sub> O <sub>3</sub>	1.39	Yb <sub>2</sub> O <sub>3</sub>	0.006
Li <sub>2</sub> O	0.053	Ce <sub>2</sub> O <sub>3</sub>	5.48	ThO <sub>2</sub>	15.80
TiO <sub>2</sub>	0.730	Y <sub>2</sub> O <sub>3</sub>	0.185	UO <sub>2</sub>	0.872
Al <sub>2</sub> O <sub>3</sub>	2.33	Pr <sub>2</sub> O <sub>3</sub>	0.863	H <sub>2</sub> O	0.465
Fe <sub>2</sub> O <sub>3</sub>	2.87	Nd <sub>2</sub> O <sub>3</sub>	3.03	F	0.89
Cr <sub>2</sub> O <sub>3</sub>	0.015	Sm <sub>2</sub> O <sub>3</sub>	0.332	- O = F	0.370
Mn <sub>2</sub> O <sub>3</sub>	0.371	Eu <sub>2</sub> O <sub>3</sub>	0.051	Total	98.50
MgO	0.180	Gd <sub>2</sub> O <sub>3</sub>	0.139		

(1) Tre Croci, near Vetralla, Viterbo province, Latium, Italy; electron microprobe analysis; B, Be, Li, OH and F by SIMS; corresponds to Ca<sub>4</sub>[REE<sup>3+</sup><sub>0.72</sub>(Th,U)<sup>4+</sup><sub>0.66</sub>Ca<sub>0.60</sub>Y<sub>0.02</sub>]<sub>Σ=2</sub>(Al<sub>0.48</sub>Fe<sup>3+</sup><sub>0.38</sub>Ti<sup>4+</sup><sub>0.10</sub>Mg<sub>0.05</sub>Mn<sup>3+</sup><sub>0.02</sub>)<sub>Σ=1.03</sub>(Be<sub>0.82</sub>□<sub>0.60</sub>Li<sub>0.04</sub>)B<sub>4.00</sub>Si<sub>4.00</sub>O<sub>22</sub>O<sub>5</sub>[O<sup>2-</sup><sub>0.97</sub>(OH)<sub>0.54</sub>F<sub>0.49</sub>]<sub>Σ=2</sub> or <sup>X</sup>Ca<sub>4</sub><sup>Y</sup>[REE<sup>3+</sup><sub>0.74</sub>Th<sup>4+</sup><sub>0.66</sub>Ca<sub>0.60</sub>]<sub>Σ=2</sub>Al<sub>1.03</sub><sup>T</sup>(Be<sub>0.82</sub>□<sub>0.60</sub>Li<sub>0.04</sub>)<sub>Σ=1.46</sub>[B<sub>4</sub>Si<sub>4</sub>O<sub>22</sub>]<sup>W</sup>[O<sub>0.97</sub>(OH)<sub>1.03</sub>]<sub>Σ=2</sub>.

**Mineral Group:** Hellandite group.

**Occurrence:** In miarolitic cavities and voids in alkali-syenitic pyroclastic ejecta. Formed by late-stage post-magmatic hydrothermal fluids enriched in Zr, Ti, REEs, and actinide elements.

**Association:** Sanidine, plagioclase (An 20-80%), feldspathoid, clinopyroxene, clinoamphibole, magnetite, titanite, zircon, danburite, thorite, fluorite, tourmaline, a cancrinite-group mineral.

**Distribution:** From Tre Croci, near Vetralla, Viterbo province, Latium, Italy.

**Name:** Honors Curzio *Cipriani*, Professor of Mineralogy and Head of the Museum of Mineralogy, (later of Natural History), University of Florence, Italy, in recognition of his contribution to mineral systematics.

**Type Material:** Natural History Museum, the University of Florence, Italy (2771/RI).

**References:** (1) Della Ventura, G., P. Bonazzi, R. Oberti, and L. Ottolini (2002) Ciprianiite and mottanaite-(Ce), two new minerals of the hellandite group from Latium (Italy). *Amer. Mineral.*, 87, 739-744. (2) Oberti, R., A. Langone, M. Boiocchi, E. Bernabè, and F.C. Hawthorne (2019) News from the hellandite group: the redefinition of mottanaite and ciprianiite and the new mineral description of ferri-mottanaite-(Ce), the first Fe<sup>3+</sup>-dominant hellandite. *Eur. J. Mineral.*, 31, 799-806.