Ciriottiite  \( \text{Cu(Cu, Ag)}_3\text{Pb}_{19}(\text{Sb, As})_{22}(\text{As}_2)\text{S}_{56} \)

**Crystal Data:** Monoclinic.  \( \text{Point Group: } \frac{2}{\overline{1}}m \). As tubular crystals, to 150 \( \mu \text{m} \).

**Physical Properties:**  \( \text{Cleavage: } \) n.d.  \( \text{Fracture: } \) n.d.  \( \text{Tenacity: } \) Brittle.

Hardness = 3-3.5  \( \text{VHN} = 190-219, 203 \) (10 g load).  \( \text{D(meas.)} = \) n.d.  \( \text{D(calc.)} = 5.918 \)

**Optical Properties:** Opaque.  \( \text{Color: } \) Black; light gray in reflected light.  \( \text{Streak: } \) Black.

\( \text{Luster: } \) Metallic.

**Optical Class:** n.d.  \( \text{Anisotropism: } \) Distinct, brownish to greenish tints.

\( \text{R}_1-\text{R}_2: (471.1) \) 37.8-33.2, (548.3) 35.3-31.8, (586.6) 34.7-31.0, (652.3) 32.5-27.9

**Cell Data:**  \( \text{Space Group: } \frac{P}{2_1}1/\overline{1}m \).  \( a = 8.178(2) \)  \( b = 28.223(6) \)  \( c = 42.542(5) \)  \( \beta = 93.55(2)^\circ \)  \( Z = 4 \)

\( \text{X-ray Powder Pattern: } \) Calculated pattern.

3.641 (100), 3.238 (82), 2.043 (78), 3.208 (57), 2.936 (54), 2.928 (37), 2.800 (36)

**Chemistry:**

\[
\begin{array}{ccc}
\text{Cu} & 2.33 & 2.95 \\
\text{Ag} & 0.53 & \\
\text{Hg} & 0.98 & \\
\text{Tl} & 0.78 & \\
\text{Pb} & 44.06 & 45.63 \\
\text{As} & 4.66 & 5.21 \\
\text{Sb} & 23.90 & 25.40 \\
\text{Bi} & 1.75 & \\
\text{S} & 20.37 & 20.81 \\
\text{Total} & 99.38 & 100.00 \\
\end{array}
\]

(1) Espérance superioire tunnel, Piedmont, Italy; average of 5 electron microprobe analyses; corresponds to \( \text{Cu}_{3.23}\text{Ag}_{0.43}\text{Hg}_{0.43}\text{Pb}_{18.74}\text{Tl}_{0.34}\text{Sb}_{17.10}\text{As}_{5.61}\text{Bi}_{0.74}\text{S}_{56} \).  (2) \( \text{Cu(Cu}_3\text{Pb}_{19}(\text{Sb}_{18}\text{As}_4)/(\text{As}_2)\text{S}_{56} \).

**Mineral Group:** Owyheeite group.

**Occurrence:** In a vug in a quartz vein in a complex hydrothermal sulfide deposit.

**Association:** Arsenopyrite, a kobellite-like mineral.

**Distribution:** From the Espérance superioire tunnel, Tavagnasco Pb-Bi-Zn-As-Fe-Cu district, ~50 km north of Turin, Piedmont, Italy.

**Name:** Honors Marco Ernesto Ciriotti (b. 1945). Italian member of the IMA CNMNC since 2013, and president of the Italian Micromineralogical Association, for his longstanding contributions to mineral systematics.

**Type Material:** Natural History Museum, University of Florence, Italy (3161/I).

**References:** (1) Bindi, L., C. Biagioni, B. Martini, and A. Salvetti (2016) Ciriottiite, \( \text{Cu(Cu}_3\text{Ag}_1\text{Pb}_{19}(\text{Sb, As})_{22}(\text{As}_2)\text{S}_{56} \), the Cu-analogue of sterryite from the Tavagnasco Mining District, Piedmont, Italy. Minerals, 6(1), 8.  (2) (2020) Amer. Mineral., 105, 1111 (abs. ref. 1).