

Coralloite, $\text{Mn}^{2+}\text{Mn}_2^{3+}(\text{AsO}_4)_2(\text{OH})_2 \cdot 4\text{H}_2\text{O}$, a new mixed valence Mn hydrate arsenate: Crystal structure and relationships with bermanite and whitmoreite mineral groups

ATHOS MARIA CALLEGARI,^{1,*} MASSIMO BOIOCCHI,² MARCO E. CIRIOTTI,³ AND CORRADO BALESTRA⁴

¹Dipartimento di Scienze della Terra e dell'Ambiente, Università degli Studi di Pavia, via Ferrata 1, I-27100 Pavia, Italy

²Centro Grandi Strumenti, Università degli Studi di Pavia, via Bassi 21, I-27100 Pavia, Italy

³Associazione Micromineralogica Italiana, via San Pietro 55, I-10073 Devesi-Ciriè, Italy

⁴Associazione Micromineralogica Italiana, via Delfino 74, I-17017 Millesimo, Italy

ABSTRACT

Coralloite is a new mineral found at the Monte Nero Mine (Rocchetta Vara, La Spezia, Liguria, Italy) having the simplified formula $\text{Mn}^{2+}\text{Mn}_2^{3+}(\text{AsO}_4)_2(\text{OH})_2 \cdot 4\text{H}_2\text{O}$. It occurs as sub-millimetric lamellar cinnabar-red crystals elongated on [100] and flattened on (001), isolated or forming wisps up to 0.5–1 mm long. Associated phases are calcite, inesite, quartz, brandtite, sarkinite, and tilasite in a chert matrix.

Crystals are pleochroic, yellow along [100] and orange-red in directions normal to it. Extinction is parallel to the cleavage traces and elongation is negative. The small crystal size does not allow accurate determination of refraction indices. Crossed polar observations of crystals placed in diiodomethane ($n = 1.74$) suggest that the mean refractive index is close to that value.

Coralloite is triclinic, space group $P1$, $a = 5.5828(7)$, $b = 9.7660(13)$, $c = 5.5455(7)$ Å, $\alpha = 94.467(3)$, $\beta = 111.348(2)$, $\gamma = 93.850(2)^\circ$, $V = 279.26(6)$ Å³, $Z = 1$. The five strongest lines in the simulated powder diffraction pattern (d_{obs} , I , hkl) are: 9.710 Å, 100.0, (0 $\bar{1}$ 0), 5.166 Å, 77.1, (100); 5.136 Å, 79.7, (001); 3.342 Å, 64.8, ($\bar{1}$ $\bar{2}$ 1); 3.324 Å, 33.6, ($1\bar{2}$ $\bar{1}$).

The structure of coralloite (final R_{all} 0.044 for 3092 observed reflections) shows similarities with bermanite: $\text{Mn}^{2+}\text{Mn}_2^{3+}(\text{PO}_4)_2(\text{OH})_2 \cdot 4\text{H}_2\text{O}$ and ercittite: $\text{Na}_2\text{Mn}_2^{3+}(\text{PO}_4)_2(\text{OH})_2 \cdot 4\text{H}_2\text{O}$. In particular, these three minerals exhibit the same structural slab formed by [⁶Mn₂³⁺(⁴XO₄)₂(OH)₂]; X = As or P. However, these structural slabs are connected by interposed layers of different polyhedra for each mineral species.

Keywords: Coralloite, bermanite, arsenates, structure refinement, Monte Nero area, Liguria