

MINERALOGY OF VIVIANITE FROM ROSIA POIENI; METALLOGENETIC SIGNIFICANCE

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ABSTRACT: Mineralogy of Vivianite from Rosia Poieni; Metallogenic significance.
The deposit at Rosia Poieni is the largest accumulation of copper in M. Metaliferi, in Southern Apuseni Mountains. By the side of Cu, in paragenesis appear Au and Te that, among other elements, forms its own minerals. These are rare minerals and were studied because they have a special scientific and economic importance. Among these minerals include Vivianite, which was discovered in Rosia Poieni ore which is described in the paper.

Keywords: *accumulation, paragenesis, rare minerals, Vivianite.*

The Rosia Poieni ore deposit represents the largest Cu-Au porphyry structure in the Metaliferi Mts., matching in celebrity the gold-silver deposit at Rosia Montana, located at approximately 4 km to the East.

Positive correlation has been observed between Cu/Te and Cu/Au ratios for pyrite-hosted fluid inclusions in Rosia Poieni ore deposit (Kouzmanov et al, 2004). A similar trend was established by Wallier (2004) & Rey (2004) – in their master thesis, for low-salinity epithermal fluids in the neighboring intermediate-sulfidation epithermal Au-Ag deposit of Rosia Montana, thus suggesting a possible genetic link between the two deposits.

Copper, gold and tellurium show similar element ratios trends for fluids of porphyry-copper and epithermal deposits. These data strongly support the hypothesis for a common origin of mineralizing fluids forming the two styles of hydrothermal ore deposit in the area.

These elements plus the regional-general observations regarding structural and metallogenic features, suggested the existence of caldera-type structures in Metaliferi Mts. yielding favorable conditions for the coexistence of Au-Ag and porphyry copper deposits (Popescu & Neacsu, 2007).

Within this body a copper stockwork has

formed, spanning over 1200 m in height. The lower-central zone is occupied by potassic alteration in close association with metallic minerals (magnetite, pyrite, enargite, hematite, chalcopyrite, bornite, digenite, molybdenite, tetrahedrite, sphalerite and galena). Towards the upper-external areas, sericite, argillic and propylitic areas develop, together with disseminated pyrite.

The existence of paleo-calderas in the Metaliferi Mts. has recently been recognized in the Rosia Montana-Bucium district (O'Connor et al., 2004, Popescu & Neacsu, 2007) and in other perimeters. It is very probable that such calderas (like is drawing in figure 1), have functioned as complex, circular-shaped structures which hosted hydrothermal activity.

The evolution of a trapdoor caldera in the Rosia Montana-Rosia Poieni area have following stages:

- a) the upper part of the magma chamber froths, expands and flows up the vent only in the south-west part; magma from the deeper parts of the chamber begins to flow out and the rocks overlying the magma begin to collapse along the fractures into the now emptied chamber; a gold silver metallogenesis is succeeded;

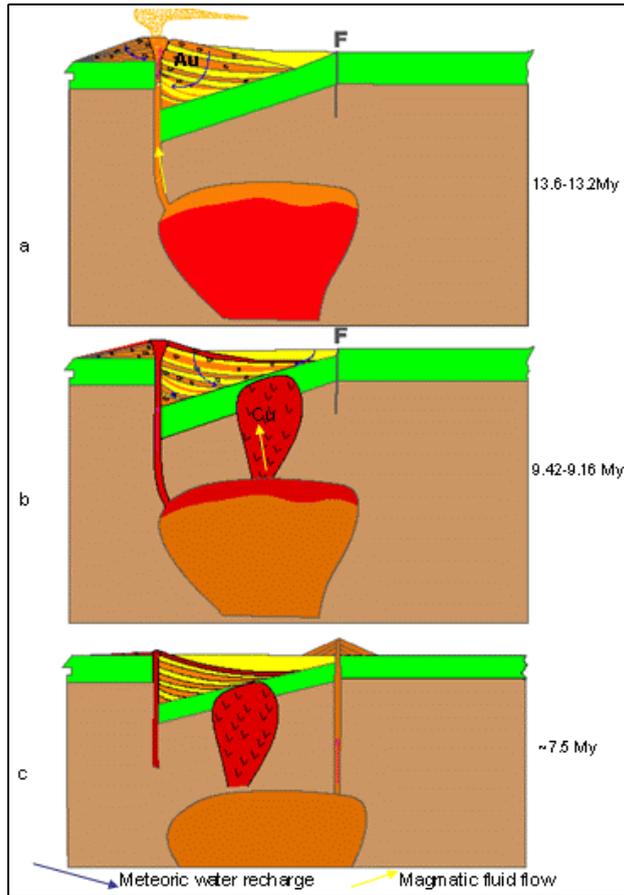


Fig 1. The evolution of Rosia Montana – Rosia Poieni volcanism and associated hydrothermal activity

- b) the magma chamber is then depleted in gases - a minor volcanic and subvolcanic activity are initialized in relation with a porphyry copper metallogenesis is manifested;
- c) the magma continues to be more basic; volcanic bodies are manifested only in the north-eastern part of the caldera.

Vivianite $\text{Fe}_{2+3}(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$, is one of the significant hydrothermal components, especially in the lower south-west part of the open pit (fig. 2), where vivianite occurs as dark-blue prismatic crystals of up to 6 cm in length, against a background of mainly argillic (subordinately potassic and silicic) hydrothermal and supergene alteration

affecting host microdiorites. The newly described vivianite occurrence might be similar with the one described in Musca gallery which intersected the lower part of Rosia Poieni complex (Giusca and Pavelescu, 1954)

Larger crystals of vivianite occur in veinlets or vugs, associated with quartz, pyrite, chalcopyrite, enargite and a yellowish argillic matter (Figures 3, 4 and 5). Thin films of vivianite may also occur along fine fissures in silicified, dark-gray microdiorites and on cleavage planes of hydrothermalized Cretaceous sedimentary rocks.

Based on the physiographic relationship with the other minerals, vivianite appears to be the last hydrothermal mineral.



Fig 2. The Rosia Poieni open pit
(arrow indicates the main area of vivianite occurrence)..

Semi-quantitative EDS chemical analyses revealed iron, phosphorous and oxygen (hydrogen inferred) as the main chemical constituents: FeO ~ 43 %, P₂O₅ ~ 28 % and H₂O ~ 29 %. Due to the determination limits of the method used, the presence of minor substituents of Fe²⁺ (i.e., Mn²⁺, Mg, Fe³⁺) could not however be completely precluded.

Powder X-ray diffraction revealed the main typical maxima of vivianite at (d/n in Å and relative intensities): 8.08 (15) 6.73 (100), 4.96 (12), 4.89 (20), 4.07 (54), 3.85 (12), 3.21 (58), 2.97 (16), 2.77 (16), 2.70 (61), 2.59 (34), 2.53 (32), 2.51 (23), 2.32 (49), 2.23 (19), 2.19 (28), 2.07 (19), 2.01 (16), etc. A ten-cycle unit-cell refinement based on 32 measured reflections resulted in



Fig 3. Typical aspect of large prismatic crystals of Vivianite from Roşia Poieni

the following parameters: $a = 10.0591$, $b = 13.4415$, $c = 4.7000 \text{ \AA}$, $\beta = 104.37^\circ$, largely comparable with other vivianites quoted by various sources.



Fig 4. Thin films of vivianite on altered microdiorites



Fig 5. Vivianite associated with pyrite and enargite in late veinlets within altered microdiorite breccias.

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