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Evolution of the Bucium Rodu and Frasin magmatic-hydrothermal system, Metaliferi Mountains, Romania

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The Miocene Bucium Rodu and Frasin maar-diatreme structures and related Au-Ag epithermal low sulfidation with passing to mesothermal mineralizations are located in the Bucium-Rosia Montana-Baia de Aries metallogenetic district, within so called the "Golden Quatrilaterum", in the northeastern part of the Metaliferi Mountains. These structures are situated at about 5 km southeast from Rosia Montana, the largest European Au-Ag deposit. The total reserves for Bucium Rodu-Frasin are estimated at 43.3 Mt with average contents of 1.3 g/t Au and 3 g/t Ag.

The Miocene geological evolution of Bucium Rodu and Frasin magmatic-hydrothermal system took place in closely relationships with tectonic, magmatic and metallogenetic activity from Bucium-Rosia Montana-Baia de Aries district in general, and adjacent areas, in special.

The hydrothermal alteration is pervasive; adularia followed by phyllic, carbonatization and silicification alterations, usually show a close relationship with the mineralizations. Propylitic alteration occurs dominantly towards the depth; argillic alteration shows a local character.

The mineralization occurs in veins, breccias, stockworks and disseminations and is hosted within two volcanic structures emplaced into a sequence of Cretaceous sediments in closely genetically relations with the Miocene phreatomagmatic fracturing and brecciation events.

Within Rodu maar-diatreme structure the mineralizations follow especially the contact between the diatreme and Cretaceous flysch. The vein sets with low, moderately and near vertical dippings, cover 400x400m with N-S trend. The most important mineralization style is represented by veins, accompanied by hydrothermal breccias and disseminations. The veins spatial distribution relives as "en echelon" tension veins. They carry gold, minor base metal sulphides (pyrite, chalcopyrite, sphalerite, galena, tetrahedrite, arsenopyrite). Gangue is represented by carbonates (calcite, dolomite, ankerite, siderite, rhodochrosite) and quartz.

In contrast, in Frasin maar-diatreme structure, the mineralizations are focused especially along the northeastern contact between the andesite dome and polimictic breccias. Stockwork is the main style of mineralization and consists of pyrite, small amounts of chalcopyrite, sphalerite, galena, arsenopyrite and gold within a gangue of quartz and carbonates similar to Rodu mineralizations.

The ore minerals deposition from hydrothermal fluids have pulsated character with a three stage evolution and mineral assemblages: 1) magnetite (hematite) - pyrite (marcasite) - quartz in the first stage, epithermal low sulfidation with passing to mesothermal; 2) arsenopyrite (Au) - (-base metal sulfides) – quartz, "Chinga" (pyrite (Au)-quartz-adularia) - carbonates (calcite, aragonite, dolomite, ankerite, $\pm$ rhodochrosite $\pm$ kutnahorite) - quartz - adularia in the second stage, epithermal low sulfidation and 3) pyrite - marcasite - carbonates - quartz, (Au) - carbonates (dominant rhodochrosite) - quartz - adularia and alabandite - rhodochrosite - quartz in the third stage, epithermal low sulfidation. The mineralizing hydrothermal fluids had near neutral pH with the gold transported probably as a bisulfide complex; boiling seems to be the main way of gold precipitation.