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Chemical variability of ore minerals in several epithermal deposits from the Gold Quadrilateral, Apuseni Mountains, Romania

Munteanu, M.^{1,2}, Cioacă, M.E.¹, Costin, G.³, Costea A.C.¹, Barbu, O.C.¹ and Bârgăoanu, D.¹

¹Geological Institute of Romania, 1 Caransebeş St., Bucharest, Romania, marianmunteanu2000@gmail.com.

²School of Geosciences, University of the Witwatersrand, 1 Jan Smuts St., Johannesburg, South Africa.

³Department of Earth Science, Rice University, 6100 Main St., Houston, TX, 77005

The Gold Quadrilateral is a mining area characterized by the presence of gold and silver epithermal deposits, commonly associated with tellurium. The mineralization is related to the Miocene magmatism in the South Apuseni Mountains, which generated mostly andesites, dacites, and diorites. As they have been mined since the ancient times, many epithermal Au deposits in the Gold Quadrilateral have been exhausted before being investigated with modern analytical techniques. We report mineral chemistry data for several ore samples from the collections of the Geological Institute of Romania as clues to defining the geochemical footprints of different Au-Ag deposits of the Gold Quadrilateral.

The study was done on gold-bearing samples from Roşia Montană, Căinel, Techereu, and Larga. Mineral chemistry was determined using a Jeol JXA 8230 Superprobe instrument with four WDS spectrometers, at the Geology Department of Rhodes University (Grahamstown, South Africa). Analytical conditions were an acceleration voltage of 15 kV, a probe current of 20 nA, a beam size of 1 µm, and count times of 20 sec (peak) and 5 sec (upper and lower backgrounds).

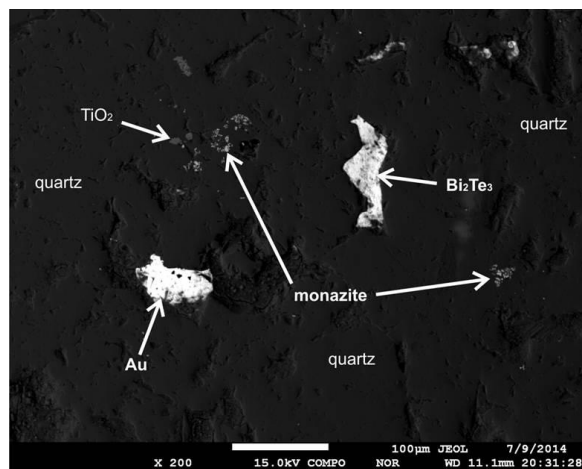


Fig. 1. Native gold (96-98 wt% Au) at Techereu, in quartz gangue with tellurobismuthite, monazite, and rutile. Back-scattered electron image.

Metallic gold has been found either included in pyrite and sphalerite grains or occurring between quartz crystals. Metallic Au occurs in electrum (27-33.6 wt% Ag) in most samples, in agreement with previously published data [1]. Only one sample from Techereu contained native gold (88-98% Au), occurring between quartz crystals, and associated with tellurobismuthite, monazite, rutile, and zircon (Fig. 1). Mercury in electrum is below the detection limit at Căinel, detectable but <1% Hg at Roşia Montană and Techereu, and slightly higher (1.4-1.5% Hg) at Larga. Electrum contains 0.3-0.6% Bi at Căinel, but undetectable amounts of Bi in the other deposits. Pyrite shows relatively high As contents at Căinel (up to 4% As), moderate contents (approx. 0.8% As) at Larga, and less than the detection limit at Roşia Montană and Techereu. Galena from Căinel has Fe, Ag, and Se contents below their detection limits but detectable Sb (0.1-0.25% Sb). Galena from Larga contains up to 0.7% Fe, 0.1-2.7% Ag, 0.2-1% Se, and undetectable Sb. At Roşia Montană, galena has < 0.1% Ag and undetectable concentrations of Se and Sb.

The mineral chemistry results are consistent with previous investigations on several tailings ponds from the Gold Quadrilateral, which suggest that the geochemical signature of Roşia Montană, the highest

grade Au+Ag deposit, is characterized by P, Cu, Zn, As, Te, Pb, and Bi contents much lower than in other deposits.

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References:

[1] Pop D et al. (2011) European J. Mineralogy 23:911-923

