

Au, Ag in the Tomtor complex rocks

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The Tomtor complex of alkaline peridotitic and carbonatitic rocks occupies about 250 km² in the northern Sakha Republic (Yakutia). It has a concentric zoned structure: a carbonatitic core surrounded with microcline-mica and microcline-apatite-mica rocks and an incomplete ring of peridotitic rocks, foidolites, and alkaline and nepheline syenites on the periphery [1]. All rocks are weathered, with the thickest eluvium derived from REE carbonatites and consisting of siderite, goethite, and francolite layers. Thin-layered Nb-REE ores enriched with biota residues occur as sheets in eluvium depressions within the Tomtor core. Grains composed of Au_{90,5}Ag_{6,7}Cu_{2,8} in calcite of kamaphorites and of Au₆₂Ag₃₈ in pyrite of syenites were found [2]. In addition Au with similar composition was found in the placer deposits near the Tomtor complex, which may have the source in alkaline rocks.

In this study, Au and Ag distribution was investigated in various rocks of the Tomtor complex (borehole 6151, depth 500 m) by the PAAS and ETAAS after acid digestion of the samples and extraction of analytes into the organic phase. Au species were investigated by the sequential extraction technique (Tessier scheme). The highest Au contents are found in calcite carbonatites (up to 24 ppb). The lower contents (10 times) are found in sideritic (up to 2.5 ppb) and goethitic (up to 3.8 ppb) rocks of the weathering profile and also in Nb-REE-rich ores (up to 4.5 ppb). The contents in apatite-rich silicate-carbonatitic and goethite-microcline rocks lower than 1 ppb. Au in Nb-REE-rich ores is partially leached in the reducible fraction (5-15 %) and mainly in the oxidizable (60-90 %). 5-25 % of Au remains in the residual fraction. The data obtained shows that Au in ores is associated with Fe, Pb, Zn sulfides. High Ag contents are established in rich ores (1.8-2.5 ppm), sideritic and goethitic rocks of the weathering profile (0.5-1.0 ppm). In the rest of the rocks contents are below 0.5 ppm. The results obtained indicate the fractionation of Au and Ag during the weathering of carbonatites and the formation of Nb-REE-rich ores.

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[1] Lazareva, E.V., Zhmodik, S.M., Dobretsov, N.L., et al. 2015. *Russian Geology and Geophysics* 56 (6), 844–873.

[2] Baranov L.N. et al. *Ores and Metals*, 2018, 42-54. *In russian*