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## **GOLD FROM THE ALLUVIUM OF THE LOWER COURSE OF THE CHORNY CHEREMOSH RIVER**

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Information is provided on placer gold from the alluvium of the lower reaches of the Chornyi Cheremosh River. A feature of placer gold is its different color within one grain: golden-yellow and silver-light gray. In the light gray part of the grain, the mercury content in gold reaches 11 %. The presence of placer gold with such a mercury content may indicate the presence of a root epithermal source of gold of endogenous origin.

*Keywords:* Chornyi Cheremosh River, alluvium, placer gold, morphology, chemical composition.

## **ЗОЛОТО З АЛЮВІЮ НИЖНЬОЇ ТЕЧІЇ РІЧКИ ЧОРНИЙ ЧЕРЕМОШ**

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Подано відомості про розсипне золото з аллювію нижньої течії річки Чорний Черемош. Особливістю розсипного золота є його різне забарвлення в межах одного зерна: золотисто-жовте та сріблясто-світло-сіре. У світло-сірій частині зерна вміст ртуті в золоті досягає 11 %. Наявність розсипного золота з таким вмістом ртуті може вказувати на наявність корінного епітермального джерела золота ендогенного походження.

*Ключові слова:* річка Чорний Черемош, аллювій, розсипне золото, морфологія, хімічний склад.

The main gold-bearing areas of the Ukrainian Carpathians are Beregovskyi, Vyshkivskyi, Rakhivskyi, Chyvchynskyi, Verkhovynskyi, Yablunivskyi, Perechynskyi, Nyzhnivoritskyi, Chernivtskyi [2, 4]. The impurity of mercury in gold has an important

indicator value. The impurity of mercury in gold is characteristic of epithermal deposits and deposits of complex genesis [2, 3]. Mercury is an indicator of the depth of formation of gold mineralization. In the Au–Hg system, solid solutions ( $\alpha$  – amalgam, mercurial gold) and intermediate phases (intermetallic compounds) have been established [3]. Gold with mercury content has been established in many areas of the Ukrainian Carpathians [1, 2, 3, 6]. In the Chyvchynskyi and Verkhovynskyi districts of the Ukrainian Carpathians, gold with mercury content has been established in Neogene volcanic formations. Mercury content is present in gold from the Saulyak ore occurrence, a placer ore occurrence on the river Turya et al. [1, 2, 3, 6].

The highest mercury content is present in placer gold from the alluvium of the Chornyi Cheremosh River (Nadiya Spit) [1, 2]. Along with very high-purity gold, very low-purity gold with a significant mercury content ( $Hg = 1.06\text{--}5.39\%$ ) is present here [2]. The mercury content ( $Hg = 0.46\%$ ) was established in high-purity gold from this placer [2]. Gold with mercury content occurs only in Quaternary deposits of the Ukrainian Carpathians [2, 3, 6]. The mercury content in gold does not depend on the size and morphology of gold grains, their sample.

It should be noted that cinnabar is present in the conglomerates of the Soymulsky Cretaceous and the Verhneslobidsky sub-suite of the Neogene, as well as in the Quaternary alluvial deposits of the rivers Chornyi Cheremosh and Bilyi Cheremosh, Tysa, Lyuchka, and the streams Zhupany, Perkalab, Vedmezhy, Vedmeditsa, Shtolnevy, and others [2].

Mercury in gold has a complex, multivariate distribution pattern. According to V.M. Kvasnytsia, asymmetric but mutually compensating concentration curves of gold, mercury, and silver indicate syngenetic heterogeneity of gold grains, i.e., simultaneous deposition of gold and mercury [2]. The bimodal distribution of mercury in individual grains may indicate the existence of several productive mineral associations [2, 3].

Native gold with mercury content was found by us during the leaching testing of alluvial deposits of the Chornyi Cheremosh River in the area of the Verkhovyna settlement, Verkhovyna district, Ivano-Frankivsk region (Fig. 1, *a*). The riverbed of the river valley is laid

down in Cretaceous-Paleogene flysch rocks. The flysch rocks are deformed and lie almost vertically (Fig. 1, *b-d*). The alluvium of the Chornyi Cheremosh River is composed of boulder-pebble material with clay-gravel-sand aggregate (Fig. 1, *b-d*). The different resistance of flysch rocks to exogenous destruction led to the formation of irregularities in the river bottom, in which psamitic and psephite alluvial material was deposited together with gold. Samples from alluvial deposits were taken from the channel alluvium close to the shore in places where there were mechanical barriers to the deposition of terrigenous material (large boulders). The samples were washed using an American-type tray in the form of a plate.

The morphology and size of native gold were studied under a binocular microscope. The chemical composition of placer gold was studied at the M.P. Semenenko Institute of Geochemistry, Mineralogy and Ore Formation of the National Academy of Sciences of Ukraine using a JEOL JMX-733 electron probe microanalyzer.

As a result of the study of gold grains, it was established that their size is 1.2–4.1 mm. The shape of the grains is round-lamellar, elongated-lamellar. The edges of the gold are smoothed, the surface is finely pitted. The color of the gold is golden yellow. The most characteristic grains of gold are presented in the figure. There are grains of gold of silver-light gray color (Fig. 1, *e*) and grains of gold, in which one part is golden-yellow and the other is silver-light gray (see Fig. 1, *f, g*).

There are grains of gold with traces of mechanical deformations, namely, bending of the edges of the grains (see Fig. 1, *c, d*).

According to the results of studies of native gold grains, it was found that the content of Au= 86.01–99.24 %; Ag= 0.0–2.84 %; Fe=0.03–2.04 %; Hg=0.0–11.10 %. The chemical composition of native gold is heterogeneous in different parts of the grain, and the silvery-light gray part of the gold grains contains an admixture of mercury up to 11.0 %.

The presence of placer gold with a significant content of mercury in the alluvium of the lower reaches of the Chornyi Cheremosh River indicates the presence of an alpine or post-alpine endogenous source of mercury-containing gold in the Ukrainian Carpathians. Perhaps the admixture of this element has an epigenetic origin, when late mercury-

containing mineralization was superimposed on early gold-bearing ores [2].

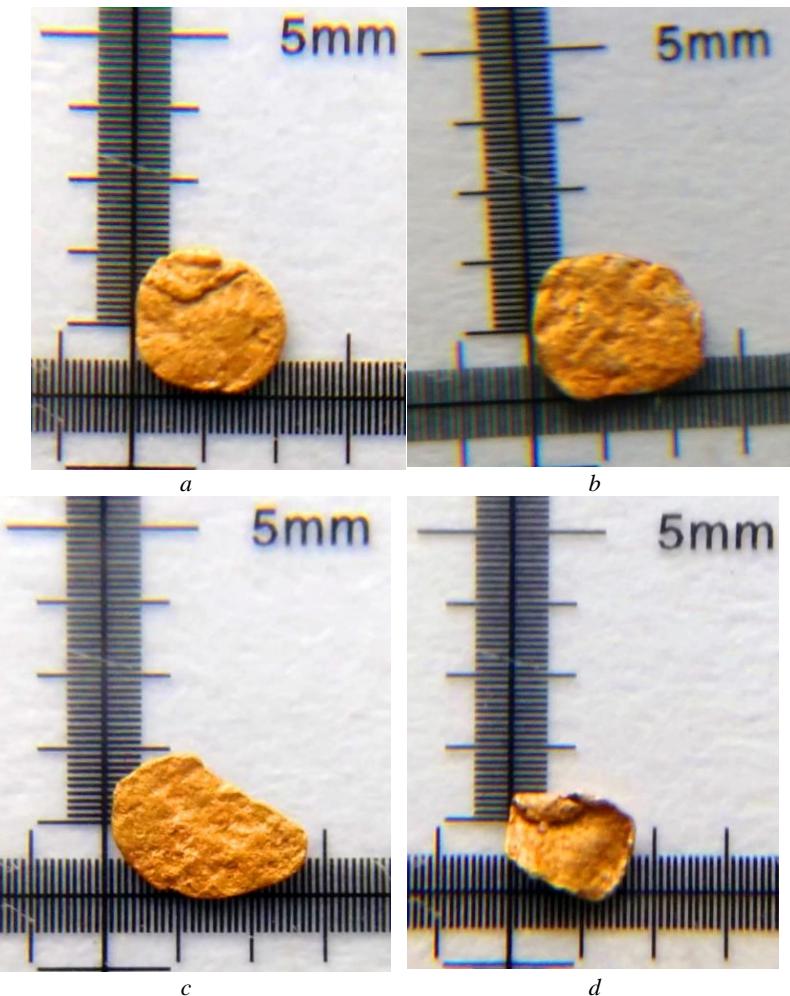


Fig. 1. The Chornyi Cheremosh River (a) and the locations of the slurry sampling (b-d)

Also, a likely source of gold with an admixture of mercury may be numerous calcite veins in flysch rocks.

The results obtained encourage the search within the catchment area of the Chornyi Cheremosh River, primarily for volcanic rocks of

Neogene age, which may contain near-surface deposits of mercury-bearing gold.



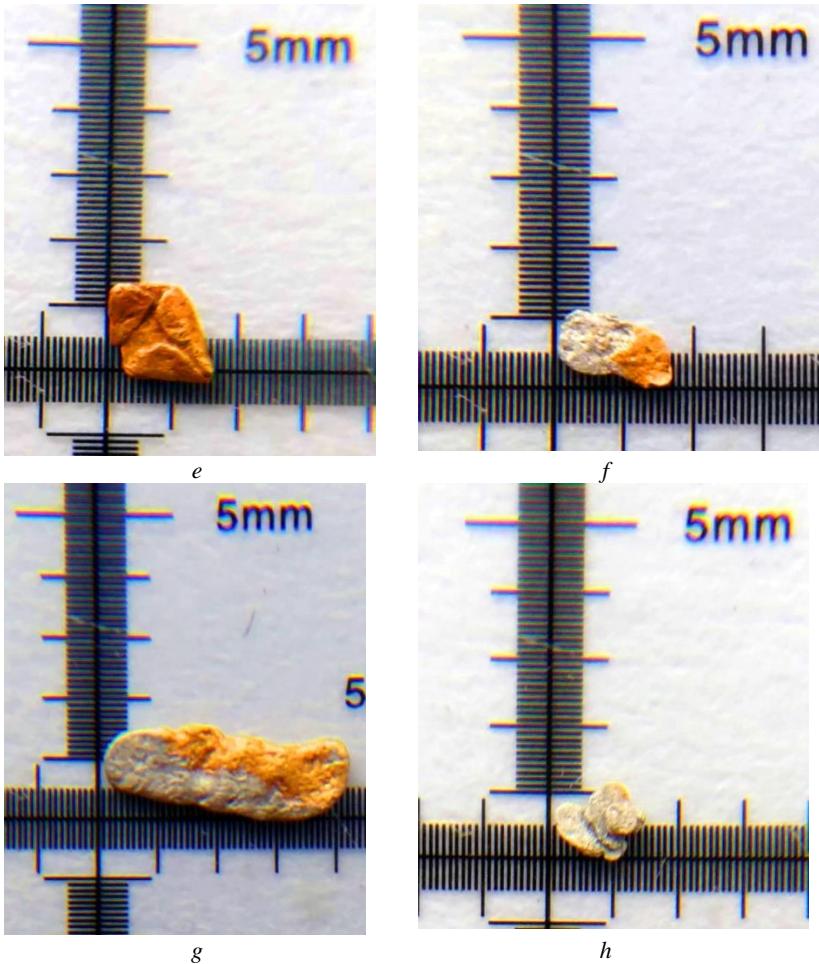


Fig. 2. Shape of placer gold grains: rounded-flattened (a-b); flattened-elongated (c); rounded-flattened with curved edges (d); square with curved edges, like an envelope (e); flattened-elongated in which the left part is silver-light gray in color, and the right part is golden-yellow (f); flattened-elongated with cut rounded edges in which the upper part is golden-yellow in color, and the lower part is silver-light gray (g); intergrowths of lamellar grains of silver-light gray in color (h)

In addition, the results obtained encourage a detailed study of the placer gold content of the Chorny Cheremosh alluvium and its tributaries in the Verkhovyna district of the Ivano-Frankivsk region.

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