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ANALYZING METHODS OF TECHNOLOGY FOR PROCESSING GOLD ORES OF COMPLEX COMPOSITION

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Abstract:

Placer sampling carried out in recent years in a number of gold bearing regions using highly effective methods has made it possible to establish in some of them an increased high (up to 70-90%) yield of fine gold. A large yield of fine gold has been established in those places where there are primary sources, which are characterized mainly by fine gold. Optimal conditions for the release of such gold from the vein material and its accumulation in loose sediments take place in the weathering crust. According to the degree of prospects and possible practical significance, a number of natural objects have been outlined, where significant accumulations of hydrogenic origin gold may arise.

Keywords: Operational and geological exploration, processing methods of gold ores, composition of gold, optimal conditions, clay components

INTRODUCTION. Recently, in the practice of operational and geological exploration, as well as at ore processing facilities, more modern and efficient installations are being introduced, which make it possible to extract fine gold from refractory raw materials. The most favorable for the accumulation of gold are eluvial-slope deposits. According to the granulometric analysis, the ore is 61.5% larger than 20 mm. The granular part is 29%, the clay component is up to 10%. Gold by size classes is distributed almost evenly, the content is on average up to 3 g/t up to 5 g/t. Based on the obtained results of material granulometric and chemical analyzes of gold-bearing sands, it was established that gold is associated with all minerals represented by a fine-grained phase. Clay components are unevenly distributed, forming clusters in the form of nests and rare individual inclusions [1]. The analysis of the beneficiation of such types of gold-bearing raw materials has shown that the most promising is the use of new promising apparatuses with subsequent leaching of gravity tailings [2].

MATERIALS AND METHODS. The content of fine gold in these deposits is in direct proportion to the clay components. Sandy pebble alluvium is not very favorable for the concentration of fine gold. It is known that in many placers the content of fine gold is about 50%, sometimes much more. With such ratios of coarse and fine gold, the currently used methods of exploration and development of placer deposits cannot be considered economically justified. Currently, the main sources of gold production are primary gold-bearing ores, which are subdivided into sulfide and oxidized. Due to the fact that gold in the ore is in finely dispersed state, in order to study the material and mineralogical composition, the ore was crushed to a size of -0.074 + 0 mm and sent for X-ray structural analysis, and the class -1 + 0 mm was used for further dressing at the concentrating table, the parameters of which correspond to the traditional scheme of dressing of these types of ores on the tables.

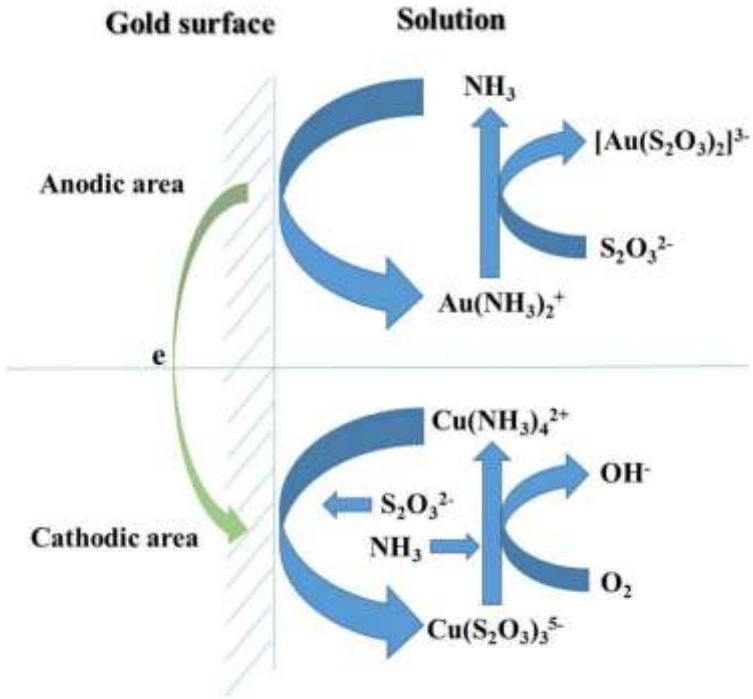

Figure 1. Sketch map of the electrochemical-catalytic mechanism of thiosulfate leaching.

For the study, the material of gold-bearing ore sample is presented by quartz-like silty-schists with veins and streaks of quartz. The average gold grade ranged from 4.4 g/t to 5.3 g/t. The size of the maximum piece was up to -110 + 0 mm. The entire mass of the sample was subjected to granulometric analysis with the determination of the yield of each class and the distribution of gold by class [3,4]. The results of the analysis showed that 61.5% of the sample consisted of pieces with a particle size of more than 20 mm. The distribution of gold in the ore is almost uniform. Allows to draw a conclusion about the finely dispersed nature of the gold of this ore. Meanwhile, fluidized roasting, which has advantages such as large phase contact area, high heat transfer efficiency, low energy consumption, was adopted in roasting process.

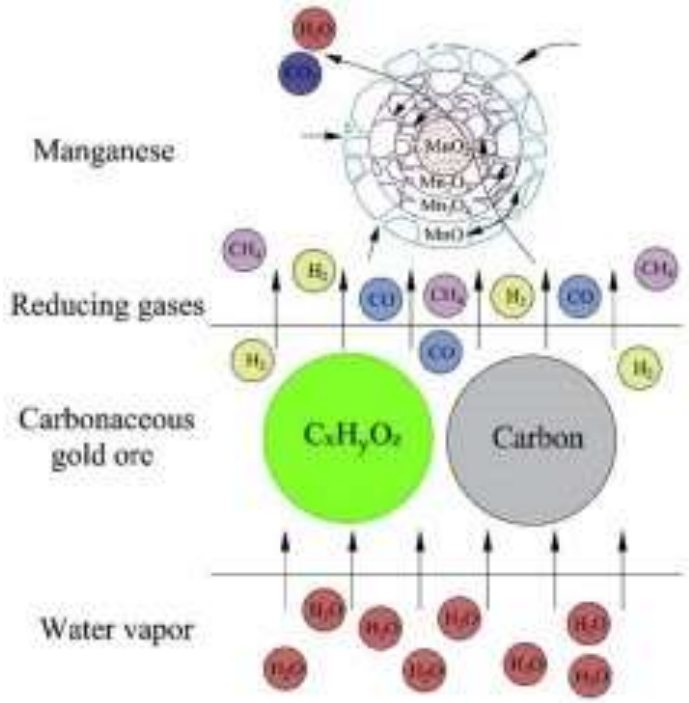

Figure 2. The coupling processing research can not only realize the utilization of the waste and decrease the emission of harmful gases during the oxidizing roasting pretreatment

An analysis of changes in the structure of gold ore raw materials over the past two or three decades shows that the relative amount of technologically "simple" gold ores that can be processed according to standard schemes is declining, and every year their share in the total balance of raw materials is noticeably decreasing. At the same time, the number of ores of complex composition is increasing, the successful processing of which requires the use of new technological methods, a combination of mechanical enrichment, flotation, hydro- and pyrometallurgy, including the use of new reagents for dissolving gold [5]. Such ores are allocated to a separate category of refractory gold-bearing raw materials. The processing of this raw material can be solved only on the basis of creating a fundamentally new technology for

processing refractory ores, based on the use of the simplest environmentally friendly schemes, as well as easily and quickly erected technological installations. Among such technologies is the thiosulfate technology for extracting gold from refractory ores. The pyrolusite is stable in the acidic or alkali conditions, but manganese can be acidic extracted from pyrolusite in reductive conditions due to the generation of acid-soluble manganese oxide. Carbonaceous gold ore contains a large amount of carbon, organic carbon and carbonate. During the gold extracting process, the dissolved gold complex will be adsorbed by carbonaceous matter, thus causing low gold extracting efficiency [6]. Therefore, it is essential to pre-roast to remove the carbonaceous matter from carbonaceous gold ore before the gold extraction. e roasting coupling technology, which is to combine the oxidizing roasting process of carbonaceous gold ore with the reducing roasting process of pyrolusite in one roaster, was presented. Based on the efficient fluidized roasting technology, the leaching effect of manganese and gold, optimal technical conditions of roasting, and the roasting process analysis were investigated

Figure 3. Gold processing

With the depletion of the world's mineral resources, the question of how to recover fine gold particles from various ores has become a problem that metallurgical workers and mineral processing workers have been concerned about for decades. The flotation process is an important part of gold mining. Domestic and foreign scholars have conducted in-depth research on the flotation process of gold mines. The prior optimization method was used to study the flotation process, and the output index was obtained through experiments after the parameters changed. One major drawback of this approach is that the output control of the flotation process is not conductive [7]. The research would have been more relevant if the interaction between parameters and the multi-objective optimization of variables in the flotation process were considered simultaneously. The mining field wouldn't be the same without this innovation, considered one of the greatest technologies applied to the industry in the twentieth century. Its consequent development boosted the recovery of valuable minerals like copper, for instance. Our world, full of copper wires used for electrical conduction and electrical motors, wouldn't be the same without this innovative process.

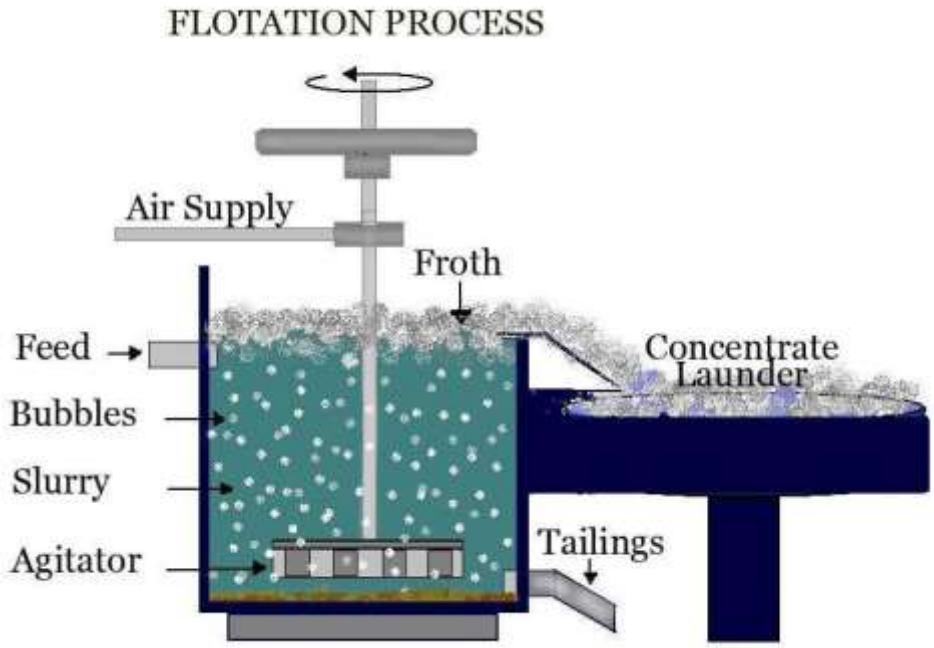

Figure 4. Flotation process

The principles of froth flotation are a complex combination of the laws of surface chemistry, colloidal chemistry, crystallography, and physics, which even after 50 years are not clearly understood. Its results are obtained by specific chemical reagents and the control of chemical conditions. It not only concentrates given minerals but also separates minerals which previously were inseparable by gravity concentration. For these types of ores, independent processing schemes have been formed, in particular, oxidized ores are processed by leaching a valuable component in cyanide aqueous media with subsequent concentration by sorbents. Oxidized quartz and unoxidized ores are beneficiated by gravity and flotation methods to obtain the corresponding concentrates suitable for further processing in the metallurgical process. In connection with the involvement in the exploitation of new deposits, represented by refractory ores of the weathering crust of rocks with a finely dispersed phase and a low content of the valuable component, there have been trends in the development of technological schemes for the processing of mineral raw materials.

CONCLUSION. The researchers came to the conclusion that the reserves of the metal in the known placers, due to fine gold, can be increased up to 20%. There are real prerequisites for revaluation of placers with substantially fine gold in order to classify them as independent industrial facilities. It is known that until recently the gold content in placers was estimated by the presence of coarse gold in them, which can be mined by gravity methods.

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