Determination of the Degree of Regeneration of Fluoride Ammonium

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ABSTRACT

The invention relates to the field of hydrometallurgy of precious metals and can be used to extract gold from the tails of gold mining factories. The objective of the invention is the additional extraction of gold from the tailings of ores and beneficiation products into commercial products by reducing the sorption activity of the solid phase by increasing the temperature of the pulp.

KEYWORDS: *tail, fractional composition, processing, slag, crushing, cyanide*

I. INTRODUCTION

Currently, studies are underway in the world to extract useful components from off-balance gold and copper ores, as well as industrial waste in a number of priority areas, including: heap leaching for balance gold and copper ores; biotechnological method for processing dumps of sulfide ores; processing of zinc clinker plants; increasing the number of output as a result of ore beneficiation and processing of waste from gold mining factories.

To determine the degree of regeneration of ammonium fluoride formed during the separation of hexofluoride ammonium silicate (HFSA), the material balance of the separation process [1] is presented in Table1

Table 1. The material balance of the process of separation of GFSA

Name, Kg	Arrival, kg	Name	Consumption, Kg
Tails	100	$(NH_4)_2SiF_6$,	187,8
Quartz	63,3	NH_3	71,7
Water	2	water	38 +2
NH_4F	234,2		
Other	34,7	other	34,7
Total:	334,2	Total:	334,2

Table 2. The material balance of obtaining ammonium bifluoride

Name	Arrival, kg	Name	Consumption, kg
NH_4F	228,2	$NH_4F*HF*H_2O$	231,28
H_2O	850,9	H_2O	795,4
		NH_3	52,42
Total:	1079,1	Total:	1079,1

The obtained ammonium bifluoride is used for repeated fluorination. Further fluorination occurs according to equation (3.2).

II. SIGNIFICANCE OF THE SYSTEM

The objective of the invention is the additional extraction of gold from the tailings of ores and beneficiation products into commercial products by reducing the sorption activity of the solid phase by increasing the temperature of the pulp.

Determination of the yield of silicon dioxide. In doing so, we use the above equation. As a result of the interaction of a solution of ammonium hex fluorosilicate with ammonia water, silicon dioxide is formed. For a more complete process, mixing is necessary.

During the experiments, a 15% ammonia solution with a density of 0.9390 g / cm^3 was used, the flow rate of which is 524.3 ml of a 15% ammonia solution per 100 g. ammonium hex fluorosilicate. Stirred for 1 hour, then filtered, the precipitate was washed three times with 100 ml and the washings were mixed with the filtrate. The precipitate is dried at150^0C uncalcined at 700^0C after cooling, weighed. The results are presented in table. 5

Table 3. **Experimental determination of the yield of silicon dioxide**

Name	Experiences				
	1	2	3	4	5
$(NH_4)_2SiF_6$, g	100	100	100	100	100
SiO_2, g	34	35	33,7	34	34

III. METHODOLOGY

In carrying out the work, complex research methods were used, including scientific generalizations, experimental studies in laboratory and industrial conditions for the processing of technogenic formations using inorganic acids and an oxidizing agent, as well as methods of mathematical statistics and correlation analysis of test results using modern computer technology.

Cyanide secondary cakes. After desiliconization, this product underwent cyanidation in order to isolate precious metals from it.

The essence of the cyanidation process lies in the fact that the crushed ore material containing gold is brought into contact with a solution of sodium cyanide, under the action of which gold passes from the ore into the solution. In the presence of oxygen, dissolution proceeds according to the following reaction:

$2Au + 4\ NaCN + O_2 + 2H_2O = 2NaAu\ (CN)_2 + 2NaOH + H_2O$ (3.12)

$Na\ Au\ (CN)_2 \leftrightarrow Na^+ + \{Au\ (CN)_2\}^-$ (3.13)

Cyanidation tests of secondary cakes were carried out in the laboratory of the Chadaksky Mill, in bottles with a closed-type mixer with a capacity of 0.75 liters. The concentration of sodium cyanide and protective alkali was determined by titration with a solution of silver nitrate in the presence of indicators. Mixing was carried out on a mechanical mixer with air from the compressor.

IV. THE EXPERIMENTAL RESULTS

Reagents and equipment The hardware scheme for processing gold-containing tailings consists of the following processes:

1 - ore opening process:

a) NH_4F loading unit;

b) - tail loading unit;

2– charge loading unit;

3-fluorination apparatus (furnace):

a - fluorination apparatus;

b - desublimation apparatus

4– dust collecting device (filter);

5– apparatus for capturing NH_3, H_2O, HF (absorber);

2 - the process of purification of ammonia water and the regeneration of ammonium fluoride:

- apparatus for mixing the resulting products;
- filter;
- mold;
- apparatus for capturing NH_3, H_2O;
- deposition and filtration of silicon dioxide:
- filtering apparatus and deposition;
- process of drying and calcining silicon oxide:
- drying apparatus;
- calcination apparatus.

V. CONCLUSION AND FUTURE WORK

The obtained results of industrial tests of the developed method for extracting gold from gold-containing tailings. Gold from the extraction factories, allowed us to determine the main technological parameters of the process before extraction. The test results indicate a high degree of readiness of the developed fluoride technology for the integrated processing of the tailings of gold mining plants.

After analyzing every hour by the liquid phase for gold, we determined the kinetics of gold dissolution from secondary cakes, which is shown in Fig. 1

Figure 1. Kinetics of dissolution of gold from secondary cakes

Thus, to determine the degree of regeneration of ammonium fluoride formed during the separation of hexofluoride ammonium silicate, a material balance of the process is drawn up on the basis of which a technological scheme for producing silicon dioxide is proposed.

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