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ANALYSIS OF TECHNOLOGY AND INNOVATIVE APPROACH TO THE PROCESSING OF MAN-MADE WASTE OF THE MINING INDUSTRY

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The article presents in laboratory conditions the possibility of separating gold, silver, zinc, lead and platanoid from the composition of clinker-residues of copper-zinc production, as well as the ways of using modern innovative technologies for the enrichment of residues of ACP.

Ключевые слова: клинкер, корреляционный анализ, сульфад меди, оставшийся после фильтрации кек, реагент, остатки руды.

Key words: clinker, overturning, correlation analysis, copper sulphate, cake left in filtration, reagent, ore residue.

In the mining industry of the Republic of Uzbekistan, the Almalyk mining and Metallurgical Combine (OKMK) has its place and prestige. At the Olmaliq zinc plant (ORZ), which operates in the structure of the OKMK, a residue-waste is formed during the velzing process. This waste was called clinker and was collected in the amount of 563,874 tons at the external disposal site (otval). Its composition consists of:

Table 1

Zn	Cu	Pb	Au	Ag
1.84 %	1.33 %	0.54	1.91 g/t	157 g/t

In the process of studying the chemical composition of the clinker sample brought from the dump site for analysis, results such as Au-1.91 g/t; Ag-157 g/t; Zn-1.84%, Cu-1.33%, Pb-0.54 g/t were determined.

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Table 2

Zn	Cu	Pb	Au	Ag	Total
10368 t	7488 t	3033 t	1,07 t	89,02 t	563 874 t

In the process of mathematical calculations of the results obtained from this clinker sample, Au-1.0769 t; Ag-8.5239 t; Se-24.24 t; Co-511.97 t; Rb-23.68 t; Sr-338.3 t; Y-34.39 t; Cd-108.25 t; Zr-3371.8 t; Sn-341.127 t; SB-1471.6 t; Ba-10374,7 t; IR-96,417 t; eu-60,89 t; ga-146,6 t; AC-3,71 t.based on specific figures, such as the need to continue research and the need to take an effective innovative approach has led to the need for research.

The results of the analysis showed that the copper-zinc production process balance is included in the quality of man-made deposits with a unique metal content as a result of the presence of gold, silver, zinc, lead and platanoid in the clinker structure, and the use of modern innovative technologies opens up opportunities for improving the economy of our country, the ecology of.

There are two methods that can be used to determine the states of lying in the place of disposal of rare and scattered elements:

1.Correlation analysis of geochemical relationships of elements throughout the man-made mine.

2. The use of high-precision content - detecting (electronic micro-X) instruments and conducting instrumental (ray spectral analysis, - GEOL,Japan) Studies.

A correct correlation analysis of the elements in samples of man-made ore residues was found to contain rare elements in geochemical relationships with other mining components as follows.

Results of phase analysis of copper compounds in clinker

Table 3

The name of the mineral	Copper content, %	Copper distribution based on connections, %
Hal'kosin, bornit	1,91	89,6
Halkopirit	0,16	7,5
Copper metal	0,01	0,5
Copper ferrite	0,05	2,4
Amount (Total)	2,13	100,0

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Clinker composition listed from the place of disposal:

Table 4

The name of the mineral	Composition %	The name of the mineral	Composition %
Steklo fayalit	35,0	Coking coal	29,55
Bornit + xal'kozin	3,0	Iron	3,0
Xalkopirit	0,5	Limonite	7,0
Pirrotin	12,0	Copper ferrite	0,10
Magnetit	5,0	Zinc ferrite	5,0
Mis metali	0,01		

The correlation geochemical analysis of elements in the samples showed the following results:

1. Composition of elements positively related to silver - mercury-0.757, lead-0.741, selenium-0.854, antimony-0.746, chlorine-0.472, vanadium-0.614, germanium-0.455, molybdenum-0.572

2. Composition of elements in negative contact with silver - sulfur-0.377, bismuth-0350, etc.

During the course of the correlation geochemical analysis, it was found that gold is in a weak relationship with arsenic to a close relationship with iron -0,414, chlorine -0,428, IE -0,334. Copper with zinc - 0,549, copper with cobalt - 0,587 - presence of positive bonding, silver-0,741, selenium - 0,704, chlorine- 0,439 , vanadium-0,680, molybdenum and lead-0,549, zinc with cobalt-0,603, silver -0,512, selenium - 0,555, arsenic -0,660, chlorine - 0,476 with molybdenum; silver -0,472, gold-0,428, mercury lead-0,439, arsenic-0,510, tin -0,387, iron-0,46 9, vanadium-0,593, molybdenum - 0,476 with chlorine iron chloride, tin – 0,469 with cobalt -0,376 sulfur-0,271 with negative correlation.

Gold is close to tellurium (0.414), chlorine (0.428); weak connection with muscle (0.334). has a geochemical connection. Copper has a positive correlation with zinc (0.549), cobalt (0.587); in lead with silver (0.741), selenium (0.704), chlorine (0.439), vanadium (0.680), molybdenum; in zinc with copper (0.549), cobalt (0.603); molybdenum with silver (0.512), lead (0.692), selenium (0.555), arsenic (0.660), chlorine (0.476); chlorine with silver (0.472), gold (0.428), mercury, lead (0.439), arsenic (0.510), tin (0.387), iron (0.469), vanadium (0.593), molybdenum (0.476) ; iron chloride, tin (0.469; 0.440), cobalt (0.376) with sulfur (-0.750), weakly correlated with gold (0.271).

Based on the results of the analysis presented above, it can be concluded that:
-as a result of the oxidation process in the waste that was previously placed in relation to the overturning, the former made significant changes in the chemical composition of the latter.
- the negative relationship of iron and sulfur generated the previously existing sulfide and oxide minerals of iron; pyrite, pyrrotite, magnetite, oxidized, formed goetite, hedrogetite, limonite, siderite, lepidocrocyte, etc.
- the interaction of gold, silver, molybdenum, copper with chlorine manifests itself in the redistribution of these metals in chloride solutions, with the formation of compounds of other metals.
The results of the analysis obtained made it possible to identify the following mineral forms of rare metals during instrumental studies:

- for silver - silver pure metal, silver amalgam, chloralgirite, chloralgirite-bromargirite, bromargirite, argentite, hessit, chlorine in silver, tetrahedrite, naumanite, polybazite, galena containing silver, lead sulfide, silver and others;
- gold, while-for natural gold, gold Telluride - is distributed in platinoids, chalcopyrite, bornite and other sulfides in the form of submicron separation and partially binds to natural pure gold.

In the first stage, experimental tests of transferring the copper contained in the cake (solution) remaining from the filtration of the process of extracting copper copper to the solution with the help of water were conducted in 4 stages.
In the 1st stage: 20 g of cake, T:J-1:5-185 ml of water were transferred to the solution at 900C for 10 minutes and cooled for 5 minutes (Fig. 1).
In the process, the color of the solution changes to light blue, and the process of extracting copper using water was seen in the experiment, and the following reaction takes place $CuO+H_2SO_4+H_2O=CuSO_4+2H_2O$ $ZnO+ H_2SO_4+ H_2O=ZnSO_4+2H_2O$

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Figure 1. The process of extracting copper from clinker using water.

H_2SO_4-20g/l In step 2: temperature 90°S It was re-melted for 10 minutes and the color remained unchanged.
H_2SO_4-20g/l In step 3: temperature 90°S It was re-melted for 10 minutes and the color remained unchanged.
H_2SO_4-20g/l In step 4: temperature 90°S It was re-melted for 10 minutes and the color remained unchanged.
At a total temperature of 900C for 40 minutes, the experimental test results remained unchanged (Figure 2).

Figure 2. In stages 2-3-4, the results of the experimental test remained unchanged for 40 minutes during the total temperature of 900C.

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In the second stage, experimental tests were carried out in 2 stages to dissolve the copper in the cake remaining in the filtration process of obtaining copper slag with the help of water and acid.

In step 1: 20 g cake, T:J-1:5-100 ml water, 11 mlH2SO4 20 g/l H2SO4 were dissolved in 90-950C for 1 min and quenched for 5 min, the color of the solution changed to dark blue "k" color, that is, the process of extracting copper with the help of acid, the process of dissolving copper more than water was seen in the experiment (Fig. 3).

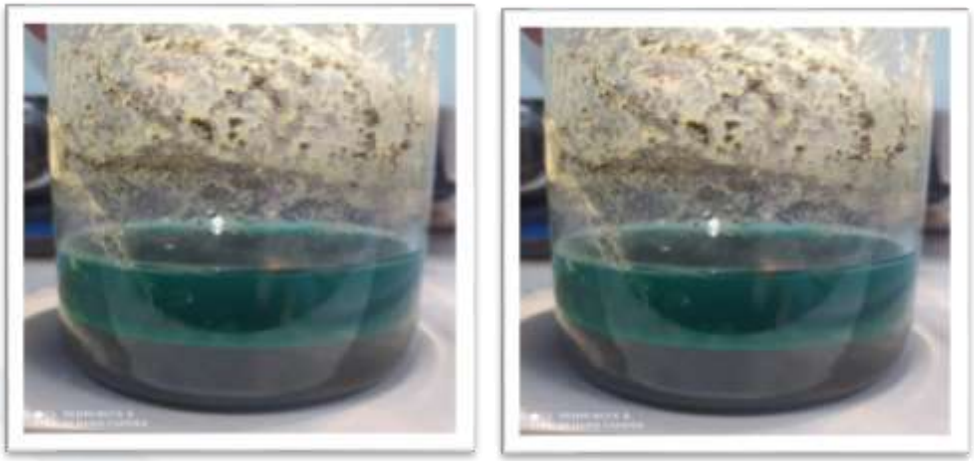

Figure 3.Step 1: the process of extracting copper using acid.

The cake left over from Stage 1 was to leave the platinoids in the solution by transferring the Au, Ag to the solution using the reagent “Sandios”.

Experiment test process T:J – 1:5 To – 30 - 400 4 hours 100 gr- 2 gr reagent solution – 1600 ml cake – 400 gr To – 30-400C reagent -80 gr 4 – hours.

Expanded chemical composition of the clinker of the almalyk zinc plant.

Table 5

T.r	Element	Natija	qism	Stat. Err.	LLD	LLQ
1	Na	2.22	Mass %	0.178	0.478	1.43
2	Al	1.35	Mass %	0.0103	0.0096	0.0287
3	Si	6.40	Mass %	0.0136	0.0035	0.0104
4	S	7.04	Mass %	0.0073	0.0057	0.0171
5	Ca	3.41	Mass %	0.0218	0.0121	0.0363
6	Mn	1.21	Mass %	0.0085	0.0078	0.0235
7	Fe	62.6	Mass %	0.0373	0.0039	0.0117
8	Cu	3.65	Mass %	0.0121	0.0029	0.0088
9	Zn	4.21	Mass %	0.0111	0.0024	0.0071
10	As	0.931	Mass %	0.0056	0.0123	0.0369
11	Zr	0.598	Mass %	0.0065	0.0024	0.0073
12	Ag	0.109	Mass %	0.0024	0.0015	0.0044
13	Sb	0.261	Mass %	0.0037	0.0024	0.0072
14	Ba	1.84	Mass %	0.0121	0.0095	0.0286
15	Pb	2.12	Mass %	0.0114	0.0229	0.0687
16	Ac	0.113	Mass %	0.0060	0.0173	0.0520

Conclusion

From this primary experiment, we found that the zinc contained in clinker is located mainly in the oxide carpet and with a combination of firrite and silinate. If you selectively dissolve it, 75-80% will go to the zinc solution. However, taking into account the fact that copper is mainly chalcidone (Cu2S) and barnite (Cu2FeS4), it does not pass into a solution in ordinary boiling water, partially switching to a solution in a solution of copper sulfuric acid in cuprite (Cu2O) and tenorite (CuO) choline. Since zinc is mainly in the ZnO state, it passes into the solution, it turns out that the remaining zinc in the zno3*Fe2O3 and znsio3(ZnO* SiO2) state partially passed into the solution. In later experiments, when zinc and copper are mainly isolated, there is an attempt to isolate metals such as gold, silver, lithium and indium in clinker. Therefore, in Table 5, the complete chemical composition of clinker was studied and chemical was obtained, positive results were obtained.

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