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The Study of the Material Composition of the Tails of Gold Mining Factories

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ABSTRACT: This article focuses on the extraction of precious metals from the gold-mining factories. This is mainly due to the use of gravitation techniques at the Chadakso gold-smelting plant, where the experiments were conducted in a research laboratory and collected.

KEY WORDS: solution, gold, silver, flotation, carried, gravity, reagent, hydrocyclone, concentrate, product.

I. INTRODUCTION

Based on the study of the material composition of the initial old tailings of the factory, the nature of the impregnation of minerals of their constituents, and the study of the results of previous studies of the tailings of the Chadaksky Mill, gravity, flotation, magnetic, and cyanidation of the initial tailings of their enrichment products were adopted as the main enrichment methods. The grinding of tailings was carried out in a laboratory ball mill brand 40 ML at T: W: W = 1: 0.75: 8. For the gravitational enrichment of the original tailings, the cheapest methods and equipment for concentrating gold were used - screw separators and gateways (in laboratory form), ZOKS concentration table, felt-coated gateway, laboratory GL hydro cyclone. Studies on the theory of the enrichment process and the processing of various wastes and mineral resources using pyrometallurgical and hydrometallurgical methods were carried out by A.P. Vinogradov, I.V. Petryanov, B.N. Laskorin, N.N. Semenov, E.V. Adamov, I.F. Baryshnikov, A.V. Vanyukov, Yu.P. Kupryakov, I.F. Khudyakov and etc. Scientific research regarding the study of object was carried out in various regions of the world in the field of rational use of mineral resources and improving the technological process of their processing by scientists such as Hector Jordan, Angel Saqhueza, Veronica Ganter, Bevilaqua D., Acciari HA, Benedetti A.V, Fugivara CS, Garciae Jr., O. FremiliosiFilho G, Jacques V., Wiertz, Magda Mateo, Berg H. and others. The scientific research A. P.Vinogradov, B.N. Laskorin, I.V. Petryanov, K. Sanakulov, NN Semenov, A. S. Khasanov, A. A. Yusuphodzhaev, M. M. Yakubov, and others devoted their problems to the processing of waste from mining and metallurgical enterprises. The research of A. A. Andreev, A. N. Dyachenko, A.A. Chizhik, I.P. Markevich, M. Ernazarov, is devoted to the study of halogenammonium technology for processing raw materials and waste and others. In world practice, the improvement of existing technological processes for the processing of mineral raw materials to produce additional metals with the aim of comprehensively extracting valuable components from the waste of mining and metallurgical enterprises is currently becoming very important when creating new highly cost-effective technologies for processing technogenic raw materials.

II. METHODOLOGY

Tail sample preparation for research. Two samples of the tailings of the Chadaksky Mill, collected from the tailings of tailing N1, were received for technological research. After mixing and averaging, average samples were isolated from these samples, which were rejected by various types of analysis: semi-quantitative spectral, chemical, assay, rational for gold and silver, granulometric and mineralogical.

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Spectral analysis of tails. Semi-quantitative spectral analysis was performed in the spectral laboratory of central analytical laboratoryJSC "Almalyksky MMC". The results of the analyzes are given in table 1.1.

Table 1.1The results of a semi-quantitative spectral analysis of average tail samples

№ try	Elements	Content,% try.1	try.2	№ tt	Elements	Content,% try.1	try.2
1.	Silicon	>1	>1	13.	Zirconium	0,006	0,004
2.	Aluminum	>1	>1	14.	Copper	0,006	0,00,
3.	Magnesium	1	0,8	15.	Lead	0,06	0,06
4.	Calcium	>1	1	16.	Silver	0,002	0,003
5.	Iron	>1	>1	17.	Zinc	0,04	0,06
6.	Manganese	0,2	0,2	18.	Gallium	0,001	0,001
7.	Nickel	0,003	0,006	19.	Beryllium	0,001	<0,001
8.	Cobalt	0,001	0,001	20.	Sodium	0,6	0,6
9.	Titanium	0,2	0,04	21.	Strontium	0,01	-
10.	Vanadium	0,003	0,001	22.	Barium	0,1	0,08
11.	Chromium	0,001	-	23.	Yttrium	<0,001	-
12.	Molybdenite	0,002	-	24.	Arsenic		0,06

Chemical analysis of tails. The results of the chemical analysis of the tail tail are shown in Table 1.2. Analyzes were carried out in the chemical laboratory of central analytical laboratory JSC "Almalyksky MMC".

Table 1.2. Chemical analysis results for medium tail samples

№ pp	Components	Содержание, % try.1	try.2	NN pp	Components	Содержание, % try.1	try.2
1.	Silica	60,2	58,36	10.	2.46	1,88	2,46
2.	Ironoxide	8,4	13,84	11.	Phosphorusoxide	(5) 0,18	0,20
3.	Ironoxide	1,58	1,22	12.	Carbonmonoxide	9,05	7,6
4.	Titaniumoxide	0,28	0,32	13.	+ H20	0,94	0,14
5.	ManganeseOxide	0,28	0,22	14,	Sulfuroxide	(6) 0,42	0,22
6.	Alumina	6,28	6,60	15.	SulfideSulfide	0,24	0,12
7.	Calciumoxide	8,52	8,5	16.	p.p.p.	8,06	8,62
8.	Magnesiumoxide	2,0	0,8	17.	Gold, g / t	0,36	0,3
9.	Sodiumoxide	0,8	0,8	18.	Silver g / t	16,6	16,9

Tail analysis for gold and silver. The content of gold and silver in the average tailings samples was determined by the chemical method of the Perkin-Elmer atomic absorption spectrometer in the laboratory of central analytical laboratory JSC "Almalyksky MMC". The, As well as by assay analysis in the laboratory of central analytical laboratory JSC "Almalyksky MMC".The .. Table 1.3 shows data on the determination of gold and silver in average tailings by various methods.

Table 1.3 Gold and Silver Tail Averages

Analysismethod	Content, g / t			
	Gold		Silver	
	try.1	try.2	try.1	try.2
Chemical	0,36	0,30	16,6	16,9
Instrument	0,3	0,3	15,0	15,5

Based on the data of analyzes of average tailings samples, particle size analysis and serial experiments, the gold content in the sample should not be taken 0.36 g / t, in the sample N2 - 0.30 g / t; silver - 15.8 and 16.2 g / t responsibly.

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Rational analysis of tails for gold and silver. To carry out a rational analysis, the standard methods were used, which consistently carried out the following cyanidation, dissolution in alkali and cyanidation of the alkaline residue, dissolution in hydrochloric acid and cyanidation of the acid residue, dissolution in nitric acid followed by cyanation of the acid residue. The results of a rational analysis of the initial samples of N1 and 2 tails of the Chadak gold extraction factories mill are given in Table 1.4.

Table 1.4. The results of a rational analysis of average samples of N1 and 2 tails of the Chadak gold extraction factories

The form of the presence of precious metals in samples and the nature of the relationship with ore components	**Distribution%**							
	Gold		**Silver**		**Gold**		**Silver**	
	g/t	**%**	**g/t**	**%**	**g/t**	**%**	**g/t**	**%**
1.Gold, silver in the form of metal oxides with ore components, sulfide simple silver sulfide (cyanide)	0,28	73,6	10,7	69,9	0,2	62,4	11,3	68,5
2. Gold, silver associated with minerals and chemical compounds of arsenic and antimony (except for arsenopyrite and compounds of 5 val. Antimony), silversulfosalts (cyanideafteralkalinetreatment)	-	-	-	-	-	-	-	-
3. Gold, silver associated with acid-soluble minerals (carbonates, oxides and hydroxides of iron and manganese) (cyanide after HCl treatment)	-	-	1,6	10,5	-	-	2,0	12,1
4. Gold and silver finely disseminated in sulfides (pyrite, arsenopyrite, etc.) (cyanideafter HNO3 treatment)	0,05	13,2	2,58	16,9	0,1	31,3	2,85	17,3
5. Gold, silver, finely disseminated in quartz, aluminosilicates and other acid-soluble minerals	0,05	13,2	0,42	2,7	0,02	6,3	0,35	2,1
Total in original tails	0,38	100,0	15,3	100,0	0,32	100,0	16,5	100

Phase analysis of tails for iron. In table 1.5. The results of phase analysis on iron, performed in the laboratory of the Ingichkinsky OMTE, are placed. This table shows that in the studied samples, iron is mainly in the form of hematite, whose share in sample No. 1 is 42.04, in sample No. 2 - 44.80%. Further, hydroxides 10.55-12.80%, iron carbonates and readily soluble silicates 19.83-25.87%, magnetite iron 10.89-15.42%. Iron-insoluble silicates 4.0-5.46%, carbonates 1.62-1.68% and sulfides (pyrite and arsenopyrite) 1.47-3.57% were found in quantities.

Table 1.5. Results of a phase analysis on iron for average tailings

Iron content form	**Iron content in samples,%**		**Iron distribution, %**	
	try.1	**try.2**	**try.1**	**try.2**
Iron carbonates and readily soluble silicates	1,52	1,89	25,87	19,83
Magnetiteiron	0,64	1,47	10,89	15,42
Carbonateiron	0,095	0,16	1,62	1,68
Sulfideiron	0,21	0,14	3,57	1,47
Ironhydroxide.	0,62.	1,22	10,55	12,80
Hematiteiron	2,47	4,27	42,04	44,80
IronInsolubleSilicates	0,32	0,38	5,46	4,0
Grossiron	5,88	9.53	100,0	100,0

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Granulometric analysis of tails. To determine the distribution of the main valuable components by size classes, the initial tails were scattered on sieves with different hole sizes. The results of particle size analysis of the initial samples in table 1.6.

Table 1.6. The results of the sieve analysis of the initial tail samples

Fineness class, mm	Yield,%		Content, g / t				Distribution,%			
	try.1	**try.2**	**try.1**		**try.2**		**try.1**		**try.2**	
			Au	Ag	Au	Ag	Au	Ag	Au	Ag
-3 +1	12,2	3,5	0,15	10,0	0,16	10,3	5,2	7,7	2,0	2,1
-1 +0,5	5,6	1,7	0,22	11,4	0,36	11,4	3,4	4,0	2,1	1,2
-0,5 +0,25	7,7	2,7	0,27	13,8	0,64	18,5	5,8	6,7	6,0	3,0
-0.25 +0,15	12,8	13,0	0,35	15,0	0,48	15,7	12,5	12,2	21,9	12,2
0,15 +0,1	24,5	20,6	0,38	16,7	0,25	18,6	26,2	25,8	18,1	22,8
-0,1 +0,074	22,5	14,1	0,44	17,6	0,18	16,2	27,5	25,0	8,9	13,6
-0,074+0,044	8,9	13,3	0,46	17,6	0,36	17,2	11,4	9,9	16,8	13,6
-1.044+0	5,1	31,0	0,49	23,8	0,22	17,0	8,0	8,7	23,9	31,5
Исходный	100	100	0,36	15,8	0,29	16,8	100	100	100	100

As can be seen from Table 2.6, in the sample N1 the classes -0.15 + преоб +0.074 mm prevail, in the sample N2 the classes -0.044 + 0 mm, i.e. the second sample is represented by finer material. The content of gold and silver in the first sample is increased relative to the average in the classes -0.25 + 0 (w; in the second - in the classes -1 + 0.15 and -0.074 + 0.044 mm.

Thus, the studied samples differ in granulometric composition: in sample N1, medium-sized grades with a high content of noble metals predominate, in sample N1, thin grades prevail, but gold and silver are concentrated in medium-sized grades.

The fractions of gravity and magnetic separation were investigated for the content of noble metals in them. The results of atomic absorption analysis are promoted in Table 1.7.

Table 1.7. The content of gold and silver in the fractions of gravity and magnetic separation

Name researched material	**Content,г/т**			
	Gold		**Silver**	
	try.1	**try.2**	**try.1**	**try.2**
Weightedfraction	1,76	1,55	24,8	22,53
Easy “-”	0,46	0,42	14,5	9,16
Electromagnetic "-"	0,5	0,2	19,0	1,4
Non-magnetic "-"	2,98	2,45	16,0	13,5
Clay "-"	0,2	0,2	12,0	9,8
Sludge	0,2	0,2	14,5	11,2

As follows from the results of atomic absorption analysis, maximum content of gold and silver are set in a heavy non-magnetic fraction (table.1.7) due to the presence in it of high amounts of sulfide minerals remaining after pre-analysis selection of gold particles. Study of sulfides in the polished briquettes under the microscope suggests that gold and silver are in fine form, called "invisible", i.e. it is difficult to extract a "hard" gold. In addition, when viewing the material isolated fractions, the polished briquettes was established the presence of "apparent" gold with a size of 0.001 mm. zolotim more "Visible" gold is approximately 70% of the total amount of gold in the samples. Order 45-40% of the gold is free from intergrowths with other minerals. The size of his zolotim ranges from 0.01 to 0.002 mm. Dominated by gold particles size from 0,004 to 0,006 mm. they Often smolder cheshuichatoe, plate, provolochnoe form.

The remaining 35-30% of the gold contained in the intergrowth of goethite, goethite-simontoye beans. The gold forms a single thin inclusions or adheres to their boundary areas, settling in the cracks and pores. The size of these zolotim

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varies from 0.04 to 0.02 mm. they are characterized amoeboid lumpy shape. Color zolotim in this Association yellow full-bodied.

Silver is also a useful element-companion gold g samples it is represented in native form and in sulfides, sulfosalts and halide. So, when viewing the polished briquettes were met by a fine selection of native silver in close intergrowths with polybasite. The size of native silver from 0.01 to 3,004 mm, polybasite to 0.02 mm. in Addition, the silver included in the composition of native gold.

With regard to the mineral iron, it should be noted that the most common among them is hematite, which is associated with the phase according to the chemical analysis in samples N1 and N2 - 42 and 45.5% of the total iron content in the ores.

REFERENCES

[1] And. S. Khasanov, K. S. Sanakulov, A. S. Atakhanov. Technology for complex processing of slag Almalinskogo MMC.Non-ferrous metallurgy, 2003, №2.
[2] And. G. Romanenko. Metallurgical slag.M, metallurgy, 1977.
[3] L. Y. Shubov, S. I. Ivankov, And N. To. Scheglova.Flotation reagents in beneficiation processes of mineral raw materials. M., Nedra, 1990, pp. 203-205.
[4] Yu. P. Kupryakov. Slag copper production and processing. 1987., p. 116-120.
[5] With. I. Mitrofanov, L. A. Barsky, V. D. Samygin. The study of minerals at obogatimost. M., Nedra, 1974

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