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Studying the Garing Content of Gold Tails

SAMADOV ALISHER USMANOVICH, NOSIROV NURZOD IKHTIYOROVICH

Deputy Director for Research and Innovation Almalyk branch of the Tashkent state technical university, PhD, associate professor, Almalyk, Uzbekistan;

Assistant Department of Mining, Tashkent state technical university Almalyk branch, Almalyk, Uzbekistan

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. Fremiliosi Filho 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 halogen-ammonium 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. SIGNIFICANCE OF SYSTEM

Electromagnetic separation was carried out on an induction-roller electromagnetic separator 138T-03M, design "Geopribortsvetmet". Magnetite separation was carried out using a hand magnet (field strength 480 oersted). The results of the enrichment experiments were evaluated according to the chemical analysis of gold, silver; in separate: in cases on tungsten or iron oxide.

III. METHODOLOGY

Gravity enrichment tails. Due to the fact that when concentrating the old tailings of the factory, the output of concentrates and the content of precious metals from them are small, for their enrichment the cheapest methods of gold concentration and the corresponding apparatuses were chosen.

One of the first machines for enriching the tailings of the factory was chosen hydrocyclone. The enrichment results of the original tailings without any additional processing are shown in Table 1. The enrichment was carried out at various relations of T. * Z and the size of the holes in the Peskovoy nozzle. The best results were obtained at T: W = 1: 4 and the size of the hole in the pesto nozzle 4 mm.

Table. 1.
Results enrichment tail in laboratory hydrocyclone GL

Name products	Output,, %	Content, r/r		Extract, %	
		gold	silver	gold	silver
Sands	84,7	0,37	16,60	89,54	87,88
Drain	15,3	0,24	12,67	10,46	12,12
Sample 1	100,0	0,35	16,0	100,0	100,0
Sands	71,6	0,33	17,1	81,48	74,20
Drain	28,4	0,19	15,0	18,52	25,80
Sample 2	100,0	0,29	16,5	100,0	100,0

As it is seen in Table 1., there is some concentration of gold, but with significant losses in the fine-grained fraction.

In tab. 2. shows the results of double enrichment of tailings on a laboratory hydrocyclone; Hydroclone 1 was re-treated in the same hydrocyclone.

Table 2
The results of double hydro-cloning tails

Name products	Output,, %	Content, r/r		Extract, %	
		gold	silver	gold	silver
Sands	84,65	0,39	16,6	91,23	88,92
Drain	15,35	0,20	11,4	8,77	11,08
Sample 1	100,0	0,36	15,8	100,0	100,0
Sands	78,43	0,34	17,05	89,21	82,56
Clay	21,57	0,15	13,1	10,79	17,44
Sample 2	100,0	0,30	16,2	100,0	100,0

IV. EXPERIMENTAL RESULTS

As it can be seen from the table. 1.2, after hydro-cycloning of tails and repeated hydro-cycloning of the discharge of hydrocyclone 1, one can distinguish the pesto fraction containing 0.34-0.39 g / ton of gold and 16.6- 17.05 g / ton of silver when extracting 89.21-91 into it, 23% gold and 32.56-88.92% silver.

In industrial conditions with the help of modernized short-cone hydrocyclones, it is possible to get, apparently, higher results.

The sands of the hydrocyclone were enriched on a laboratory screw separator with a helix diameter of 150 mm, and the discharge of the hydrocyclone was enriched on a 1200 x 200 laboratory sluice with a felt covering. The experiments were carried out according to the scheme shown in Fig. 1, the results are shown in Table 3.

Table 3
The results of tailings enrichment on a hydrocyclone, screw separator and gateway

Enrichment Products	Output, %	Content, gr/t		Extract, %	
		gold	silver	gold	gold
(Concentrate Sun	18,71	0,89	27,60	46,26	32,68
Konstantin gateway	6,09	0,46	22,16	7,78	8,54
Combined end	24,8	0,78	20,53	54,04	41,22
Tails sun	55,2	0,25	12,57	38,33	44,54
Gateway tails	20,0	0,14	11,25	7,63	14,24
united tails	75,2	0,22	12,35	45,96	58,78
Sample 1	100,0	0,36	15,8	100,0	100,0
Concentrate Sun	21,8	0,62	23,3	45,08	31,4
Konstantin gateway	7.1	0,31	18,7	7,34	8,2
united end	28,9	0,48	21,4	52,42	39,6
Tails sun	52,2	0,23	14,20	40,02	45,76
Gateway tails	18,9	0,12	12,55	7,56	14,64
united tails	71,1	0,20	13,76	47,58	60,4
Sample 2	100,0	0,30	16,2	100,0	100,0

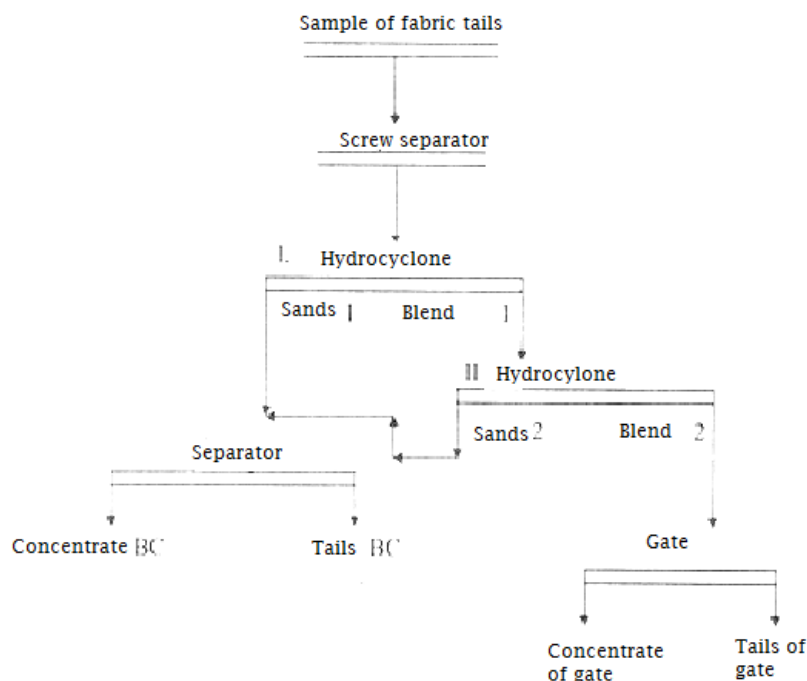


Fig.1. Scheme of gravitational enrichment of tails of the factory on a hydrocyclone, a screw separator and a gate

For comparison, experiments were carried out on tailings enrichment on a concentration table according to the scheme shown in Fig. 2. The operation mode on the concentration table: the swing frequency is 110 strokes per minute, the

swing amplitude is 11 mm, the transverse tilt of the deck is 10 mm / m, the flow rate of flush water is 4.8 cubic meters / min. The results of the experiments are given in table 4.

Table 4
Results enrichment tails on the concentration table

Enrichment Products	Output, %	Content, gr/t		Extract: %	
		gold	silver	gold	silver
Sample N1					
Concentrate1	2,1	4,2	180,8	25,94	23,58
Concentrate12	9,4	0,58	28,3	16,10	16,52
Promptproduct	8,0	0,35	19,2	8,24	9,54
Tails	80,5	0,21	10,07	49,72	50,36
Sample N1	100,0	0,34	16,1	100,0	100,0
Sample N2					
Concentrate1	1,8	3,62	157,1	22,47	17,24
Concentrate2	9,8	0,43	31,7	14,53	18,94
Promptproduct	7,5	0,31	17,8	8,02	8,14
Tails	80,9	0,20	11,29	54,98	55,68
Sample N2	100,0	0,29	16,4	100,0	100,0

As it follows from table 4. the enrichment of tails on the table, you can highlight graviconcentrate containing 3,62-4.2 g/t gold and was 157.1-180,8 g/t silver for extraction of metals of 22.47-25,94 and 17,24-23,58 %, respectively. The total recovery of gold and silver in a rough concentrate is 45,02-50,28 and 44,32-49,64%, respectively. However, the metal content in it will be: gold - 0,68-0,88 g/t, silver - 38,05-40,98 g/t.

When cleaning out rough concentrate a significant amount of precious metals goes into intermediate products. To reduce the output of industrial products and povyshenie concentration of noble metals in concentrate tailings initial factory passed the sieve casings, 0.25 and 0.15 mm, and the coarse fraction was milled for 5 min in a ball mill. The resulting material, to crushed to a particle size of 0.25 and 0.15 mm were subjected to enrichment on the table in the same terms as the original tails. The results of the experiments are given in table.5.

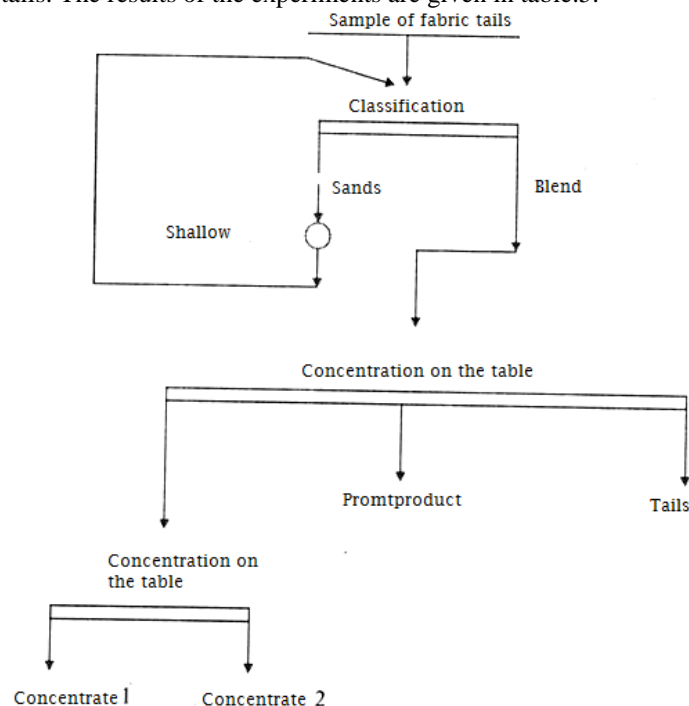


Fig. 2.FLOWSHEET TAILINGS BY SHAKING TABLE

Table 5
The results of enrichment on the concentration table regrind factory tails

Enrichment products	Output%	Content, gr/t		Extract, %	
		gold	silver	gold	silver
Sample N1, 0,25-0 MM					
Concentrate 1	1,8	6,93	277	35,64	31,36
Concentrate 2	4,9	1,91	40,71	26,70	12,53
Promptproduct	6,2	0,30	13,8	5,31	5,38
Combined concentrate	12,9	1,84	60,73	67,65	49,27
Tails	87,1	0,13	9,26	32,35	50,73
Sample N1 (0,25-0MM)	100,0	0,35	15,9	100,0	100,0
Sample N1, 0,15-0 MM					
Concentrate 1	1,7	6,81	265	32,16	28,51
Concentrate 2	4,5	3,06	46,4	38,30	13,21
Promptproduct	5,6	0,32	14,0	4,98	4,96
Combined concentrate	11,8	2,34	63,58	75,44	46,68
Tails	88,4	0,10	9,53	24,56	53,32
Sample N1 (0,15-0 MM)	100,0	0,36	15,8	100,0	100,0
Sample N2, 0,25-0 MM					
Concentrate1	1,7	5,63	220	30,87	22,94
Concentrate12	5,2	1,86	94,2	31,14	30,05
Promptproduct	6,1	0,36	16,7	7,08	6,25
Combined concentrate	13,0	1,65	61,74	69,09	49,24
Tails	87,0	0,11	9,50	30,91	50,76
Sample N2 (0,25-0 MM)	100,0	0,31	16,3	100,0	100,0
Sample N2, 0,15-0 MM					
Concentrate1	1,6	5,34	204	28,48	20,15
Concentrate2	4,8	2,22	73,2	35,48	21,70
Promptproduct	5,8	0,35	17,1	6,77	6,12
Combined concentrate	12,2	1,74	63,70	70,73	47,97
Tails	87,8	0,10	9,60	29,27	52,03
Sample N2 (0,15-0 MM)	100,0	0,30	16,2	100,0	100,0

As can be seen from table 5, after regrinding the coarse fractions of tailings to 0.25 or 0.15 mm, it is possible to reduce the gold content in the tailings to 0.1 and 0.13 g/t, silver to 9.26-9.6 g/t gold Content in the concentrate increases to 5.34-of 6.93 g/t, and the total recovery it is in the United graviconcentrate to C7,65-75,44 %. These data indicate the potential to raise the levels of enrichment tailings gravity methods. After classification sand to crushed to 0.15-0.25 mm.

According to the scheme with the inclusion of the operation of tailings regrinding to a particle size of 0.15 mm (Fig. 3) experiments were conducted according to the scheme, including the double hydrocyclone acting of the original tails, the double helical separation of the granular part and the fine fractions of sluicing and tailings spiral separation followed by enrichment on a concentration table of all heavy fractions and concentrates. The results of the experiments are given in table. 6.

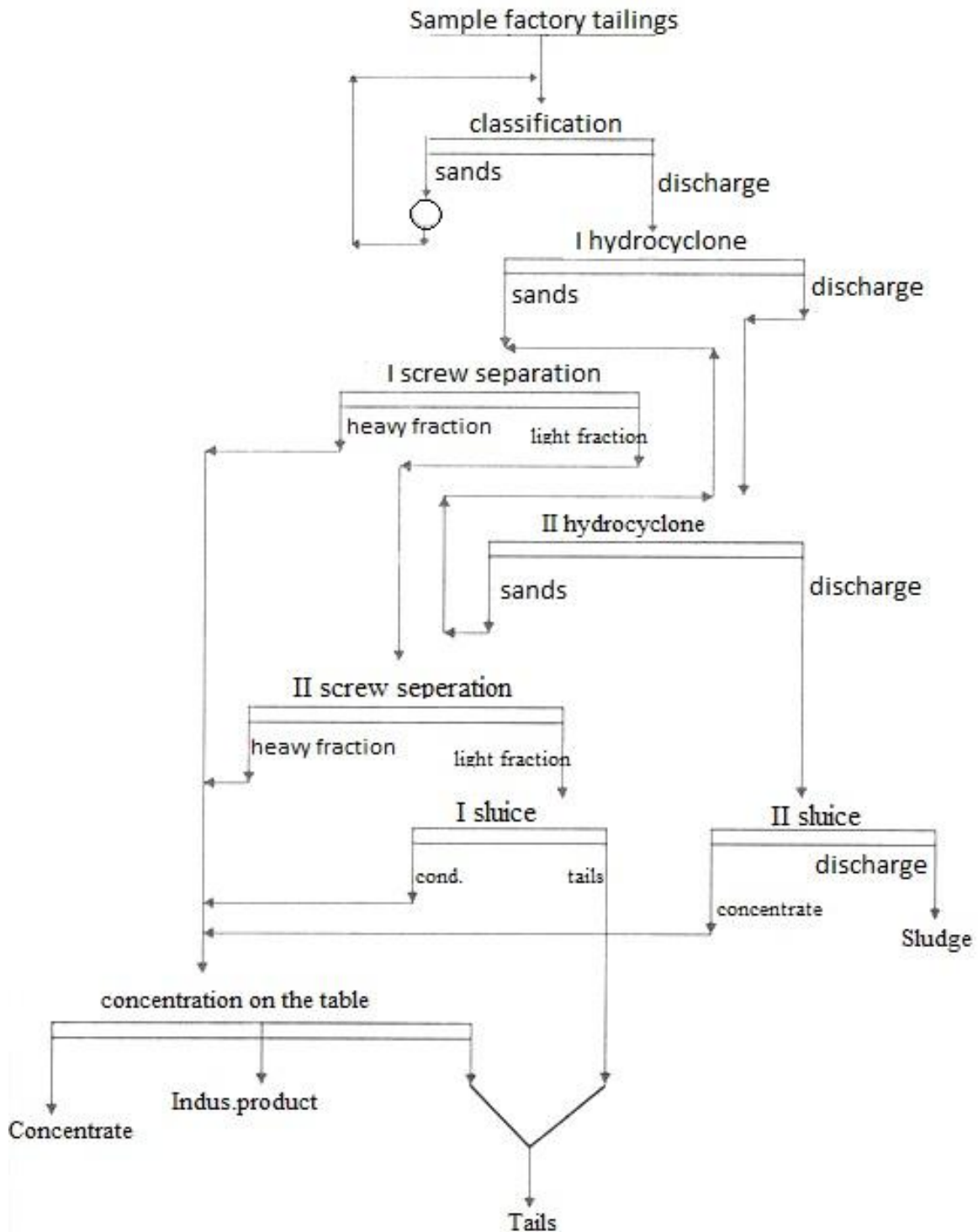


Fig. 3. Recommended gravitational scheme of enrichment plant tails Chadaksko.

Table 6
The results of gravitational enrichment stale tails Chadaksko.


Enrichment products	Output, %	Content, gr/t, %				Extract, %			
		Au	Ag	Fe ₂ O ₃	S сульф.	Au	Ag	Fe ₂ O ₃	S сульф.
Concentrate	3,2	5,86	177	66,2	3,59	52,11	35,85	25,22	47,33
Promptproduct	1,8	1,56	30,81	16,2	0,48	7,80	3,51	3,47	3,56
Tails	26,0	0,21	11,96	8,2	0,14	15,17	19,68	25,38	15,0
Shlams?	69,0	0,13	9,38	5,59	0,12	24,92	40,96	45,93	34,11
Sample№1	100,0	0,36	15,8	8,4	0,24	100,0	100,0	100,0	100,0
		Content, gr/t, %				Extract, %			
Concentrate	3,0	5,44	203,7	67,83	2,64	54,40	37,72	14,70	47,85
Promptproduct	2,4	1,45	28,7	33,04	0,49	11,60	4,25	5,73	7,10
Tails	27,0	0,12	12,26	11,25	0,10	10,80	20,43	21,95	16,30
Shlams	67,6	0,10	9,01	11,80	0,07	23,20	37,60	57,62	28,75
Sample№2	100,0	0,3	16,2	13,84	0,12	100,0	100,0	100,0	100,0

As follows from this table, with the enrichment of the initial tailings according to the developed scheme, it is possible to isolate gravity concentrates with a yield of 3.0–3.2%, containing 5.44–5.86 g / t of gold; 177-203.7 g / ton of silver; 66.2-67.837. Ge203; 4.39-5.05% Al2G3; 0.19-0.2% WO3; 2.64-3.59% sulfur sulfide when extracting components 52.11-54.4; 35.85-37.72; 14.70-25.22; 2.24-2.30; 30.4-33.33; 47.3-47.85%, respectively.

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AUTHOR'S BIOGRAPHY

<p>Samadov Alisher Usmanovich, Director of the Almayk branch of the Tashkent State Technical University named after Islam Karimov, doctor of technical science, associate professor.</p>	
<p>Nosiro Nurzod Ixtiyorovich, assistant of the Department of Mining of the Almayk branch of the Tashkent State Technical University named after Islam Karimov.</p>	