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THE STUDY OF THE POSSIBILITY OF OBTAINING CHROMITE CONTAINING CONCENTRATE FROM TAILINGS

Abstract: *The article presents the possibility of additional extraction of chromite concentrate from enrichment tails of chromite containing ores by the gravitational method. The enrichment of chromite-containing sludges by gravity methods - on a concentration table and a KNELSON centrifugal separator have been conducted. Concentration on the table for the class size sludge -0.2 + 0.071 mm obtained chromite concentrate with Cr_2O_3 48.8%, a centrifugal separator KNELSON slurry on the class size -0.071 0 mm obtained in open loop chromite concentrate with Cr_2O_3 42.8 %;*

Key words: *enrichment, sludge tailings, chromite, concentrate, concentration table, centrifugal separator.*

Analysis of the current scientific and technical data shows the increased difficulty in innovative solutions development for metal extraction from different kinds of mineral raw materials, due to fundamental change in mineral resources base of metallurgy. Apart from polymetallic ores, complex in chemistry and intractable, the basis for the current mineral resources base is formed by technogenic production waste. In most cases, technogenic waste is not used, and their use is a threat to the environment. The most dangerous are technogenic wastes containing toxic elements, including sludge tailings of enrichment of chromite-containing ores [1, 2, 3, 4, 12, 13].

A fundamental disadvantage of existing technologies for processing chromite-containing ores is the formation of production waste - sludge stored in ponds - sludge collectors. Modern gravitational technologies of enrichment of chromite-containing ores make it possible to effectively obtain chromite concentrates from large and medium fractions, and fine sludge is practically not enriched due to the difficulty of separating complex minerals into chromite concentrates and waste rock.

The traditional method of enrichment of chromite ores by gravity methods consists in the stage-by-stage crushing and grinding of ore containing chromites to a particle size of 0.5 mm and the use of enrichment operations in heavy liquids, on depositors and (or) on concentration tables [5-8]. However, only large-scale chromite ore with a mass fraction of chromium oxide of 30.0% is subjected to enrichment. Get a concentrate containing 55.0% of chromium dioxide and final tailings with a chromium dioxide content of more than 5.0%. The disadvantage of this method is the low extraction of chromium dioxide in the concentrate, due to the large losses it with tailings - sludge in the form of fine particles and intergrowths. Gravity concentrates can be finished by flotation [9] and magnetic separation [10-11].

Additional extraction of chromium from these technogenic formations, taking into account the existing demand for chromium concentrates, is an important practical task.

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For research was used sludge - fine fraction (class -0.2 + 0 mm), tailings of the processing plant of chromite-containing ores of the Republic of Kazakhstan table. 1.2.

Table 1 - Chemical analysis of tailings of the processing plant

Element	Content,%	Element	Content,%
Cr_2O_3	25.47	Cu	0.008
Fe_2O_3	9.1	Pb	0.05
SiO_2	21.53	As	0.025
AI_2O_3	1.51	Sb	0.23
H_2O(связанная)	7.8	K	0.05
CaO	0.75	Na	0.05
MgO	29.4	P	0.008
MnO_2	0.053	C	< 0.2
$S_{общ}$	0.1	Ag г/т	< 2.0
$S_{сульф.}$	< 0.1	Au г/т	< 0.05
Zn	0.1	Ni	0.28
Co	0.02		

Table 2 - X-ray phase analysis of sludge tailings

Phase name	Formula	The content of the phase,%
Antigorite	$Mg_3Si_2O_5(OH)_4$	41.8
Clinochrysotile	$Mg_3Si_2O_5(OH)_4$	5.1
Lizardite-1M	$(Mg, Fe)_3Si_2O_5(OH)_4$	12.5
Aluminum Ferrous magnesite	$MgAl_6Fe_{1.4}O_4$	8.7
Chromite	$(Fe_{0.52}Mg_{0.48})Cr_{0.76}(Al_{0.24})O_4$	15.3
Klinohlor	$Mg_6Si_4O_{10}(OH)_8$	5.6
Aluminum Magnesium Silicate	$Ca_{23.20}Mg_{22.4}(Al_{92}Si_{100}O_{384})$	11.0
Quartz	SiO_2	-

The enrichment of medium and poor in quality of chromite-containing ores and technogenic raw materials is carried out according to the technological scheme of multi-stage extraction of a valuable component as it is discovered, which is based on gravity processes.

In this study, studies were conducted on the gravitational enrichment of sludge of a particle size of -0.2 + 0.071mm on a concentration table and -0.071 + 0 mm on a KNELSON centrifugal concentrator model KS-MD3 of FLSmidth Company.

Data on the enrichment of sludge particle size -0.2 + 0.071 mm on the concentration table are given in Table 4, and on enrichment of the class of paricle size -0.071 + 0 mm on a centrifugal separator are given in Table 5.

With the enrichment of sludge on the concentration table in the open cycle, a chromite concentrate was obtained with a Cr_2O_3 content of 48.8%, with its output of 29.42% and Cr_2O_3 extraction of 73.02% of the operation. The loss of chromium oxide with concentration section tails constitute 18.62%, when the content of Cr_2O_3 6.5 %.

In a centrifugal separator KNELSON in open loop obtained chromite concentrate centrifugal separator with a content of Cr_2O_3 42.8%, with 48.5% of its output and extracting Cr_2O_3 66.64% of

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the operation. The loss of chromium oxide with centrifugal separator tails is 19.16%, with a Cr_2O_3 content of 15.75%.

Table 4 - Processing of sludge on the concentration table

Name	Output, %		Content of Cr_2O_3,%	Extraction of Cr_2O_3,% from class	Extraction of Cr_2O_3,% from sludge
	from class	from sludge			
Concentrate concentration table	29.42	4.84	48.8	73.02	7.45
Middling concentration table	14.3	2.35	11.5	8.36	0.85
Tails of the concentration table	56.28	9.27	6.5	18.62	1.9
TOTAL	100.0	16.46	15.64	100.0	10.2

Table 5 - Sludge dressing on a KNELSON centrifugal separator

Name	Output, %		Content of Cr_2O_3,%	Extraction of Cr_2O_3,%	
	from class	from sludge		from class	from sludge
Main separation concentrate	48.5	32.1	42.8	66.64	55.0
Control separation concentrate	13.6	9.02	32.8	14.2	11.72
Separation tails	37.9	25.08	15.75	19.16	15.80
TOTAL	100.0	66.2	31.14	100.0	82.52

Yield of total concentrate containing 43,58% Cr_2O_3 was 37.0% of the original sludge. Extraction of Cr2O3 in concentrate was 62.45%. The total loss of chromium in the tails and in the class of particle size +0.2 mm will be 24.98%, with its content ~ 12.0%.

The results of gravitational enrichment of sludge show the feasibility of applying the concentration table process for a particle size of -0.2 +0.071 mm and centrifugal separation for thin size classes (-0.071 + 0 mm).

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