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Development of Technology for Producing Tungsten Product with WO_3 Content Not Lower than 40% from Technogenic Waste SIE«Almalyk MMC»

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ABSTRACT: This article contains information about a number of analyzes to study the mineralogical and chemical composition of industrial waste. The article provides data on a short technical regulation of the redistribution of tailings of concentration plants and a scheme of gravity-fractional analysis of technogenic waste samples from the SIE "Almalyk MMC".

KEY WORDS: industrial waste, technogenic deposit,sludge cake, gram-size analysis, gravity- magnetic fractionation.

I.INTRODUCTION

In modern conditions, requiring the expansion of the raw material base of the Republic of Uzbekistan, ore mining is increasing and at the same time, the quality of the extracted minerals is changing. First of all, the content of the useful component decreases in them. Therefore, there is a development of technology for processing industrial waste from mining with the extraction of useful components from them.

Continuous improvement of the processing technology of mineral raw materials, the use of more advanced methods and techniques, the selection of optimal technological schemes allow economically sound allocation of previously unpromising wastes that are cost-effective for processing. Over the years of independence of the Republic of Uzbekistan, the total volume of waste, even with the most conservative estimates, has increased by at least ten times. In addition, industrial waste occupies about 12 thousand hectares of land, which includes well-developed arable land, urban territory, and irrigated pasture land. The natural landscape changes and peculiar landforms are formed, represented by dumps, tailing dumps filled with massive industrial wastes that adversely affect the natural environment. In the area of the tailings storage pond, the chemical composition of soils changes, easily soluble compounds are washed out, groundwater is polluted, and thus irreparable harm to nature is caused. Huge amounts of money are annually spent on the maintenance and storage of these wastes.

II. SIGNIFICANCE OF THE SYSTEM

The problem of processing the tailings of the processing plants and extracting useful components from them with their subsequent use as secondary raw materials is one of the urgent. This problem has several aspects. Firstly, the metal extracted from the cake is much cheaper than the metal extracted from the ore as a result of a number of technical conversions. Secondly, after the extraction of metals from the sludge cake, the later can be beneficially disposed of.

Finally, the useful processing of industrial waste makes it possible to free up the territory occupied by dumps, or at least not expand it to indefinite limits, that is, it improves the environmental situation in the dump zone and around it.

III. LITERATURE SURVEY

Mineral processing is accompanied by the receipt of a large amount of waste, a significant part of which is still not used, is stored in dumps, storages, and settling tanks. Such wastes include flotation tails. Huge reserves of useful components are contained in industrial waste arising from the extraction, enrichment and processing of products of enrichment of ores of non-ferrous and rare metals. These industrial wastes are a kind of artificial deposits created as a result of human activities. V.I.Vernadsky in his works introduced the concept of “technogenic deposit” in connection with the possibility of using industrial wastes in order to recover useful components from them.

The study of this problem shows that its solution is possible due to maximum utilization and inclusion in closed cycles of industrial use of resources.

IV. METHODOLOGY

In industry, enrichment methods - gravity, flotation, and combined methods - are used to process industrial waste in order to extract valuable components (WO_3).

Sieve analysis is one of the methods for determining the content of fractions (classes) of particles of certain sizes in bulk material, carried out by sifting the sample through a set of sieves with different sizes of square holes.
For laboratory experiments on grinding, weighed samples of 2000 and 5000 grams were selected.

To conduct a sieve analysis of samples, the following set of equipment was used:
- a set of sieves (wire, woven) from 3 to 0.074 mm with a pallet and a lid;
- a mechanical shaker, equipped with a device for automatic shutdown at certain intervals;
- prefix for washing and wet sieving of samples and material; a drying cabinet with a device for maintaining the temperature in the drying chamber within 105 ± 5C;
- laboratory scales.

When performing a sieve analysis with a mechanical shaker, it is considered sufficient if less than 0.1% of a sample placed in this sieve is sifted for 1 min during control screening. Screen analysis was carried out with preliminary washing of sludge. In this case, the washed sludge was defended, and the clarified water was siphoned off, the residue was dried, weighed, and the mass was summed with the mass of the fraction passing through the same sieve during dry sieving.

After sieving, the product residues on each of the sieves were weighed and the content of each fraction was determined from the measured mass.

The Ingichki man-made deposit of stale tungsten-bearing tails was formed as a result of the operation of the Ingichki mine and, in particular, its concentration plants in the period from 1949 to 1976. Ore dressing by flotation was carried out at a small factory with a processing capacity of up to 100-150 tons of ore per year. As a result of its activities, tailing dump No. 1 with a total volume of 3.6 million tons of tailings was reclaimed. In 1976, the second factory was put into operation, having a capacity of the original, raw materials up to 500 thousand tons of ore per year, which worked until 1996. As a result of its activity, tailing dump No. 2 was formed, containing about 12 million tons of dead tail.

The tailing area No. 1 is 96 thousand square meters.
The area of tailing pond No. 2 is 450 thousand square meters.
The maximum total thickness of technogenic deposits is 26.2 m at tailing pond No. 1 and 31.5 m at tailing pond No. 2.
The total stocks of stale tails according to factory accounting are estimated:
- the total amount of 14662 thousand tons, including:
- small tailing dump - 3614 thousand tons;
- large tailing dump - 11048 thousand tons.

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Metal reserves in turn are:
- the total amount of 9011.7 tons, including:
- small tailing dump - 2349 tons;
- large tailing dump - 6662.7 tons.

The average content in stale tails of WO3 is 0.06%.

The chemical composition of the tails is shown in table 1

The following is a brief technical regulation of the redistribution and scheme No. 1.

The feedstock enters repulpation 1, where it is mixed with water in the ratio solid to liquid ratio = 1.5 ÷ 2, on average 1.7. Next, the pulp enters the enrichment operation on screw separators. As a result of enrichment, two products are obtained - concentrate 1 with a WO3 content of 0.8-1.5% and tailings 1.

Tailings 1 are dumped and sent to a tailing dump or temporary warehouse for possible subsequent use in secondary production. The concentrate 1 enters the operation of repulpation 2, where it is mixed with water in the solid to liquid ratio = 2, then the pulp enters the operation of cleaning on a screw separator. As a result of cleaning, a concentrate 2 and tails 2 are formed on a screw separator.

Tailings 2 are sent to repulpation 1, concentrate 2 is sent to repulpation operation 3 (solid to liquid ratio = 2), pulp from repulpation 3 is fed to the cleaning operation on the concentration table.
Cleaning on the concentration table is carried out with the supply of water. As a result of cleaning, two products are formed on the concentration table - concentrate 3 and tailings 3. Concentrate 3 with a WO3 content of at least 35% is a finished product and is sent to consumers, tailings 3 are sent for repulpation 1.

The mineral composition of the tailings was determined according to the mineralogical analysis of the averaged sample and, using mineralography, from briquettes made of a sulfide product (foam product of flotation of a draft gravity concentrate).

For mineralogical analysis, the sample was preliminarily subjected to gravitational-magnetic fractionation according to the scheme shown in Figure 1. Then, mounted transparent sections were made from each fraction, in which the minerals were accurately diagnosed under a microscope and their quantitative ratios were calculated.

V. EXPERIMENTAL RESULTS

As a result of gram-size analysis (Fig. 1, table 1) and gravitational magnetic fractionation, the chemical composition of the tailings and the mineral composition of the fractions were determined. According to the results of analysis of samples from the Ingichkitechnogenic deposit, the content of the following components was: wolframite ($FeWO_4$) <0.01%, tungstite ($WO_2 (OH)_2$) <0.01%, molybdenite (MoS_2) <0.01%, scheelite ($CaWO_4$) -0.12%.

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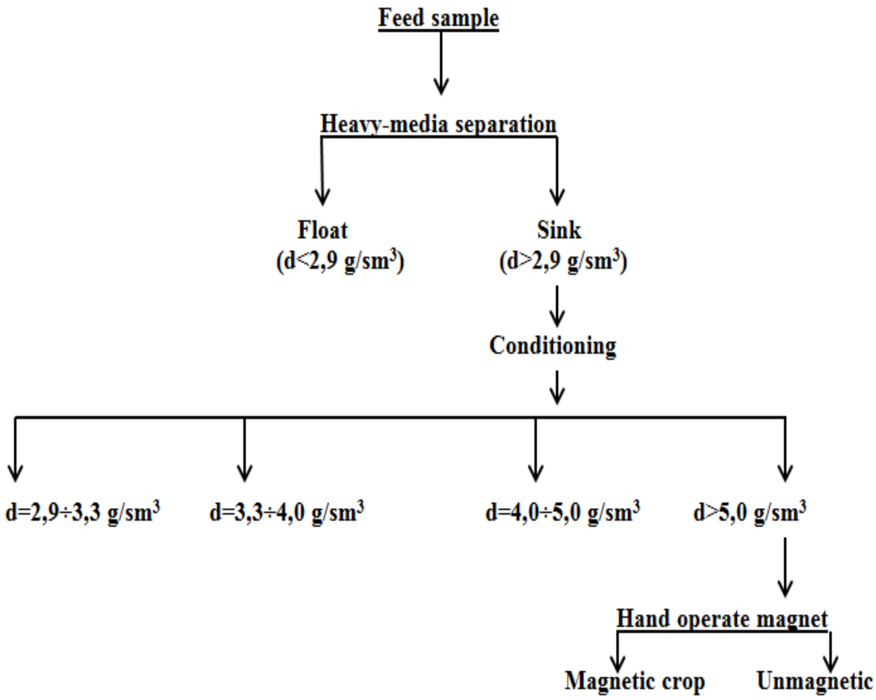

Fig. 1.Scheme of gram-size analysis and gravity- magnetic fractionation.

Table1.The chemical composition of the tails

Elements and oxides	**Composition, %**
SiO_2	48,55
Fe_2O_3	14,70 (total iron)
K_2O	0,80
Na_2O	1,20
CaO	18,95
MgO	2,21
Al_2O_3	3,96
TiO_2	0,14
P_2O_5	0,11
MnO	1,40
H_2O	0,18
CO_2	6,64
S (total)	1,28
Mo	-
As	-
Pb	-
Cu	0,02
Zn	0,001
Amount	**100,12**
FeO	10,42
SO_3	0,15
Loss on ignition	6,76

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VI.CONCLUSION AND FUTURE WORK

The basis of non-waste technology is the development and implementation of fundamentally new technological processes that exclude any kind of waste, various drainless technological schemes and water cycles based on effective cleaning methods, as well as the widespread use of waste as secondary raw materials. An important problem of creating non-waste technology is its organizational principles, where a certain role is played by the choice of areas, the structure of units. In this regard, there is a positive experience of a number of enrichment enterprises, both foreign countries and CIS countries.

Wide coverage of scientific and technological developments, their theoretical analysis, as well as a generalization of the experience of leading enterprises in the processing of industrial waste play an important role in the problem of creating an improved non-waste technology in non-ferrous metallurgy.

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