DISPOSAL OF MINING INDUSTRY WASTE

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Abstract:

The mining industry plays a vital role in global economic development, providing essential raw materials for various sectors. However, it is also responsible for generating substantial quantities of waste materials, presenting unique challenges in terms of disposal and environmental impact. This scientific article provides an in-depth analysis of the disposal of mining industry waste, exploring the diverse waste types, environmental implications, and the evolving strategies and technologies aimed at sustainable waste management. By comprehensively examining these issues, we highlight the importance of responsible waste disposal in the mining sector and the need for ongoing innovation to minimize environmental degradation.

Keywords: Mining Industry, Mining Waste, Waste Disposal, Environmental Impact, Tailings, Overburden, Sustainable Mining, Regulatory Framework, Innovative Technologies, Reclamation.

Most of the developed foreign countries have for many years been trying to re-use man-made deposits in order to save their mineral raw materials, by developing waste processing technologies in order to use industrial waste. For example, since 1993, the share of secondary products in the production of non-ferrous metals in the USA is 55% for copper, 28% for tungsten, and 25% for nickel.

A similar idea of recycling secondary products is observed in Canada, Great Britain, South Africa, Spain and other countries.

In the 70s of the last century, two devices for re-separating copper were put into operation at the "Arthur" and "Magna" factories of the USA, which enrich 100,000 tons of copper-molybdenum ores per day. Waste is classified in hydrocyclones, sand is re-crushed and sent to flotation. In the processing of copper-bearing sands with a content of about 0.09%, the two devices gave a low-grade enrichment of less than 72 tons per day, and allowed to increase the production of copper at the factory from 234 tons to 259 tons per year.

Waste from the "Toledo" plant in the Philippines contains 0.08% copper. A device for re-flotation of the sand part of the waste is installed in the factory. The resulting concentrate containing 1.0-1.5% copper is sent to the main plant, where it is combined with the control flotation concentrate, regenerated and refined until the final concentrate is obtained. The use of this technology in the factory allows the total separation of copper from 87.84% to 91.69%, the amount of copper in the beneficiation

It allowed to increase from 28% to 30%. The amount of copper in waste is reduced to 0.05%.

In Montana, USA, 2 tons of gold and 4 tons of silver are extracted annually from tailings containing 0.84 g/t gold and 2.8 g/t silver in Mandiskey mine ore enrichment.

In Canada, copper recovery up to 40% has been achieved by selectively digesting waste from a copper beneficiation plant containing 0.45% copper with the help of bacteria.

In Bulgaria, 0.1-0.15% copper-bearing waste was obtained three times cheaper than the beneficiation obtained from raw materials.

In South Africa, 3.5 tons of gold and 696 tons of uranium are extracted from the wastes of gold separation factories containing 0.53 g/t of gold and 40 g/t of uranium.

In Russia, due to the need to solve the problems of ore processing of man-made mines of the Urals, the target program "Processing of derivatives of man-made mines of the Sverdlovsk region" was adopted.

Sviatogor OJSC Sorinsk concentrator sludge (500 tons per year) is involved in processing using flotation and magnetic separation, in which copper, apatite and iron-vanadium enrichments, as well as sand used in construction, are obtained. Since 1998, flotation processing has been carried out in this enterprise in order to extract copper, iron and precious metals from waste containing pyrite. Copper and pyrite enrichments are obtained.

Since 2005, the slags obtained at the "Urtaural Copper Smelting Plant" OJSC have been processed by the flotation method, and copper enrichment and iron sands are obtained. The production capacity of the processing line is 1200 tons of slag. 1 mln. 6 thousand tons of copper, 200 kg of gold, 6 tons of silver, and 900 thousand tons of iron sand are obtained as a result of processing tons of slag.

At the slag enrichment plant of JSC "Uralelektromed" waste is processed according to the flotation scheme. Extraction of copper from slag is 65%, during flotation more than 90% of zinc goes to waste, method of extraction of zinc has not yet been developed. The resulting concentrate containing 10-15% copper is prepared and sent to the metallurgical plant.

In addition to the examples of the processing of man-made mineral objects, there are a large number of scientific developments that study the methods of processing secondary mineral raw materials (6-13). The methods of obtaining copper, gold rare metals, calcium enrichment, molybdenum, magnetite-hematite enrichments, construction enrichments, etc. from man-made mineral raw materials are presented in the listed sources. However, these developments have not been implemented on an industrial scale for various reasons.

Mining wastes in the territory of Uzbekistan are studied by many authors. Among them, the experiments carried out on the study of the wastes of the copper beneficiation factory (MOF) of the Almalyk Mining and Metallurgical Combine (OKMK) are important.

In 1999, the "SredazNIItechnology" institute developed a complex for digging and processing waste from the landfill of 5.5 million tons of OKMK MOF-1 per year. The institute proposed two options for waste processing: 1) purchase of technological machines for the enrichment factory from the German company Krup Polizius; 2) Purchase of machines from the Swedish company "Svedola".

As a result of the calculations, it was found that the planned factory is economically unprofitable in terms of collective enrichment: copper - 67.07%, molybdenum - 45%, gold - 55.2%, silver - 35.2%. In this case, the amount of copper in collective enrichment is 10.0%, the amount of molybdenum is 0.126%, gold is 14.53 g/t, silver is 40 g/t. One-year interest was 9533 thousand US dollars according to the 1st option, 8143 thousand US dollars according to the 2nd option. Since 2004, experiments have been carried out on selective melting of 4,411 tons of large sand fraction containing 0.165% copper in the flotation waste with the help of

bacteria. As a result of 28-month bioselective smelting experiments, the separation of copper into beneficiation was 48%.

It is known that from the point of view of ecology, the technology should be waste-free. This means all the main and auxiliary materials included in the process - raw materials, reagents, fluxes, additional materials, etc. should come out only in the form of goods or in the form of semi-finished products used in other enterprises. It is difficult to achieve a complete elimination of waste, but reducing its volume is one of the main directions for improving the production of non-ferrous metals. Low-waste technology has been developed for many types of mineral raw materials.

The creation of low-waste technology is directly related to the problems of rational use of reagents and related components. Depending on the method of using reagents and basic materials, technological schemes can be divided into five groups:

- reagents are used in processes and removed with waste products;
- reagents are used in processes and released as intermediate products processed in other enterprises;
- reagents are used in processes and released as by-products;
- additional operations on the regeneration of reagents are foreseen in the technological schemes;

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