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# Studying The Possibilities of Processing of Mining Slags

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**Abstract:** The article discusses the inevitability of copper losses due to slag, as well as the possibility of decreasing them through various approaches and the use of local secondary technogenic formations. It has been demonstrated that the developed and commonly used in industry slag decontamination procedures only partially alleviate the problem and result in large irreversible metal losses with dump slag. The primary elements that influence the size of the losses are identified, and recommendations for limiting their negative impact are made. The use of ideal mixing equipment is advised in this scenario because a maximum decrease in the residual copper concentration in the waste slag is possible. With the organization and implementation of low-waste technologies, it is feasible to achieve an increase in the complexity of raw material utilization. In this article discusses about information of studying the possibilities of processing of mining slags.

**Keywords:** mining slag, loss of metals, processing, reduction, sulfidation of oxides, depletion, ideal mixing apparatuses, low-waste technology, processing.

It has become a necessary to tackle a whole complex of complicated challenges in the mining and metallurgical industries around the world, and in particular in Uzbekistan. This includes, among other things, the widespread depletion of rich and easily discovered ore reserves, rising environmental protection demands, increasing the complexity of raw material use, and developing and implementing low-waste technologies. Despite the abundance of mineral resources, effective forecasting of Uzbekistan's economic development is impossible without accounting for the mining and metallurgical industries' involvement in waste processing, where the content of valuable components is often significantly higher than in the extracted primary raw materials.

The Almalyk Mining and Metallurgical Combine (AMMC) has amassed a huge number of tailings from concentration facilities, copper slag, and clinker from zinc cake processing in its waste and intermediate products. These materials are made up of a significant number of non-ferrous noble metals and are not part of the manufacturing process. By involving them in the processing process, the facility will be able to greatly increase its raw material base while lowering capital expenses for geological and mining operations. As a result, approximately 1 billion tons of tailings from enrichment plants with copper concentration ranging from 0.07 to 1.112 percent are currently accumulating in tailings. They include over 800,000 tons of copper, 20,000 tones of molybdenum, 182 tons of friction, 500,000 tons of zinc, and a variety of other precious materials.

These slags are partially reloaded into melting furnaces, part of them are stored, and a large portion of them are floated. In the best-case scenario, copper extraction during flotation is 40-60%; the balance of the copper, as well as gold and silver, is lost irreversibly in slag tails. Over 2.2 percent copper, 2.40 percent zinc, 0.01 percent cadmium, 5-8 g/t gold, 250-500 g/t silver, and many other valuable components can be found in zinc production clinker. A portion of the clinker is fed into melting furnaces, while the rest is held in slag storage. By incorporating these materials into the manufacturing process, the factory will be able to obtain thousands of tons of copper, a large number of precious metals, and other important items.

Tailings ponds and, in particular, slag dumps, which occupy thousands of hectares of farmland, pollute the air basin, and deface the landscape, are a direct threat to the natural environment. The cost of assessing the environmental damage leads to a large extension of the economic feasibility of developing and implementing low-waste technology. In this situation, the economic efficiency of combining production grows, and new requirements for the construction of industrial production structures related to

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environmental impact emerge. It is critical in this regard to develop a reasonable and integrated technology for the processing of slag and secondary industrial formations in local industrial businesses.

The material composition of solid slag and other components was determined using chemical and microscopic methods. The distribution of copper in terms of components can be estimated using microscopic study of quenched and crystallized slag, and the results can be extrapolated to the forms of copper presence in the melt. Electronic microprobe analysis, which allows identifying the selected composition of structural components by doing a point analysis, provides more prospects in this direction. The viscosity of the melts created has a significant impact on the production of the final melting products – matte and slag, the degree of their separation, and, finally, the result of depletion. The method of damped oscillations was used to determine viscosity, and the approach is detailed in the literature. A refractory tube was inserted into the furnace and 2 l/min of argon was pumped through it to establish a neutral environment. In a molybdenum crucible, the charge was melted and the viscosity changed. A molybdenum spindle was lowered into the melt. A tungsten-rhenium thermocouple was used to regulate the temperature. The studies were carried out at temperatures ranging from 1200 to 1600 degrees Celsius.

Materials that are intermediate products and waste from local industrial firms were used to determine technological parameters. The authors' concerns with magnetite reduction, sulfidation of oxidized copper compounds, bubbling a liquid bath, establishing a weakly reducing atmosphere in the furnace, and obtaining slag of ideal composition and properties were taken into consideration when selecting these materials. The authors were guided in their material selection by the primary provisions of the concept of depletion that they established, which are as follows: 1) The technology should be based on the utilization of only locally available materials, such as intermediate products and trash; 2) The technology should not necessitate extra capital investments; 3) The technology should not produce dangerous gases in excess of legal limits; 4) The technology should reduce the quantity of processing; and 5) The technology should be capable of extracting additional production of linked materials such as gold and silver.

For any metallurgical operation, the preparation of the combination is quite critical. The usage of a bedding system for this reason would be excellent. However, this will necessitate huge capital expenditures for the building of the charge preparation machine, significant free areas, and raw material stocks, which will be difficult to implement under the current Almalyk mining and metallurgical combine conditions. Furthermore, it is planned to process accumulated materials and waste from diverse industries for production demands, the particular preparation of which will have a negative impact on the process's economic performance. As a result, there are no plans for an expensive charge preparation. The unit on which the created technology is based will have a strong influence on its manufacturability and feasibility. A second melting furnace in a liquid bath is scheduled to be decommissioned as part of the Almalyk smelter's long-term strategy for upgrading and rehabilitation. This is the furnace that the lean process recommends.

In conclusion: The physicochemical parameters of the melts, as well as the ideal compositions of slag and matte, oxidation potential of the gas phase, temperature, and the technological mode of smelting, are all intimately related. All of the aforementioned process variables have a substantial impact on the copper concentration of the slag. However, not all of them can vary in broad representations, giving you the chance to influence the depletion's eventual outcome. The resistance of refractories in a hostile environment, for example, and the higher solubility of copper in these conditions limit the upper temperature limit. The lower limit is set by the melt fluidity, the difficulty of separating slag and matte due to a sudden increase in viscosity with decreasing temperature, and other factors. The copper concentration of the slag is directly influenced by the matte's composition. However, there are no options for a vast range of variations. When working with rich mattes, the copper percentage of the slag rises. Work on bad matte increases the volume of a unit of production upon receipt, resulting in high copper losses during the subsequent conversion operation. As a result, metallurgists are obliged to work with copper-rich mattes ranging from 30 to 46 percent.

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