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REVIEW OF TECHNOLOGIES OF PROCESSING OF TECHNOGENIC PRODUCTS OF COPPER PRODUCTION

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Extraction of rare metals from a production wastes is actually as they small quantities accompany non-ferrous metals and generally collect in products of processing of the main raw materials. In article offered technological schemes of processing of such materials were considered.In article the technological schemes of processing of waste of copper production containing rare metals are considered. The offered ways can will be applied in metallurgy to extraction of osmium and rhenium from waste.

Key words: osmium, rhenium,industrial waste, cupper production

INTRODUCTION

Due to the accumulation of technogenic wastes with a high content of rare metals in copper productions in Kazakhstan, their complex processing problem is particularly acute.

During the processing of sulfide copper, copper-molybdenum deposits of Kazakhstan, a gas cleaning products (in the dusts, slimes, cakes, wash solutions) contain such rare and expensive metals as rhenium and osmium. The peculiarity of copper production is that these metals are distributed on all industrial products production, and osmium and rhenium content increased a hundredfold in some products.

Published to date methods of obtaining rare and platinum group metals from industrial products multistage and do not sufficiently selective and comprehensive extract rhenium and osmium.

Thus, the extraction of rare and platinum group metals from cakes, slime and washing solutions is actual problem as at present, so in future.

It have studied the physical and chemical properties of the slime, cakes of copper production and developed science-based technologies for their complex processing.

It is established, that slimes, cakes contain 40 - 60 % of lead in a sulphatic and carbonate form and 20 - 50 g/t of osmium, 300 – 2 000 g/t rhenium [1]. Processing of this wastes is effective both from ekonmic and ecological side.

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EXPERIMENTALAND DISCUSSION

Technology of producing osmium-, rhenium-containing concentrate from slimeof copper production bylow-temperature restoration-sulfiding sintering [2].

After the results of research it was proposed a technological scheme oflead slime complex processing, which provides virtually complete removal of lead in solution and getting enriched concentratewith osmium 100 - 120, rhenium 50 - 60 times (Figure 1).

The technology feature is the transfer of all the oxide and sulfate compounds of metals (Pb, Cu, Zn, etc.) into a single sulfide form, but metal sulfides, how it’s

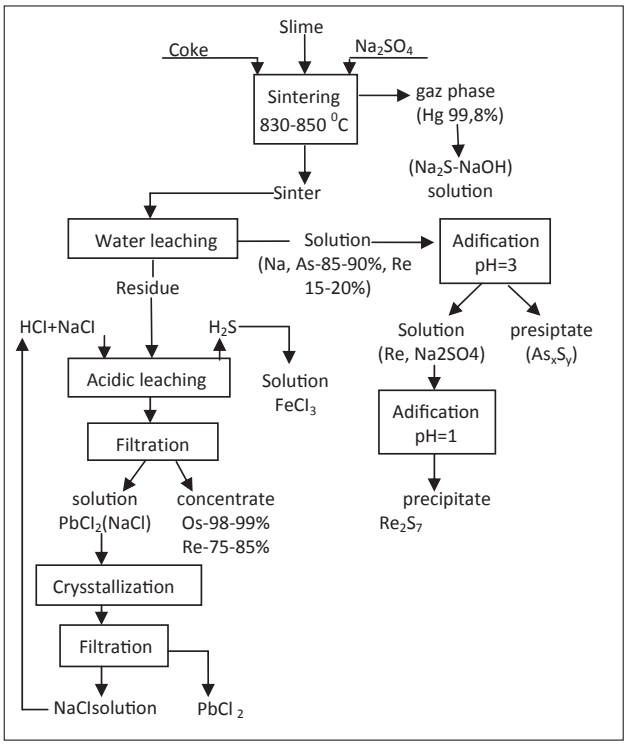

Figure 1 Technological scheme of slime processing to osmium-rhenium containing concentrate

known [3, 4], prevent fading and oxidation of osmium. With such processing of slime osmium compounds are reduced to compounds with low oxidation.

During the leaching a sinter by water the arsenic quantitatively removes in solution and the subsequent leaching of the cakes with a solution of sodium chloride in the presence of hydrochloric acid, lead is dissolved, osmium fully remains in residue.

It was investigated and established the optimal mode process of obtaining osmium concentrate. The efficiency of the process was assessed by enriching the concentrate with osmium and the degree of lead transition to solution during leaching.

The technology has the following advantages:

- translating osmium and rhenium compounds in the slime tocompounds which are steady of low-valent acid effects, it will be able toachieve high extract and enrich themto concentrate;
- removing mercury to the gas phase and arsenic,in the form of sulfide, toseparate products solves environmental problems;
- forms pure chemical lead chloride during a process.

The technology of selective separation of osmium and rhenium from slime on the first stage by hydrometallurgical method [5].

Technology it is based on oxidation of compounds of osmium and rhenium in the presence of hydrogen peroxide, thus tetraoxide of osmium is selectively driven away in a gas phase, compounds of rhenium turn into the highest connections and get water-soluble forms Figure 2.

The selective separation technology of osmium and rhenium on individual products by hydrometallurgical method has the following advantages:

- the selective separation of osmium and rhenium on individual products goes onin the first stage, which differs by high technological parameters;
- using hydrogen peroxides as the oxidant, it turns purer rhenium solutions than the known technological solutions;

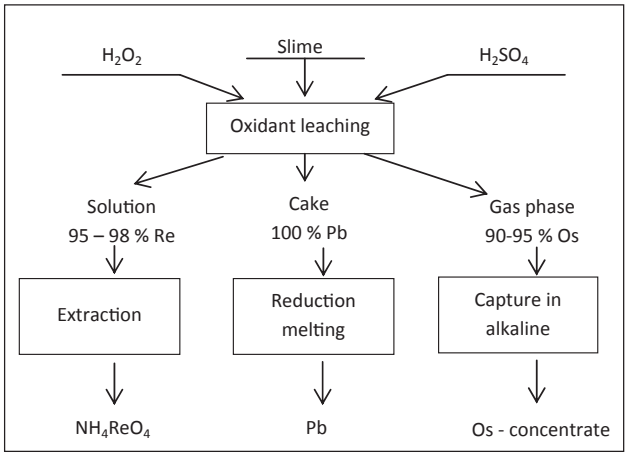

Figure 2 Technological scheme of slime processing by hydrometallurgical method

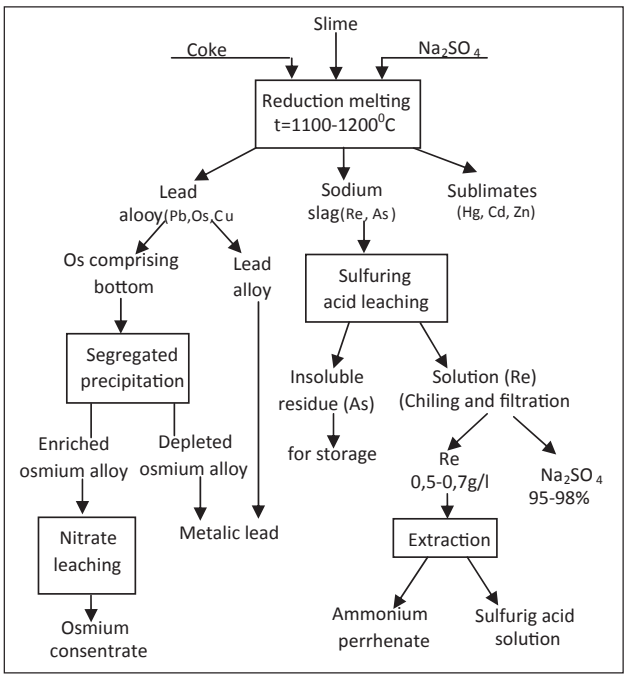

Figure 3 Technological scheme of slime complex processing with selective separation of osmium and rhenium

- the technology doesn't needtreatment(drying, neutralization, granulation) of the original material;
- doesn't needa lot of energy and it is easy to make hardware design.

The technologyof selective separation of osmium and rhenium from slimeby reduction melting [6].

Research results of reduction melting processes helped to create the technologicalbases and to provide a technological scheme of lead and sulfuric acid slime and cakecomplex processing (Figure 3).

The high efficiency of the developed technology of lead slimeprocessing which gives a lead alloy, containing osmium and sodium slag, containing rhenium determines the advantages of this technology over the existing. The efficiency of the proposed technology are:

- providing selective separation of osmium and rhenium and other metalsto alloy products in the first stage of processing;
- an original approach to the extraction of rhenium in a water-soluble form and arsenic in an insoluble compound form in the molten slag, that favors the resulting solution with pure rhenium concentrates without arsenic;
- the possibility of osmium concentration in the lower parts of the melt and the resulting concentrate which contains 55 – 67% of the metal osmium;
- a high extraction rates of rare metals to an individual alloy products with utilization of mercury, cadmium, and zinc to a sublimates, arsenic in the form of low-toxic lead arsenate.

Processing technology rare metall-containing technogenic waste copper production sulfidation sulfur [7].

The results we have obtained previously sulphidation of sludge with sodium sulfate and coke, showed a direct

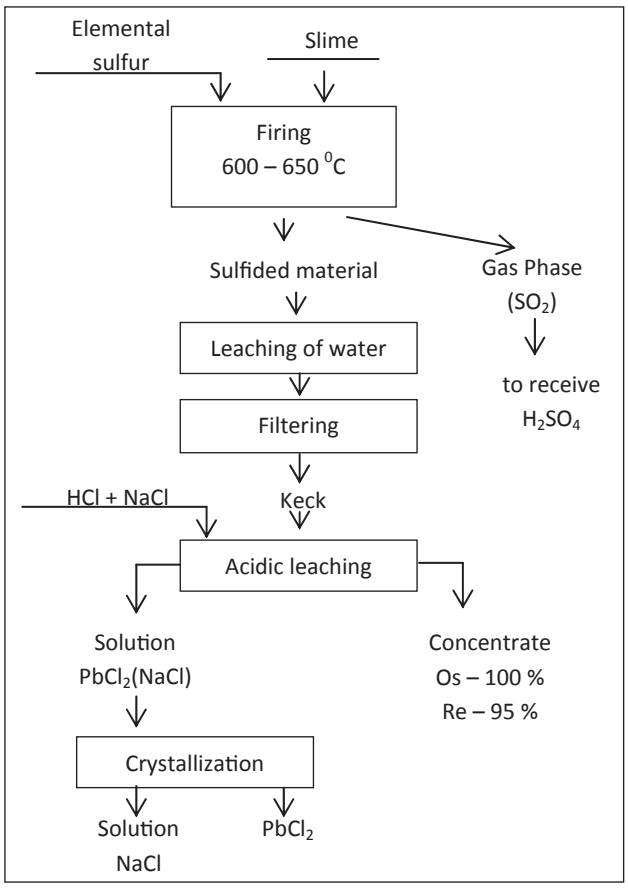

Figure 4 Technology of processing rare metal containing technogenic waste of copper production with sulfur sulfidation.

dependence of the degree of sulfidation of osmium and rhenium with sulfidation of main sludge component - lead sulphate [3-5]. The same dependence is observed in the process of sulfidation with sulfur Figure 4.

The degree of extraction osmium and rhenium spectrum increases with the content of lead sulfide in the resulting product.

Maximum extraction of osmium and rhenium spectrum is observed at temperatures 600 – 800 °C and flow of sulfur 30 – 50 % by weight of the slurry.

Effectiveness of the technology is as follows:

- For sulphidation it applies the oil industry waste – technical sulfur;
- There is utilization of sulfur and processing of man-made waste copper production with the extraction of precious metals at the same time;
- The sulfidation temperature reduced to 600 °C, which makes energy savings.

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CONCLUSIONS

It was offered technological schemes for recycling copper production waste with extraction of valuable components. Technologies are highly effective:

- In the first method occurs 100-fold enrichment of osmium and rhenium in the concentrate;
- The second method features easy implementation;
- In the third method it occurs selective separation of osmium and rhenium in separate concentrates in the first step of processing;
- The fourth method is energy saving.

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Note: The responsible for English language is the lecturer from University named after Sh. Esenov