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TREATMENT OF WASTEWATER OBTAINED IN PROCESS FOR PRECIOUS METALS RECOVERY FOR ANODE SLIME

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ABSTRACT
In the aim of increasing the precious metals exploiting degree, hydrometallurgical treatment of deselenization anode slime is proposed.
In this paper, the type of wast water which are obtained in this process, are defined.
Propose of technological procedure for wastewater treatment is formed on the base of the results of semi-industrial testing which were done in the Plant for precious metals production. The wastewater treatment process is consisedt of the next phases: cementation of copper and other metals using iron powder, neutralization of acid wastewater with alkaline wastewater, separation of solid-liquid phases.
Adopted technical procedure was used for technical solution proposes.
Key words: anode slime, wastewater, chemical treatment

1. INTRODUCTION

Anode slime, as the raw material for precious metals recovery, is formed as secondary product in electrolytical copper refining [1]. Disadvantages of pyrometallurgical process for recovery of precious metals from anode slime, used in RTB Bor, are low recoveries of precious metals and long retention the same in unfinished production. For the aim of overgoing the noticed disadvantages in the used technology, the investigation were aimed to development of new methods for slime treatment[2,3,4].

The preliminary laboratory investigations of hydrometallurgical treatment the anode slime from RTB Bor were carried out in Copper Institute Bor, upon what the semi-industrial testing was carried out in the work section for production of precious metals and showed positive results regarding to recovery and quality of precious metals[5].

Technological stages included in technological line of anode slime treatment are decopperization and deselenization, upon what deselenized anode slime is produced that presents the raw material base in the process of hydrometallurgical recovery the precious metals.

Process of recovery the precious metals from deselized anode slime by the use of hydrometallurgical method consists of the following technological stages:

- selective silver separation by the use of leaching with nitric acid solution and silver recovery of 99.99% Ag purity
- leaching of gold, platinum and palladium and selective gold separation of 99.99 % Au purity.

Acid and base wastewater are obtained during hydrometallurgical process of recovery the precious metals. The aim of this work was defining of wastewater types obtained in the process of recovery the precious metals and proposal of technological method for their neutralization due to the undisturbed discharge into existing water streams.

2. EXPERIMENTAL

Semi-industrial laboratory investigations of hydrometallurgical method for production of precious metals on a sample of 100 kg of deselenized anode slime were carried out in the work section for production of precious metals.

Acid wastewater is obtained during leaching process of deselenized anode slime for the aim of silver, gold, platinum and palladium recovery. Content of some elements in acid wastewater is: 0.5-10 % Cu, 0.04-0.2 % Fe, 0.6 % Si, 0.07 % Se, 1-1.5 % Te, 0.008 % Mg, 0.05 % Pb, 0.002 Sn, 0.2 % Bi, 0.05 % As, Cl^-, SO_4^{2-} and other. Acidity of wastewater is in range pH = 1-2.

Base wastewater, pH value 12-14, obtained upon separation of silver chloride from ammonium solution of silver and in the reduction process of ion palladium from ammonium solution, contain ammonium hydroxide, sodium chloride and a part of unreacted hydrazine hydrate and sodium hydroxide

3. RESULTS AND DISCUSION

A technological solution and necessary equipment were proposed by recognition the content of obtained wastewater.

Cementation of copper and other more electropositive metals by the use of powdered iron is proposed as the first stage on total treatment of acid wastewater. Cementation process will be carried out in the existing tank of the work section for production of precious metals in Bor. Separation of solid from liquid stage on plane filter, solid stage – cement slime with copper content up to 90% will be transported to the Copper Smelter, and liquid stage – acid solution into neutralization tank.

Base waste solution, collected into tank for base solutions, are used for neutralization of acid waste water, and present hydrazine hydrate for reduction of metal ion residue. Neutralization of acid and base wastewater will be developed with intensive mixing and permanent control of pH value.

Quantity of base wastewater is a function of silver content in deselenized anode slime that is variable, until quantity of acid wastewater is result of solid – liquid ratio in the leaching process. Due to this reason if total quantity of base water is not sufficient for neutralization, the additional neutralization is proposed with 10 % lime milk for attaining pH value of 6.5 – 7.5.

Treated wastewater, upon filtration on filter press, will be transported into wastewater collector of the work section for production of precious metals. Discontinuous connection to the wastewater from the electrolytical copper refining plant is proposed. Solid residue upon solid – liquid separation will be transported on the solid waste dump.

The proposed technological process for wastewater treatment is given in technological scheme, Figure 1.

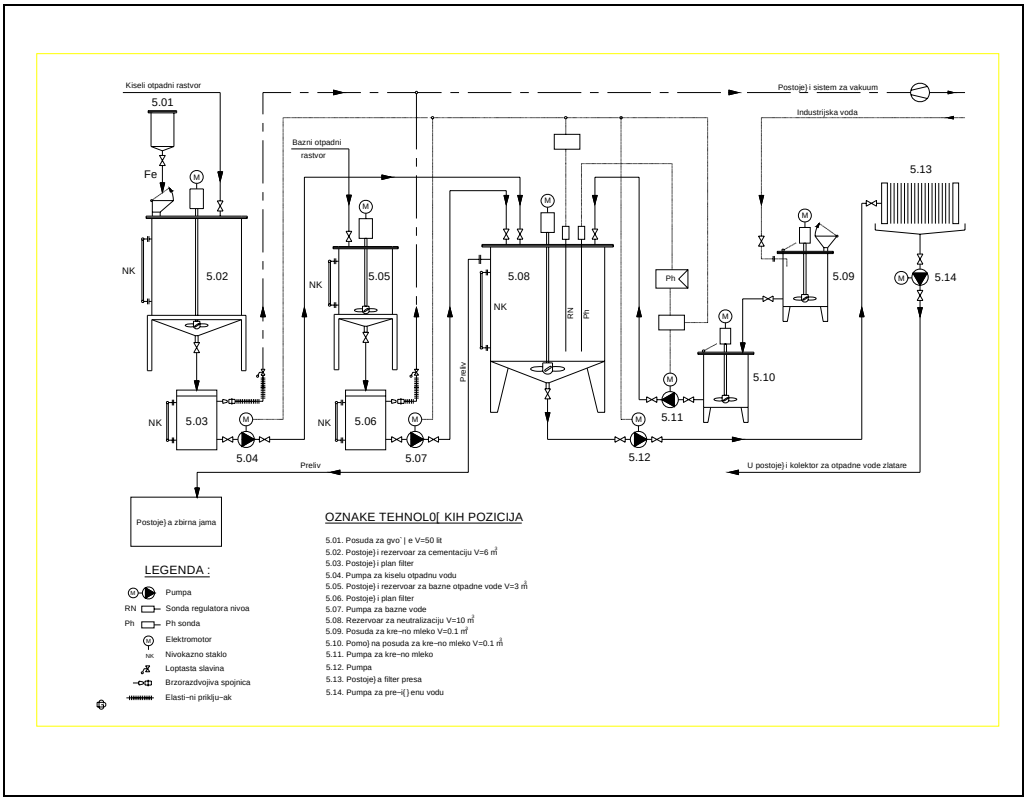

Figure 1. Technological scheme of wastewater treatment in the hydrometallurgical process of metal recovery

4. CONCLUSION

Based on semi-industrial investigations of hydrometallurgical process for precious metals recovery from deselenized anode slime, besides development of technology for precious metals recovery, the wastewater treatment process was simultaneosly defined through the following technological stages:

- Cementation of copper and other metals by the use of powdered iron from acid wastewater
- Neutralization of acid wastewater with base wastewater
- Solid – liquid separation

5. ACKNOWLEDGEMENT

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