



Method For Separation Of Platinum From Platinum-Containing Waste Solutions

Orifjon Naziraliyevich Usmankulov

Head Of The Copper Metallurgy Department Of The Central Laboratory Of New Technologies Of Jsc “Almalyk Mmc”, Uzbekistan

ABSTRACT

This article describes a new technology for the separation of platinum and palladium from solutions after gold electrolysis. As a result of the research, the presence of platinum metal in the solutions of the copper smelter of JSC “Almalyk MMC” was determined and work was carried out on its extraction. The concentration of platinum and palladium in the solution is low, so the method of forming an inelastic complex during their initial precipitation was used. This was followed by palladium and platinum refining steps involving several pyrometallurgical and hydrometallurgical processes. In the end, positive results were achieved and the developed new technology is applied to the production of these metals. [1]

KEYWORDS

Electrolyte, decantation, platinum, thiourea, precipitation, heating, complex compound.

INTRODUCTION

Worldwide, there is a shift towards clean energy, according to the Wall Street Journal, so investors have boosted demand for platinum, with metal prices now rising 14 percent. [2]

In recent years, the use of platinum has been expanding worldwide, especially in Uzbekistan. This is the main reason for the rise in the price of platinum.

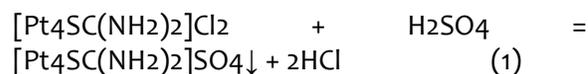
Rising platinum prices in Uzbekistan



The raw material for separating platinum is a solution after gold electrolysis. To precipitate all the gold from this solution, the solution is treated with hydrazine, while the gold is reduced to a state of zero valence and precipitated. Platinum and palladium, on the other hand, are reduced from the 4-valent state to the 2-valent state, but do not sink. Then the solution is sent to the separation of platinum and palladium. Due to the low valence state of these metals in the solution, they do not precipitate under the influence of conventional precipitators. Therefore, additional measures were taken to precipitate platinum from the solution. Platinum and palladium solution is in the form of chloride $PtCl_2$, the concentration of $PdCl_2$ is on average 50-400 mg/l.

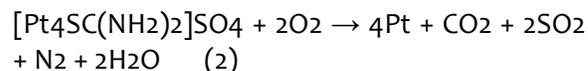
Extraction of high purity platinum powder is carried out in the following sequence.

The initial solution is heated to 70° C and a thiourea solution is added to it according to the amount of platinum in the solution. For example, 1 m³ This forms a thiourea-soluble complex of platinum $[Pt_4SC(NH_2)_2]Cl_2$. For platinum precipitation, the solution is stirred well with 30% sulfuric acid while continuing to heat, allowing the platinum to settle completely for 40-50 minutes.



When the thiourea-insoluble complex of platinum $[Pt_4SC(NH_2)_2]SO_4$ is completely precipitated, the precipitate is filtered and thoroughly washed with distilled water, and the resulting solution is directed to the separation of palladium.

The platinum-containing precipitate, washed from other water-soluble compounds and acid residues, is dried at 110–120° C for 1–1.5 h. After drying, the precipitate is placed in special crucibles and baked in a muffle furnace at 1000° C. The firing process is carried out in several stages, initially holding the temperature at 400° C for 30 minutes and at 500° C for 45 minutes, until the temperature rises to 1000° C and then for one hour at 100° C. The burning process is based on the following reaction:



At the end of the process, platinum powder is obtained, which may contain small amounts of palladium and other non-ferrous metals. The insoluble property of platinum in nitric acid is used to purify the obtained platinum powder from other elements. A 20% solution of nitric

acid is prepared and the platinum powder is thoroughly washed in this solution (S: Q ratio 4: 1) at 60° C for one hour. In this process, almost all of the palladium and other non-ferrous metals are dissolved. The solution is separated from the platinum powder by

filtration or decantation, the resulting wet powder is washed with bidistilled water and dried. At the same time, platinum powder with a purity of 86.9% and 99.90% purity will be produced.

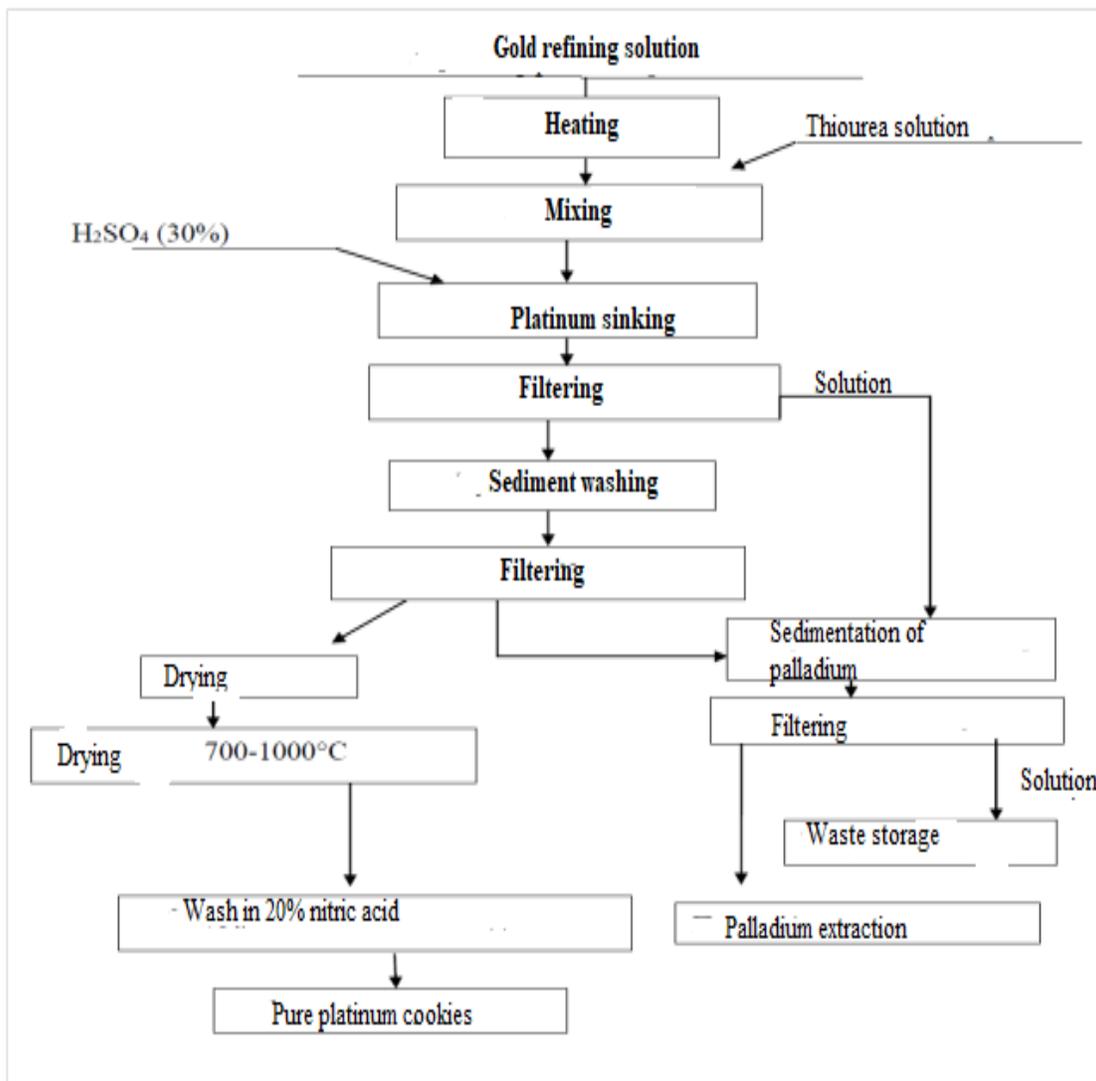


Figure 1. Scheme of separation of platinum powder from gold refining solutions

This technology is embodied:

1. The technology of obtaining refined platinum powder consists of simple, relatively easy processes and includes 16 operations.
2. Provides high efficiency (> 86%) separation from low-platinum solutions as a result of its application.

3. The purity of platinum in the form of powder is higher than 99.90%.

The application of this technology also serves to separate valuable components from waste solutions, as well as to neutralize and neutralize them.

REFERENCES

1. Metallurgy of noble metals, Book 2 Yu.A. Kotlyar, M.A. Meretukov, L.S. Strizhko. Publishing house "Ore and Metals", Moscow 2005 -Pp. 366,367 and 368
2. <https://www.interfax.ru/world/739266>
3. Method for extracting platinum from chloride solutions, Sidorenko Yu.A. Shulgin D.R. V.A. Nasonova Maltsev E.V. Bezprozvannykh I.V. RF patent 2175677. Publication date 10.11.2001.
4. Method for producing platinum metal powder, Antipov N.I. A. V. Tarasov RF patent2 136 770 publication date: 09.10.1999.