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OBTAINING THE PLATINUM (IV) – CHLORIDE $PtCl_4$ OF COMMERCIAL QUALITY

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ABSTRACT
This paper describes the technological procedure of obtaining the PtCl4 of commercial quality. The procedure of decomposition H2[PtCl6] x 6H2O in chlorine stream was used to obtain the platinum (IV) chloride.
By experimental laboratory testing, the platinum-tetra-chloride of commercial quality (content of Pt-57.9%) was obtained.
Starting material was platinum powder quality of 99.98%, obtained by processing the used platinum catalysts in chemical industry (production of nitric acid).
The process of PtCl4 was developed in several stages:
1) dissolution of Pt powder
2) evaporation and crystallization of H2PtCl6
3) obtaining of PtCl4 by chlorination of H2PtCl6 in the defined working regime.
Based on the experimental laboratory testing, the optimum parameters for obtaining the PtCl4 of commercial quality are defined.
Key words: PtCl4, commercial quality, chlorination

1. INTRODUCTION
Platinum (IV) chloride (PtCl4) is a brown hygroscopic crystal easily soluble in water. Standing in the air receives water and passes easily in bright yellow hydrate $PtCl_4 \times 5H_2O$. At higher temperatures, it decomposes to the platinum metal [1].
In the Mining and Metallurgy Institute in Bor, $PtCl_4$ of commercial quality was obtained with platinum content of 57.9% according to the selected technology [2]. The following equipment was used: the Erlenmeyer flask for dissolving Pt powder, a bottle with Cl_2, a sand bath for evaporation and crystallization of H_2PtCl_6 and a tubular oven for annealing of H_2PtCl_6 crystals in a chlorine stream H_2PtCl_6.
Chemical content of final product has shown the presence of following impurities:
Si<50 ppm, Fe< 20 ppm, Pb<10ppm, Al< 10ppm, Cu<20ppm, Ag<17ppm, Pd - 80 ppm, Ca -80ppm, Mg – 120 pmm.

2. EXPERIMENTAL PART
Experimental studies were focused on getting the platinum (IV) - chloride, where the starting raw material was platinum powder of purity 99.98% Pt. The process of obtaining the $PtCl_4$ is shown in Figure 1 in technological scheme.

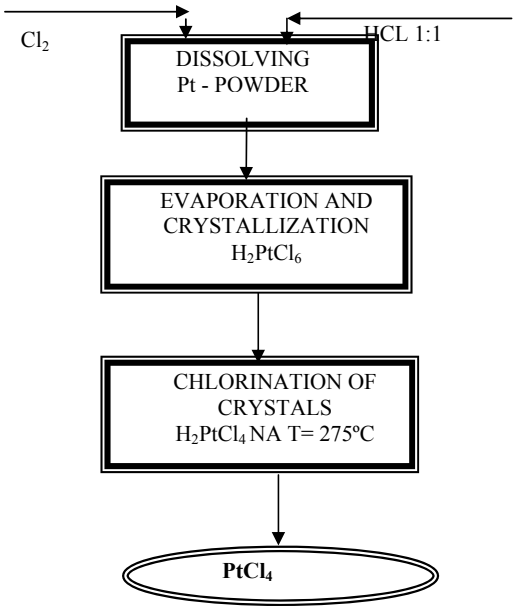

Figure 1. Technological flow sheet of obtaining the $PtCl_4$ of commercial quality

The first phase of PtCl4 obtaining is dissolution of platinum powder as shown in Figure 1 by the technological flow sheet. Weight of Pt sample for disolving was 100 g. The best result of platinum dissolution was realized at the following conditions: 1. dissolving in HCl 1:1 + Cl_2, 2. temperature 90°C, 3. dissolution time 3 h.

The obtained solution of platinum acid H_2PtCl_6 was furher evaporated in a glass bowl on the sand bath to the syrupy coexistence.

The obtained crystals of H_2PtCl_6 x $6H_2O$ were charged in a boat of quartz glass. Chlorination process was developed in a tubular oven, shown in Figure 2. Manufacturer of oven is "Heraeus"- Germany.

Figure 2. Tubular oven for annealing

Chlorine from the bottle, through a rubber hose, is led to the cover of tubular oven and is constant introduction of Cl_2 is carried out. Chlorine flow is regulated through a valve on the bottle. Heating mode is controlled by the thermostat which is supplied with furnace. At temperature of 60ºC, at the constant introduction of chlorine, the melting of a product has started. Temperature was gradually increased to 150ºC until the disappearance of water vapor. During the period of 2 h, the heating was gradually done until the working temperature of 275ºC was reached. At a constant operating temperature with the introduction of chlorine, the annealing was continued for another ½ h.
After completion the annealing process, the product was cooled at temperature below 150ºC and, in a warm state, is packed into dry and heated jars of opaque glass with security flap.

3. CONCLUSION

For the production of $PtCl_4$ salt of commercial quality, the pure platinum is required with more than 99.95% Pt. The material of boat is very important where the H_2PtCl_6 x $6H_2O$ crystals are annealed as well as the tube, where the boat is, in the process of chlorination and heating. The most effective material is a quartz glass due to the resistance to increased temperatures and gaseous chlorine.
After a series of performed annealing experiments of H2PtCl6 x 6H2O crystals in the tubular oven, the technology is completely developed and confirmed for obtaining the $PtCl_4$ per selected technology [2]. The quality of obtained product $PtCl_4$ is fully suitable for the foreign consumers.

4. ACKNOWLEDGEMENTS

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5. REFERENCES

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