

TITANIUM POWDER SEGREGATION OUT OF CATHODE DEPOSIT OF TITANIUM ELECTROLYZERS

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Processes of fluorination and electrolytic reduction of TiF_4 in a fluoride salt melt are key processes of fluoride technology for producing titanium powders [1]. The present work is devoted to the development of one of the most important stages of the proposed fluoride titanium technology - the process of washing off the cathode deposit from electrolyte salts. This deposit forms in the course of electrolytic recovery of titanium from fluoride melts.

In order to wash off impurities of titan-containing cathode deposit, two techniques were proposed - in a mixture of inorganic acids and anhydrous HF; advantages of washing off with HF are shown; the impurity content in the titanium powder obtained by washing off in anhydrous HF is slightly lower than at "acid" washing off. This happens due the dissolution of these impurities in anhydrous HF in the course of washing off. In the industrial implementation of washing off the cathode deposit in anhydrous HF, this reagent recycles in a circuit that ensures environmental safety of production and low production cost of the obtained titanium powder.

When carrying out washing off, the cathode deposits of 50 g weight. Ti content in sediments was 30-35% by weight (17.5 g), and the content of fluoride salts of electrolyte LiF-KF-NaF – 70-65 % by weight (32.5 g) accordingly. Results cathode deposit change studies in dependence on the temperature are shown in Fig. 1. Obtained results show that at $-40\text{ }^\circ\text{C}$ the decrease in the cathode deposit weight occurs in the minimum time – 20-22 minutes. With increasing washing off temperature sharply increases the number of HF, being in a gas phase, and the washing off process becomes ineffective.

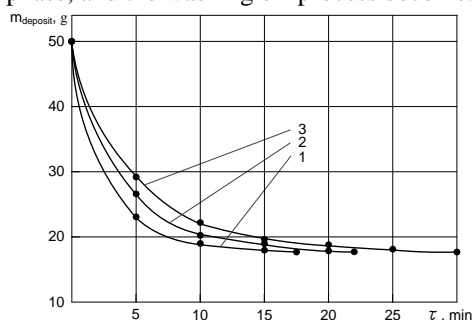


Fig. 1. Effect of washing off temperature on the change in the cathode deposit weight. Temperature of the washing off process: 1 – $50\text{ }^\circ\text{C}$; 2 – $-40\text{ }^\circ\text{C}$; 3 – $-30\text{ }^\circ\text{C}$.

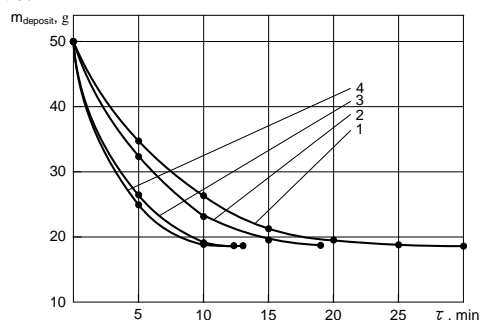


Fig. 2. Effect of HF excess on the dissolution rate of fluoride salts of the cathode deposit. Temperature of the washing off process $-40\text{ }^\circ\text{C}$; HF excess: 1 – 5 % vol.; 2 – 10 % vol.; 3 – 20 % vol.; 4 – 30 % vol.

The effect of HF excess on the dissolution rate of fluoride salts contained the cathode deposit at $-40\text{ }^\circ\text{C}$. The research results are presented in Fig. 2. It is shown that when increase of HF excess from 5 up to 20% by volume, the dissolution time of fluoride salts, contained in the cathode deposit, is reduced. These salts dissolve almost completely in 20% by volume. HF excess in the course of 10-12 minutes. Increase of HF excess of HF up to 30% by volume does not lead to reducing dissolution time of the cathode deposit. Therefore, the deposit dissolution process should be performed at 20% HF excess.

BIBLIOGRAPHY

1. Cardarelli F. "Materials Handbook. A Concise Desktop Reference." 2nd edition. Springer, New York. – 2008. – P. 288-296.