Badania nad zastosowaniem dodatków zawierających ciecze jonowe w procesach elektrolitycznego wydzielania miedzi

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Abstract

In the proposed thesis, the results of research on the selection of new sets of inhibitors for the electrolytic copper deposition process and their impact on current indicators and the quality of the final product have been presented. Commonly used additives have disadvantages, including the loss of inhibitory properties and durability due to hydrolysis at elevated temperatures and the acidic environment of the electrolyte or the presence of sulfur in the thiourea molecule, which can be incorporated into the copper structure. To eliminate the numerous inconveniences and improve the performance of classical inhibitors, attempts have been made to develop a new set of additives, including an ionic liquid. No domestic or global electrolytic refinery produces electrolytic copper by adding this group of compounds. The criterion for evaluating the effectiveness of the new set of inhibitors was the improvement of the current process indicators while maintaining quality standards for the highest quality electrolytic copper.

Several organic substances have been selected, and their electrochemical properties have been examined using cyclic voltammetry. Electrolytic deposition and electrorefining tests with new additives have been carried out, and their consumption has been determined during the process. Initial concentrations of the components of the inhibitor sets in the circulating electrolyte have been selected, and the size of their dosing has been determined. The interaction of new and previously used industrial inhibitors on the course and results of the studied process has also been checked. The selected sets have been directed to tests using a model apparatus for conducting electrolytic copper deposition processes on a scale reflecting industrial conditions. The tests have been carried out over time using industrial electrolytes and industrial anode copper. The studies determined the impact of the initial concentration and dosing of new inhibitors on the quality of the obtained cathodic deposits and the current indicators of copper electrorefining. The effect of new inhibitors on the process, including mainly the distribution of impurities between cathodic copper and the forming anode sludge, has also been determined.

The research has been proven that new inhibitors, including an ionic liquid, are possible, enabling high-quality, fine-crystalline copper cathode deposits with favorable process current indicators and high cathodic current efficiency. The scope of the research and the obtained results have been created the premises for scaling up the process to ultimately use the developed sets of inhibitors under industrial conditions.