Full Paper _____ *Thematic Section:* Research into New Technologies.
Reference Object Identifier – ROI: jbc-02/18-55-8-120 *Subsection:* Electrochemistry.
Publication is available for discussion in the framework of the on-line Internet conference "*Chemical basis for the rational use of renewable natural resources*".
http://butlerov.com/natural_resources/
Submitted on Jule 14, 2018.

Investigations of the influence of white spirit on the parameters of electrolysis of zinc from acidic solutions

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Keywords: white spirit, zinc, current density, potential, transfer number, exchange current, stirring, sulfuric acid.

Abstract

The aim of the work was to obtain data on the constants of electrolysis of zinc in the presence of an organic solvent of white spirit during potentiostatic and galvanostatic studies using a potentiostat.

As a result of the work performed, it was shown that additions of organic solvent of white spirit reduce the speed of the electrochemical process and the total polarization capacity. At the same time, molecules of organic substances have relatively large dimensions, and their adsorption leads to an increase in the distance between the plates of the capacitor in the double layer and, thereby, reduces the polarization capacitance.

From the experimental data obtained by us, it can be seen that the total polarization capacitance with the addition of white spirit decreases from $13.0 \cdot 10^{-3}$ to $5.5 \cdot 10^{-3}$ F/cm^2. According to galvanostatic measurements, the Tafelian dependences of the cathode overvoltage on the logarithm of the current density were constructed and the transfer numbers and exchange currents were calculated. These parameters were calculated on two sections of the Tafel curve: at the initial section (including the current load of 1.3 mA and, respectively, the current density 0.01429 A/cm^2) and at the final stage – up to 3 mA (0.03333 A /cm^2). It is shown that the transfer numbers of zinc electroconversion in the initial sections decrease with the increase in the amount of the additive, and in the final sections increase with increasing current load. Such a pattern of the change in the transport numbers is connected, in our opinion, at low currents with the reverse process of zinc oxidation, and at high currents, with practically no increase in overvoltage with an increase in the current load in the presence of white spirit additives.

The results of the investigations made it possible to obtain new data on the effect of organic solvents used in zinc production in the extraction of indium on the electrochemical parameters of zinc electrolysis.

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