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Cathode processes in solutions of zinc sulfate in the presence of surface active substances

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Abstract

Electrochemical studies of the effect of surfactant additives and a background solution of sodium sulfate on electrode processes involving zinc were carried out. Electrochemical investigations were carried out on a sulfate electrolyte containing 0.005, 0.0125 and 0.025 mol/l $ZnSO_4$ in a background 0.5 mol/l solution of Na_2SO_4. Individual studies were performed using electrolytes of composition: 0.25 mol/l $ZnSO_4$; 0.25 mol/l $ZnSO_4$ + 18 g/l H_2SO_4. To the electrochemical cell, the flocculants were dosed in the form of an aqueous solution with a concentration of 2.5 g/l in an amount of 25-50 mg/l. The dosage of flocculants corresponded to their consumption in the hydrometallurgical cycle. Lignosulphonate (LST) was added in an amount of 80 mg/l. The removal of the polarization curves in a dynamic mode was carried out on the potentiostat "*Potentiostat P-30 Jcom. Elins Electrochemical Instruments*" using a three-electrode cell. The working electrode (cathode) is made of Z0A zinc with the area of 0.35 cm^2, the auxiliary (anode) is made of platinum plate with the area of 0.20 cm^2, the reference electrode is silver chloride (Ag/AgCl).

Polarization curves are obtained in dynamic mode at a sweep rate of 100 mV/s in the potential range from -1000 (-1075) to -1250 mV (Ag/AgCl). It is shown that in the presence of a background solution of sodium sulfate, after an initial increase in the cathode current, its decrease occurs at potentials that depend on the ratio of zinc to sodium sulfate in the electrolyte.

When the polarization curves are removed under conditions of intense mixing, the value of the potentials, characterizing the onset of a decrease in the growth of the cathode current density shifts more positively. At a potential of -1200 mV, the cathode current begins to rise again.

The polarization curves obtained in the dynamic mode in the presence of cationic and anionic flocculants and lignosulfonate are consistent with the theory of electrochemical processes. In the presence of additives, the density of the cathode current decreased, which can be related to the blocking of the surface (Loshkarev effect). At the same time, according to the electrochemical theory, the cationic surface active flocculant K6645 flask in the presence of specific adsorption should increase the cathodic polarization of the zinc discharge in connection with the increase of the diffusion potential, which agrees with the experimental data obtained by us. The anionic K4034 flask, as well as the anionic lignosulfonate, in turn, should reduce the cathodic polarization and thereby increase the density of the cathodic current.

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