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Development of electrodialysis process for aluminous solutions

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One of the mostly perspective method of scrapping industrial drains is electrodialysis, which is used by us for processing of low concentrated aluminous solutions (g/L: Na_2O_{total}－23.2, $Na_2O_{caustic}$－3.9, Al_2O_3－2.7, SO_3－5.8), arises by receipting of aluminum hydroxide, which goes to synthesis of aluminum hydroxochloride-high effective new generation coagulant. While electrodialysis caustic alkali concentrates in cathodic camera, hydroxide aluminum detaches in anodic camera.

Research takes place in installation with two cameras with steel electrodes and with cation-exchange membrane MK-40, which separates the installation on two equal cameras (cathodic and anodic) with volume 200 mL. With the increasing of current density from 1 to 4 A/dm^2, time of alkali concentration (from 17 to 32 g/L) reduces from 4 to 0.75 h. At the range of current density from 2 to 4 A/dm^2 there is practically a linear dependence of current density to time. We receive kinetic dependencies of concentration model solutions and real industrial drains from temperature, different current densities, voltage and initial concentration of caustic alkali.

The concentration of 15% alkali is reached in cathodic camera by repeated concentration of initial solution from anodic camera. It allows us to use concentrated alkali second time for production alumina. The transportation speed of Na^+ ions to the anodic camera practically not depends of concentration NaOH in anodic camera.

Economical calculation of using electrodialysis as the method of processing low concentrated aluminous solutions on factory for 169 000 m^3/year shows high effectiveness. The time of recompense is less then 0.8 years.

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