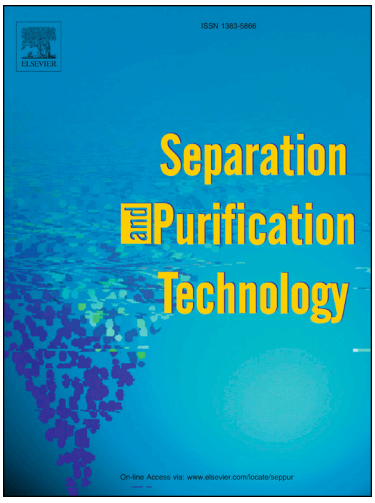

Pilot scale complex electrodialysis technology for processing a solution of lithium chloride containing organic solvents

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Abstract

The paper presents the results of tests of an electromembrane installation for the complex processing of a technological solution formed in the production of para-aramid fibres. The installation consists of two main units and three different electrodialysers, each of which performs its specific function. Electrodialysis with bipolar membranes is designed to produce lithium hydroxide, a conventional electrodialysis module is designed for preliminary treatment of the technological solution and its preconcentration and electrodialysis with ion-exchange resin serves for finishing cleaning and complete removal of ionic impurities from the solution. Optimum parameters of the process were chosen, which allows processing 6.3 m3 of technological solution per day. The total operating time of the installation during the tests was 770 hours.

The main specific characteristics of the process of obtaining lithium hydroxide by electrodialysis with bipolar membranes from technological solutions with a mass fraction of organic components ranging from 1.8 to 59% are determined. The average current efficiency in solutions with different contents of organic components were 0.6; the specific productivity for lithium hydroxide decreases from 5.7 to 2.1 mol × m-2 × h-1 with an increase in the proportion of organic solvents. The combination of conventional and ion-exchange electrodialysis allows obtaining a pure water-organic mixture with a current yield of no less than 0.4.

During the entire operation of the plant, no signs of degradation of the ion-exchange membranes used and deterioration of the installation operation have been detected.

Keywords: electrodialysis; bipolar electrodialysis, electrodeionization, lithium hydroxide, lithium chloride, dimethylacetamide, aprotic solvent, membrane stability.

1 Introduction

Ion-exchange membranes and electromembrane processes are widely used in water treatment, food industry, energy production, separation of fermentation products of biomass, analytical chemistry, medicine, etc. [1].