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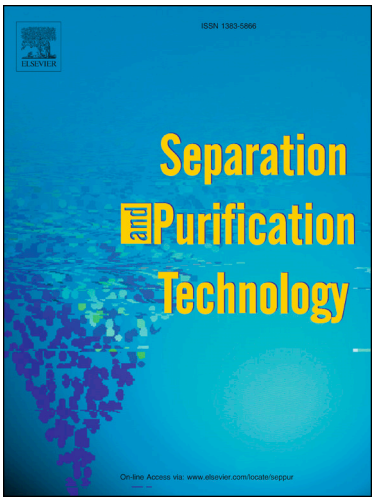

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Evaluation of the effect of the solution concentration and membrane morphology on the transport properties of Cu(II) through two monopolar cation-exchange membranes

Kayo Santana Barros[1]; Tatiana Scarazzato[2]; Jorge Alberto Soares Tenório[3]; Denise Crocce Romano Espinosa[4]

[1,2,3,4]Department of Chemical Engineering, University of São Paulo (USP). Av. Professor Lineu Prestes, 580, Bloco 18 – Conjunto das Químicas, 05434-070. São Paulo – SP. Brazil.

[1]Corresponding author: kayobarros.s@gmail.com

[2] tatiana.scarazzato@gmail.com

[3] jtenorio@usp.br

[4] espinosa@usp.br

Abstract

The transport properties of the heterogeneous HDX 100 and homogeneous PC-SK membranes were evaluated by chronopotentiometry for the treatment of the cyanide-free electroplating wastewater with copper ions in acid medium and they were related to the membranes morphology. It was determined the fraction of conductive area, limiting current density, ohmic resistance, plateau length and transport number for both membranes in different Cu^{2+} concentrations (0.1; 0.5, 1.0, 1.5 and 2.0 g/L) in pH 3. Typical current-voltage and chronopotentiometric curves of monopolar membranes were constructed and the obtained results showed that the PC-SK achieved a local concentration of cupric ions at the conductive regions greater than HDX and it affected some transport properties as the ohmic resistance. In addition, chronopotentiometric curves of a concentrated solution with 5 g Cu^{2+}/L were also constructed and only the curves of PC-SK showed an additional inflexion point typical for bipolar membranes. Besides, a large amount of a blue solid material was formed and visually observed at the end of the experiment only with PC-SK and it is related to its homogeneity, low fraction of conducting regions, water content, and ion exchange capacity.

Keywords: Chronopotentiometry; electrodialysis; copper; heterogeneity; membrane.

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