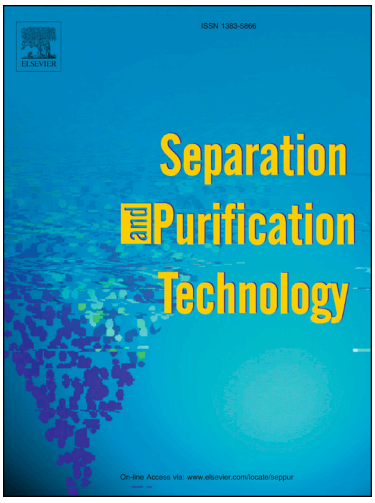

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Kayo Santana Barros, Denise Crocce Romano Espinosa

PII: S1383-5866(18)30248-X
DOI: https://doi.org/10.1016/j.seppur.2018.03.013
Reference: SEPPUR 14433

To appear in: *Separation and Purification Technology*

Received Date: 21 January 2018
Revised Date: 4 March 2018
Accepted Date: 6 March 2018

Please cite this article as: K. Santana Barros, D. Crocce Romano Espinosa, Chronopotentiometry of an anion-exchange membrane for treating a synthesized free-cyanide effluent from brass electrodeposition with EDTA as chelating agent, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.03.013

Chronopotentiometry of an anion-exchange membrane for treating a synthesized free-cyanide effluent from brass electrodeposition with EDTA as chelating agent

Kayo Santana Barros[1]; Denise Crocce Romano Espinosa[2].

[1,2]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@usp.br

[2]espinosa@usp.br

Highlights

- CVCs, ChPs and speciation diagrams suggest formation of H_4EDTA precipitate at pH 11
- At pH 12, the 1st and 2nd inflexion points were due to $Zn(EDTA)^{2-}$ and $Cu(EDTA)^{2-}$
- For Cu^{2+}/Zn^{2+} molar ratios lower than 50%, the undesirable insoluble CuO is formed
- The increase in EDTA concentration practically do not alter the CVCs and ChPs
- The best condition may be pH 9 or 10, Cu^{2+} proportion = 50% and EDTA/Cu^{2+} = 2.5

Abstract

The promising substitution of cyanide by EDTA as chelating agent in brass electrodeposition has been evaluated by many researchers in the last few years. This is very interesting for treating the effluent generated, since the presence of EDTA facilitates the recovery of the metals using electrodialysis, for example. Hence, using chronopotentiometry, our aim was to investigate the transport properties of the chelates involved in the potential treatment by electrodialysis of the effluent generated in the free-cyanide brass electrodeposition. We assessed the limiting current density, ohmic resistance, plateau length, concentration polarization and the undesirable precipitate formation in function of the solution pH, Cu^{2+}/Zn^{2+} proportion and EDTA/Cu^{2+} molar ratio using the anionic HDX200 membrane. The pH solution showed a strong relation with all the properties and under higher pH, precipitate formation by the curves behavior was verified. Besides, the precipitate formation was also observed for the lower proportion of Cu^{2+}, while no unexpected behavior was verified for Cu^{2+} concentrations $\geq Zn^{2+}$. Finally, the EDTA concentration altered only the limiting current density, since similar typical chronopotentiograms and current-voltage curves were obtained. It was found that the better conditions of the effluent to be treated may be pH 9/10, Cu^{2+} proportion = 50% and EDTA/Cu^{2+} = 2.5.