Application of an electrodialysis process to recover nitric acid from aluminum finishing industry waste

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ABSTRACT

In this study, experiments were conducted with a conventional electrodialysis (ED) process to recover nitric acid from rinsing-wastewater originated in the aluminum finishing industry. A laboratory-scale ED cell was used, and the optimal operating conditions and parameters were defined in these tests. Five different external voltages (10, 15, 20, 25, and 30 V) were applied to the ED system to determine the appropriate potential difference. Conductivity, pH, acidity, and quality of recovered nitric acid were monitored continuously. The maximum conductivity removal was achieved as 90% when the potential difference was applied as 25 V. The efficiency of the ED process was calculated through current density, energy consumption, etc. The specific energy consumption was calculated as 0.11 kWh/mol when the potential was adjusted to 15 V. Applicability of the method for recovery of nitric acid was examined. With the aim of zero pollutant emissions, the ED process might be of significant interest to the aluminum industry, providing a closed-loop acid usage in aluminum anodizing process, reducing the environmental and economic burdens.

Keywords: Aluminum industry; Nitric acid recovery; Electrodialysis process; Rinsing wastewater

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