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Effect of current density on COD removal efficiency for wastewater using the electrocoagulation process

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ABSTRACT

The electrocoagulation process is an electrochemical technique that has demonstrated wide potential because it can be applied to wastewater from different industrial sectors considering the principles of electrolysis and coagulation. It is a low-cost method and of easy installation. Effluents with high concentrations of oils grease and chemical oxygen demand (COD) can be treated successfully obtaining high removal efficiencies. The purpose of this study was to analyze the effect of current density on the performance of oil/grease removal (OG), COD, and turbidity (NTU), as well as the pH variation and electrical conductivity during the process in batch mode. The effluent from the dairy industry with 172.6 mg OG/L, removed 70.30% OG, 75.38% COD with 76.92 A/m^2 in 25 min of electrolysis. Two combinations of 2Fe-1Al and 1Fe-2Al anodes were analyzed at 68.38 A/m^2, reaching removals of 74.74% and 70% of OG, respectively. Regarding the domestic kitchen effluent, the COD initial was 1,766 mg/L, and working with two Fe-anodes, the OG removal efficiencies in 15 min of electrolysis were 94.9%, 96.75%, and 96.53% with current densities of 37, 56, and 74 A/m^2, respectively. The OG removal efficiencies were similar with Al-anodes. The COD removal efficiencies with Fe-anodes were 66.7%, 76.9%, and 68.7%, and with Al-anodes were 76.3%, 77.4%, and 77.5%, respectively. Both effluents were studied with an inter-electrode distance of 3 cm, and the pH in both cases varied from 7 to 8, which favors the elimination of contaminants by adsorption. The electrical conductivity did not undergo major changes, favoring the economy of the electrocoagulation process. Electrocoagulation is a low-cost electrochemical process in order to remove organic pollutants.

Keywords: Electrocoagulation; Dairy industrial and domestic wastewater; Fe- and Al-anodes

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