

Oily wastewater treatment by hybrid ultrasound and electrocoagulation batch process

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ABSTRACT

Chemical coagulants are often added to destabilize secondary oil in water emulsions. However, numerous studies showed that electrocoagulation is an adequate alternative for the chemical coagulation process in wastewater treatment. Therefore, the effect of a hybrid system with ultrasound and electrocoagulation batch processes on the treatment of oily wastewater is analyzed in this paper. Totally, six experiments, with three different setups, were performed on a laboratory scale. For removal of mineral oil, the combination where electrocoagulation was used prior to ultrasound, with the addition of NaCl, showed to be the most efficient as the mineral oil concentration decreased by 70% after 40 min of the treatment. This combination also showed to be the most efficient for chemical oxygen demand (COD) removal (35% removal efficiency). The addition of electrolyte also positively affected the COD removal efficiency in the other two setups, that is, in parallel (simultaneous) operation and when electrocoagulation was used after the ultrasound. The parallel operation with the addition of electrolyte showed to be the most successful for Cr (99.12%), Ni (98.15%) and Pb (99.79%) removal. Regardless of the electrolyte addition, electric conductivity decreased during the electrocoagulation process due to the oxidation of chloride and metal ions.

Keywords: Chemical oxygen demand removal; Electrocoagulation; Heavy metals removal; Mineral oil removal; Oily wastewater; Ultrasound; Wastewater treatment

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