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Efficient and Sustainable Remediation of Refinery Wastewater Using Electrocoagulation and Advanced Oxidation Techniques

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ABSTRACT

Effluent wastewater from industrial processes needs to be properly treated before being discharged into the environment. Conventional procedures for handling this wastewater can be problematic due to the presence of toxic elements, time constraints, and complexity. However, a new electrochemical procedure has been developed as an effective method for remediation. In a recent study, refinery wastewater was successfully treated using an electrochemical technique combined with ultrasonic irradiation and photocatalysis. The study found that electrocoagulation, which uses cheap and recyclable metal electrodes, was a simple, efficient, practical, and cost-effective way to handle refinery wastewater. Various parameters were investigated, including electrode metals, operating time, applied voltage, pH, inter-electrode gap, and temperature. The aim was to determine the optimal configuration for pollutant removal. The study also focused on the synergistic effects of combining electrocoagulation and photocatalysis to improve the efficiency of contaminant removal in oily wastewater. By integrating these two treatment technologies, the researchers aimed to enhance pollutant removal rates, energy efficiency, and overall system performance. The research provided valuable insights into the feasibility, optimization parameters, and applicability of the electrocoagulation-photocatalysis process for remediating organic contaminants in oily wastewater industrial effluents. The results showed that electrocoagulation, especially when combined with ultrasonic irradiation and TiO_2 photocatalysis, was highly effective in pollutant removal within a short timeframe. These findings support the implementation of this procedure for remediating most industrial wastewater.In conclusion, the study contributes to the development of more effective and sustainable water treatment strategies. The electrocoagulation-photocatalysis process shows promise in addressing the remediation of organic contaminants in oily wastewater from industrial processes.

Keywords: electrocoagulation, photocatalysis, ultrasonic, wastewater, refinery, oily wastewater

INTRODUCTION

The growing shortage of fresh water is a worldwide concern. A substantial reduction in the amount of obtainable fresh water (in both quality and quantity) is exacerbating fears about how this will influence human well-being, ecosystems, and the world economy (Al-Jadir et al., 2022). Thus, many countries and organizations have attempted to solve this problem by reducing contamination, eliminating dumping, decreasing the number of unsafe materials that are released, reducing the quantity of untreated wastewater, and greatly increasing reprocessing and safe recycling.