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Using electro-peroxone process for petrochemical wastewater treatment: cost evaluation and statistical analysis

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ABSTRACT

Recently, advanced oxidation processes (AOPs) are getting growing courtesy to be employed for petrochemical wastewater remediation. Electro-peroxone is a branch of AOPs which is a combination of ozone and electrochemically generated H_2O_2 that can generate hydroxyl radicals. In this study, it was used for the treatment of petrochemical wastewater. The central composite design (CCD), was utilized to investigate the impact of functional parameters on chemical oxygen demand (COD) removal (response). The optimal conditions predicted through the CCD were pH at 8.2, and the amount of COD at 1,340 mg/L, ozone flow rate at 1.00 L/min, and applied current at 1.61 Å. The graphical Pareto chart was executed to study the effect of each operative variable on the response and the amounts of COD have a remarkable impact on the removal of COD. The predicted and actual COD removal were 93.1% and 94%, respectively, at the predicted optimum conditions. The operational H_2O_2 generation from ozone at the cathode is the crucial parameter for the significant COD removal. The amounts of other parameters such as total organic carbon, total dissolved solids, and biological oxygen demand were reduced significantly. At optimal conditions, the COD was decreased from 1.34 to 0.11 kg/m^3 and the total reduction of COD was 1.23 kg/m^3. Due to the cost analysis, the operational cost was achieved to be 1.0 US \$/m^3, and about 1.0 US \$ was needed to treat 1 m^3 of studied wastewater. Therefore, this treatment method is more cost-effective.

Keywords: Electro-peroxone process; Pareto chart; Central composite design; Advanced oxidation processes

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