

Purification and detoxification of petroleum refinery wastewater by electrochemical process

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Abstract: The treatment of synthetic oily wastewater having the characteristics of a typical petrochemical wastewater (PRW) by electrocoagulation (EC) using iron and aluminum electrodes was conducted in an electrolytic reactor equipped with fluid recirculation. During the treatment, the emulsion stability was followed by the measurement of Zeta potential and particle sizes. Effects of some operating conditions such as electrodes material, current density and electrolysis time on removal efficiencies of turbidity and chemical oxygen demand (COD) were investigated in details. The PRW purification by EC process was found most effective using aluminum as anode and cathode, current density of 60 A/m² and 30 min of electrolysis time. Under these conditions, the process efficiencies were 83.52% and 99.94% respectively for COD and turbidity removals which correspond to final values of 96 mgO₂/L and 0.5 NTU. A moderate energy consumption (0.341 kWh) was needed to treat 1 m³ of PRW. Besides, the ecotoxicity test proved that toxic substances presented in the PRW, and those inhibiting the germination growth of wheat, were eliminated by the EC technique.

Keywords : petroleum wastewater purification, electrocoagulation, energy consumption, ecotoxicity test.