

## **Comparative study of electrochemical oxidation and electrochemical Fenton processes for simultaneous degradation of phthalic and para-toluic acids from aqueous medium**

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### **Abstract:**

Degradation of binary component of purified terephthalic acid wastewater viz. phthalic acid and para-toluic acid from aqueous medium was investigated in this study. Aqueous solution was initially subjected to acid precipitation treatment at various pH (2–4) and temperature (15–60 °C). After acid treatment, the solution was further subjected to electrochemical oxidation and electrochemical Fenton treatments using graphite electrodes. During electrochemical treatments, effect of process variables such as initial pH: (1–9), current density: (30.48–91.45 A/m<sup>2</sup>), NaCl concentration: (0.5–1.5 g/L), Fe<sup>2+</sup> concentration: (0.5–1.5 mmol/L) and time: (15–95 min) was studied and optimized through central composite design. Maximum removal efficiencies during electrochemical oxidation treatment were 64.55%, 60.24% and 62.77% for phthalic acid, para-toluic acid and chemical oxygen demand respectively with an electric energy consumption of 28.50 kWh/kgCODremoved at optimum conditions. The removal capacities during electro-Fenton treatment were found 75.21%, 65.19% and 68.15% for phthalic acid, para-toluic acid and chemical oxygen demand respectively with 20.11 kWh/kgCODremoved energy consumption at optimum conditions. Both processes were compared based on removal efficiencies, electric energy consumption, kinetics and sludge characteristics. Sludge generated after electrochemical treatments was analyzed by various characterization techniques. In order to get maximum removal efficiencies and minimum energy consumption, electrochemical Fenton method was found more effective than electrochemical oxidation during this study.

### **Keywords:**

Electrochemical oxidation, Electrochemical-Fenton, Phthalic acid, Para-toluic acid, Central composite design

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