Electrochemical Degradation of Diethyl Phthalate under Different Operating Conditions

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In this study, different operating conditions were tested for the electro-degradation of diethyl phthalate (DEP) (an emerging contaminant) in aqueous solutions. The results show that the DEP electro-degradation followed pseudo first-order kinetics. The degradation efficiencies and (apparent) rate constants of DEP increased with the increase of current density and solution temperature (activation energy = 8.0 kJ/mol), but decreased with initial DEP concentration. The boron-doped diamond (BDD) anode was significantly better than PbO₂ and Pt for DEP degradation and TOC removal. The apparent rate constants were 2.87×10^{-4} , 2.00×10^{-4} , and $5.00 \times 10^{-5} \text{ s}^{-1}$ for the degradation of 50 mg/L DEP at 200 mA/cm² and 25°C in 0.1 M Na₂SO₄ solution at BDD, PbO₂, and Pt anodes, respectively. After 210 min electrolysis, the BDD achieved total mineralization of 50 mg/L DEP in both 0.1 M Na₂SO₄ solution and municipal wastewater treatment plant secondary effluent. Hence, the electrochemical method was a promising process for the effective treatment of DEP and similar pollutants in municipal wastewater.

Keywords: electrochemical degradation; diethyl phthalate; boron-doped diamond (BDD) electrode; mineralization

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