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ELECTRO-FENTON PROCESS FOR DIBUTYL PHTHALATE DEGRADATION: TOWARD LANDFILLS LEACHATE TREATMENT

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Abstract

Landfill leachate is a complex effluent containing a wide variety of contaminants likely to harm receiving ecosystems. First, an in-depth analysis of the raw leachate was carried out, revealing the presence of several organic and inorganic pollutants, including dibutyl phthalate (DBP), a plasticizer known for its endocrine-disrupting properties and persistence in the environment. DBP was chosen as the model pollutant for the optimization of the homogeneous Electro-Fenton process (EFB), because of its representativeness and toxicity. The optimization was carried out on a synthetic matrix containing only DBP, making it possible to assess the effect of various experimental parameters: current intensity, electrolyte dose, concentration of ferrous catalyst, initial concentration of the pollutant, and treatment time. The experiments were carried out in a 250 mL EFP reactor, equipped with a synthetic graphite cathode and a *Ti/Pt* anode, favoring the in-situ generation of hydrogen peroxide (H_2O_2) and hydroxyl radicals (•OH), key reactants in the process. The best performances were obtained under the following conditions: $[DBP]_0$ = 120 mg/L, $[Na_2SO_4]$ = 3 g/L, $[Fe^{2+}]$ = 50 mg/L, *pH* = 3, for a treatment time of 2 hours. These conditions resulted in a significant reduction in *DBP* concentration, accompanied by a removal of around 92% of chemical oxygen demand (*COD*), testifying to a high degree of mineralization of organic matter in a simple matrix. In a second phase, the optimized conditions were applied to real leachate, in order to assess the effectiveness of the process on a more complex matrix. Overall, a 65% reduction in the total organic load of the leachate was observed, confirming the potential of the electro-Fenton process for treating persistent organic pollutants in complex real effluents.

Keywords: Chemical Oxygen Demand, dibutyl phthalate, electro-Fenton, landfill, leachate, synthetic solution

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