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Electrochemical treatment of bio-treated landfill leachate: influence of electrode arrangement, potential, and characteristics

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Abstract

The integration of electrocoagulation and electrooxidation process was employed to treat residual organic pollutants, ammonia, and total phosphorus for bio-treated landfill leachate. Electrochemical processes with dimensional stable anode, iron electrode and graphite felt cathode were studied under different electrode arrangement of bipolar electrode, dual anodes, and monopolar anode systems. Their performance for removal of pollutants and characteristics of the precipitates was evaluated. The effects of applied voltage from 7 V to 14 V, flow direction, and contents of suspended solids on removal performance were investigated. The best performance of simultaneous removal was recorded at the bipolar system, with the removal efficiency of 65%, 100%, and 91% for organic pollutants, ammonia, and phosphorus at 1.5 Ah L^{-1}. The fluorophore distributions in the fractions of organic pollutants revealed that humic and fulvic acid-like substances were removed after the bipolar electrode process. Different compositions of Fe and O identified as FeO(OH) and γ-Fe_2O_3 were found in precipitates generated in bipolar and dual electrodes system. An applied voltage of 10 V and the cathode inflow mode facilitated the simultaneous removal process. Suspended solids served as the core of colloidal coagulant, was of great importance in integrated process to remove organic pollutants, but had no obvious effect to remove ammonia. These results indicate that this integrated