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TREATMENT OF MATURE LANDFILL LEACHATE BY USING COMBINED ARB PROCESS AND SULFATE RADICAL OXIDATION

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Abstract

Treatment experiments for mature landfill leachate were conducted by using combined aged refuse bioreactor (ARB) process and sulfate radical oxidation. In the ARB process, the effects of wet/dry ratios, hydraulic loading, and influent introduction time on contaminant removal were investigated. In the oxidation process, $\text{Na}_2\text{S}_2\text{O}_8$ was activated by heat to generate powerful oxidants, such as sulfate radicals, to oxidize residual contaminants in the effluent. The removal of chemical oxygen demand (COD), ammonia nitrogen, and color were investigated by changing the oxidant dosage, wastewater pH, and temperature. Experiment results showed that the combined process was an efficient treatment pathway for mature landfill leachate. The optimum working conditions of the ARB process were as follows: 1:5 to 1:8 wet/dry ratios, $35 \text{ L} \cdot \text{m}^{-3} \cdot \text{d}^{-1}$ to $45 \text{ L} \cdot \text{m}^{-3} \cdot \text{d}^{-1}$ hydraulic loadings, and 3 h to 7 h continuous introduction time. The optimum working conditions of the sulfate radical oxidation process based on thermal activation were as follows: 45 C to 60°C, 90 mmol/L to 150 mmol/L oxidant dosage, and pH 3 to 4. By combining ARB with sulfate radical oxidation, COD, ammonia nitrogen, and color reduction could be enhanced to 96%, 92%, and 100%, respectively.

Key words: aged refuse bioreactor, mature landfill leachate, sulfate radical oxidation, thermal activation

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