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Degradation of organics from landfill leachate by combined process of semi-aerobic aged refuse biofilter and ozone oxidation

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ABSTRACT

The effect and mechanism of the combined process of semi-aerobic aged refuse biofilter (SAARB) and ozone oxidation on landfill leachate degradation were investigated. While SAARB pretreatment alone could remove most of the organics, especially 99.97% ammonia (NH_4^+–N), high concentrations of biorefractory organics such as humic acids and fulvic acids were noted in the SAARB-pretreated leachate. Therefore, a subsequent ozone oxidation treatment was performed, which achieved 34.3% chemical oxygen demand (COD), 44.1% UV_{254}, and 67.6% color number (CN) removal efficiencies, respectively. Furthermore, the UV-vis spectroscopy and three-dimensional fluorescence spectrum analyses demonstrated that refractory organics (i.e., aromatic compounds) in SAARB-pretreated leachate were substantially degraded and removed after ozone oxidation process, leading to a significant decline of humification in the leachate. Overall, the combined process of SAARB and ozone oxidation showed a complementary effect on the removal of organics and NH_4^+–N from landfill leachate, and could achieve 95.0% COD, 99.5% CN, 98.2% UV_{254}, and nearly 100.0% NH_4^+–N removal efficiencies.

Keywords: Landfill leachate; Semi-aerobic aged refuse biofilter; Ozone oxidation; UV-Vis spectrum; Three-dimensional excitation and emission matrix