Mesoscale Aerobic and Anaerobic Landfill Bioreactors

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Abstract

Current regulations require the capping and lining of municipal solid waste landfills. While this is effective in controlling the release of harmful chemicals to the environment, this containment also limits biodegradation. Because landfills are becoming increasingly expensive to maintain it is necessary to find some way to further improve degradation rates while protecting the environment. To accelerate the biodegradation and stabilization of landfilled waste, both air injection and leachate recirculation were applied to mesoscale laboratory bioreactors filled with municipal solid waste. The purpose of this study was to compare the effect of aerobic and anaerobic treatment on the quality of the landfill leachate, specifically with respect to metals. The following conditions were compared: aerobic treatment of waste with leachate recirculation and anaerobic treatment of waste with leachate recirculation. The anaerobic tank leachate had higher levels of total phosphorous, total nitrogen, chemical oxygen demand, biochemical oxygen demand, total organic carbon, dissolved organic carbon, ammonia, and sulfides. The anaerobic tank leachate also had order of magnitude higher concentrations of Mg, Mn, Fe, Si, Sn, Ca and K. The results demonstrate that aerobic treatment of landfills with leachate recirculation improves the quality of the leachate increases the rate of stabilization and reduces the need for leachate treatment.