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DEGRADATION OF CONCENTRATED TOLUENE VAPORS IN A UV/O₃ PROCESS COMBINED WITH BIOTRICKLING FILTRATION

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Abstract

This study compared performance of the O_3/UV process and biotrickling filtration as standalone and combined system on elimination of toluene from a waste gas stream. The performance of the bench scale O_3/UV reactor was investigated with inlet toluene concentration of 650 ppmv and reaction time of 7.5 s. The results demonstrated that the combined O_3/UV process degraded 34.1% of toluene under the selected conditions. The biotrickling filter had a maximum elimination capacity of 125.6 g/m^3.h, corresponding to a removal percentage of 83.5%, at a toluene concentration of 650 ppmv and empty bed contact time of 45 s. It was also determined that the pressure drop of the biotrickling filter, when operated as a separate process increased up to 4.3 cm H_2O/m bed over the entire course of the operation. The combined processes of O_3/UV and biotrickling filter led to considerable improvement to the level of toluene removal; for toluene mass loading rate of 195.5 g/m^3.h and elimination capacity of 190 g/m^3.h, the removal percentage was 97.2%. Overall, coupling the O_3/UV process with the biotrickling filter was found to be an efficient and promising method to treat waste air streams containing high concentrations of toluene that could also be applied to treat other hydrophobic volatile organic compounds.

Key words: biodegradation, biotrickling filtration, hydrophobic aromatics, O_3/UV process

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