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SIMULTANEOUS REMOVAL OF NITROGEN OXIDES AND VOLATILE ORGANIC COMPOUNDS IN FUNGAL VAPOR-PHASE BIOREACTORS

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Recent studies have shown that vapor-phase bioreactors containing the fungus Exophiala lecanii-corni can remove nitric oxide (NO) and volatile organic compounds efficiently from waste gas streams. However, when ammonium accumulates in the bioreactor, the NO removal efficiency abruptly drops to 20 %. To achieve high NOx removals in the bioreactors, low ammonium levels must be maintained, or a different nitrogen source needs to be provided. For VOCs removal, however, a proper nitrogen source should be available for the fungal growth at adequate level. In this study, two different nutrient supply methods were examined to control nitrogen levels in the bioreactors for attaining simultaneous removal of NOx and toluene. The influence of nitrate and ammonium on NOx and toluene removal was also investigated. Two cylindrical bioreactors connected in series were operated at a 30 sec overall EBCT for 90 days. The spike nutrient addition method was proved to be inefficient regardless of the nitrogen species supplied. After the nutrient aerosol transfer method was employed, ammonium level in the bioreactors was maintained at low level, and dramatic increase in NOx and toluene removal was observed. 119 g/m3/hr of toluene elimination rate was obtained at 136 g/m3/hr of toluene loading rate, and 31 g/m3/hr of NOx elimination capacity was achieved at 38 g/m3/hr of NOx loading rate. Nitrate was found to be less efficient than ammonium for both NOx and toluene removal. Pressure drop in the bioreactors was effectively controlled by periodically exposing the bioreactors to NOx over 80 days.