

以生物滴濾塔處理含MTBE與BTEX廢氣之生物分解能力與生物相研究

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摘要

甲基第三丁基醚(Methyl tert-butyl ether, MTBE)為一廣泛使用之汽油添加劑,且在汽油中亦含有其他芳香烴化合物(苯、甲苯、乙苯、二甲苯,合稱BTEX)。近年來陸續發現加油站及大型地下油槽汽油滲漏之情形頗為嚴重,且MTBE與BTEX會隨著汽油滲漏而造成土壤與地下水污染,進而嚴重影響人體之健康。本研究乃以實驗室規模之生物滴濾塔系統,於最佳操作條件(同向流、循環水流量300 ml/min、氣體停留時間固定為85.6秒、循環水溫28)下,進行生物降解MTBE與BTEX之研究,且輔以分子生物技術(SSCP)觀察反應器,於不同有機負荷與不同種類複合碳源的環境下,其菌群結構之變化情形,並建立反應器內微生物去除污染物之效率與其菌群結構間的關係。研究結果顯示:(1)當進流濃度於2.67-50.76 g/m³ hr時,系統處理MTBE之效率為98.6-57.3%;(2)當系統所使用之氮源由(NH₄)₂SO₄更換成NaNO₃時,系統去除MTBE之能力增加至93.5%;(3)當系統於總有機負荷小於22.28 g/m³ hr-carbon(即入口濃度為0.55 g/m³-carbon)之條件時,對於處理含有MTBE與 toluene之廢氣,具有相當好的處理能力;(4)本系統處理MTBE與BTEX之能力依序為benzene > toluene > ethylbenzene > xylene > MTBE;(5)於總有機負荷小於37.4 g/m³ hr-carbon之條件時,對於處理含有MTBE與 BTEX之廢氣,具有相當好的處理能力;(6)若有本研究之其它基質分別與benzene與toluene共存時,系統會因優先分解benzene與toluene之因素,進而影響塔體內微生物分解其它基質之能力,若系統所承受之有機負荷較高,甚至會有抑制微生物分解其它基質之現象產生;(7)對分解含等量之碳數而言,本系統處理含MTBE與BTEX之複合碳源時,其效率明顯優於僅處理MTBE之單一碳源情況。

關鍵詞:生物降解;生物滴濾塔;單股DNA構形多型性;菌群結構;甲基第三丁基醚;芳香族化合物

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