結合實驗室級透水性反應牆與固定化技術處理受MTBE與BTEX污染之地下水研究

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摘 要

本研究之主要目的在於結合透水性反應牆(PRB)與固定化技術，處理受MTBE與BTEX污染之地下水。研究中採用一系列之批次試驗與管柱試驗，求出固定化顆粒之最佳機械強度後，將其系統串連於實驗室模組之透水性反應牆系統，藉以不同濃度之基質，監測反應牆系統內之整體去除效率。

研究結果顯示：(1)固定化顆粒最佳機械強度之製備條件為浸泡2.46小時之5% H3BO3與2.5% CaCl2混合溶液以及6小時之5% KH2PO4溶液；(2)固定化顆粒具有微孔，可供菌體附著生長所需之空間、氧氣及基質間之傳遞；(3)批次試驗結果顯示：(3a)甲苯降解菌(Pseudomonas sp. YATO411)最適包埋之菌體量濃度為26.7 mg/L；(3b)甲苯具最高之降解速率可達12.4 mg/L．h；(3c)高濃度甲苯下，固定化顆粒之效率較懸浮為佳；(3d) Pseudomonas sp. YATO411菌種可降解苯、甲苯及乙苯，可做為其碳源與能量來源；(3e) Methylibium petroleiphilum PM1適合於浸泡5小時之H3BO3與CaCl2混合溶液及2.5小時之KH2PO4；(4)管柱試驗結果顯示，甲苯去除率隨顆粒量增加而遞增；(5)長期PRB監測結果顯示：(5a) PRB系統中加入Methylibium petroleiphilum PM1後，其去除效率只提高至42.4 %；(5b)於80 ppm之BTEX有機負荷時，結合PRB與包埋Pseudomonas sp. YATO411菌種之固定化顆粒系統，其基質之去除效率分別可提高為：99.4 % (苯)、98.2 % (甲苯)及97.5 % (二甲苯)；相較之下，於未結合固定化顆粒之系統，其去除效率僅分別為：49.2 % (苯)、48.6 % (甲苯)及62.9 % (二甲苯)。

關鍵詞 : 透水性反應牆、固定化、甲基第三丁基醚、BTEX、Methylibium petroleiphilum PM1、Pseudomonas sp. YATO411

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