以即時定量聚合?￣嚍磥狄釦瑋N監測透水性反應牆之微生物族群變化研究 = Microbial community dynamics in a permeable ...

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摘 要

本研究主要目的在於建立以變性梯度凝膠電泳(denaturing gradient gel electrophoresis, DGGE)與即時定量聚合?鏈鎖反應(real-time PCR)之分子生物技術，藉以追蹤及監測實驗室模組之透水性反應牆(permeable reactive barrier, PRB)中之微生物分解BTEX能力及菌群分佈消長情形。

由氮源濃度對BTEX之批次降解能力評估可知，硝酸鈉之添加量多寡，影響「現地混合菌」降解BTEX之效果顯著。「現地混合菌」對污染物之負荷能力評估中顯示，苯與甲苯於20、40及80 ppm之濃度均可被完全降解；提高濃度至120、160、240及320 ppm時，則苯無法有效完全降解，殘存率分別為40、60、65、90及100 %；而甲苯之殘存率則分別為10、40、55、90及100 %。此外，各濃度之菌量變化可由吸光值、瓊脂膠電泳及real-time PCR三者獲得一致之結果。由釋氧物質(ORC)之管柱實驗結果顯示，在連續監測20天中，CaO2添加比例為40 %之自製ORC顆粒所得之平均溶氧最高為5.08 mg/L，其單位重量之氧氣釋放率為0.25 mg O2/day/g-ORC。

由釋氧反應牆分解BTEX之長期穩定性評估實驗結果顯示：⑴ ORC顆粒之氧氣釋放量足以供應給釋氧反應牆系統中之「現地混合菌」所利用；⑵BTEX於有機突增後，其苯、甲苯、乙苯及對-二甲苯之去除效率分別下降21 %、19 %、17 %及10 %；⑶有機負荷突增後對基質之去除效率回復速度為對-二甲苯 > 乙苯 > 苯 > 甲苯；⑷ORC顆粒之釋氧能力可持續約40天；⑸由DGGE圖譜顯示，於PRB系統進行有機突增(shock loading)之前後期，其菌群種類變化由原先至少13種遞減至9種，顯示有機突增易造成系統中之菌種危害；⑹以開環酵素(catechol 2,3-dioxygenase)基因之序列進行real-time PCR定量結果可知，在PRB系統中，有機突增之衝擊會造成具開環酵素基因之菌量遞減，但隨系統趨於穩定(第79天後期)則菌量亦遞增。

關鍵詞 : 變性梯度凝膠電泳、即時定量聚合?連鎖反應、透水性反應牆、生物降解

目錄

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