Factors Controlling Bioremediation Efficiencies in MTBE-Contaminated Groundwater and its Microbial Community Dynamics

吳志鴻、林啟文

E-mail: 9314394@mail.dyu.edu.tw

ABSTRACT

The objectives of the research are to investigate the factor controlling biodegradation efficiencies in a MTBE-contaminated groundwater and its microbial community dynamics. Specially, the experiments are designed to study the removal efficiencies of the contaminants and microbial dynamics under different environmental conditions. In this research, batch experiments using a 250ml amber glass bottle were conducted to determine the biodegradability of ether-based oxygenated gasoline additives (MTBE, TAME, ETBE), and aromatic compounds (benzene, toluene) in a mixed culture. In addition, a molecular biotechnology by PCR-SSCP was used to explore the microbial community. Results of the research show that: (1)MTBE can be degraded under pH4-10, but the biodegradability was superior under pH4-6.77 compared to under pH7-10. Additionally, the microbial consortium can be divided into acid-microbial community and base-microbial community. (2)In a single substrate condition, MTBE removal increases as the biomass increases under substrate concentrations ranging from 3.6ppm to 1,440ppm. (3)In mixed substrate conditions, both ether-based compounds and aromatic compounds tested can be degraded. The microbial community was also dynamic as changing the types of substrates.(4)The microbial community was not sensitive to temperature investigated. (5)The concentrations of PCR products in 15-24 ng/ μl can provide the best photograph for electrophoresis gel. (6)If mixed cultures contained a screened culture, the specific strain can be determined via. jumping position of SSCP gel by use of additional primer. (7)TBA, a MTBE biodegradation by-product, can also be degraded by MTBE-degrading culture.

Keywords : MTBE ; PCR ; SSCP ; Microbial community ; Biodegradation

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