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ABSTRACT

Bio-Remediation of BTEX-Contaminated Water with Enhanced Removal Efficiency

by

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The recent rapid urban development in Macau has resulted in a huge demand for the land supply. The reclamation of contaminated land should be taken into account more extensively so as to ensure the future sustainable development as well as the living quality of the citizens in Macau. Problems associated with the cleanup of leaking disposal sites and spills of toxic substances have been intensively concerned worldwide in recent decades. This study aims to develop an innovative technology to remediate subsurface contaminated with petroleum hydrocarbons using a biological method.

Pure cultures were isolated from a potential petroleum-polluted site in Fai Chi Kei, Macau SAR, China. The potential of these pure cultures for the biodegradation of benzene, toluene, ethylbenzene and xylenes (BTEX) was studied. The screened bacterial isolates were cultivated in mineral salts medium containing various combinations of BTEX as the sole substrates. The effect of incubation conditions, such as temperature, pH of medium, and the presence of other nutrients in medium, on the substrate degradation was investigated. It was found that the BTEX biodegradation could be achieved at a temperature range of 15°C to 35°C; the highest specific growth rate was recorded at 30°C, which was more than twice of that at 15°C; the largest magnitude of cell yield was also recorded at 30°C. Abiotic removal of BTEX was not significantly affected by the

variation of temperature in this study. Satisfactory BTEX biodegradation could be noticed at a pH range of 6.0 to 9.0. Results indicate that the presence of more easily biodegradable substrates would decrease the biotic removal efficiency of BTEX, when compared to the experiments using BTEX as the sole substrates. Optimal design parameters for the microbial cultivation could be established with respect to the above data.

Further development of this technology could not only provide a crucial solution to cease the spreading of petroleum products but also contribute to enhance the thriving economy in Macau through the environmentally sound and sustainable reuse of the reclaimed land.