

## Permeable Reactive Biobarrier for Treatment of Leachate from Landfill

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### ABSTRACT

Release of leachate from landfill that no liner system and leachate treatment facility were installed (i.e., unsanitary landfill) has caused the environmental problems such as the soil and groundwater contamination, because several contaminants in leachate from landfill have been commonly founded. The high concentration of BOD and COD, nitrogen compounds (e.g., ammonia), in some case heavy metals, and chlorinated compounds (e.g., trichloroethylene (TCE) and tetrachloroethylene (PCE)) have been detected. To prevent migration of mixed contaminants in leachate from landfill into soil and groundwater, multi-permeable reactive barriers (M-PRBs) consisted of two permeable reactive barriers are considered. Zero-valent iron and converter slag barrier preliminarily reacts with contaminants in leachate from landfill, and then biobarrier amended with anaerobic sludge on wasted tire rubbers is followed as shown in Fig. 1.

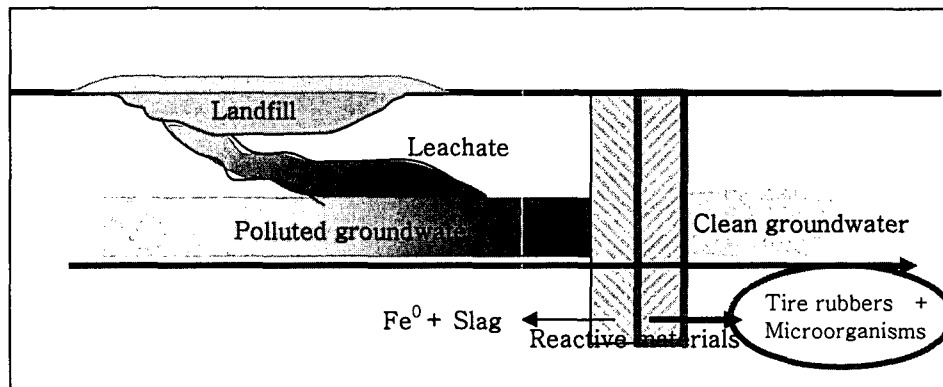


Fig. 1 Schematic diagram of M-PRBs (multi-permeable reactive barriers)

In this paper, the performance of the biobarrier to treat heavy metals, chlorinated compounds, and

organic constituents was studied. Adsorption of contaminants (e.g., heavy metals, TCE, and PCE) onto wasted tire rubbers and removal of same contaminants except for heavy metals by biobarrier were investigated.

Little adsorption capacity of heavy metals onto tire rubbers is shown in Fig. 2. Amounts of TCE and PCE, however, were adsorbed onto tire rubber. The distribution coefficient of 0.34 and 0.26 with tire rubbers to TCE and PCE were made for 0.425-0.6mm of tire size, respectively, suggesting that adsorption capacity of small size of the tire rubbers is slightly higher than that of large one.

Biobarrier removed TCE and PCE as well as organic constituents through adsorption and biodegradation processes. The removal efficiency of TCE and PCE by biobarrier showed 92% and 77% for 10 d, respectively (Fig. 3). In addition, approximately 80% of organic matters (BOD) were also degraded by biobarrier.

Overall, this present study suggests that permeable reactive biobarrier can effectively clean up groundwater contaminated with varying contaminants in leachate and prevent migration of leachate from the unsanitary landfill.

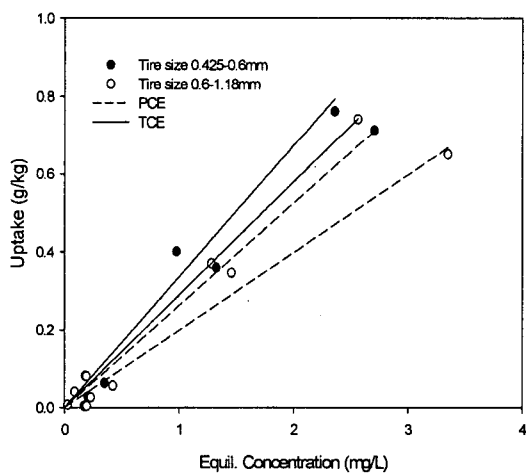


Fig. 2 Linear adsorption isotherm of TCE and PCE

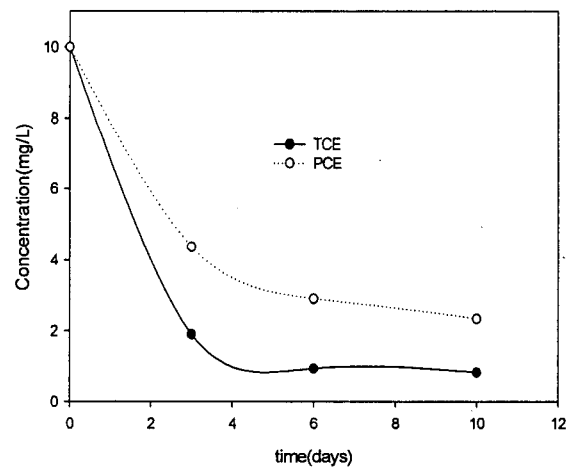


Fig. 3 Removal of TCE and PCE by biobarrier.

Key words: M-PRB, biobarrier, leachate, TCE, PCE