



Column Experiments on Treating Landfill Leachate – Contaminated Groundwater by Low-Cost and Waste Matter as Reactive Media in Permeable Reactive Barriers (PRBs)

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Abstract

Water percolating through the decomposing waste matters in a dumpsite picks organic and inorganic compounds and becomes leachate. Since leachate infiltrates into the soil profile and accumulates in groundwater aquifers, it causes heavy contamination in groundwater flows. This contaminated groundwater plume should be treated. Permeable Reactive Barrier (PBR) is an in-situ method to treat contaminated groundwater. This can also be effectively applied to treat landfill-leachate-contaminated groundwater. In this study PRBs were modelled by five laboratory-scale columns. First column was filled with a mixture of Dewatered Alum Sludge (DAS), Washed Quarry Dust (WQD), Saw Dust (SD), Fire Wood Charcoal (FWC) and Silica Sand (SS). Second column was filled with the above materials in equal layers. The third, fourth and fifth columns were filled with Granular Activated Carbon (GAC), Zero-Valent Iron (ZVI) and Red Laterite Soil (RLS) respectively. RLS represents the typical soil. The latter three columns were used as controls. The columns were flushed with tap water for several days to remove all readily flushable contaminants of the media. Thereafter the columns were loaded with 10 % diluted landfill-leachate collected by a dumpsite. The treatment of efficiencies of parameters such as COD, BOD₅, Nitrogenous compounds and Total Dissolved Solids (TDS) by the reactive media in each column was estimated by characterizing influent and effluent samples. Removal of organic matters in control experiments was higher than those of the experimental columns. BOD₅ removal was almost 80% in all control columns. Removal efficiency of mixture is almost equal to controls. Least removal shown by the column with layers but more than 50%. The highest removal efficiency for NH₃-N occurred in the experimental columns with mixed reactive materials. Therefore the tested low-cost and waste matter can be considered as potential reactive media for PRBs to treat landfill leachate contaminated groundwater.

Keywords: *Column experiments, Reactive media, Nitrogenous compounds*