

Migration of calcium hydroxide compounds in construction waste soil

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Abstract. Migration of leachate generated through embankment of construction waste soil (CWS) in low-lying areas was studied through physical and chemical analysis. A leachate solution containing soluble cations from CWS was found to have a pH above 9.0. To determine the distribution coefficients in the alkali solution, column and migration tests were conducted in the laboratory. The physical and chemical properties of CWS satisfied environmental soil criteria; however, the pH was high. The effective diffusion coefficients for CWS ions fell within the range of $0.725-3.3 \times 10^{-6}$ cm²/s. Properties of pore water and the amount of undissolved gas in pore water influenced advection–diffusion behavior. Contaminants migrating from CWS exhibited time-dependent concentration profiles and an advective component of transport. Thus, the transport equations for CWS contaminant concentrations satisfied the differential equations in accordance with Fick's 2nd law. Therefore, the migration of the contaminant plume when the landfilling CWS reaches water table can be predicted based on pH using the effective diffusion coefficient determined in a laboratory test.

Keywords: calcium hydroxide; advection; diffusion; ICP-AES; contamination; construction waste soil

1. Introduction

Construction waste landfilling has recently been associated with increasing environmental issues due to larger quantities of waste. Although annual generation of construction waste has decreased in Germany and Japan, it has increased in the United Kingdom, Italy, the Netherlands, Switzerland, and Korea. Construction waste has been increasing in these countries because of the redevelopment of buildings and urban infrastructure (OECD 2015). Most of the aggregate from the demolition of buildings is reused through separation and recycling of usable materials in the construction field. Since most construction waste cannot be landfilled because of environmental concerns, construction waste soil (CWS) is increasingly being used in construction projects as landfilling material. However, although use of recycled concrete aggregate and CWS has increased at construction sites, the quality of these materials has not been verified. It is unclear whether

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