

Evaluation of Leaching Characteristic of Soils using an Up-flow Percolation test

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1. BACKGROUND AND OBJECTIVES

Large volumes of soils containing heavy metal have been distributed over ages in Japan. These soils are excavated on construction sites, and so have to be evaluated for suitability of use as construction materials. Concentrations of heavy metal occurring naturally are affected by the way sample and solvent are reacted, so batch leaching test is not suitable for obtaining leaching mechanism. In contrary to the batch leaching test, up-flow percolation test (column test) is able to determine change of chemical form, relationship with chemical element and leaching mechanism. This test is therefore suitable to evaluate construction material's suitability of use. However, there is no column test method standard in Japan. In recent years, standardization of the column test based on ISO/TS 21268-3 has been done. In this study, 3 types of soils containing heavy metal in various concentrations are used. The leaching behaviour of arsenic and fluorine as main heavy metal are focus of this study. The author investigated the effects of solvent type, saturation method and sample conditions on the leaching behaviour by using two types of sandy soil containing natural occurring heavy metal. In addition, relation with particle size adjustment and accumulative leached amount were studied by gravel soil containing natural occurring heavy metal. (Figure 1)

2. MAIN ACHIEVEMENTS

- 1) 1 mmol/L CaCl_2 solvent might be able to flocculate to colloidal particles and prevent clogging of filter. However, the tests results are underestimated in case of adsorbed heavy metal with sample colloids.
- 2) Unless there is difference of saturation method, upon test completion, the saturation degree is observed to be approximately $100\pm 5\%$.
- 3) The dry density, void ratio, contact time and leaching velocity are important conditions because of their effect on test result. So, it is necessary to conduct further research to evaluate their effect separately as well as the effect of more different conditions.
- 4) In this study, 3 types of leaching behaviour were obtained from the column test results. (a) High concentration was observed in the first leachant; (b) Decrease of leaching concentration with passing time; (c) Increase of leaching concentration with passing time.
- 5) The samples were separated by basis of particle size (<2 mm, <4.75 mm, <9.5 mm) and then the author studied about the difference of particle size adjustment. As a result, the leaching trends was same each other. In addition, sample saturation shows approximately $100\pm 5\%$ under such condition. (column diameter/maximum particle size=5.2-25) It implies that the condition is not affected by sample saturation.

References

- 1) ISO/TS 21268-3 Soil quality-Leaching procedures for subsequent chemical and ecotoxicological testing of soil and soil materials Part 3: Up-flow percolation test, 2007.
- 2) K. Nakamura et al., Toward Standardization of a Percolation Test for Environmental Safety of Soil Materials, The Japanese Geotechnical Society 2015, No.4, pp.697-706, 2014.

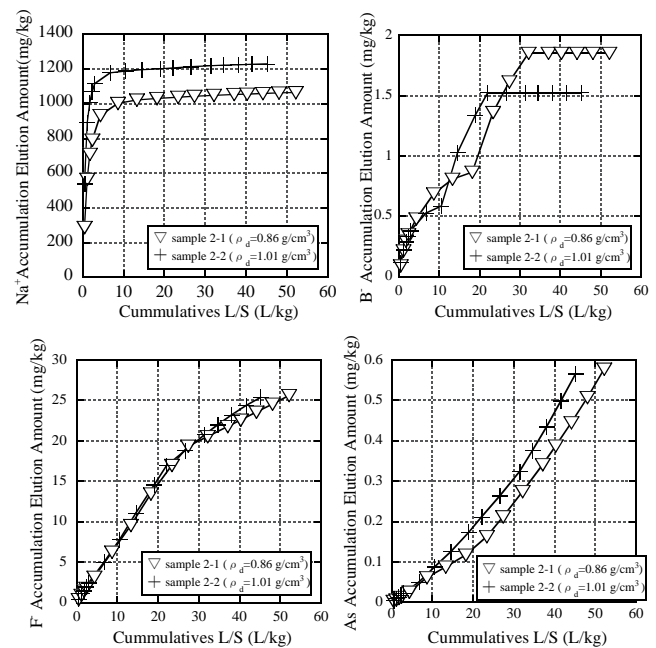


Figure 1 Difference of dry density results