Experimental study on the performance of sorption layer using stabilizing Agent

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Key words: Sorption layer method, Stabilizing agent, Compaction, Unconfined compression strength, Sorption, Hydraulic conductivity

1. Introduction

Excavated soils and rocks generated from construction works in Japan usually contain natural derived heavy metals. Without proper treatment, these soils will generate hazardous leachate and cause environment contamination. Sorption layer method is a newly developed technology which has the potential to be a high economical countermeasure. It utilizes a permeable soil layer lying beneath the material of concern to retain the heavy metal contained in the leachate thus making the effluent meeting the environmental standard. This study was conducted to evaluate the performance of sorption layer by mixing a typical soil, decomposed granite soil, which is widely distributed in Japan, with the Ca/Mg composite stabilizing agent.

First, the compaction properties and unconfined compressive strength were tested to evaluate its mechanical properties. Second, saturated hydraulic conductivity values of the mixtures were measured to assess the basic hydraulic performances, which influence the leachate flow conditions in the sorption layer. Then, batch sorption tests were performed on the mixtures with different stabilizer contents and curing periods to obtain the sorption isotherms for arsenic. The main focus was placed on effects of the stabilizer content and curing time on the mechanical, hydraulic, and sorption performances of the mixtures.

2. Main conclusions

(1) With the increasing content of stabilizing agent, optimum water content increase and maximum dry density decrease. However the variation is small, so the addition has no obvious on compaction properties.

(2) Curing increase the unconfined compressive strength of sorption layer, however the effect of different mixing ratio is not obvious. The strength is still relatively low towards higher layer thickness. The effect of longer curing period and higher stabilizer content is hoped to achieve higher unconfined compressive strength.

(3) Higher stabilizer content has stronger sorption capacity. However the sorption isotherm of different sorbents and distribution coefficient under equilibrium sorption concentration of 0.01mg/L shows that effect of curing period is not obvious.

(4) Effects of both the stabilizer content and curing time are not obvious on the hydraulic performance of sorption layer. Test results have poor reproducibility. More test cases need to be conducted to obtain reliable conclusions.

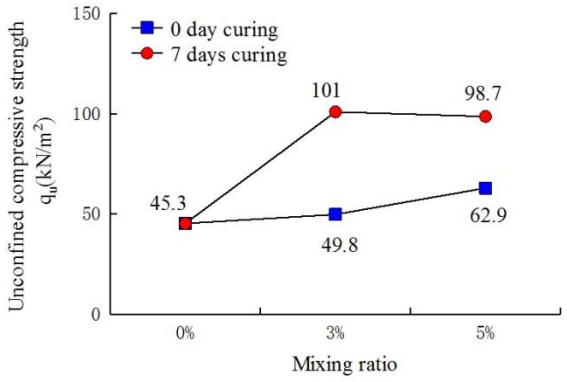

Fig 1 Unconfined compressive strength

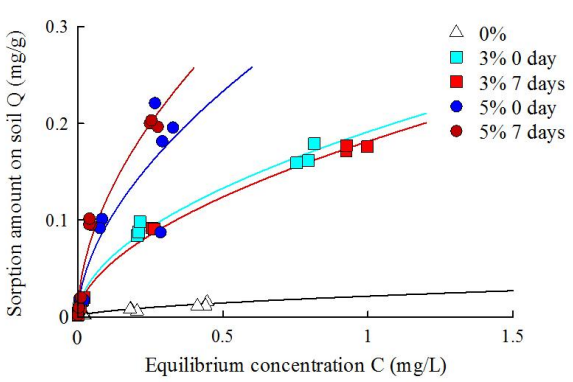

Fig 2 Sorption isotherm of different sorbents