

Geotechnical properties for waste mixed materials

*Kento Hahimoto¹, Piumali Abeywickrama¹, Takeshi Saito¹, Ken Kawamoto¹

1. Graduate School of Science and Engineering, Saitama University, Japan

Waste disposal sites are essential infrastructure facilities for human and industrial activities. However, it is difficult to construct new disposal facilities due to the lack of land and the public opposition surrounding. Therefore, an effective use of limited space in existing waste disposal sites is highly needed. The control of geotechnical properties such as compaction, consolidation, and shear strength of waste materials is important to reduce disposal space. In this study, geotechnical properties such as basic physical, chemical, and mechanical properties such as compaction, consolidation, and un-drained shear strength were investigated for waste mixed materials of sludge with less than 2.0mm, crushed concrete with the fraction 2.0mm and 9.5mm, and incineration ash with the fraction less than 2.0mm. The materials were mixed with various proportions based on mass ratio. First, mixed materials were compacted by the standard proctor method to achieve 90% degree of compaction. Then, the compacted samples were used for the oedometer test and the Consolidation-Undrained triaxial compression test. The sample size for the consolidation test was 10 cm in diameter and 10 cm in height. The sample size for the triaxial compression test was 10 cm in diameter and 20 cm in height. The triaxial compression test was carried out under three confining stresses of 50, 100, and 150kPa, and the strain rate was maintained as 0.1% per minute. Results show the maximum dry density increased with decreasing the mixing proportion of sludge and the optimum moisture content decreased with decreasing the mixing proportion of sludge. For the mixed materials of sludge and crushed concrete or incineration ash, measured friction angles showed positive linear relations with increasing the mixing proportion of crushed concrete or incineration ash irrespective of different particle size distributions for crushed concrete and incineration ash. Compression index for the mixed materials of sludge and incineration ash linearly decreased with decreasing the mixing proportion of sludge, while for the mixed sample containing crushed concrete, they rapidly decreased with decreasing the mixing proportion of sludge. Therefore, it is highly important to mix the crushed concrete for increasing the strength of waste materials.

Keywords: Evaluation of Geotechnical Properties for Mixed Materials of Sludge, Crushed Concrete, and Incineration Ash