

Effect of biocementation via enzymatic induced calcium carbonate precipitation (EICP) on the shear strength of compacted clay liner

ABSTRACT

The strength of residual soil treated via biocementation means by employing enzymatic induced calcium carbonate precipitation (EICP) was assessed based on the standard recommended for compacted clay liner. EICP treated samples were prepared at four different concentrations of cementation solution (urea-CaCl₂) (0.25, 0.50, 0.75 and 1.00 M) and at various moulding water content (-2, 0, +2 and +4% OMC) using reduced British standard light compaction effort (RBSL). The result obtained has shown UCS values of untreated natural soil at the four moulding water contents were less 200 kPa, the minimum standard recommended for compacted clay liner. Upon EICP treatment, it was determined that the UCS values increase with the increase in the concentration of cementation solution. The treated soils at all the cementation solutions and moulding water contents have UCS values greater than 200 kPa. The lowest strength of the treated soils was 468.5 kPa determined at 0.25 M cementation solution and +2% OMC moulding water content. The maximum UCS (643.5 kPa) value was determined at 1.00 M urea-CaCl₂ and -2% OMC. The results also reveal that calcium carbonate content in the treated soil increases with the increase in the concentration of cementation solution. Microstructural analysis on the treated soil indicated the presence of white precipitation within the pore space of the soil, and the mineral was confirmed to be calcite through XRD analysis.