

Effect of acid rain on geotechnical properties of residual soils

ABSTRACT

In this study, the effect of acid rain on the physico-chemical and microstructural properties of two different residual soils was investigated. In order to reproduce the process of soil-acid rain-chemical interaction, an infiltration setup was fabricated. The samples were then infiltrated by different pH levels of acid rain, and for different fluxes of acid rain equivalent to the precipitation, for 1–20 years. The compressive strength, consistency limit, compaction characteristics, and coefficient of permeability were evaluated, to investigate the mechanical changes of the soils after being exposed to acid rain. In addition, zeta potential, atomic adsorption spectroscopy (AAS), scanning electron microscope (SEM) and energy dispersive X-ray spectroscopy (EDX) were carried out to identify the underlying controlling mechanisms. The results showed that low pH and high fluxes of acid rain led to a reduction in soil strength and maximum dry density as well as an increase in the coefficient of permeability, liquid limit, and optimum moisture content of the soil. The SEM, EDX, and atomic absorption analysis of the soils confirmed the reduction in the concentration of elements, and the loose structure for both soils due to the effects of acid rain.

Keyword: Acid rain; Residual soil; Atterberg limits; Compressive strength; Compaction characteristics; Coefficient of Permeability