

Strength behavior of fly ash-stabilized soil reinforced with coir fibers in alkaline environment

ABSTRACT

Alkaline activation has received much attention in recent years as a method for improving the soil properties. This paper presents the details of laboratory investigation to evaluate the feasibility of using the alkaline activation along with the treated coir fibers for improvements of engineering characteristics of soils and subgrade performance of pavements. In the presence of high alkali solutes, the fly ash (FA) was used as a precursor due to its amorphous nature and high silica-to-alumina ratio. Additionally, this study adopted the physical treatment of the fiber surface with the linseed oil. Treated coir fibers and fly ash were added to soil in 1% and 60% ratios (by weight), respectively. Accordingly, a series of unconfined compressive strength (UCS), modulus of elasticity (E_s), direct shear (DS) and California bearing ratio (CBR) tests were conducted on the stabilized soil with and without pairing with treated fibers. By adding alkali-activated (AA) fly ash and inclusion of treated fibers led to increasing deformability and failure strain. Based on the atomic force microscopy tests, the addition of treated fibers contributes to the enhancement of AA-stabilized soil through yielding a denser and more uniform structure. The findings encouraged the application of AA-stabilized soils reinforced with treated fibers to improve the strength of soils in alkaline environment as subgrade of pavements.