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Mechanical properties of biopolymer treated binary soil mixture

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ABSTRACT

Biopolymer (BP)-treated soil has gained considerable attention as an eco-friendly soil binder with a compatible strength. A number of studies have demonstrated the feasibility of BP soil treatment to enhance engineering properties by increasing the compressive and shear strength, permeability reduction, and erosion resistance.
While most studies have utilized electrically neutral sand grains as the base soil to quantify BP treatment, little work has been performed with complex soil mixtures. Soil mixtures with fine particles alter the packing of sand grains, shift the plastic behavior, and disturb the BP treatment owing to BP-clay interactions. Therefore, in this study, a series of direct shear tests (DST) was performed on various biopolymer treated sand-clay binary mixtures to quantify the effects of fine particle interactions with BP, soil packing, and curing conditions. An optimal ratio of 15% fine content resulted in the maximum density in a sand-clay binary mixture. The DSS test results demonstrated an increase in cohesion owing to the BP treatment without friction angle change in all soil compositions. However, among hydrophilic Xanthan gum biopolymer treated soil, cation crosslinked xanthan gum depicts a stable strength under drying-rewetting process implementing an enhanced durability of polysaccharide biopolymer.

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