

The Influence of Incorporating Coffee Grounds on Enhancing the Engineering Properties of Expansive Soils: Experimental Approach and Optimization

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Abstract : The utilization of waste materials in civil engineering has gained widespread attention in recent years due to their adverse effects on the environment. One such waste material is coffee grounds, a black residue generated daily across the country after coffee brewing. Instead of disposing of it, there is a growing interest in repurposing it for various agricultural and industrial applications. Utilizing coffee grounds in geotechnical engineering, such as in road embankments, presents an opportunity for its valorization. The study aims to contribute to the valorization of coffee grounds by enhancing the physical and mechanical properties of clayey soils through their incorporation at varying weight percentages (3%, 6%, 9%, 12%) as partial replacements in these soils. This not only addresses the issue of coffee ground waste but also makes a tangible contribution to sustainable development. The findings demonstrate that incorporating coffee grounds generally has positive effects on the physical and mechanical properties of clayey soil. However, the extent of these effects depends on factors such as the quantity of coffee grounds added, the particle size of the grounds, and the characteristics of the soil. Additionally, coffee grounds can improve the compression and tensile strength of clayey soil, resulting in increased stability and reduced susceptibility to deformation under external forces.

Keywords : clay soil, coffee grounds, optimizing, improvement, valorization, waste

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