155. A study on physico-mechanical properties of blended cement with laterite soil

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Abstract

The adoption of Supplementary Cementitious Materials (SCMs) has gained traction globally as a solution for reducing the anthropogenic Carbon dioxide (CO2) emissions associated with cement production. Previous studies have extensively tested the mechanical and durability properties of cement blends containing various SCMs. However, there is a notable gap in the literature regarding the use of laterite soil as an SCM, particularly in cement blends. Existing research primarily focuses on laterite as an aggregate rather than a binder component. This study aimed to investigate the potential of laterite soil as supplementary material in blended cement, especially in regions where kaolinite clay soil is scarce but laterite is abundant. The research specifically explores the physicomechanical properties of a ternary blended cement comprising 50% clinker, 15% limestone, 30% laterite soil, and 5% gypsum. The blend was formulated by partially replacing the Ordinary Portland Cement (OPC) with limestone and laterite in a 1:2 ratio, maintaining a 45% replacement level. The experimental investigation involved evaluating the influence of laterite soil on the physical and mechanical properties of the blended cement using the Vicat apparatus and compressive strength tests. The results demonstrate a synergistic effect between laterite and limestone, achieving a compressive strength of 38 MPa after 28 days. The physical properties of the blended cement were comparable to those of limestone and calcined clay blends, indicating that laterite soil can effectively substitute clay as an SCM. This study contributes to the limited body of knowledge on laterite soil as a component in cement blends and suggests avenues for further research. Future studies could explore the compatibility of the laterite-limestone blend with chemical admixtures such as set retarders and investigate the long-term durability of the blend under various environmental conditions.

Keywords: *Laterite soil, Supplementary Cementitious Materials (SCMs), Compressive strength, Physical Properties, Limestone Calcined Clay Cement (LC3)*