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EXPLORING SUSTAINABLE CONCRETE: BANANA PEEL ADDITIVES AND OPTIMIZED MIX RATIOS FOR ENHANCED DURABILITY AND STRENGTH

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Abstract

This study investigates the properties of concrete incorporating banana peel additives, affirming the material's enhanced durability. Recognized for its potassium content and abundant natural fibers, banana peel powder has been introduced as an additive, resulting in elevated flexural modulus, split tensile strength, and compressive strength in the concrete. Additionally, the study presents a simulation of a cantilever beam using ANSYS, incorporating Cellulose Nano Fibres (CNFs) derived from plantain peel. These CNFs are partially substituted for regular Portland cement at rates of 1%, 2.5%, 3.5%, and 4%. Structural analysis involves varying the mix ratio of cement, CNF, Metakaolin, Silica Fume, and applied force. The findings indicate that a mix ratio with 3.5% CNF, 10% Metakaolin, and 7.5% Silica Fume replacement offers superior strength, establishing it as a viable composition. Consequently, the research reports compressive strength, split tensile strength, and flexural strength at 28 days, measuring 64 MPa, 4.9 MPa, and 7.85 MPa, respectively.

Key words: ANSYS software, banana peel, cellulose nano fibre, compressive strength, flexural strength, high-performance concrete

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