

Experimental Study on Environment-Friendly Concrete Production Incorporating Palm Oil Clinker & Cockle Shell Powder as Cement Partial Replacement

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Abstract

The demand for civil construction has increased recently; cement is now the most produced and consumed material globally. The cement sector contributes significantly to world carbon dioxide (CO₂) emissions, ejaculating at a rate of 1 tonne of (CO₂) per tonne of cement production, corresponding to 5-7% of total global emissions. Therefore, to mitigate and minimize the environmental impact of cement production, supplementary cementitious materials such as palm oil clinker powder (POCP), a waste by-product of palm oil mills, which is obtained after burning the solid palm oil waste for producing electricity and cockle shell powder (CSP), an agricultural and aquaculture by-product derived from cockle shell combustion used as partial cement replacement in concrete. This study investigates the effects of POCP and CSP on concrete by substituting cement in different weight ratios from 0 to 20%. The experimental work examines compressive and flexural strength for different percentages of POCP and CSP after 7 and 28 days of curing. The study showed that samples with 10% cement replacement (including 5% POCP and 5% CSP) had good results in terms of mechanical properties. The research findings suggest that studying concrete structures with POCP and CSP is a novel and significant scientific topic that should be highlighted.

Keywords: Plam oil clinker powder; Cockle shell powder; Cement replacement; Compressive strength; Flexural strength