Mechanical properties of oil palm waste lightweight aggregate concrete with fly ash as fine aggregate replacement

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ABSTRACT

Environmental degradation posed by fly ash (FA) disposal from coal power plants and shell from the oil palm fruit processing trade is non-trivial. The destruction of flora and fauna resulting from the extraction of river sand and granite aggregate from the green hills in an uncontrolled fashion for the production of concrete that is widely used in the construction industry does also require a solution. Introducing oil palm shell (OPS) and fly ash as a mixing ingredient in zero granite lightweight aggregate concrete production is an appealing notion. Success in utilising the available solid waste would reduce dumping of these by-products and consumption of natural aggregates, thus ensuring the preservation of the environment for the future generation. Therefore, this research explores the influence of FA content as sand replacement towards the mechanical and durability properties of agro-based lightweight concrete. Five concrete mixes with FA quantity ranging from 0% to 40% were prepared. Two forms of curing procedure were practised viz. water and indoor air curing. All the mixes were tested for fresh and hardened characteristic as well as sulphate resistance. The test results demonstrated that a substitution of 10% sand with FA yielded better mechanical properties and denser concrete with more resistant to sulphate attack in comparison to the control mix. The utilisation of two industrial waste materials such as FA and OPS may address the issue of paucity of natural resources that is experienced in the construction industry, particularly in the case of natural granite and river sand.

KEYWORDS: Oil palm shell; Fly ash; Fine aggregate replacement; Lightweight aggregate concrete; Mechanical properties

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