

Properties of fresh and hardened sustainable concrete due to the use of palm oil fuel ash as cement replacement

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ABSTRACT

Palm oil fuel ash (POFA) is a by-product resulting from the combustion of palm oil waste such as palm oil shell and empty fruit bunches to generate electricity in the palm oil mills. Considerable quantities of POFA thus generated, accumulate in the open fields and landfills, which causes atmospheric pollution in the form of generating toxic gases. Firstly, to protect the environment; and secondly, having excellent properties for this purpose; POFA can be and has been used as partial cement replacement in concrete preparation. Therefore, this paper compiles the results obtained from previous studies that address the properties of concrete containing POFA as cement replacement in fresh and hardened states. The results indicate that there is a great potential to using POFA as cement replacement because of its ability to improve compressive strength, reduce hydration heat of cement mortar and positively affect other fresh and hardened concrete properties. The paper recommends that conducting further studies to exploit high volume of POFA along with other additives as cement replacement while maintaining high quality of concrete can help minimize CO₂ emissions due to concrete.

KEYWORDS:

Cement additives; Compressive strength; Concrete additives; Concretes; Hardening; Oil shale; Waste incineration