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# Sulphate resistance of lightweight aggregate concrete comprising sieved palm oil fuel ash as fine aggregate replacement

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ABSTRACT

Oil palm shell (OPS) and palm oil fuel ash (POFA) disposal from palm oil industry causes environmental pollution. The present research investigates the compressive strength and sulphate resistance of oil palm shell lightweight aggregate concrete containing palm oil fuel ash as partial fine aggregate replacement. Sieved POFA was used as partial fine aggregate replacement from 0% up to 20% by weight of sand. Water cured specimens were tested to determine compressive strength and durability towards sulphate attack. Use of 10% POFA slightly enhances concrete strength and durability against sulphate attack via pozzolanic reaction from the fraction of fine ash present.

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## 1. Introduction

The continuous mounting world population creates a need for constructing more and more buildings and infrastructures. These infrastructures are commonly built using concrete. The ease of producing concrete through blending natural coarse aggregate, sand and water, which are present in many places with cement as binder is preferred by builders throughout the world. Beside stones, the use of sand in construction, especially in concrete manufacturing, is also rising worldwide. Sand which is acquired from beds of underwater environment such as river, lake or beach, etc., continuously renewed through natural process. Sand from the river is the utmost utilized aggregate in building industry owing to its high-quality properties and easiness in acquiring it [1]. Annually, the global need for sand reaches up to 50 billion tonnes [2]. River is the source of aggregates supply for construction owing to ease of harvesting it and high quality. At present, sand harvested from the environment exceeds its usual replenishment rate [2] due to the growing demand. This situation poses severe risks on both economy and environment [3]. Occurrence of sand exhaustion taking place in some places [4,5] may affect the industries prosperity which depend on its supply as well as community's income. Supply of good quality sand is also diminishing in certain area [6]. As the industry's request for sand resource surges in the developing countries, conflict concerning its supply and demand would intensify further [7]. Issues related to local natural sand has already started to be felt in terms of restricted supply and presence of unwanted impurities as its demand from Malaysian construction trade is rising [5]. Looking from the point of environment sustainability, the growing sand mining business has detrimental effect to the natural surroundings. Unwelcomed environmental destruction caused by river sand mining industries in certain locations across the globe has been previously reported [8 –11]. As mounting shortage of river sand is anticipated in the future owing to increasing demand from construction industry for this non-renewable asset, measures to mitigate this upcoming issue must be addressed immediately. Option of using quarry dust obtained by crushing stones which also harms the environment through air and noise pollution [12] should be switched with healthier choice. In other words, sand production activities pose severe negative impacts to environment and it varies depending on extraction method or manufacturing technologies used [13]. The destruction to river environment

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