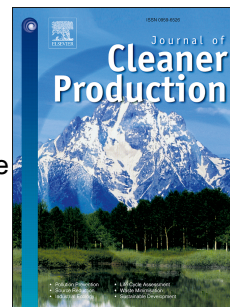


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**Assessing some durability properties of sustainable lightweight oil palm shell concrete incorporating slag and manufactured sand**

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**Abstract**

This paper explores some of the durability properties of a sustainable concrete utilizing oil palm shell (OPS), which is a waste material from the palm oil industry, as lightweight coarse aggregate and manufactured sand to replace conventional natural mining sand as fine aggregate. Ground granulated blast furnace slag (GGBS) was used at 20%, 40% and 60% cement replacement levels with the aim of reducing the cement consumption in OPS concrete (OPSC) and the effect of the GGBS on the water absorption, sorptivity and the long-term free shrinkage of OPSC was investigated. The use of GGBS was found to reduce the sorption of OPSC as the 90-d sorptivity values fell in the range of 0.047 – 0.065 mm/min<sup>0.5</sup>, compared to 0.091 mm/min<sup>0.5</sup> for mixes without GGBS. The OPSC containing GGBS was also found to have initial water absorption of below 3%, which indicated good quality of concrete. In the long term study, over a period of 365 d, the free shrinkage of the OPSC with up to 40% GGBS replacement level was comparable to the corresponding OPSC without GGBS. The GGBS was also found to be beneficial in enhancing the long term compressive strength gain as well as lowering the strength decrease of OPSC upon heat exposure.

**Keywords:** ground granulated blast furnace slag; lightweight concrete; sorption properties; shrinkage

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