

Effect of spent garnet waste as partial fine aggregate replacement on properties of high strength lightweight aggregate concrete

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ABSTRACT

As time goes on, the usage of natural resources for concrete production affects the environment. Both the quarrying activities for granite aggregate harvesting and sand mining destroys the environment. At the same time, industrial by-products namely palm oil clinker (POC) and spent garnet waste which thrown as waste, also cause pollution. The inclusion of spent garnet waste as fine aggregate replacement in POC lightweight aggregate concrete production would reduce the consumption of river sand. This research investigates the effect of using spent garnet waste as a fine aggregate replacement on workability, dry density, and compressive strength of POC lightweight aggregate concrete. Five concrete mixes were prepared by varying the percentage of spent garnet waste as a fine aggregate replacement up to 40% by the weight of fine aggregate. All concrete specimens underwent water curing until the testing age of 7 and 28 days. The specimens were tested to determine dry density and compressive strength. Overall, the use of spent garnet as partial fine aggregate replacement influences the concrete properties. Inclusion of 20% spent garnet in concrete resulted in formation of semi-lightweight concrete with density of 2240 kg/m³. On top of that, the concrete with spent garnet exhibit higher compressive strength of about 60MPa which is about 14% higher than control specimen. Conclusively, the utilization of spent garnet as a partial fine aggregate replacement would save river sand consumption and reduce the dumping of spent garnet.

KEYWORDS

Concrete; Partial fine aggregate replacement; Spent garnet waste; Strength; Workability

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