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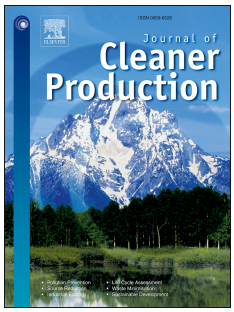

Green concrete production incorporating waste carpet fiber and palm oil fuel ash

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Green concrete production incorporating waste carpet fiber and palm oil fuel ash

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Abstract

With the increasing amount of waste generation from various processes, there has been a growing interest in the utilization of waste in producing building materials to achieve potential benefits. This paper highlights the results of an experimental investigation on the performance of concrete incorporating waste carpet fiber (WCF) and palm oil fuel ash (POFA) as partial replacements of ordinary Portland cement (OPC). Six volume fractions varying from 0 to 1.25% of 20-mm-long carpet fiber were used with OPC concrete mixes. Another six mixes were made that replaced OPC with 20% POFA. The specimens were cured in water and tested for fresh and hardened state properties. The combination of WCF and POFA decreased the slump values and increased the VeBe time of fresh concrete. The addition of WCF to either OPC or POFA concrete mixes did not improve the compressive strength or modulus of elasticity. At 91 days, the compressive strength was in the range of 38.1 to 49.1 MPa. The positive interaction between WCF and POFA, however, leads to high tensile and flexural strengths, thereby increasing the concrete ductility with higher energy absorption and improved crack distribution. The maximum increases in tensile and flexural strengths compared to those of plain concrete were achieved by the addition of 0.5% carpet fiber at the age of 91 days. The ultrasonic pulse velocity (UPV) was examined and was classified as good quality concrete. The study showed that the use of waste carpet fiber and palm oil fuel ash in the production of sustainable green concrete is feasible both technically and environmentally.

Keywords: Waste carpet fiber; Palm oil fuel ash; Physical and mechanical properties; Green concrete production.