

Durability performance of a novel ultra-high-performance PET green concrete (UHPPGC)

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The production of green sustainable concrete with enhanced performance against severe environmental conditions by using recycle waste materials has been a primary concern for recent studies. This article reports a study on investigating the effect of incorporating ultra-fine palm oil fuel ash (UPOFA) with shredded recycled waste bottle in form of Polyethylene Terephthalate (PET) on the engineering and transport properties of ultra-high-performance concrete. UPOFA was used as a partial replacement binder in varied proportions (20% and 40%) of the total cement binder, whereas shredded recycled PET bottles were added as reinforced fibre by 1% of the total mix volume. The greatest compressive strength was registered by a combination of 20% UPOFA and PET fibre in U20-UHPPGC. The combination of 40% UPOFA and PET fibres in U40-UHPPGC mix demonstrated a superior enhancement in terms of transport properties at the age of 28 days, such as porosity, initial surface absorption, gas permeability, water permeability and rapid chloride permeability. Thus, pozzolanic UPOFA can improve the engineering and transport properties of ultra-high-strength concrete. The overall results indicated that the PET fibre reinforced with UPOFA can produce UHPPGC with promising improvements in engineering and transport properties. The incorporation of waste materials into concrete constructions can reduce cement consumption and prevent the environmental pollution with save energy at the same time.