

Improving mechanical properties of lightweight Porcelanite aggregate concrete using different waste material

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Abstract

Improving the mechanical properties of lightweight concrete using waste material is the goal of this work to get both structural and environmental advantage besides cost saving. Porcelanite aggregate was used as lightweight aggregate. First plastic bottles were cut into slices and used as fibers with these percentages: 0.0%, 0.5%, 0.75%, 1.0%, 1.25% and 1.5% by volume. The results of tests under compression and tensile stress showed that mix 1% plastic fiber (PF) gave the best results when compared to reference mix without PF. Egg shell (rich with CaO) and glass wastes (rich of silca) were crashed and powdered to desired size and used as partial replacement of cement with these percentage: 0%, 5%, 10%, 15% and 20%. Compressive strength, flexural strength, density, absorption and modulus of elasticity were tested. Comparison was made with reference mix (without waste powder) to figure the efficiency of using these waste in lightweight Porcelanite concrete. The results of tests showed that mixes with 1% PF and 5% eggshell powder (ESP) gave results so close to reference mix. Using more than 5% ESP made no improvement in lightweight concrete, while the mix with 1% PF with any glass powder (GP) percentages used in this research gave good improvement in the tested properties especially at 20% GP.