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STUDY ON THE INCORPORATION OF FIBERS AND MGPW AND THEIR EFFECTS ON THE FRACTURE ENERGY AND RESIDUAL STRENGTH OF SELF-COMPACTING CONCRETES

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Abstract

This study evaluated the mechanical properties and crack resistance of different concretes using three-point bending tests, with the CMOD (Crack Mouth Opening Displacement) system used to record crack opening. Four compositions were compared: Conventional concrete (CVC), CVC with polyvinyl alcohol fibers (CVC-PF), self-compacting concrete (SCC), and self-compacting concrete with PVA fibers and marble and granite powder waste (SCC-PF). The results highlighted the superior performance of the SCC-PF mixture, which exhibited the highest fracture energy (an increase of approximately 366% compared to CVC) and a 332.93% increase in toughness. This combination also achieved the highest residual flexural strengths. Additionally, SCC, even without fibers, outperformed CVC, showing an increase in initial cracking resistance of approximately 25%. In summary, the study demonstrates that using SCC combined with fibers and Marble and Granite Powder Waste (MGPW) is an effective and sustainable alternative, promoting superior crack control and a significantly improved energy absorption capacity for structural applications.

Key words: conventional concrete (CVC), cracking, crack mouth opening displacement, polyvinyl alcohol fibers, self-compacting concrete (SCC)

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