

Enhancement of autogenous healing on pre-cracked PFA concrete using response surface methodology (RSM)

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ABSTRACT

Concrete is used as a construction material because of its superior mechanical and durability performance and comparably inexpensive cost when compared to other building materials. However, because of its innate heterogeneity, low tensile strength, and unfavourable service environment, concrete is vulnerable to progression and coalescence in micro-cracks production. This study looked into the self-healing assessment of pre-cracked PFA concrete. PFA cement was utilized to replace 10, 20, and 30% of the weight of cement used. To investigate the strength development of PFA concrete, compressive strength was determined. An ultrasonic pulse velocity (UPV) test was performed to monitor the self-healing progress of the concrete to assess the impact of PFA on autogenous healing concrete. The tests were conducted at 7, 28, 60, and 90 days after being cured in water. The result shows that concrete integrated with 10% of PFA as a cement replacement recorded the highest compressive strength compared to those mixes. It is also revealed that UPV readings increased significantly with the increased curing ages for concrete mixes. The results also revealed that the autogenous healing ability of pre-cracked and PFA concrete progressively improved. Based on RSM analysis, the inclusion of PFA in concrete has a strong relationship with strength and autogenous healing progression. Considering all these test results, it was attained that 10% of PFA in concrete exhibits excellent compressive strength and autogenous healing concrete.

KEYWORDS

Ultrasonic pulse velocity; Autogenous healing; Compressive strength; Pulverized fuel ash

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