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Mechanical properties and self-healing evaluation of strain-hardening cementitious composites with high volumes of hybrid pozzolan materials

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The study investigates the self-healing performance and mechanical behavior of strain-hardening cementitious composites (SHCCs) incorporating high volumes of blended ground-granulated blast-furnace slag and fly ash (GGBS-FA SHCCs). The prepared SHCC specimens are pre-cracked by imposing a 0.5% or 1% tensile strain at the age of 180 days, and then exposed to lab-controlled dry, water immersion, or natural weathering conditions for 90 days. Multiple performance evaluation approaches are employed, including compressive tests, tensile tests, resonant frequency measurements, scanning electron microscopy, and energy dispersive x-ray analysis. In comparison with the performance of SHCCs without GGBS, blending GGBS and fly ash in SHCCs is shown to improve the tensile and compressive strengths at 7, 28, and 90 days, while the strain capacity and the multiple narrow cracking pattern of SHCCs are weakened. Furthermore, the SHCCs with blended GGBS and fly ash have enhanced self-healing performance compared to the SHCCs incorporating only fly ash.

Keywords: A. Fibres; B. Microstructures; B. Mechanical properties; D. Non-destructive testing.

1. Introduction

Concrete is vulnerable to cracking during its service life due to multiple factors. For young concrete, the presence of cracks is commonly the result of plastic settlement, plastic and drying shrinkage, and/or early thermal contraction. In later service life, the formation of cracks can be

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