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Mechanical behaviour of self-compacting concrete made with recovery filler from hot-mix asphalt plants

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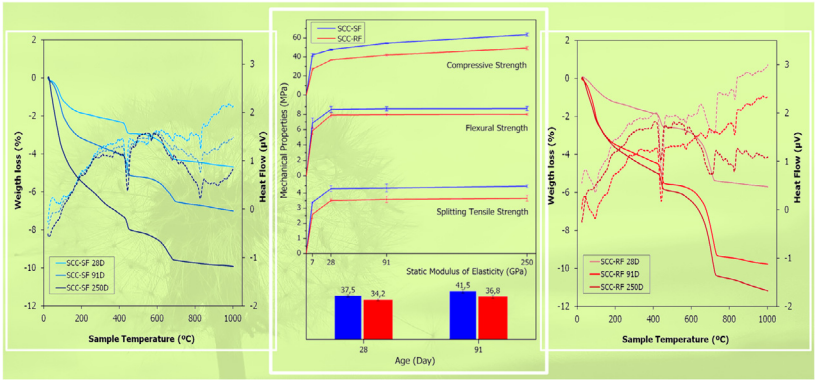
HIGHLIGHTS

- A comparative study of two types of SCC was carried out.
- The aging mechanism of the SCC mixes (SCC-SF and SCC-RF) was different.
- Pozzolanic reactions occurred during curing of the SCC-SF.
- Shrinkage in the SCC-RF was lower because of the larger particle size.
- Recovery filler from hot mix asphalt plants is adequate to produce SCC.

GRAPHICAL ABSTRACT



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ABSTRACT

The aim of this paper is to assess the feasibility of the use of a fine grain waste generated in hot-mix asphalt plants (HMA), namely recovery filler (RF), as filler materials in self-compacting concrete (SCC) production. A comparative study of two types of SCC was performed. The first concrete type was made incorporating recovery filler (SCC-RF) of a dolomitic nature and the second was made with commercial siliceous filler (SCC-SF), the latter used as reference. Good results of self-compatibility were obtained using RF. The thermogravimetric study showed that in SCC-SF the higher loss weight occurs in the dehydration zone (0–400 °C) and in SCC-RF it occurs in the decarbonation area (550–735 °C). The aging mechanism of both concrete types (SCC-SF and SCC-RF) was different. In the SCC-SF mixes, portlandite undergoes carbonation processes and pozzolanic reactions and in the SCC-RF mixes it only undergoes carbonation processes. The experimental results (splitting tensile strength, flexural strength and static modulus of elasticity) show the validity of using EHE-08, initially proposed for NVC (Normally Vibrated Concrete), in SCC. The ultrasonic pulse velocity values for SCC-SF was greater than for SCC-RF, which can be attributed to compacity and compressive strength. The shrinkage behaviour was better in SCC-RF than SCC-SF, mainly due to the greater particle size of recovery filler (RF), although the SCC-RF mixes showed lower density and mechanical strength than SCC-SF. In short, the SCC manufactured

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