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

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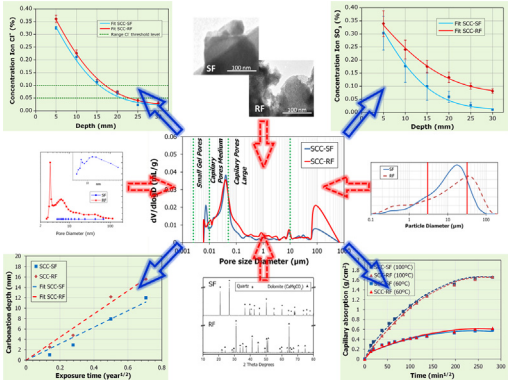
HIGHLIGHTS

- A durability-related comparative study of two SCCs was carried out.
- The porous structure of SCC-RF is less fine than that of SCC-SF.
- Both SCCs could be used in aggressive environments in terms of water absorption.
- The mixes have a good performance regarding chloride and sulphate ions penetration.
- The penetration depth of CO_2 is related with the porosity and the curing mechanism.
- SCC-RF showed better features than SCC-SF in long-terms shrinkage.

GRAPHICAL ABSTRACT



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ABSTRACT

In construction, there is a need to respond to environmental challenges and implement the Circular Economy as a strategy for the sustainable growth of the sector.

To eliminate the lack of confidence in the application of the waste from this sector, it is necessary to carry out research in order to achieve an effective and integral management, as well as the reuse and recycling of these materials.

In this work, a detailed study of Self-Compacting Concrete (SCC) was carried out, using as filler a waste from the drying process of the aggregate used in the manufacture of hot-mix asphalt. The results showed that it is possible to obtain a high-performance SCC in terms of durability by replacing a commercial siliceous filler (SF) with this dolomitic residual powder (RF), with high performance against the attack of aggressive agents (chloride, sulphate and carbonate ions) and shrinkage.

In this study the analysis of the physical parameters of the materials (density, open porosity and pore size distribution as obtained from mercury intrusion porosimetry) and water absorption (by immersion and capillarity) was fundamental. The joint analysis of all the studied parameters allowed obtaining exhaustive results about the durability of the mixes and its interrelation with the properties of the constituents.

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