

# Durability of self-compacting concrete made from non-conforming fly ash from coal-fired power plants

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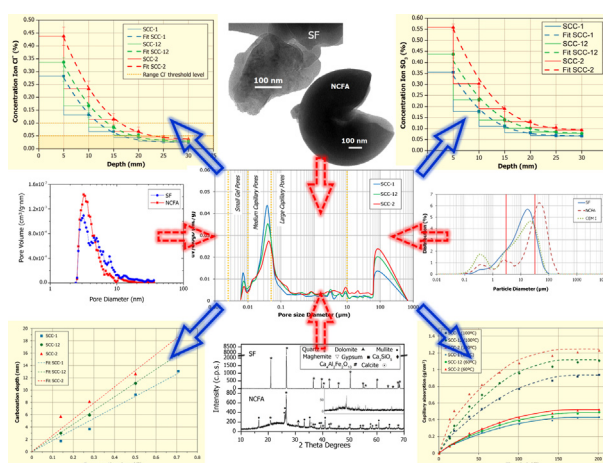
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## HIGHLIGHTS

- A durability-related comparative study of three SCCs was carried out.
- The porous structure of SCC-2 is less fine than that of SCC-1.
- SCCs could be used in aggressive environments in terms of water absorption.
- The mixes have good performance regarding chloride and sulphate ions penetration.
- The penetration depth of CO<sub>2</sub> is related to the porosity and curing mechanism.
- SCC–NCFA showed better features than SCC–SF regarding long-term shrinkage.

## GRAPHICAL ABSTRACT



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## ABSTRACT

The search for answers to the environmental challenges is one of the obligations of the current society. Therefore, the optimisation of natural resources and the minimisation and revaluation of waste should be present in any activity. These purposes should be included in both the construction and energy sectors owing to the large amount of resources consumed and of pollutants and waste generated by them. The present work carries out a feasibility study of the use of fly ash from coal-fired power plants as a filler for self-compacting concrete (SCC). This kind of fly ash does not meet the compliance criteria determined by the regulations, and thus, it is non-conforming fly ash (NCFA). The dual objective of this work is the optimisation of a natural non-renewable resource and the recovery of waste, which should achieve the qualification of end of waste before being used as a by-product. For this purpose, a comparative study of three mixes is performed, namely, SCC-1 with commercial siliceous filler (SF) (SCC reference), SCC-12 with a mix 1:1 by volume of SF and NCFA, and SCC-2 with NCFA. All the mixes showed good self-compactability. The analysis of the relevant parameters, i.e., apparent and dry density, open porosity,

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