

Durability of SCC under aggressive environments

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Overview

Since it was introduced in the early nineties, Self-Compacting Concrete (SCC) has become one of the most desirable types of concrete, and it has opened a new area of research in the field of concrete technology.

SCC has been used widely in highway bridge construction. Moreover, it is used in widespread applications such as buildings, bridges, culverts, tunnels, tanks, dams and precast concrete. Recently, it has been used to form a remarkably large and vital part of infrastructure and substructures across the world which can be exposed to external environmental attack.

Taking into account the fact that SCC is a relatively new concrete and it has a short history in the construction industry, the long term durability characteristics, especially carbonation, chloride ingress and steel corrosion have to be studied very carefully.

The aim of the study

The overall aim of the present investigation is not to develop anew SCC but to further understand the

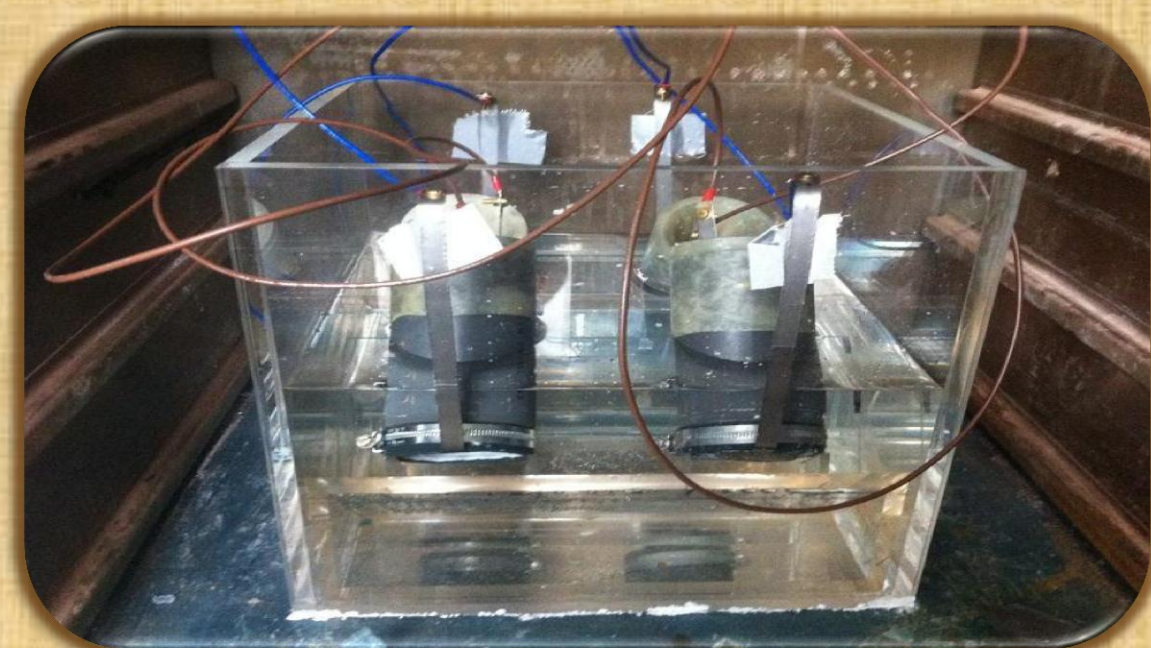
performance of SCC containing different types of fillers (limestone, fly ash and silica fume) at the same water binder ratio, and more importantly, to investigate the durability in conditions of carbonation and chloride penetration using accelerating tests.

Specific aims

- ❖ Investigate the progression of carbonation and chloride diffusion in SCC with different types of filler.
- ❖ Quantify the transport properties of SCC at the microscopic scale particularly the interfacial transition zone (ITZ).
- ❖ Examine the pore structure of SCC and its influences on the transport properties before and after carbonation.

Methodology

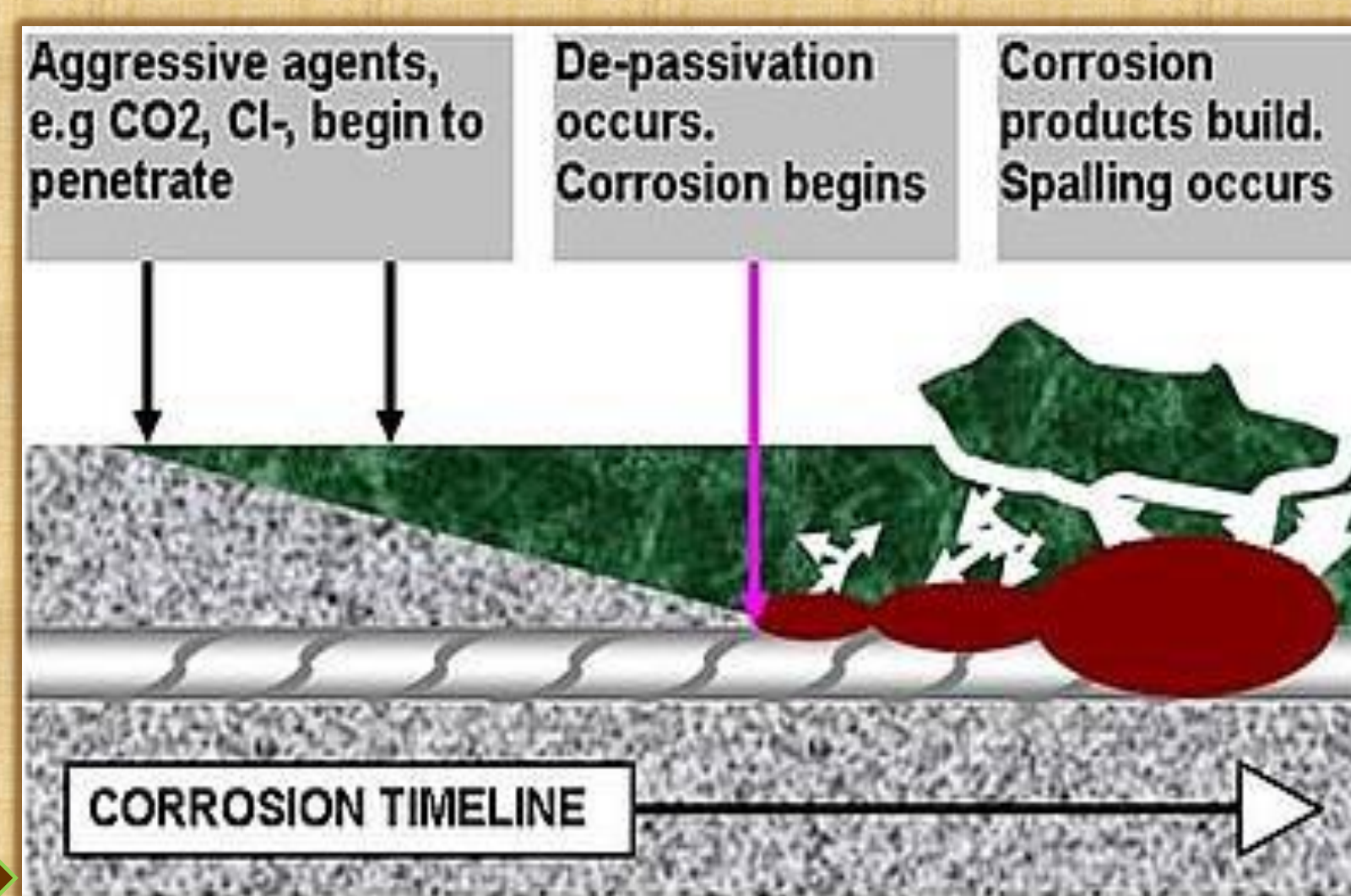
Different types of SCC will be tested under accelerated carbonation and rapid chloride migration test. In addition, the Scanning Electron Microscopy (SEM) and Mercury Intrusion Porosimetry (MIP) will be used to investigate the transport properties at the microscopic scale.



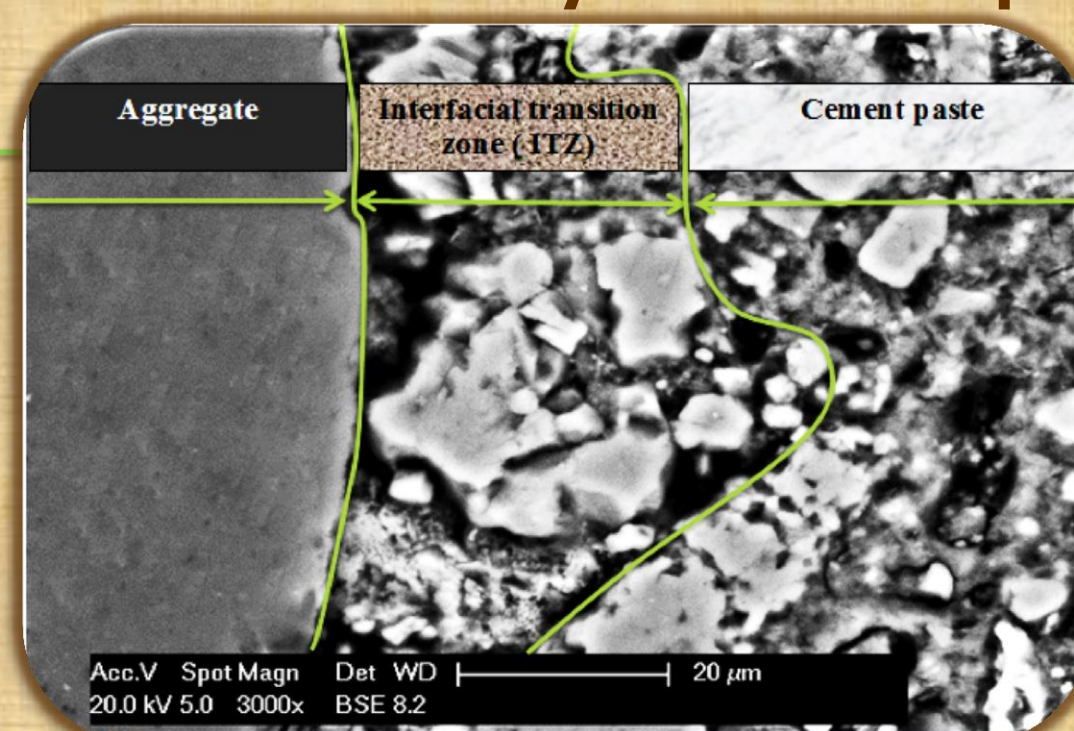
Modified rapid chloride migration test



Chloride depth in different types of SCC in modified rapid chloride migration test



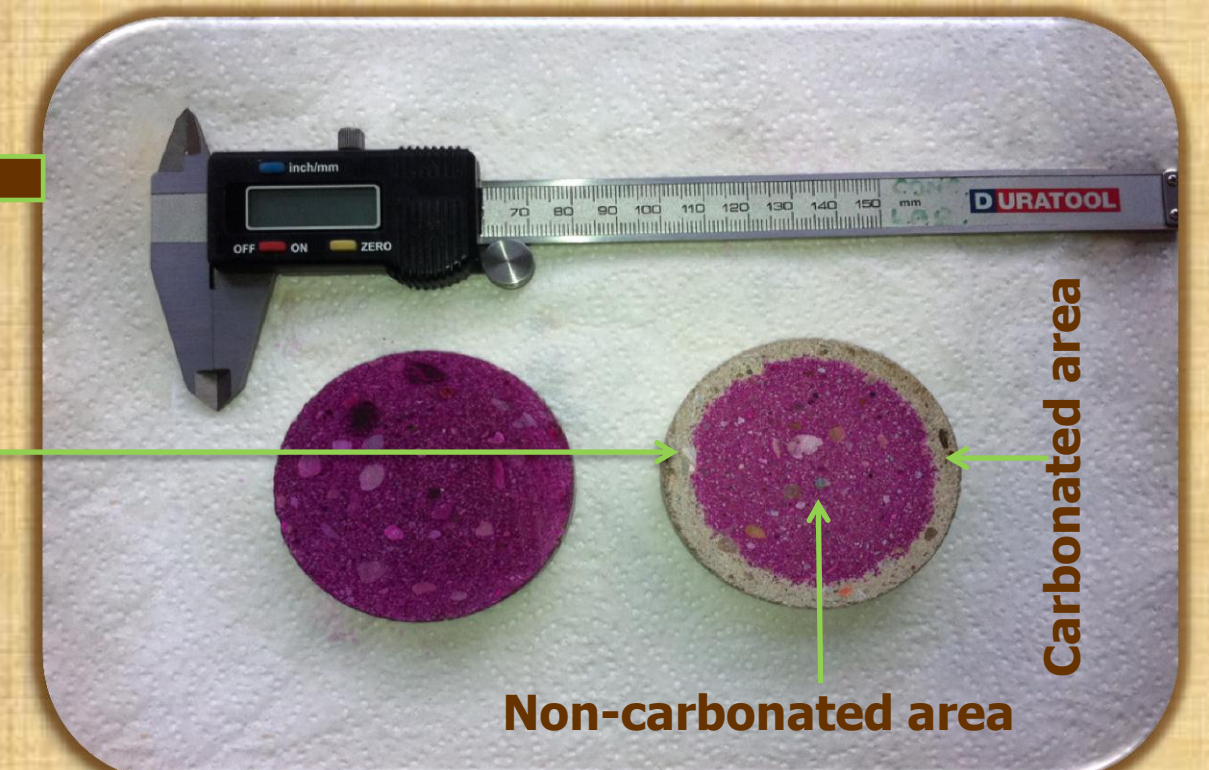
Corrosion of steel caused by CO₂ and Cl⁻ penetrations



Close-up view of the ITZ of limestone SCC



Accelerated carbonation test 100% CO₂



Carbonation depth for limestone SCC in 100% CO₂ accelerated test

Use of SCC in aggressive environments



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