Numerical Modelling of “Self-Protection” Processes in Concrete and its application within a multiscale framework

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ABSTRACT:

The reduced service life of corroded RC structures is a well-recognized problem in the scientific community \([1]\). Concrete is inherently porous \([2]\) and allows corrosion initiating ions such as [Cl\(^-\)] and [CO\(_3^{2-}\)] to pass through. Accumulation of such ions on the embedded rebars leads to the breakdown of the native passive-layer \([3]\), thereby leading to corrosion initiation. Innovative additives that can reduce the influx of such ions inside concrete are required. In the recent years, Layered Double Hydroxides (LDH) have evoked a strong interest in the concrete community due to their ion entrapping properties which can be used to capture external anions from their environment \([4]\). LDHs can be used inside concrete to capture [Cl\(^-\)] ion and release inhibitive anions (NO\(_2^-\), for example). This property is known as “Self-Protection” of concrete.

In this talk, we present numerical models to explain the sequestration capacity of LDH, the exchange kinetics of chloride capture and inhibitor release, and the action inside mortar and concrete. Its position within a multiscale modelling framework is shown and application within an engineering tool introduced.

Keywords: Numerical modelling, Self-protection, corrosion.

Acknowledgements:

This research is a part of multi scale modelling approach under EU-LORCENIS project under grant number: 685445

List of References


