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# Chloride binding capacity of pastes influenced by carbonation under three conditions

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**Abstract:** This research investigates the influence of carbonation on chloride binding capacity under three conditions varying in the sequence and way of carbonation-chloride contact: I, hardened pastes first carbonated then contacted with chloride; II, hardened pastes first contacted with chloride then carbonated; III, pastes inner-introduced with chloride during casting, hardened and then carbonated. The results indicate that, before carbonation, the bound chloride content of pastes inner-introduced with chloride is slightly higher than that of pastes first hardened then contacted with chloride because more Friedel's salt is formed through the former way. And during the carbonation process, the remaining bound chloride content mainly depends on the content of un-carbonated C-S-H gel. And based on the content of it before total carbonation, the content of residual bound chloride in samples under condition I is higher than that under the other two conditions after the same carbonation time. After complete carbonation, the bound chloride content under the three conditions all approximates to zero, which indicates that carbonation makes paste lose chloride binding capacity completely.

**Key words:** paste, chloride binding capacity, bound chloride, carbonation, Friedel's salt, C-S-H

## 1 Introduction

The durability of steel-reinforced concrete structures being in contact with either marine environment or deicing solutions is determined mainly by their resistance to chloride-induced corrosion[1]. Meanwhile, as is well known, it is the free chloride that triggers the steel corrosion. However, the binding of chloride ions decreases the concentration of free chloride[2,3], and it reduces the risk of steel corrosion. Therefore, chloride binding capacity is of great significance for the durability of concrete structures.

There are two types of mechanism driving chloride binding[1,4]: a physical one, which denotes the adsorption of chloride ions onto cement hydrates (mostly on C-S-H gel which is supposed to be capable of physically binding chloride due to its high specific surface values[5,38]), and a chemical one, where the reaction between chloride ions and AFm compounds results in chloride containing AFm compounds(like Friedel's salt). The binding of chloride is a relatively complex process and chloride binding capacity is influenced by different factors. And several recent investigations demonstrate that chloride binding capacity greatly depends on the content of

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