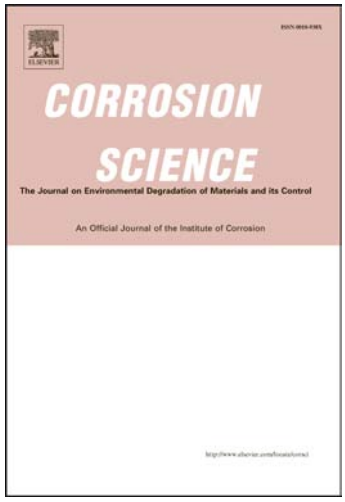

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Feasibility of electrochemical chloride extraction from structural reinforced concrete using a sprayed conductive graphite powder-cement paste as anode

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ABSTRACT

This article summarizes research on the application of a conductive cement paste as an anode in the now classical technique of electrochemical extraction of chlorides applied to a concrete structural element by spraying the paste on the surface of a concrete structural element, a pillar. Sprayed conductive cement paste, by adding graphite powder, is particularly useful to treat sizable vertical surfaces such are structural supports. Outcomes indicate that this kind of anode not only provides electrochemical chloride removal with similar efficiency, but also is able to retain moisture even without the use of a continuous dampening system.

INTRODUCTION

The electrochemical extraction of chlorides (ECE) is a non-destructive methodology to prevent corrosion of steel rebar, the main problem in structural concrete. There is an extensive bibliography on this technique beginning with its initial utilization in the 1970s [1-3]. The method basically consists of applying an electric field between the steel rebar (the negative pole or cathode) and an externally deposited electrode at the concrete surface (the positive pole or anode). Since chlorides (Cl^-) are negatively charged ions, the imposed electric field causes them to migrate from the rebar to the exterior electrode through the concrete pores [4-9].

Cementitious materials are of key importance in structural engineering because of their mechanical strength, durability and low cost. In recent years, however, efforts have been made to draw further benefits from this material by broadening its functionality [10]. Different categories of cement-based multifunctional materials can be distinguished. One of them is the electrically conductive cement-based materials. As regular concrete is a poor conductor (dielectric), different electrical properties can be obtained by the addition of conductive materials, for example graphite powder (GP) or carbon fibers. This way the resulting composite materials have special physical and chemical properties that make them suitable for new technologically advanced products [11-15].

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