Influence of free chloride ions diffusion in the start of corrosion in reinforced concrete structures

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ABSTRACT

One of the main parameters that influence the steel corrosion in reinforced concrete structures is the concentration of free chloride ions, which penetrate through diffusion process from the outside ambient when the concrete submerges in seawater [1,2]. Corrosion starts when a certain concentration of free chloride ions is reached at the steel surface. In this work, numerical simulation is carried out to set the time needed to reach the limit concentration of free chloride ions for the initiation of corrosion as a function of the diffusion coefficient when the domain is saturated [3]. This coefficient, which depends on the temperature, is studied for a wide range of values in order to evaluate its importance in the corrosion processes of the metal structure. Different reinforced concretes are studied for which their main characteristics are known, as well as experimental diffusion coefficient, porosity and others. Also, the influence of temperature in the diffusion process, which turns the problem to be nonlinear, is analysed. The problem is numerically solved using the network method, providing all the values of the variables involved in the diffusion process [4,5]. The reliable and computationally fast model, whose design is explained in detail, is run on standard (free) electrical circuit simulation software (NgSpice) [6].

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