Electrochemical and Passivation Behavior of Duplex Stainless Steel in Simulated Concrete Pore Solution

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Corrosion of steel bars is an important cause of damage to concrete structures, and the passivation films formed on the surface of steel bars could play an effectively protective effect against corrosion. In this study, the common passivation intervals of the 2101, the 2205 and the 2304 duplex stainless steels were determined through cyclic voltammetry and potentiodynamic polarization in simulated concrete pore solution. Following the electrochemical impedance spectroscopy, the results demonstrated that three types of duplex stainless steels formed the most stable passivation film at the -0.2V polarization potential. Finally, the passive film formed on the surface of the three duplex stainless steels, was characterized through the Mott-Schottky and XPS analysis. The experimental data demonstrated that the corrosion resistance of the 2205 duplex stainless steel was improved compared to the 2101 and 2304 duplex stainless steels at the -0.2V polarization potential in the simulated concrete pore solution. This was relative to the alloy composition that generated the formed passive film difference.

Keywords: concrete structure; duplex stainless steel; passive film; electrochemical tests.

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