Short Communication

Corrosion Resistance of Niobium Microalloyed HRB500 Mild Steel Rebar in the Alkaline Concrete Pore Solution

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Recently, micro-alloyed steel rebars had been evaluated extremely to improve corrosion resistance of steel rebars in corrosive environments which intended to enhance the service life of reinforced concrete structures. In this study, corrosion resistance of niobium (Nb) microalloyed HRB500 mild steel rebar in the alkaline concrete pore solution were investigated by electrochemical technique. Electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV) and potentiodynamic polarization techniques were used to study the effect of Nb content on corrosion behavior of steel rebars. The CV results showed that the current density in zero potential decreased by increasing the Nb content, indicating that a small amount of Nb microalloy in steel rebars facilitated the stability of the formed passive layers. The polarization plots showed that the steel rebar with 0.055 wt% Nb content had a smaller corrosion current-density than the other samples which was in the passive state during the test. The EIS results indicated that the double-layer capacitance value decreased with the addition of Nb content, resulting in enhanced protective capacity. The surface morphology of the samples revealed that the surface of steel rebar with 0.055 wt% Nb was smooth and no visible corrosion was observed.

Keywords: Corrosion resistance; Niobium microalloyed steel rebar; Electrochemical impedance spectroscopy; Simulated concrete pore solution

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