Temperature Effect on Corrosion Behavior of 304LN Stainless Steel and Carbon Steel Rebars in Chloride Contaminated Concrete Pore Solution Using Electrochemical Method

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Corrosion of steel rebars in alkaline environments can be exacerbated in hot weather conditions, which has a direct impact on the durability of reinforced concrete structures. Here, the corrosion resistance of 304LN stainless steel and carbon steel rebars were studied using the electrochemical impedance spectroscopy and potentiodynamic polarization techniques in chloride contaminated concrete pore solution at various temperatures. Corrosion rate of all samples had increased with increasing exposure temperatures from 25 °C to 55 °C. Polarization data revealed enhanced corrosion resistance of stainless steel rebar under hot alkaline environments compared to carbon steel rebar which can be attributed to the formation of chemically stable, thin and passive oxide layer caused by chromium into the stainless steel structures. The electrochemical results indicate that 304LN stainless steels reveal a higher impedance with a higher durability, lower corrosion current density, and higher corrosion resistance than carbon steel.

Keywords: Corrosion resistance; Concrete pore solution; Stainless steel rebar; Temperature effect; Electrochemical techniques

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