Short Communication

Portland Cement Partially Replaced by Blast Furnace Slag and Multi-Walled Carbon Nanotubes: Effect on Corrosion Resistance of Carbon Steel Reinforcement in 3% NaCl

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A partial replacement for Portland cement (PC) through supplementary cementitious materials is an alternative technique to reduce carbon steel corrosion in reinforced concrete under exposure to marine environment. Here, the effect of blast furnace slag (BFS) and carbon nanotubes (CNTs) admixtures into PC on the electrochemical corrosion resistance of carbon steel reinforced concrete was assessed by electrochemical impedance spectroscopy (EIS) and polarization systems during immersion in 3.5 wt% NaCl media. The higher compressive strength was observed for BFS-CNT sample which can be attributed to the pozzolanic reaction of BFS filler, the formation of denser microstructure and acceleration of the hydration process. The polarization results show that the concrete samples containing CNTs admixture had a lower value of corrosion current density and corrosion rate revealing the superior performance than the other samples. The EIS measurements indicated that BFS-CNT sample was most effective for enhancing the corrosion resistance of the steel rebar due to the decrease of water absorptivity and chloride ion permeability.

Keywords: Carbon nanotubes; Blast furnace slag; Portland cement; Corrosion resistance; Electrochemical characterizations

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