Short Communication

Electrochemical Corrosion Resistance of Carbon Steel Rebar in Concrete Structures Exposed to 3.5wt% NaCl Solution: Effect of Green Inhibitors and Micro-Silica as Partial Replacement

Shao-hua Shi*, Yong-Quan Xiong

School of Architectural Engineering, Sichuan University of Arts and Science, Dazhou, Sichuan Province, 635000, China

*E-mail: sshssh080612@sina.com

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In this research, the simultaneous effect of mineral admixtures and a green inhibitor on corrosion resistance of carbon steel rebar in concrete exposed to 3.5wt% NaCl solution were studied. Portland cement (PC) was replaced by a mixture of metakaolin and micro silica (MS) admixtures. Electrochemical impedance spectroscopy technique and polarization measurement, water absorption test and compressive strength were used to assess the corrosion resistance of carbon steel in concrete. The electrochemical results revealed that the MS15M15 concrete containing both MS and metakaolin had higher corrosion potential and resistance than the other samples. The water absorption results exhibited that the MS15M15 specimen significantly influence on mobility and penetration of water and chloride ions. The morphology characterization of the surface of carbon steel rebar showed that slight pits and low corrosion products appeared on the surface of MS15M15 sample which was according to the results achieved from electrochemical tests. The polarization results revealed that the *disporopsispernyi* leaves extract (DPLE) was a mixed-type inhibitor that improved the corrosion resistant performance in carbon steel rebar considerably with formation of an organic layer to prevent both cathodic and anodic corrosion reactions. These findings exhibited that mineral admixtures and DPLE inhibitors led to a decrease of hydroxide ion contents which caused an enhancement in passivation of carbon steel rebar and an enhanced corrosion resistance.

Keywords: Partial replacement; Carbon steel rebar; Mineral admixtures; Electrochemical corrosion behavior; Green inhibitor

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