Jordan University of Science and Technology

Effect of benzotriazole derivatives on corrosion of steel in simulated concrete pore solutions.

Authors: Sheban, M., Abu-Dalo, M. Ababneh, A.

Abstract: Purpose ? The aim of this research was to develop corrosion protection systems for reinforced concrete structures under chloride attack. Benzotriazole (BTA) and BTA derivatives were used as corrosion protection materials for the steel. Design/methodology/approach ? The effect of BTA and four other BTA derivatives on the corrosion resistance of steel in simulated concrete pore (SCP) solutions was studied. BTA derivatives were used as two separate protection systems: inhibition and pickling protection systems. The experiments were performed in SCP solutions which simulated concrete with and without severe chloride attacks. Electrochemical techniques, i.e. potentiodynamic polarization and electrochemical impedance, and Fourier transform infrared spectroscopy (FTIR) were used to assess the steel corrosion protection systems. Findings ? The potentiodynamic polarization studies showed an increase in the pitting potential for all protection systems tested. In addition, a large increase in the steel solution interfacial resistance was observed by electrochemical impedance studies (EIS) due to the formation of steel-BTA derivatives complex on the surface. This film was formed on the steel surface with either mono-or bi-dentate bonds between the triazolic nitrogen ring and the steel surface as shown by the FTIR. Research limitations/implications ? BTA derivatives provided good protection for steel in SCP solutions, indicating their applicability in reinforced concrete structures. However, tests using reinforced concrete samples are required to study possible interactions between steel, BTA derivatives and concrete constitutes, e.g. sand, gravel, cement and chemical admixtures. These BTA-based systems also should be studied under carbonation attack. Originality/value ? BTA derivatives provided a good protection for steel in the SCP solutions, and this indicates the applicability to use them in reinforced concrete structures.