Short Communication

Electrochemical Corrosion Behaviour of Carbon Steel in Concrete with Metakaolin Admixture Exposed to Soil with High Concentration of Chloride Ions

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One of the most useful construction materials is concrete. Cementitious materials blended with some admixtures have been used to improve durability, sustainability and reduction of production cost. In recent years, the use of metakaolin as one of the most efficacious pozzolans in concrete has received remarkable interest. On the other hand, chloride ions in different environments play a significant role in corrosion reaction. To evaluate the effects of soil environment, especially the soil with high concentration of chloride ions on the corrosion of carbon steel in concrete with metakaolin admixture, investigations were carried out. In this study, electrochemical corrosion behavior of carbon steel in concrete with metakaolin replacement in different ratios (5 wt%, 10 wt%, 15 wt% and 20 wt%) was discussed. Electrochemical corrosion behavior was studied by monitoring of corrosion potentials, polarization measurement and electrochemical impedance spectroscopy (EIS) and also the surface morphology was studied by scanning electron microscopy (SEM). EIS results indicated that the concrete containing metakaolin, especially the sample with 15 wt% MK revealed higher corrosion resistance compared to the ordinary Portland cement (OPC). Furthermore, polarization measurements showed that the lowest corrosion current density and the highest corrosion potential belonged to the 15 wt% MK sample which was consistent with EIS results. Scanning electron microscopy revealed that the mixture containing 15 wt% MK is denser and more uniform with less porosity than that of the OPC sample.

Keywords: Corrosion resistance; Electrochemical Impedance spectroscopy; Metakaolin; Polarization; Carbon steel in concrete mixtures

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