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Time-varying law of rebar corrosion rate in fly ash concrete

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Highlights

- The addition of FA preferably increased the resistivity of concrete.
- The influence of pore water saturation on the resistivity of concrete was considered.
- The addition of FA slowed down the corrosion process and reduced the corrosion ratio of steel bar in concrete.
- Evaluation of steel bar corrosion in concrete by using advanced digital video microscope measure system.

Abstract: Whereas steel bar corrosion is the main cause for durability deterioration of existing reinforced concrete structures, it is important to understand the steel bar corrosion in concrete and predict the corrosion process in a sufficient way. In this paper, the corrosion process of rebar in ordinary concrete and three types of fly ash concrete specimens casted with 15%, 30% and 45% fly ash replacement ratios by mass under constant climate conditions were investigated. Meanwhile, the advanced digital video microscope measure system was used to study the microstructure of the steel/concrete interface at the different stages of corrosion. The effects of fly ash replacement were analyzed in terms of the electrical resistivity of concrete and the corrosion rate in the corrosion process of steel bars in fly ash concrete. The results showed that the resistivity of concrete increased with an increase in fly ash replacement, and the corrosion rate declined with the fly ash replacement increases. In addition, in fly ash concrete, the corrosion rate of plain bars were obviously smaller than that of ribbed bars.

Keywords: Fly ash concrete; Corrosion rate; Electrical resistivity; Time-varying; Pore water saturation

1. Introduction

Although reinforced concrete is one of the most widely used building materials in construction industry for its good durability and relatively lower cost, producing the cement will

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