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- Published: 24 July 2020

Response Surface Analysis of the Corrosion Effect of Metakaolin in Reinforced Concrete

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Silicon **volume 13**, pages2053–2061 (2021)Cite this article

A Correction to this article was published on 06 October 2020

Abstract

Concrete is one of the most utilized construction materials. The use of sustainable cementitious material is one of the new trends in concrete technology. Several cementitious materials have been used as partial and full replacement for cement in concrete. These materials have been used in a bid to improve sustainability and reduce production cost. However, the corrosion effect of these materials has been neglected. The experimental research assessed the corrosion effect of metakaolin on some samples of concrete. This was achieved by evaluating the concrete pore solution. The metakaolin was used as a partial replacement for cement at 0, 10, 20, and 30% replacement which gave the optimum mechanical strength. The concrete pore was extracted through mechanical means. The inhibition efficiency of metakaolin in concrete production was assessed using the and weight loss method by inserting the mild steel in artificial concrete pore solution. A reduction in the

corrosion rate was observed at higher percentage addition of metakaolin which signifies an improvement in the inhibition of the developed concrete The relationship between the observed parameters was evaluated using response surface methodology. The result of the analysis showed that a unit increase in time would cause a 0.03 increase in the corrosion rate. Additionally, a unit increase in the temperature will have a 0.065 positive effect on the corrosion rate of mild steel. The R^2 value showed that about 89.7% variation in the corrosion rate was accounted for by the effect of the independent variable (time, temperature and metakaolin). The outcome of this research will serve as a guide for construction workers, engineers and other researchers on the corrosion effect of this sustainable supplementary material in concrete technology towards the design and construction of sustainable concrete infrastructure.

34,95 €

Change history

- 06 October 2020

  A Correction to this paper has been published: https://doi.org/10.1007/s12633-020-00754-1

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Acknowledgements

The authors are grateful to the management of Covenant University, Ota, Ogun State, for the privilege to use the Transportation and Highway and corrosion laboratories.

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Busari, A.A., Kupolati, W.K., Ndambuki, J.M. *et al.* Response Surface Analysis of the Corrosion Effect of Metakaolin in Reinforced Concrete. *Silicon* **13,** 2053–2061 (2021). https://doi.org/10.1007/s12633-020-00587-y

Download citation

- DOIhttps://doi.org/10.1007/s12633-020-00587-y

Keywords