

DIFFUSIVITY OF SULPHATE ION IN SELECTED ORDINARY PORTLAND AND PORTLAND POZZOLANA CEMENTS MORTAR

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ABSTRACT

Cement is subject to degradation by aggressive media. This study investigated sulphate diffusivity in mortar made from selected Kenyan cements which included three brands of Ordinary Portland Cements (OPC) and three brands of Portland Pozzolana Cements (PPC) sampled within Kenyan markets. The test cements were used to make mortar prisms at different water/cement ratios. Compressive strength was determined at the 7th and 28th day of curing. The mortars were subjected to laboratory prepared 3.5 % by mass of sodium sulphate solution under accelerated ion migration test method for a period of thirty six hours using a 12V DC power source. The compressive strength before subjecting to aggressive media was found to increase with curing duration as well as on decreasing w/c. Compressive strength at all w/c ratios was found to increase after the aggressive media ingress, however, prolonged exposure or exposure to high levels of sulphate is known to be deleterious to cement/concrete. After subjecting the mortar cubes to SO₄

2- media, they were sliced and the cores from the slices analyzed for SO₄

2-

content. From these results, apparent diffusion coefficient, D_{app}, was approximated from solutions to Fick's 2nd law using the error function. PPC at all w/c ratios showed lower D_{app} than OPC. SO₄ 2- ingress for both cement types across all cement categories, increased with the increase in w/c ratio. Chemical analysis results showed that the Kenyan Cement meet the minimum chemical and phase requirements.

Key Words: Diffusivity, Aggressive media, water/cement ratio, Compressive strength, Ingress.