World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:12, No:03, 2018

Bulk Electrical Resistivity of Geopolymer Mortars: The Effect of Binder Composition and Alkali Concentration

Authors : Mahdi Babaee, Arnaud Castel

Abstract : One of the main hurdles for commercial adaptation of geopolymer concrete (GPC) as a low-embodied-carbon alternative for Portland cement concrete (PCC) is the durability aspects and its long-term performance in aggressive/corrosive environments. GPC is comparatively a new engineering material and in the absence of a track record of successful durability performance, proper experimental studies to investigate different durability-related characteristics of GPC seem inevitable. In this context, this paper aims to study the bulk electrical resistivity of geopolymer mortars fabricated of blends of low-calcium fly ash (FA) and ground granulated blast-furnace slag (GGBS). Bulk electrical resistivity is recognized as one of the most important parameters influencing the rate of corrosion of reinforcing bars during the propagation phase of corrosion. To investigate the effect of alkali concentration on the resistivity of the samples, 100x200 mm mortar cylinders were cast at different alkali concentration levels, whereas the modulus ratio (the molar ratio of SiO2/Na2O) was fixed for the mixes, and the bulk electrical resistivity was then measured. Also, the effect of the binder composition was assessed with respect to the ratio of FA to GGBS used. Results show a superior performance of samples with higher GGBS content. Lower concentration of the solution has increased the resistivity by reducing the amount of mobile alkali ions in the pore solution. Moreover, GGBS-based samples showed a much sharper increase in the electrical resistivity with decreasing the moisture content.

Keywords : bulk resistivity, corrosion, durability, geopolymer concrete
Conference Title : ICCET 2018 : International Conference on Concrete Engineering and Technology
Conference Location : London, United Kingdom
Conference Dates : March 15-16, 2018