Performance Evaluation of Hybrid One-Part Alkali Activated mortar

Eddy Yusslee (Eddy Mohd Fairuz Bin Mohd Yusslee) [1]
Auckland University of Technology (AUT), New Zealand

S Beskhyroun (Dr. Sherif Beskhyroun)[2]
Auckland University of Technology (AUT), New Zealand

ABSTRACT

The two-part alkali-activated materials (AAMs) has been widely used as an alternative to Portland cement. This product could emit lesser carbon dioxide by utilizing industrial waste products to make this cement binder technology greener and sustainable. One-part AAMs system was introduced in recent years to overcome the two-part system's shortcomings. This technology, renowned for its 'just add water' concept, was easier and more practical to apply at construction sites. This study was carried out to evaluate the mechanical performance of one-part alkali AAMs in the form of mortar under lab ambient temperature in the tropical climate country of Malaysia. Drying shrinkage measurement of the mortar was also tested to give an early indication of its durability. The one-part alkali-activated mortar was composed of hybrid aluminosilicate precursors between fly ash (FA), Ground Granulated Blast Furnace Slag (GGBFS) and Portland composite cement (PCC). Low alkaline activator of solid potassium carbonate used for geopolymerization process, and three types of solid admixtures added to complete the composition of the new mix design. According to the results obtained, the mechanical strength of one-part alkali-activated mortar achieved the minimum requirement for Class R3 - concrete structural repair materials as per EN1504-3 specifications. This eco-friendly cement binder has excellent potential for further engineering development, particularly to become a new concrete repair product in the future.

Keywords: Geopolymerization, Mechanical strength, Mortar mix design, Low alkaline activator, Concrete structural repair.