



## Fly ash Based Banana Fiber-reinforced Geopolymer Mortar

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### Abstract

Banana fiber-reinforced geopolymer (BFRG) mortar is an engineered cementitious composite (ECC) that can be used in masonry units and repair system of different concrete elements. During geopolymerization, only small amount of carbon dioxide (CO<sub>2</sub>) is generated and reinforcing it with banana fibers (BFs) made the matrix compact and more earth-friendly. BFs treated with sodium hydroxide (NaOH) enhanced its surface roughness and significantly increased its tensile properties. Design of experiment (DOE) with 13 design mixtures are aimed to obtain the highest value of compressive strength. Factors considered in the DOE are the silica fume (SF) and BF content, ratios of the activator to precursor, water to solids, NaOH to water glass (WG) and fly ash (FA) to sand. The experiment revealed the optimum BFRG mortar and the compatibility of BF to the geopolymer which gained great values for workability, split tensile strength and compressive strength.

**Keywords:** engineered cementitious composites; natural fiber; treated banana fiber; geopolymer flowability; geopolymer ambient curing; geopolymerization

### 1 Introduction

Geopolymer mortar reinforced with banana fiber (BFRG) mortar is an ECC which has great potential as an alternative or replacement of ordinary

Portland cement (OPC) mortar that are commonly used in masonry units and repairing/patching of different concrete elements. OPC has been used for more than 200 years as the main ingredient of concrete [1]. The finite resources and the