

Application of alkali-activated palm oil fuel ash reinforced with glass fibers in soil stabilization

ABSTRACT

The feasibility of using palm oil fuel ash (POFA) as a precursor for alkali activation reactions, in combination with glass fibers as a discrete reinforcement, has been investigated. The experimental work was focused on the shear strength (using unconfined compression tests) and the tensile strength (using indirect tensile tests and flexural tests). According to the results, it was found that the peak stress increased and the post-peak behavior was modified from a brittle to a more ductile response depending on the amount of fiber reinforcement in the alkali-activated mixtures. An analysis of the microstructures revealed that the most significant factor contributing to the enhanced behavior of the reinforced mixtures was the interaction between the geo-polymeric matrix and the fiber surface. The present work brings new insights to the soil stabilization industry by providing an effective method for enhancing the properties of soil treated by the alkali activation of POFA (a low-value agro-waste by-product) through the inclusion of glass fibers. This brings advantages over the traditional calcium-based binders (i.e., lime and cement) as their production involves the emission of carbon dioxide, one of the factors significantly contributing to global warming.

Keyword: Glass fibers; Alkaline activation; Ground improvement; Geopolymerisation