



Effects of Temperature in Different Initial Duration Time for Soft Clay Stabilized by Fly Ash Based Geopolymer

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Abstract

When soft clay soils are included in engineering projects, it's stabilized usually with some kinds of admixtures named as stabilizers. The common stabilizers that highly practiced are OPC, lime, high calcium fly ash (FA), etc. Each one of these stabilizers has its shortcomings. Geopolymers are the product of alkali activated aluminosilicate sources that excelled as an alternative to ordinary binders due to its sustainability, low cost and good mechanical properties. This study investigates the effects of some key elements like liquid over fly ash ratio (Liq/FA), initial duration curing time (D) and its temperature to soil – FA based Geopolymers samples characterized by its unconfined compressive strength testing (UCS), volumetric measurements, scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and X-Ray diffraction (XRD). The Liq/FA taken as 2.71, 3.167, 3.8 and 4.75 respectively and the duration time taken were 1, 6, 18 and 24 hrs. respectively. The tests results showed that the maximum peak strength gain when Liq/FA is 3.8 at 90 °C with 24 hrs. D. It was observed that Young's Modulus increased with increasing curing temperature for certain D. Volumetric strain increased by increasing D and its temperature. SEM and XRD analyses confirmed the Geopolymers gels formation for a selective precursor while EDX analyses showed that silicon over aluminium ratio is 1.38 for selective spectrum within the gel to the same mixture.

Keywords: Geopolymers; Soil Stabilization; Scanning Electron Microscopy (SEM); Energy Dispersive Spectroscopy (EDS); X-Ray Diffraction (XRD).

1. Introduction

Soils can be categorized according to its particles size usually into cohesive and cohesion less. Cohesive soils have a small particle sizes which causes general tendency to illustrate sticky properties and / or particle – water attraction, furthermore, physical disturbances, wetting exposure may dictate such soils to possess low shear strength, high plasticity and high compressibility [1]. Soft clay is a term refers to soils that exhibit low undrained shear strength (less than 40 kPa) and high compressibility (C_c between 0.19 to 0.44) at specified moisture contents (45 to 65%) [2, 3].

When soft clay soils are encountered in any engineering projects, some kind of ground improvement is essentially needed to overcome its defects. Techniques like pre loading, electro osmoses, stone column were highly examined in the literature. The chemical stabilization represents a suitable method to treat soils under consideration. This method can be done by addition of chemical admixtures (stabilizers) to soils to render some geo technical properties like strength, volume and moisture change) less sensitive to fluctuations [4].

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