ABSTRACT

Durability or longevity of stabilized subgrade soil is a critical parameter that defines the structural capacity and long term performance of pavement layers. Moisture is known to be one of the detrimental factors affecting the long-term performance of stabilized subgrade layers. Although the presence of water (optimum moisture conditions) is needed to sustain long term pozzolanic reactions, ingress of external water is known to degrade the structural properties of these stabilized layers. The magnitude of damage due to intrusion of water has been shown to depend on the extent of pozzolanic reaction achieved. Even though lime treatment reduces the affinity for water in clayey soils, the stabilized matrix can hold external water due to the inherent water holding capacity of the precipitated Calcium Silicate Hydrate (C-S-H) phases. Hence the amount of water held in the stabilized layer may further depend on the type and concentration of individual cementitious phases formed during lime-soil interaction. However the structure, composition and morphology of cementitious phases vary with the physiochemical conditions existing in the stabilized layer during the time of precipitation. Being the major strength contributor in stabilized soil, moisture exposure and the subsequent changes in physiochemical properties of C-S-H phases can significantly influence the strength and durability of the treated soil. A differential scanning calorimeter with thermo gravimetric analyzer was used to study the changes in type and concentration of different C-S-H phases formed in treated soils. This study primarily focuses on determining the probable cause behind durability issues in stabilized layers due to moisture intrusion, mainly during the early stages of curing when the stabilized soil has not achieved appreciable strength. The study also focuses on the impact of different C-S-H phases on the durability of lime stabilized soils. Results suggest that different C-S-H phases are formed in a given soil depending on the amount of lime added. Furthermore, a difference in concentration and type of individual cementitious phases may also contribute to difference in behavior of stabilized layers.

KEYWORDS: lime stabilization, durability, calcium silicate hydrate (C-S-H), C-S-H I, C-S-H II, thermal analysis, DSC, TGA.