

Internships 2013

Effect of cement on textural and chemical properties of clays

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Natural resource management is a critical challenge to be taken into account in any land development project, especially earthworks. The use of soils located within the project rights-of-way offers an alternative that allows conserving natural resources. To proceed with this alternative, soil stabilization using lime and/or hydraulic binders is a widespread technique employed to improve the workability and hydromechanical properties of soils.

Lime or cement was mostly used as additive for the stabilization of natural soils by cementing action of the secondary compound like calcium silicate hydrates (C-S-H) and calcium aluminate hydrates (C-A-H). These compounds are also responsible for improving the mechanical properties of the soil and notably the unconfined compressive strength. Many studies have been conducted in order to describe lime effects on a soil. These reactions, their kinetics and the type of hydrates formed all depend on the nature of the mineral phases composing the soil with the uniqueness of kaolin and mica

Unlike smectites, these minerals have a lower reaction kinetics, which depends on their structures and surface properties. It has thus been shown that the montmorillonite has a high initial reactivity associated with consumption of lime and forming C-S-H, whereas kaolinite has a low reactivity, but undergoes a structural change (morphology, interlayer connections ...) and gradually form AFm phases.

The objective of the present study is to generalize these results to other clay samples, but also to compare this behavior when cement is added. The objective is to better understand the changes of surface properties of clays in the addition of cement, in connection with their rheological behavior.

During this study, student will compare the reactivity of smectite and kaolinite in an addition of cement, from the evolution of mineralogy (XRD, IR) and textural properties of the samples (BET, gas adsorption, SEM / TEM).