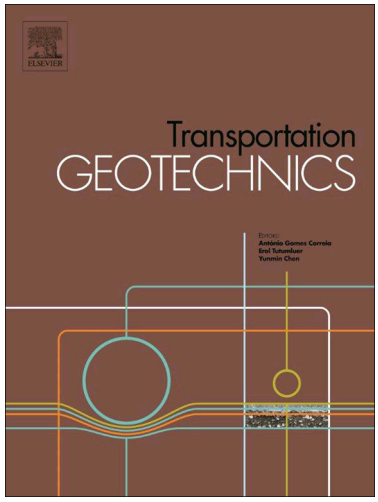

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Dennis Pere Alazigha, Buddhima Indraratna, Jayan S. Vinod, Ana Heitor

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MECHANISMS OF STABILIZATION OF EXPANSIVE SOIL WITH LIGNOSULFONATE ADMIXTURE

Dennis Pere Alazigha[1], Buddhima Indraratna[2], Jayan S. Vinod[3], Ana Heitor[4]

Abstract

This study investigated and identified the mechanisms by which a remoulded expansive soil was modified or altered by a non-traditional admixture, lignosulfonate (LS). To achieve this objective, untreated and LS treated samples of expansive soil were examined microscopically using X-Ray Diffraction (XRD), a Scanning Electron Microscope coupled with Energy Dispersive Spectroscopy (SEM/EDS), Fourier Transform Infrared (FTIR), Computed Tomography (CT-Scan), Nuclear Magnetic Resonance (NMR), Cation Exchange Capacity (CEC), and the role of Specific Surface Area (SSA). The interest was to identify and compare any physical and chemical changes between the untreated and treated samples and then propose the most likely reaction modes between the admixture and the soil minerals.

The results indicated that the percent swell is intimately related to the amount of water that is adsorbed by the expansive clay minerals. Furthermore, the amount of moisture in an expansive soil is influenced by a small addition of organic (cationic) compound such as LS. The adsorption of LS on the mineral surfaces provided waterproofing effect on soil due to the hydrophobic nature of LS, which in turn contributed to a decrease in the extent of swelling of the otherwise expansive soil. The basal and peripheral adsorption of LS led to smearing and subsequent agglomeration of soil particles restricting water ingress into the soil body. In addition, the cationic exchange between the admixture and the soil particle surfaces (i.e. replacing the negative surfaces on clay lattices) prompted flocculation, which further decreased the soil's affinity to water.

Key words: Stabilization With Admixtures, Physical-Chemical Interactions of Soil and Rock, Geotechnics of Sustainable Construction