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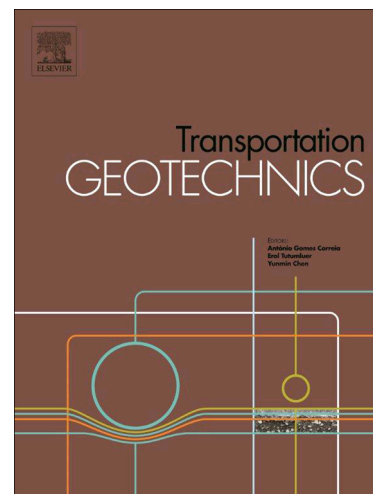
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STABILIZATION OF BLACK COTTON SOIL WITH LIME AND IRON ORE TAILINGS ADMIXTURE

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ABSTRACT

A laboratory study on the stabilization of black cotton soil (BCS) with up to 8 % lime admixed with up to 10 % iron ore tailing (IOT) by dry weight of soil compacted with British Standard light, BSL energy (relative compaction – 100 %) was carried out to establish the soil improving potential of the lime – IOT blend. Tests carried out include index, compaction, strength and durability. Unconfined compressive strength (UCS), CBR (soaked and unsoaked condition) and resistance to loss in strength of specimen yielded peak values at 8 % lime / 8 % IOT treatment. Microanalysis using scanning electron microscope (SEM) revealed that crystalline hydration products present in the optimally treated black cotton soil majorly contributed to the gain in strength. The batch equilibrium test results on the leaching potential of iron (Fe^{2+}) from the BCS – lime - IOT mixture into the environment show that the desorbed value 0.272 mg/l of Iron (Fe^{2+}) concentration for 8 % lime / 8 % IOT content falls within the permissible value of not more than 0.3mg/l Iron (Fe^{2+}) concentration for drinking water recommended by the World Health Organisation (WHO) and Nigerian Industrial Standard (NIS). Based on strength criterion, an optimal 8 % lime / 8 % IOT is recommended for treatment of black cotton soil for use as sub base material in the construction of low volume roads. The benefits of the application include reduction in the environmental impact of the disposal of iron ore tailings.

Key words: Batch equilibrium, Black cotton soil, Iron ore tailings, Lime, Microanalysis, Stabilization.

INTRODUCTION

Black cotton soil belongs to the smectite group, and includes montmorillonite, a highly expansive and the most troublesome clay mineral when encountered in construction (Osinubi et al., 2010). Black cotton soils are poor materials to employ in highway or airfield construction because they contain high percentages of plastic clay. In areas where they occur, usually there

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