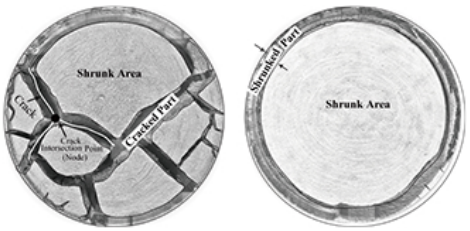
activities where the infrastructures are built up in this type of soil. The subject of this article is to simulate/replicate the expansive black cotton soil by using the mixture of other clay soils based on their physical, mineralogical, and chemical composition parameters. The various combinations of soils have been attempted and investigated to create/replicate the artificial/pseudo black cotton soil. Atterberg limit, shrinkage limit, Free Swelling Ratio (FSR), and X-Ray Diffraction (XRD) analysis test methods have been performed to simulate the expansive clay soil and as well as to analyze the engineering property of the replicated clay soil.

Keywords: Simulated black cotton soil, Bentonite and kasaoka clay, Swell-shrinkage, Engineering property of the soil

Effect of Diatomaceous Earth on Desiccation Cracking of Expansive Soils



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Expansive soils shrink and swell, causing considerable density differences as the moisture content varies and cracks develop as the soil dries. This cracking condition has a detrimental effect on the stability of infrastructure built on expansive soil, such as road embankments. In this study, experimental tests were conducted on saturated slurry to investigate diatomaceous earth's effect (at 5%,10%,15%, and 20% DE percent by mass) on the desiccation cracking of expansive soils. The study quantitatively uses the computer image analysis technique to examine and express soil desiccation cracking from digital images. Experimental parameters examined and analyzed here are the geometric features of cracks, such as surface crack area and crack connectivity. The study defines soil crack area ratio and cracking index to show the effect of diatomaceous earth on expansive soil desiccation cracking. The experimental results show that the desiccation cracking is uneven and of significant size on 0%,5%, and 15% DE blends. However, the blend at 10% and 20% DE shows reduced desiccation cracking and a homogenous radial cracking pattern. The soil blend at 20% DE effectively reduces desiccation cracking. The study revealed that diatomaceous earth substantially affects surface crack reduction through the image analysis approach, an essential quantitative method to quantify soil desiccation cracking.

Keywords: Expansive soil, Desiccation cracking, Diatomaceous earth (DE), Image analysis

Mechanical Properties of Soils Treated with Fine Shredded Paper (FSP) and Hydrated Lime

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As urbanization and population increase, there is a shortage of land where construction is required to build over a weak and soft clay subsoil profile that has a low bearing capacity which may cause excessive settlement. To mitigate this problem, replacing the soft soil with selected material is one of the techniques used for several decades. However, as this approach is too expensive researchers come up with some stabilization methods using different stabilizing agents like cement, lime, solid wastes, an agricultural byproduct, chemicals, fibers and so on.

In this study finely shredded paper (referred as FSP) is utilized in combination with hydrated lime as an additive of stabilization of Kasaoka clay soil. The study focuses on the improvement of the engineering properties of soil with the addition of different content of additives both the FSP and hydrated lime. For this purpose, a series of laboratory experiments were conducted using samples at different curing periods. The compressive strength value of treated soil increases as the curing period increases from 7, 28, and 60 days. In addition, X-ray Fluorescence (XRF) and Scanning Electron Microscope (SEM) are conducted to understand microscopic characteristics of the stabilization process where the formation of flocculation is clearly observed as the curing period increases. The combination of FSP fiber and hydrated lime creates new cementitious material between clay particles which creates a stiffer soil matrix that changes the properties of treated soils.

Utilization of fine shredded paper with hydrated lime for subgrade stabilization of soft soil can be used as a sustainable and cost-effective method of improvement where it can be used for rural road maintenance.

Keywords: Fine shredded paper, Hydrated lime, Kasaoka clay, Unconfined compressive strength