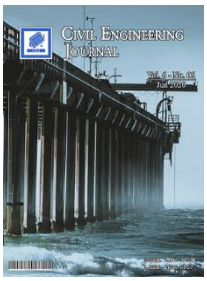
Available online at www.CivileJournal.org

Civil Engineering Journal

Vol. 6, No. 6, June, 2020



# Incorporating of Two Waste Materials for the Use in Fine-Grained Soil Stabilization

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Received 14 January 2020; Accepted 25 April 2020

**Abstract**

The present experimental work briefly aimed to utilize two different waste materials; calcium carbide residue (CCR) and the locally available rice husk ash (RHA) to produce an eco-friendly binder for the use in fine-grained soil stabilization. The effect of different binary mixtures, produced by mixing CCR and RHA with different proportion, on the geotechnical properties of a fine-grained soil was investigated. For the unconfined compressive strength (UCS) test, the soil specimens were subjected to various curing periods (7, 21, 28 and 90 days). The microstructure of the soil treated with the optimum mixture was carried out by utilizing scanning electron microscopy (SEM) test. Results of UCS test showed an interesting growth after the treatment of binary mixtures relative to those samples treated with only CCR. Plasticity index (PI) was found to decrease noticeably with use of CCR only while further reductions in PI were achieved after the RHA incorporation. Clear variations in the microstructure of the treated soil were revealed from SEM testing approving the creation of cementitious products. The results of the current study indicated that the wastes utilized in this investigation could be potentially used as alternatives to the conventional binders and final disposition with economic and environmental advantages.

*Keywords:* Calcium Carbide Residue; Microstructure; Rice Husk Ash; Soil Stabilization; Unconfined Compressive Strength.

## 1. Introduction

In areas with weak or soft soils, civil engineering projects have traditionally incorporated enhancement for the properties of the soils utilizing different methods. Soft soils are the most problematic soils in civil engineering due to their high compressibility, and tendency to swell with low compressive strength [1]. The accepted usual technique to mitigate such issues is the process of soil stabilization [2]. Soil stabilization technique has been introduced many years ago in order to make soils meet the engineering projects requirements [3, 4].

Stabilization of subgrade soil has traditionally been carried out using either lime and/or cement which react chemically with soil particles to bind them to each other resulting in stronger soil structure. It is proven that the use of lime and ordinary Portland cement (OPC) as soil stabilizers significantly enhance the properties of the soil by increasing the workability, the durability, and the compressive strength, and led to reduction in the compressibility and permeability as indicated in Jauberthie et al. [5], Önal [6], Modarres and Nosoudy [7], Jha and Sivapullaiah [8]. However, the production processes of lime and OPC have many drawbacks such as negative environmental impact, the

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http://dx.doi.org/10.28991/cej-2020-03091533