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# The Behavior of Stabilized Reinforced Soil for Road Embankments Application

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## Abstract

This research evaluates the stress-strain behavior of soil stabilized with cement and rice husk ash and reinforced with polypropylene fiber. Each sample contained 2 and 5% cement, 15% rice husk ash, and 0.5% polypropylene fiber. Four tests were performed: The unconfined compressive strength and the splitting tensile strength at three curing times (7,

28, and 90 days); the triaxial tests in the consolidated undrained condition for specimens cured for 28 days; and electron microscopy scanning to evaluate the blends. The

polypropylene fiber contributed through the absorption capacity, inhibiting the amplitude of the cracks associated with the rupture of the samples. The unconfined compressive strength and the splitting tensile strength increased with the addition of the materials, making the soil a composite with a stiffer and more agglomerated matrix. A road embankment simulation was also performed in this article for the optimum moisture, saturation conditions, and different geometries using the Slide software. The pure soil exhibited instability on slopes from 5 m in height, observing the most critical scenario with a safety factor  $< 1$ , which changed to 3.1 for the soil treated with 5%, 15%, and 0.5% of cement, rice husk ash, and polypropylene fibers, respectively. By this analysis, it is possible to affirm that rice husk ash is a good substitute for cement in soil improvement processes; also, fibers contribute positively to the better geotechnical behavior of soils, especially on the ones used for the stability of road embankments.

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## Data Availability

Enquiries about data availability should be directed to the authors.

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## Ethics declarations

## Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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