

# Stabilization Effect of Aluminum Dross on Tropical Lateritic Soil

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## Abstract:

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Stabilization Effect of Aluminum Dross on Tropical Lateritic Soil  
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**Keywords:** Aluminum Dross, Soil stabilization, Lateritic soil, Soil waste, Sustainable Road

**Abstract:** This experimental research assessed the engineering and geotechnical properties of Aluminum Dross (ALDR). Glumly, this solid waste is usually open dumped with detrimental effect on the environment. In a bid to reduce solid waste in the environment and also improve pavement interlayer properties, this research utilized ALDR as a stabilizer for tropical lateritic soil. The lateritic soil was stabilized with the addition of this solid waste at 2% intervals from 2% to 16%. Response surface analysis was used in optimizing the strength and consistency of the stabilized soil sample. The addition of this non-conventional stabilizer helped in modifying the engineering properties of the soil sample, this had indications on the atterberg limit as the liquid limit, and the plasticity index increased from 43% to 54.61% and 28.02%- 40.8% respectively, while the plasticity index reduced from 15.1% - 13.8% signifying soil improvement. The load-bearing capacity of the sample increased from 51.22% to 62.41%. Additionally, the unconfined test showed that addition of ALDR residue improved the consistency of the stabilized soil sample. From the model equation, a positive relationship exists between CBR and UCS. R<sup>2</sup> value of 0.81 showed the robustness of the model developed. The research showed that aluminum dross is a suitable material for improving the engineering properties of the tropical lateritic soil towards a sustainable road construction.

**1.0 Introduction**  
The demand for sustainability in road construction is growing, driven by the need to reduce the carbon footprint of infrastructure projects. This is achieved through the use of sustainable materials and construction practices. One such material is Aluminum Dross (ALDR), a by-product of the aluminum smelting process. ALDR is a highly reactive material that can be used as a soil stabilizer. The use of ALDR in road construction offers several advantages, including its high strength, low water absorption, and ability to improve the engineering properties of soil. This research aims to evaluate the effectiveness of ALDR as a soil stabilizer for tropical lateritic soil. The study focuses on the optimization of the strength and consistency of the stabilized soil sample. The research also explores the relationship between the engineering properties of the soil and the amount of ALDR added. The results of the study will provide valuable insights into the use of ALDR in road construction and contribute to the development of sustainable road infrastructure.

This experimental research assessed the engineering and geotechnical properties of Aluminum Dross (ALDR). Glumly, this solid waste is usually open dumped with detrimental effect on the environment. In a bid to reduce solid waste in the environment and also improve pavement interlayer properties, this research utilized ALDR as a stabilizer for tropical lateritic soil. The lateritic soil was stabilized with the addition of this solid waste at 2% intervals from 2% to 16%. Response surface analysis was used in optimizing the strength and consistency of the stabilized soil sample. The addition of this non-conventional stabilizer helped in modifying the engineering properties of the soil sample, this had indications on the atterberg limit as the liquid limit, and the plasticity index increased from 43% to 54.61% and 28.02%- 40.8% respectively, while the plasticity index reduced from 15.1% - 13.8% signifying soil improvement. The load-bearing capacity of the sample increased from 51.22% to 62.41%. Additionally, the unconfined test showed that addition of ALDR residue improved the consistency of the stabilized soil sample. From the model equation, a positive relationship exists between CBR and UCS. R<sup>2</sup> value of 0.81 showed the robustness of the model developed. The research showed that aluminum dross is a suitable material for improving the engineering properties of the tropical lateritic soil towards a sustainable road construction.