

FEASIBILITY OF UTILIZING RICE HUSK ASH AS A REINFORCEMENT MATERIAL FOR SOIL-BASED ROOFING SHEETS

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Rice husk is one of the major by-products in agriculture. Rice husk ash (RHA) and rice husk biochar (RHB) are significant derivatives of rice husk and have the potential to be utilized as reinforcement materials in engineering aspects. This study tested the feasibility of using RHA as a reinforcement material for soil-based roofing sheets as an alternative to RHB which involves complex procedures to make. A soil-based cementitious corrugated roofing sheet was made using 50% ordinary Portland cement, 39% soil, and 10% sand, including 1% reinforcement materials. This study used RHB, partially controlled RHA (PC-RHA), and uncontrolled RHA (UC-RHA) as reinforcement materials. The prepared roofing sheets with RHB, PC-RHA, and UC-RHA reinforcement materials were cured for 28 days. Then, the breaking load testing was performed, and the best-performed material was further tested for flexural load, density, water absorption, resistance to acetic acid, and water tightness tests according to the SLS specifications. The breaking load testing indicated the highest load-bearing capacity of 6.55 kN m⁻¹ for UC-RHA, 6.27 kN m⁻¹, and 5.17 kN m⁻¹ for PC-RHA and RHB, respectively. Validation testing yielded a mean breaking load of 3.20 kN m⁻¹, a density of 2281.18 kg m⁻³, a 17.37% water absorption, and resistance to acetic acid of 0.08 kg m⁻² with passed water tightness testing. However, the subsequent validation testing revealed a fluctuation of the mean breaking load values for the UC-RHA compared to the initial test results. In conclusion, this study shows that RHA is feasible as a reinforcement material for soil-based roofing sheets. Variations in uncontrolled environmental conditions impact the reinforcement properties. Therefore, further studies are required to determine the controlled environment of the RHA production process.

Keywords: Reinforcement, Rice husk ash, Rice husk biochar, Roofing sheets