

Experimental Investigation of Sisal Fiber Reinforced Recycled Low-Density Polyethylene Composite Filled with Egg Shell Powder for Wall Tile Application

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Abstract : This paper focuses on an experimental investigation into the development of wall tiles made of a composite material consisting of eggshell powder (ESP), waste recycled low-density polyethylene (LDPE), and sisal fiber. Although waste plastic has been a popular material for packaging in recent years, its nonbiodegradability is generating contamination in the environment. Waste LDPE is a common material that is used extensively and discarded eggshell powder contributes to environmental contamination. By recycling them into usable items and reinforcing them with natural textile fibers to create composite materials, these waste plastics and eggshell powder can be eliminated from the environment. Natural fiber-based composites are ecofriendly, with better properties and low cost. The sisal fibers were treated with 6% NaOH in 24 hr. to improve the fiber-matrix interaction. The composites were manufactured by the melt-mixing method followed by compression molding. The effects of mixing time, eggshell powder content and fiber length on the composite properties were investigated using tensile, flexural, impact, compressive, flame retardant and water absorption tests. The investigation showed that the optimum mixing time, ESP and fiber length for the optical properties of the composite were achieved at 15.766 min, 1.668% and 10.096 mm, respectively. The maximum optimized tensile strength of 57.572 Mpa, flexural strength of 59.262 Mpa, impact strength of 24.200 Mpa, compressive strength of 120.307 Mpa, and flame retardant of LOI values of 28.692 % were obtained. Water absorption of the tiles increased with an increase in the fiber length. Overall, the experimental findings demonstrate the possibility of using sisal-reinforced LDPE filled with ESP composite as a sustainable substitute material to create wall tiles that are better for the environment, within a low cost and have enhanced mechanical, physical, and chemical properties of the composite.

Keywords : composite, sisal, ESP, LDPE

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