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Development of Coir Reinforced Composite for Automotive Parts Application

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Abstract : The demand for lightweight and fuel-efficient automobiles has led to the use of fiber-reinforced polymer composites in place of traditional metal parts. Coir, a natural fiber, offers qualities such as low cost, good tensile strength, and biodegradability, making it a potential filler material for automotive components. However, poor interfacial adhesion between coir and polymeric matrices has been a challenge. To address poor interfacial adhesion with polymeric matrices due to their moisture content and method of preparation, the extracted coir was chemically treated using NaOH. To develop a side view mirror encasement by investigating the mechanical effect of fiber percentage composition, fiber length and percentage composition of Epoxy in a coir fiber reinforced composite, polyester was adopted as the resin for the mold, while that of the product is Epoxy. Coir served as the filler material for the product. Specimens with varied compositions of fiber loading (15, 30 and 45) %, length (10, 15, 20, 30 and 45) mm, and (55, 70, 85) % weight of epoxy resin were fabricated using hand lay-up technique, while those specimens were later subjected to mechanical tests (Tensile, Flexural and Impact test). The results of the mechanical test showed that the optimal solution for the input factors is coir at 45%, epoxy at 54.543%, and 45mm coir length, which was used for the development of a vehicle's side view mirror encasement. The optimal solutions for the response parameters are 49.333 Mpa for tensile strength, flexural for 57.118 Mpa, impact strength for 34.787 KJ/M2, young modulus for 4.788 GPa, stress for 4.534 KN, and 20.483 mm for strain. The models that were developed using Design Expert software revealed that the input factors can achieve the response parameters in the system with 94% desirability. The study showed that coir is quite durable for filler material in an epoxy composite for automobile applications and that fiber loading and length have a significant effect on the mechanical behavior of coir fiber-reinforced epoxy composites. The coir's low density, considerable tensile strength, and bio-degradability contribute to its eco-friendliness and potential for reducing the environmental hazards of synthetic automotive components.

Keywords : coir, composite, coir fiber, coconut husk, polymer, automobile, mechanical test
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