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EXPERIMENTAL INVESTIGATION ON MECHANICAL BEHAVIOR OF PALM BASED NATURAL FIBRE REINFORCED POLYMER COMPOSITES

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ABSTRAC

Natural fibre provides a strong and a green biodegradable substitute to the popular synthetic reinforcement, i.e. glass fibre, with low cost and basic mechanical properties. They may not provide strength equal to that of synthetic fibres but can be considered on the grounds that they are environmentally friendly. The present works deals with a natural fibre-reinforced polymer composite prepared using a polyester resin as the matrix material and palm fibres/glass sandwich as reinforcement adopting hand-layup technique. Various parts of palm tree were used like leaf stalk (PLst), leaf sheath (PLsh), leaf spine or petiole (PLsp) and fruit (PFrt) that are less utilized and possess appreciable fibre strength for preparing specimen of different combination. The specific objectives of this study were developing an eco-friendly NFRPC to be used in various parts of an automobile, studying the effects of pretreatment on fibres, filler addition, hybridization of fibres, and evaluating the mechanical characteristics of the FRP composites like hardness, tensile, flexural, impact strength and water absorption rate. It has been found that palm fibres can be used as a successful natural reinforcement to develop biobased composites after suitably bonding with the resin. The surface treatment by potassium permanganate on natural palm fibres is possible and it improves the mechanical characteristics. The sandwiching of palm fibres within the glass fibre layer combines the strength of both the natural and synthetic fibres. The cheaper and naturally-available coconut shell nano-filler can be added to the composite resin system which disperses uniformly within the polyester resin enhancing the overall characteristics of the composites. The characterization also proved that the hybridization and addition of filler materials have definitively created impacts on increasing the mechanical properties of natural palm fibre based composites.

Keywords: Natural-fibre · Palm · Mechanical behavior · Tensile-Strength · Ecofriendly · Hardness · Flexural · Impact-Strength