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MECHANICAL & THERMAL BEHAVIOUR OF PINEAPPLE FIBRE-EPOXY POLYMER COMPOSITES TOUGHENED BY CTBN AND B4C

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ABSTRACT
An epoxy bio composite was created using Pineapple fibre (PF), Boron Carbide (B4C) and Carboxyl-Terminated Butadiene-acrylo Nitrile Rubber particles (CTBN) to meet a various technical application. The mechanical, wear, thermal stability, fatigue, fracture behaviour, DMA properties, and water uptaking capacity of a pineapple-epoxy composite toughened with B4C and CTBN particles reinforcement were investigated in this research work.

Keywords:
Pineapple fibre (PF), CTBN, B4C, DMA properties

INTRODUCTION

According to the FT-IR spectra, saline was successfully grafted onto the surface of the fibre and particles. Mechanical testing revealed that combining saline-treated pineapple fibre, B_4C, and CTBN particles into a matrix resulted in the higher tensile, flexural, impact toughness, and hardness values. The surface-modified N5 designated composite possesses an enhanced tensile strength and a flexural strength values. The maximal Izod cantilever beam impact toughness and maximum hardness value was obtained in surface-modified N5 designated composite. When compared to no particle reinforcement, the saline-treated fibre and particles reinforcement composite exhibits the remarkable improvement in adhesion and composite bonding. Similarly, B_4C and CTBN particles improved composite bonding and diminish the wear. In addition to minimising the stress intensity factor in surface altered composite, the N5 composite designation has the minimal wear rate of 0.007 mm^3/ Nm and a Coefficient Of Friction of 0.42.

OBJECTIVES

The objective of this research work was to improve the load bearing capability of a highly brittle matrix by utilizing environmentally friendly fiber and particles. The fiber's surface and filler particles were treated with an amino saline, 3-Amino-Propyl-Tri-Methoxy-Silane (APTMS). The surface treatment of saline was done in aqueous solution with acetone as a promoter. The composites were formed by hand layup method and then cured at room temperature for 24 hours. The composites were prepared in various designations by changing the Vol. % of fiber, reinforcements and matrix. In accordance with ASTM standards, test specimens were sliced from the molded epoxy hybrid composite by using an Abrasive Water Jet Machining (AWJM) processes under the specified conditions.

METHODOLOGY

Figure depicts the technique developed for this current investigation. The sequence of various steps for these current investigations was shown in flowchart format.

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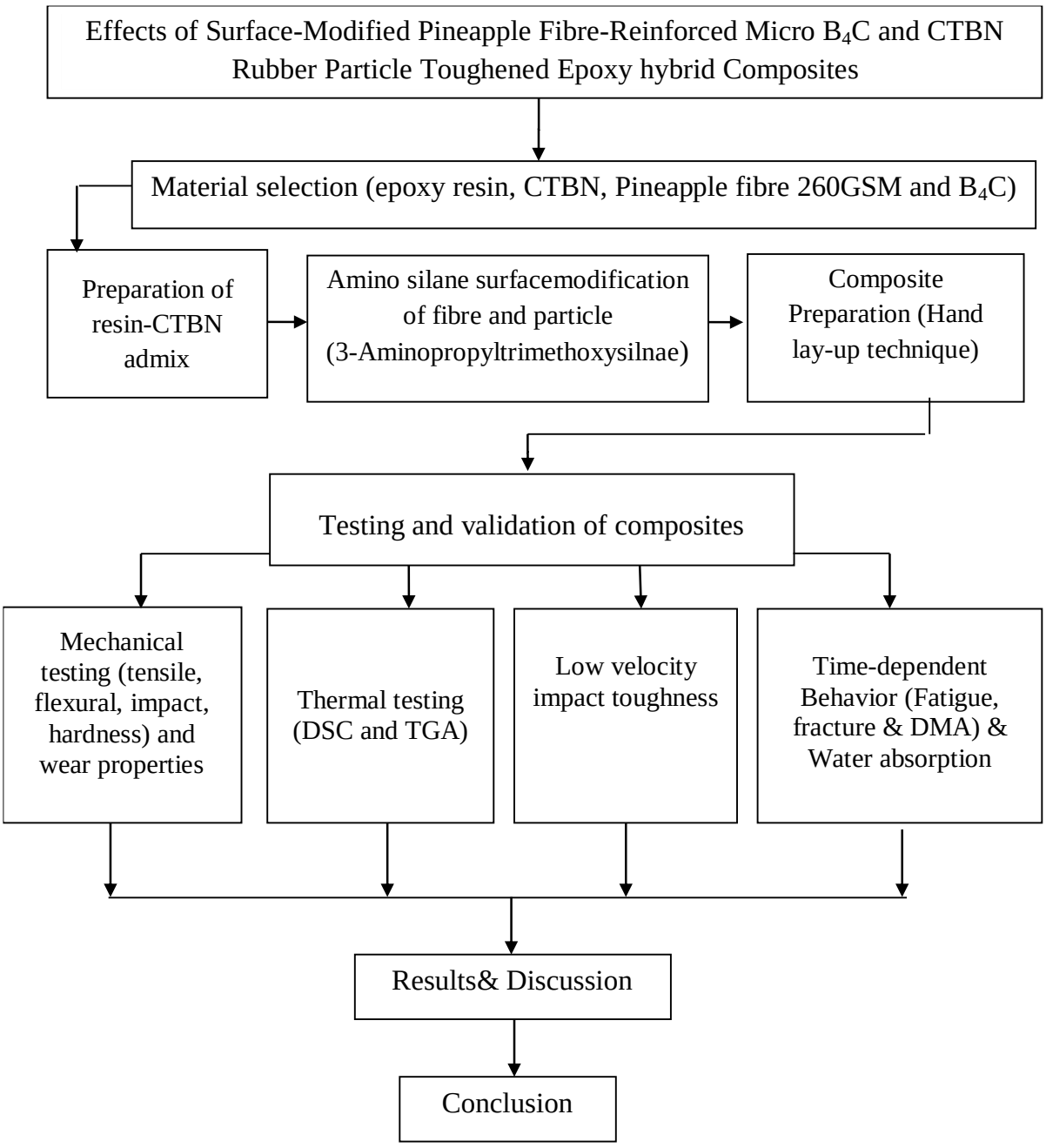

Figure 1 Methodology of the research

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RESULTS AND DISCUSSION

The time-dependent behavior of composites was described with acceptable justification starting with the surface treatment procedure on reinforcements. In order to justify the basic reasons stated in each property, more recently published literature was used as support.

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CONCLUSION

The surface-modified epoxy composites give improved mechanical, thermal, drop load and water uptake resistance compared to the as-received fiber and particles in epoxy resin composite. So it is advisable that when using natural fiber and particles of interest, surface modification by saline is recommended and its outcome is highly notable in all properties of polymer matrix composites

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