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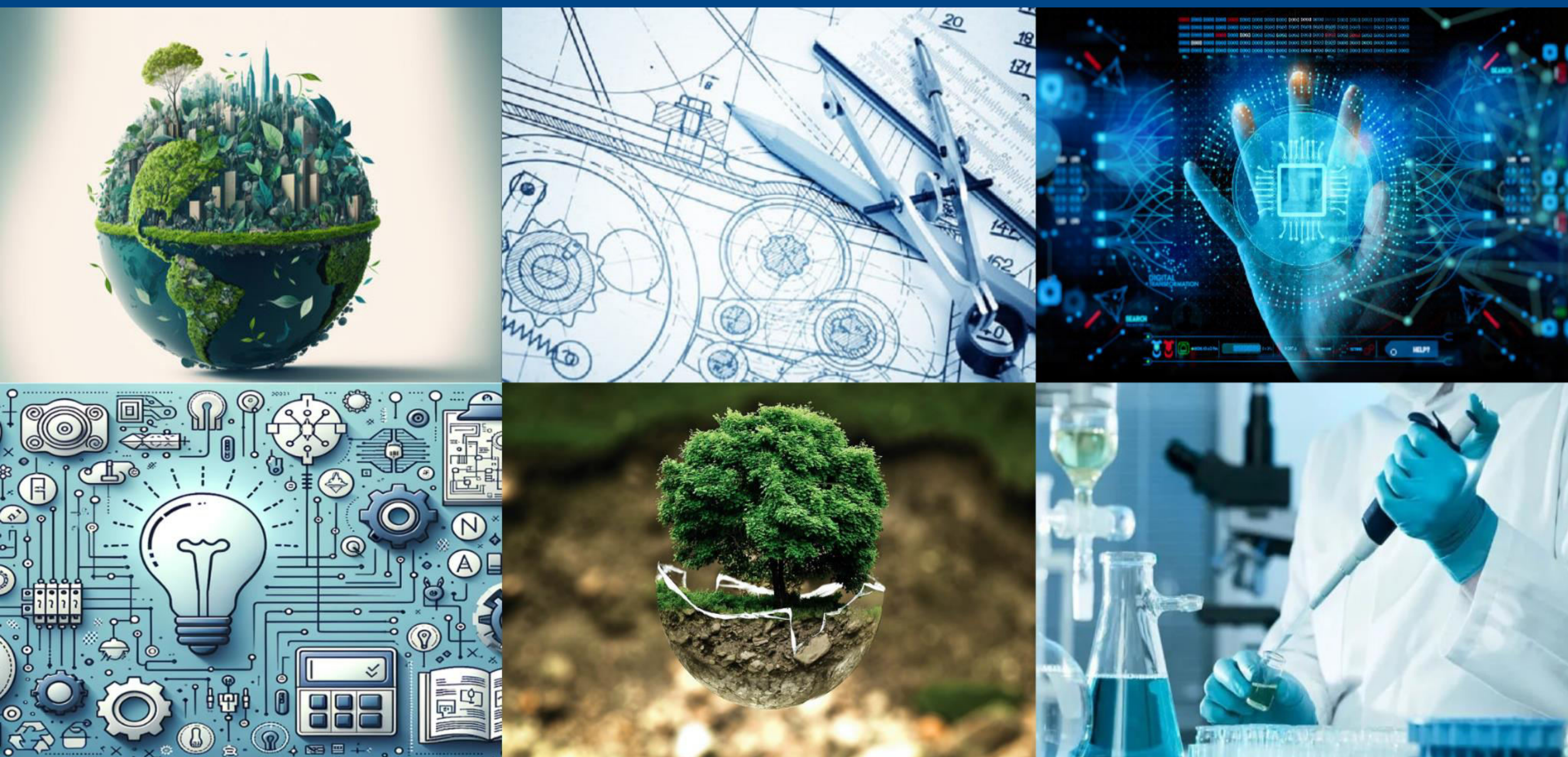

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Modification of Snowboard using Epoxy Resin Glass Fibre and Carbon Fibre

J Jeremy Jeba Samuel, M Aditya, R Andrews Antony, R Dhivakar,V Joseph Nevil

Assistant Professor, Dept. of Mechanical Engineering, Francis Xavier Engineering College, Tirunelveli, Tamil Nadu, India

UG Student, Dept. of Mechanical Engineering, Francis Xavier Engineering College, Tirunelveli, Tamil Nadu, India

ABSTRACT: The modification of snowboards using epoxy resin, glass fiber, and carbon fiber enhances strength, flexibility, and durability. Traditional snowboards often face issues like impact damage and limited responsiveness. By incorporating epoxy resin as a binding agent and reinforcing the structure with glass and carbon fiber, significant improvements can be achieved. Glass fiber enhances flexibility and shock absorption, while carbon fiber increases stiffness and strength, improving energy transfer and carving performance. Epoxy resin ensures strong adhesion, moisture resistance, and durability. The modification process involves layering these materials and curing them for optimal structural integrity. This results in a lightweight yet robust snowboard with reduced vibrations, improved maneuverability, and better performance on various terrains. This study evaluates the impact of these reinforcements on snowboard design, providing insights for manufacturers and riders seeking high-performance snowboards with superior strength-to-weight ratio, enhanced control, and greater durability.

KEYWORDS: Light Weight, Durable, Protective.

I. INTRODUCTION

The Snowboarding is a popular winter sport that demands high-performance equipment capable of withstanding extreme conditions while providing optimal control and maneuverability. Traditional snowboards, typically made from wood, plastic, and metal edges, often face challenges such as limited strength, impact susceptibility, and inadequate flexibility.

To enhance the durability, strength, and responsiveness of snowboards, the integration of advanced composite materials such as epoxy resin, glass fiber, and carbon fiber has gained significant attention. Epoxy resin acts as a strong adhesive, ensuring structural integrity and resistance to environmental factors like moisture and temperature variations.

Glass fiber improves flexibility and shock absorption, while carbon fiber enhances stiffness and energy transfer, leading to superior ride quality. This project focuses on modifying snowboards using these materials to optimize their performance, reduce weight, and increase durability.

The study aims to analyze the effectiveness of these reinforcements in enhancing snowboard characteristics, offering valuable insights for manufacturers and enthusiasts.

II. FABRICATION AND ANALYSIS

The fabrication of a modified snowboard using epoxy resin, glass fiber, and carbon fiber involves a structured process to ensure enhanced strength, flexibility, and durability. Initially, the base structure of the snowboard is prepared by selecting a suitable core material, typically wood or foam, to provide the necessary foundation.

Layers of glass fiber and carbon fiber are then strategically placed over the core, with epoxy resin applied as a binding agent to create a strong composite structure. The layering process is followed by compression and curing under controlled temperature and pressure conditions to achieve the desired mechanical properties.

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Once fabricated, the snowboard undergoes various analyses to evaluate its structural integrity and performance. Mechanical tests such as flexural strength, impact resistance, and tensile strength assessments are conducted to determine its durability and flexibility.

Additionally, field testing on different terrains helps assess maneuverability, vibration damping, and overall ride quality. The study aims to compare the modified snowboard's performance with conventional designs, demonstrating the effectiveness of composite materials in improving strength-to-weight ratio, energy transfer, and durability. This analysis provides valuable insights for manufacturers and riders seeking high-performance snowboards with enhanced stability and responsiveness.
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III. PROPOSED METHODOLOGY

The methodology for this project follows a systematic approach to designing, fabricating, and evaluating a lightweight composite of the snowboard, epoxy resin (LY556), and hardener (HY951). The process ensures that the final product achieves high impact resistance, mechanical strength, and reduced weight, making it suitable for all condition. The first step involves a literature review and material selection, where an in-depth study of existing snowboard and their properties is conducted. The benefits and limitations of Kevlar fibre and epoxy composites in armour applications are analysed, and suitable materials are selected based on strength, durability, and lightweight characteristics. Next, the design and specifications of the composite of the snowboard are defined, including its dimensions, thickness, and layering structure to achieve optimal impact resistance. An appropriate *fibre to-resin ratio is chosen for improved mechanical performance.

The fabrication process begins with material preparation, where carbon fibre sheets are cut to the required size, and the epoxy resin and hardener are mixed in precise proportions. The hand layup metho is used for composite layup, where carbon layers are placed in a Mold, resin is applied uniformly, and the process is repeated to build the composite structure. The panel is then cured at room temperature for 24 hours, with optional heat curing or compression moulding for enhanced strength. After curing, the panel undergoes finishing and trimming, where excess material is removed, and surface treatments are applied to improve durability.

Once fabricated, the composite undergoes mechanical and ballistic testing to evaluate its tensile strength, impact resistance, flexural strength, and hardness. The performance is compared to traditional glass fibre snowboard to measure improvements. Data analysis and optimization follow, where test results are reviewed to determine efficiency, weight reduction, and impact resistance. The fabrication process and material composition are further refined for better performance finally, the conclusion and future recommendations summarize the key findings and evaluate the success of the composite armour. Potential improvements and future research directions in lightweight ballistic protection are suggested. By following this structured methodology, the project ensures the successful development, testing, and evaluation of an innovative, lightweight, and impact-resistant composite snowboard.

IV. COMPARISION

Additionally, field testing on different terrains helps assess maneuverability, vibration damping, and overall ride quality. The study aims to compare the modified snowboard's performance with conventional designs, demonstrating the effectiveness of composite materials in improving strength-to-weight ratio, energy transfer, and durability. This analysis provides valuable insights for manufacturers and riders seeking high-performance snowboards with enhanced stability and responsiveness.

When subjected to maximum load, **Wood + Carbon Fiber endured 48 KN, while Wood + Glass Fiber withstood only 45 KN**, confirming the greater load-bearing capability of carbon fiber reinforcement. Additionally, in the compression test, **Wood + Carbon Fiber exhibited a strength of 48.6, significantly higher than Wood + Glass Fiber's 40.3**, proving its superior resistance to compressive forces. Overall, while **Wood + Carbon Fiber** provides better structural strength and durability, **Wood + Glass Fiber** offers slightly better impact resistance, making the choice dependent on the desired snowboard performance characteristics.

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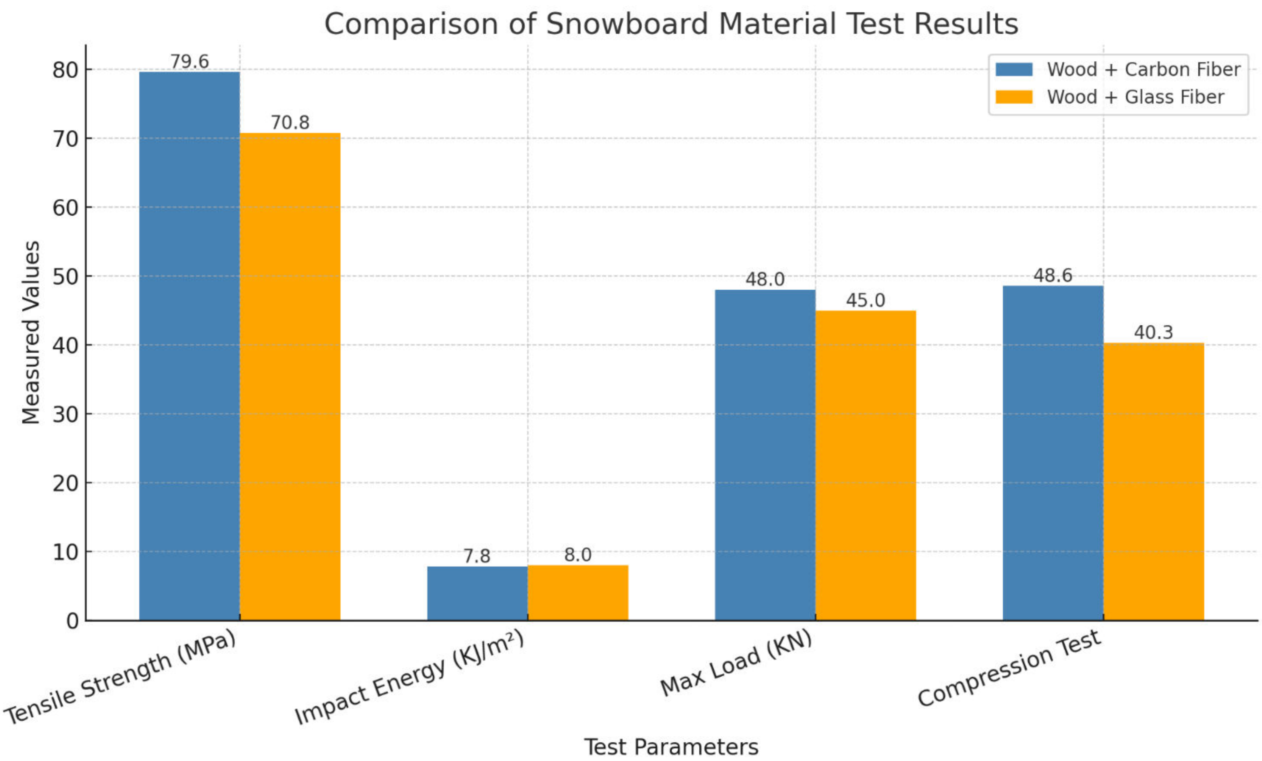
V. RESULT AND DISCUSSION



In this Fig,The graph shows visually compares the mechanical properties of **Wood + Carbon Fiber** and **Wood + Glass Fiber** composites based on test results. It includes four key parameters: **Tensile Strength, Impact Energy, Maximum Load, and Compression Strength**.

VI. CONCLUSION

The modification of snowboards using epoxy resin, glass fiber, and carbon fiber has demonstrated significant improvements in strength, durability, and overall performance. By integrating these advanced composite materials, the snowboard exhibits enhanced flexibility, impact resistance, and energy transfer, leading to better maneuverability and stability on various terrains. The fabrication process, which includes careful layering, epoxy resin application, and controlled curing, ensures a strong and lightweight structure capable of withstanding extreme conditions.Mechanical testing confirms that the modified snowboard has superior flexural strength, tensile properties, and shock absorption compared to conventional designs. Field testing further validates its improved ride quality, reduced vibrations, and increased responsiveness.This study highlights the effectiveness of composite reinforcement in snowboard design and offers valuable insights for manufacturers and riders seeking high-performance equipment. Future research can focus on optimizing material combinations and refining the fabrication process to further enhance snowboard efficiency and durability.

REFERENCES

1. Smith et al., "High-Performance Snowboards Using Carbon Fiber and Epoxy Resin," Journal of Composite Materials, 2018.
2. Johnson and Lee, "Mechanical Properties of Carbon Fiber Reinforced Snowboards," Materials & Design, 2019.
3. Wang et al., "Hybrid Carbon Fiber Composites for Snowboards," Composite Structures, 2020.
4. Brown and Adams, "Structural Design of Snowboards with Carbon Fiber Reinforcement," Journal of Sports Engineering, 2021.

5. Taylor et al., "Optimization of Epoxy-Carbon Fiber Snowboards for Professional Use," Advanced Materials Research, 2018.
6. Green et al., "Sustainable Snowboard Design Using Recycled Carbon Fiber Reinforcement," Journal of Cleaner Production, 2021.
7. Patel et al., "Advanced Composites in Snowboard Construction," Composite Part B, 2017.
8. Kumar and Singh, "Vibration Damping in Carbon Fiber Snowboards," Journal of Composite Structures, 2019.
9. Zhao et al., "Epoxy-Cured Snowboards with Carbon Nanotube Reinforcements," Nano Materials and Sports Applications, 2020.
10. Evans et al., "Wear Resistance in Carbon Fiber Snowboards," Wear and Materials, 2021.

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| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

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