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# REVIEW PAPER ON FIBRE REINFORCED POLYMER

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**ABSTRACT**
*Composites have been found to be the most promising and discerning material available in this Era. Composites reinforced with fibers of synthetic or natural materials are gaining more importance as demands for lightweight materials with high strength for specific applications are growing in the building structures. Fiber-reinforced polymer composite offers not only high strength to weight ratio, but also reveals exceptional properties such as high durability; stiffness; damping property; flexural strength; and resistance to corrosion, wear, impact, and fire. These wide ranges of diverse features have led composite materials to find applications in mechanical, construction mainly. Performance of composite materials predominantly depends on their constituent elements and manufacturing techniques, therefore, functional properties of various fibers available worldwide, their classifications, and the manufacturing techniques used to fabricate the composite materials need to be studied in order to figure out the optimized characteristic of the material for the desired application. An overview of a diverse range of fibers, their properties, functionality, classification, and various fiber composite manufacturing techniques is presented to discover the optimized fiber-reinforced composite material for significant applications. Their exceptional performance in the numerous fields of applications have made fiber-reinforced composite materials a promising alternative over solitary metals or alloys.*
**KEYWORDS**:*Fiber- Reinforced Polymer, Composite Materials, Natural Fiber, Synthetic Fiber, Carbon, Glass, and Aramid*

## INTRODUCTION

Fibre-Reinforced polymer (FRP),Also Fibre-reinforced plastic, is a composite material made of a polymer matrix reinforced with fibres. The fibres are usually glass, carbon, or aramid although other fibres such as paper or wood or asbestos have been sometimes used. The polymer is usually an epoxy, vinylester or polymer thermosetting plastic, and phenol formaldehyde resins are still in use. FRP are commonly used in the Construction engineering, Mechanical engineering, Areospace Engineering.

Fibre-reinforced polymer (FRP) composites are comprised of a reinforcing fibre in a polymer matrix. Most commonly, the reinforcing fibre is fiberglass, although high strength fibres such as aramid and carbon are used in advanced applications. This combination of plastic and reinforcement can produce some of the strongest materials for their weight that technology has ever developed.

FRP composites are incredibly versatile—it is possible to produce an endless variety of composites to meet the exact requirements of very specific applications. Designers and engineers can modify the physical and chemical characteristics of FRP by specifying different materials. For example, high glass fiber reinforcement structures produce maximum physical strengths; high resin content structures produce maximum chemical resistance. An engineer can specify the combination of the two materials to create a composites structure resulting in an optimum design.

FRP composites may also contain fillers, additives, and core materials to modify and enhance the final product. FRP composites can also be engineered for additional attributes, such as light transmission, translucence, fluorescence, and conductivity.

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## 1.COMPONENTS OF COMPOSITE MATERIALS

### 1. Fibres

The choice of fibre frequently controls the properties of composite materials. Carbon, Glass, and Aramid are three major types of fibres which are used in construction. The composite is often named by the reinforcing fibre, for instance, CFRP for Carbon Fibre Reinforced Polymer. The most important properties that differ between the fibre types are stiffness and tensile strain.

### 2. Matrices

The matrix should transfer forces between the fibres and protect the fibres form detrimental effects. Thermosetting resins (thermosets) are almost exclusively used. Vinylester and epoxy are the most common matrices. Two main types of polymeric matrices are thermosetting and thermoplastic. Epoxy is mostly favoured above vinylester but is also more costly. Epoxy has a pot life around 30 minutes at 20 degree Celsius but can be changed with different formulations. Epoxies have good strength, bond, creep properties and chemical resistance.

## 2.TYPES OF FIBRE REINFORCED POLYMER (FRP)

### 1. Glass Fibre Reinforced Polymer (GFRP)

Glass fibres are basically made by mixing silica sand, limestone, folic acid and other minor ingredients. The mix is heated until it melts at about 1260°C.The molten glass is then allowed to flow through fine holes in a platinum plate. The glass strands are cooled, gathered and wound. The fibres are drawn to increase directional strength. The fibres are then woven into various forms for use in composites.Based on an aluminium lime borosilicate composition, glass produced fibres are considered as the predominant reinforcement for polymer matrix composites due to their high electrical insulating properties, low susceptibility to moisture and high mechanical properties.Glass is generally a good impact resistant fibre but weighs more than carbon or aramid. Glass fibres have excellent characteristics equal to or better than steel in certain forms.

### 2. Carbon Fibre Reinforced Polymer (CFRP)

Carbon fibres have a high modulus of elasticity, 200-800 GPa. The ultimate elongation is 0.3-2.5 % where the lower elongation corresponds to the higher stiffness and vice versa.Carbon fibres do not absorb water and are resistant to many chemical solutions. They withstand fatigue excellently and neither corrode nor show any creep or relaxation.

### 3. Aramid Fibre Reinforced Polymer (AFRP)

Aramid is the short form for aromatic polyamide. A well-known trademark of aramid fibres is Kevlar but there does exist other brands as well such as Twaron, Technora and SVM.The modulii of the fibres are 70-200 GPa with an ultimate elongation of 1.5-5% depending on the quality. Aramid has a high fracture energy and is therefore used for helmets and bullet-proof garments.They are sensitive to elevated temperatures, moisture and ultraviolet radiation and therefore not widely used in civil engineering applications. Finally, Aramid fibres do have problems with relaxation and stress corrosion.

## 3.APPLICATIONS OF FRP

1. Carbon FRPs are used in prestressed concrete for applications where high resistance to corrosion and electromagnetic transparency of CFRP are important.
2. CFRP composites are employed for underwater piping and structural parts of offshore platform. Added to that, FRP declines the risk of fire.
3. Carbon fibre reinforced polymers are used to manufacture underwater pipes for great depth because it provides a significantly increased buoyancy (due to its low density) compared to steel.
4. The stairways and walkways are also made of composites for weight saving and corrosion resistance.
5. It is used in high-performance hybrid structures.
6. FRP bars are used as internal reinforcement for concrete structures.
7. FRP bars, sheets, and strips are used for strengthening of various structures constructed from concrete, masonry, timber, and even steel.
8. FRPs are employed for seismic retrofitting.
9. Fibre reinforced polymers are used in the construction of special structures requiring electrical neutrality.
10. The high energy absorption of aramid fibre reinforced polymer (AFRP) composites makes them suitable for strengthening engineering structures subjected to dynamic and impact loading.

## CONCLUSION

In recent years so many research work has been done on Fibre reinforced polymer. It is very useful and economical to building construction perspective. FRP is also very useful to repair and renovation of old building, it improves the life of building and it is light weight in nature so it very workable for construction purpose. If the Structural and Construction Engineer have proper knowledge to FRP than Old building becomes more durable and shows stiffness in Earthquake Situation. FRP have so many types and it have so many methods to use it, proper application of FRP and Using Proper Technique in Building Make it more Stable in Any load Combination.

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