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A Review Paper of Composite Materials: Advantages and Applications

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ABSTRACT: The advent of **C**omposite materials changed the quality and usefulness of mechanical parts of equipment and product.Composite material has replaced many of the conventional materials in parts design. The corrosion resistance, high strength, lightweight, design flexibility, durability, and in many more key benefits composite materials can have apart from regular mechanical properties. The composite has many applications from day-to-day life to industrial products. This paper presents a general review of specific use, advantages, and disadvantages of composite materials. The usefulness of composite material in place of consumable material nowadays is very common.

Key Words: Composite material, matrix, fiber.

I. INTRODUCTION

Engineers are doing research continuouslyfor structural materials which have low density, low weight, high strength and stiffness, abrasion and impact resistance, resistance to wear, low thermal expansion, and corrosion resistance at a lower cost. Two or more materials are combined to develop the above properties, referredto as composite material.

A composite material can be defined as when two or more different chemical constituents are combined macroscopically to generate useful materials. The composite materials can also be defined as a combination of a matrix and reinforcement which is combined to provide superior properties to the properties of the individual component.

Composite material is combined with the help of a matrix and reinforcement, where the matrix is defined as a binding material and the reinforcement is defined as a property enhancer material. The fiber has a high length-to-diameter ratio and its diameter is approximately its crystal size.

The whiskers are similar in diameter to fibers, but in general, they are short and have a low length-to-diameter ratio, barely exceeding a few hundred millimeters. The fibers and whiskers in composites are held together by a binder known as a matrix.

The composite materials can be manufactured by many techniques as per technical requirements, one of which is discussed below. The composite materials, which are of natural fibers when reinforced with epoxy by a simple wet hand lay-up technique, provide higher strength and enhance mechanical properties. The wet hand lay-up method is one of the traditional methods used in the industry. It is a very simple process, where each ply is handled only by hand and is slanted layer-by-layer up to the chosen thickness.

The advantages of the composite are very wide, that are in, that properties like strength, weight, vibration damping, resistance to wear, and many more properties get enhanced if composites

are used. The limitations of composites are that, they are non-homogenous, costly, difficult to fabricate, the sensitivity to temperature, moisture effect, and others.

The applications of composite materials are worldwide. They are used in daily life in the industrial environment and many other places. Nowadays conventional materials have been replaced by composite materials. The widest range of applications is in the in-house decoration of schools, homes, colleges, cafes, restaurants, and many more.

The composite materials are used in transportation and infrastructure, sports, Aerospace, automotive industry, environmental engineering, electrical distribution, and at many more areas. The composite materials have attractive mechanical and physical properties. The attractive properties make composite materials replace the conventional materials which are used in the present day.

The composite materials from natural fibers are been much used as they show good properties and are cheap and can be easily fabricated as compared to the other fibers. The natural fibers mostly used are Sisal fiber and Glass fiber. The sisal fiber has lower tensile strength and tensile modulus when reinforced composites than the glass fiber reinforced composites. Natural fiber-reinforced polymer composites are renewable, cheap, absolutely or in part recyclable, and biodegradable. In the case of natural fibers, no punctures and no sharp points nothing is being observed. They are biodegradable also and have relatively low density.

II. LITERATURE REVIEW

The following are the reviews related to the composite material that have been studied:

ShindeRohit Anil et al. (2021) fabricated a helmet with epoxy-based composite material from natural fiber. The composites of natural fiber i.e., sisal fiber are reinforced and provide good mechanical properties than pure matrix material. The sisal fiber is successfully got reinforced with epoxy by a simple wet hand lay-up technique. They have done experiments on bending, tensile, and impact strength on the manufactured helmet.

M. Venkatesulu et al. (2021) had done a study on composite material. The composite materials are designed flexible, lightweight, corrosion-resistant, and durable. The composite materials do not lose their respective identities but they still relate their properties to the product produced from their mixture. The composite materials have great capability application in construction subjected to mainly compressive loads.

Shishupal Singh et al. (2021) had done processing and strength analysis on composite material for packaging. The tensile and flexural strength ofa three-layer composite has highest than those four layers. The material made is only used for low-load packaging, utilities of treated jute fiber-reinforced polyester matrix composite were investigated, and found some good results.

M P Todor et al. (2018) had done research on the development of composite materials for completely or partially biodegradable using natural textile fibers of new vegetable origin and those recovered from textile waste. The natural fibers are shown for reinforcement fixtures with complex shapes that give over a wide surface. The composite materials are good solutions for the mass drop without cost growth. The textile waste resulting from industrial waste is a process by which these products are reduced, reused, recycled, collected, etc.

III. CONCLUSION

The composite materials offer endless design options and the matrix, fiber, and perform selections are critical in the design process. Now composite materials have become a part of our everyday life. The selection of the correct raw materials and the right manufacturing technique will make a good composite material. Structures of composite material can be produced with specific properties to meet end-user requirements. The application of composite indicates an optimal set of minimum structural weight and manufacturing cost. Many investigations have been done and are going on for the evolution of new composite materials for replacing conventional materials.

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