The Fundamentals of Epoxy Composites with Filler for Different Applications: a Review

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February 2, 2022

The Fundamentals of Epoxy Composites with Filler for Different Applications: A Review

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ABSTRACT

Abstract Composites or composite materials are engineered materials that consist of two or more constituent materials with wide discrepancies in their physical, chemical, and mechanical properties. The characteristic properties of these composite are as a result of the individual properties of their constituent parts and their respective volume fractions and arrangements in the material system. Depending on the intended application, composites can be designed to satisfy specific geometrical, structural, mechanical, chemical, and sometimes aesthetic requirements. Areas of application of these synthetic materials includes construction such as in buildings and bridges, automotive industry such as in car bodies, aeronautic, naval (e.g., ships and boats), and in the biomedical fields. Therefore, the main purpose of this paper is to introduce composite materials, epoxy resins their additives, fillers and discuss their current and potential use in coatings, electronic materials, adhesives, and matrices for fiber reinforced composites because of their outstanding mechanical properties, high adhesion strength, good heat resistance, and high electrical resistance.

Keywords: *Ccomposites, Epoxy resins, additive, fillers, application of epoxy resins, etc*

I. INTRODUCTION

Overview on Composite

In the innovatively propelled engineering system, there is a developing interest for cost-effective and new materials for different applications. Superior materials and processes have an expanding role in accomplishments for environmental protection, advancement of infrastructure, modern and consistent development in the transportation system. The accessibility of natural wealth and man-made materials are conveying down accessibility today. This has brought about the requirement for research, selection of new choices, and suitable materials. Therefore, there was an interest for robust and lightweight materials thus composite materials were developed.

Composite materials or composites are designed materials comprised of at least two constituent materials, with altogether extraordinary physical or chemical properties that keep them independent and appreciable levels among the completed structure. The properties of composite materials attained by joining the different constituent materials can't be accomplished by any of the individual components used alone.

Composite materials are typically manufactured by three different materials like metals, ceramics, and polymers. A large portion of the composite materials is created to enhance the mechanical properties, for example, stiffness, toughness, and hardness. Composites moreover have predominant alternative properties like high strength, lightweight, wear, and corrosion resistance.

The two basic constituents in the composite are reinforcement and a matrix. The strength and stiffness properties are offered by the reinforcement phase. Normally the reinforcement phase is stronger, stiffer, and harder. Generally, the reinforcement is available in the form of fiber or particulate. Fiber has a length that is significantly more prominent than its diameter. The length to diameter (l/d) ratio is known as the aspect ratio and can change enormously. Long fibers have more aspect ratio and preferred orientation while short fibers have minimum aspect ratio and are randomly oriented in nature.

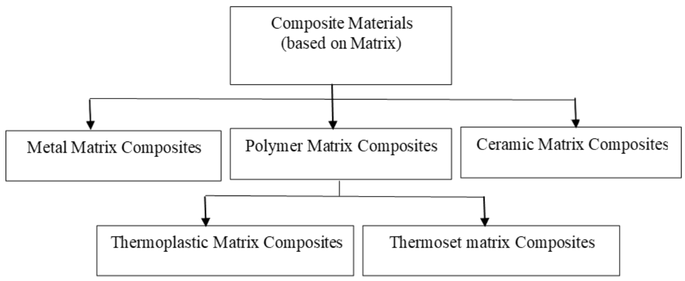

Figure 1.1 Types of composites

The dimensions of particulate composites have equal in all directions. They might be spherical, platelets, or some other consistent or unpredictable geometry. Particulate composites tend to be significantly weaker and less stiff than long fiber composites, however, they are typically considerably less costly. Particulate strengthened composites generally contain minimum reinforcement because of difficulty in processing.

The matrix is a continuous phase in composites. The matrix plays a major role to perform several functions like keeping up the fibers in the proper orientation, spacing furthermore and protecting them from abrasion and deterioration. In polymer matrix composites form a strong bond between the fiber and the matrix. It transmits the load to the fiber through shear at the interface.

Due to an extensive lifetime, the effectiveness of materials, and the simple manufacturing procedure of composites the usage of these composites is unavoidable. The composite materials are having great financial advantages and societal utilize due to their promptly available nature.

1.1 Elements of Composite

Composites are a mixture of two materials in which one of the materials called the reinforcement phase (dispersed phase) is in the form of fibers, particles, or sheets, and is surrounded by the other materials called the matrix phase (continuous phase). The reinforcement material and the matrix material can be metal, polymer, or ceramic. It can provide greater strength and rigidity than is found in any of the separate components while being as light as could be expected under the circumstances. The matrix phase supports and surrounds the reinforcement phase by keeping their relative position.

The reinforcements impart their excellent mechanical and physical properties to improve the matrix properties. A combination between the matrix and reinforcement creates the properties which are inaccessible from the individual constituent materials. The wide range of matrix and reinforcement materials allows the researcher to choose an optimum ratio between them.

The matrix material is placed into the reinforcement previously or after the reinforcement material is introduced into the mould. The matrix material encounters a blending occasion, after which the part shape is set. Depending upon the characteristic of the matrix material, this combination will happen from various perspectives such as polymerization or curing of the liquid state.

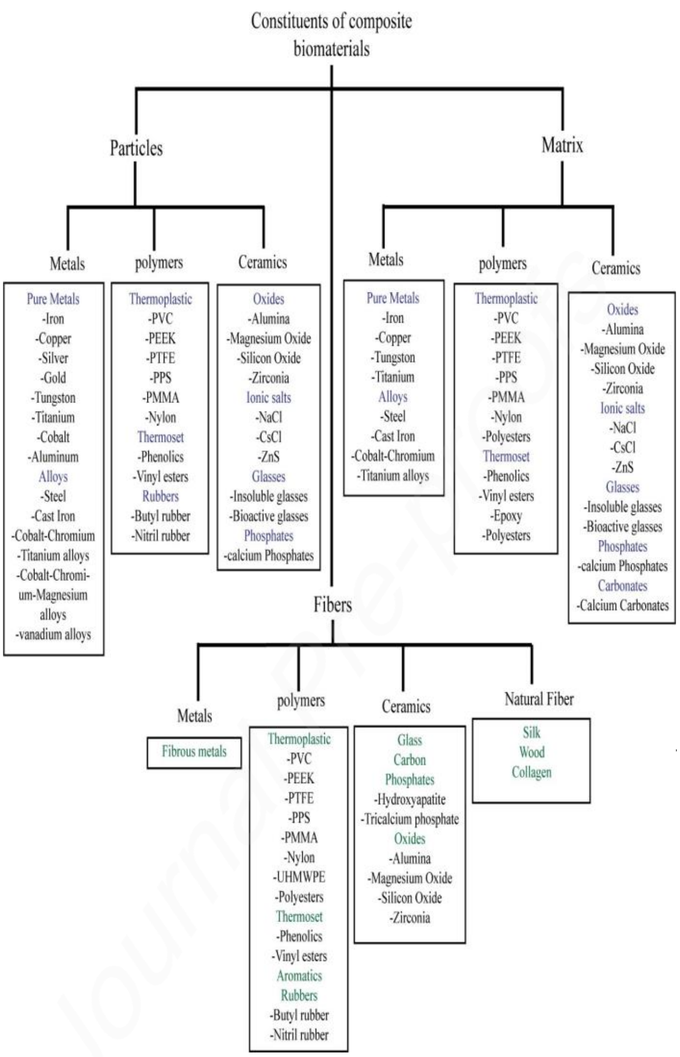

Figure 1.2 Constituents of composite biomaterial [1]

Advanced composite materials are generally characterized by high-strength fibers with high stiffness compared to other materials while embedded together by weaker matrix. The high-strength fibers are additionally low density while possessing a large fraction of the volume.

These composites exhibit good physical and chemical properties that include lightweight, high stiffness, and strength along the direction of the reinforcing fiber, dimensional stability, temperature, and chemical resistance, and generally easy handling. Nowadays advanced composites are replacing metal parts, especially in the aerospace industry. The common fibers commercially used are glass fiber, carbon fiber, and aramid fibers.

1.3 FIBER-REINFORCED PLASTICS (FRP)

FRP is a composite material that utilization of natural or synthetic fibers embedded in the polymer matrix to increase strength and stiffness. FRPs used to strengthen and reinforce the structures are greatly stronger than typical steel. Fiber-reinforced polymer composites (FRPs) are classified into:

i. Carbon Fiber Reinforced Polymer Composites (CFRPs)

ii. Glass Fiber Reinforced Polymer Composites (GFRPs)

iii. Aramid Fiber Reinforced Polymer Composites (AFRPs)

1.3.1 Merits of FRPS Composites

The achievement of fiber-reinforced polymer composites in the competitive environment is basically because of their outstanding performance contrasted with different materials. The benefits include:

- High strength to weight ratio
- Dimensionally stable
- Resistant to corrosion and abrasion
- Good thermal and electrical resistance
- Enhanced impact, fatigue, and compression strength
- Lower shrinkage rate

1.3.2 Demerits of FRPS Composites

- High initial cost.
- Weakness to mechanical damage
- Less flexibility
- Minimum shear strength
- Lack of ductility

1.4 SYNTHETIC FIBERS

Synthetic fibers are manmade fibers by the chemical synthesis process. In general, synthetic fibers are manufactured by extruding fiber through the form die into air and water. These fibers are high-performance fibers that possess high tensile strength, stiffness, and thermal stability than those of the traditional fibers. The performance of a fiber-reinforced composite is estimated by its length, shape, arrangement of the fibers, and the mechanical properties of the matrix material.

1.5 Glass Fibers

More than 95% of the fibers utilized as a part of strengthened plastics are glass fibers, as they are low cost, simple to fabricate, and have high strength and stiffness compared to the plastics, with which they are reinforced. Their low densities, corrosion resistance, and high fatigue life are advantages of the glass fiber.

Generally, glass fibers are available as discontinuous and continuous fibers, cloths, mats, tapes, and yarns. The addition of different mineral oxides to silica sand gives the resulting product having different types. Based on the chemical composition and its application, glass fibers can be classified into various types. The most commonly used glass fibers are E- glass (fiberglass) also S-glass. The E-glass fibers are high electrical resistive glass made with alumina calcium borosilicate. It is also used for general purposes due

to its good mechanical properties. The S-glass fiber remains for the higher substance of silica. It maintains its strength at high temperatures when compared with E-glass and has higher fatigue strength. It is utilized mostly in aerospace applications. Another kind of fiber is C-glass (corrosive resistant glass) used in corrosive environments. D glass (dielectric glass) is used for applications requiring low dielectric constants. R glass (reinforcement glass) is used in high strength and construction applications and A-glass (alkali glass) is used to enhance surface appearance. Figure 1.3 shows the different forms of glass fiber[1,2].

(a) Chopped fiber (b) roving
(b)

(c) Woven roving

Figure 1.5 (a-c) different forms of glass fiber

1.6 Carbon Fibers

Carbon fibers also called graphite fibers are about 5 – 10 micrometers in diameter and mostly composed of carbon molecules. 90 percent of manufacturing carbon fiber is the oxidation and thermal pyrolysis of polyacrylonitrile (PAN) material and 10 percentage are made from rayon or petroleum pitch. These materials are natural polymers, characterized by long series of molecules bound together by carbon atoms. The advantages of these fibers are high strength and modulus, low thermal expansion, and high fatigue strength. The disadvantages include high cost, high electrical conductivity, and low impact strength. These fibers are reinforcement for composite materials used in aircraft components, High-performance vehicles, sports items, wind blades, and other high-performance applications.

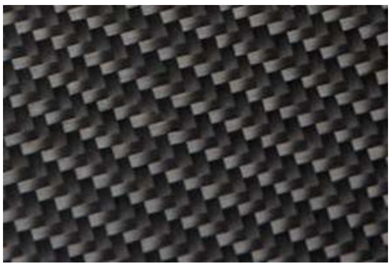

Figure 1.6 Carbon fiber

1.7 Aramid Fibers

Aramid fibers are synthetic fibers, with molecules that are described by moderately rigid polymer chains. These molecules are linked by solid hydrogen bonds that transmit mechanical stress proficiently and making it feasible to utilize chains of relatively low molecular weight.

The characteristics of aramid fibers are

- Good resistance to abrasion and corrosion
- Good resistance to organic solvents
- Non-conductive
- No melting point
- Low flammability
- Good fabric integrity at elevated temperatures
- High strength

They are used in aerospace and military applications, for ballistic rated body armor fabric and ballistic composites, marine cordage, marine hull reinforcement, and as an asbestos substitute. Though the high cost of the material, the intricate manufacturing process and preparing of the composite material has constrained their popularity when compared with glass fiber or carbon fiber.

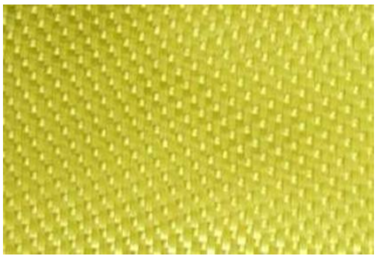

Figure 1.5 Kevlar fiber

Mechanical properties of various synthetic fibers shown in Table 1.1.

Table 1.1 Mechanical properties of synthetic fibers [2]

Fiber	Density (g/cm^3)	Elongation (%)	Tensile strength (MPa	Elastic modulus (GPA)
E-Glass	2.5	0.5	2000–3500	70
S-Glass	2.5	2.8	4570	86
Carbon	1.4	1.4–1.8	4000	230–240
Aramid	1.4	3.3–3.7	3000–3150	63.0–67.0

1.8 Polymer Matrix Material

In polymer matrix composites, the matrix material performs two important functions. They are binding the reinforcement material in the respective place and distribute the mechanical stress to the reinforcement under an applied force. Polymers are the perfect materials as they are handled effortlessly, have lightweight, desirable mechanical properties. The two different types of polymers are thermosets and thermoplastics.

The characteristics of thermosets have limited three-dimensional atomic structure after curing. Whereas, thermoplastics have may be single or two-dimensional atomic structures. Thermoplastics tend to lose their property at elevated temperatures.

Nowadays thermoset polymers are used as superior composite matrix materials. The thermoset materials (i.e., epoxy, polyester, vinyl ester, polyimide) are changing phase from liquid to solid by an irreversible process, finally, we get a cross-linked chain. After the cross-linking process is done, they can't be liquefied again. The advantages of using a thermoset are a liquid stage

at room temperature and during processing only low or medium pressure are required and they are low-cost materials.

Epoxy resins are most extensively used in polymer matrix composites and are suitable for the compression moulding process. They are sensibly steady to chemical contacts and are outstanding adherents having minimum shrinkage during the curing process and no discharge of unpredictable gases. Generally epoxy resins are low molecular weight organic fluids containing various epoxide groups, which are three-part rings with one oxygen and two carbon atoms. The chemical structure of epoxy resin is shown in Figure1.6. Polyepoxides, epoxy, epoxy resins, epoxides (Europe), epoxy or 1,2-epoxy represent a special class of highly reactive pre-polymers or polymers that contain epoxide groups in their molecular structures. The term epoxy represents any basic or cured end products of ERs [1, 2]. An epoxy is reacted with a hardener (curing agent), they set to a hard material and it does not melt or dissolve in solvents. The important properties of epoxy resins are viscosity, molecular weight and epoxide equivalent weight.

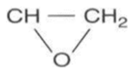

Figure 1.6 Structure of epoxy resin

1.8.1 Types of Epoxy Resin

There are two principle classifications of epoxy resins, to be specific the glycidyl epoxy and non-glycidyl epoxy resins. The glycidyl epoxies are further divivded into glycidyl-ether, glycidyl-ester and glycidyl- amine. The non-glycidyl epoxies are either aliphatic or cycloaliphatic epoxy tars. Glycidyl epoxies are manufactured through a condensation process of proper dihydroxy compound, dibasic acid or a diamine and epichlorohydrin.

Merits of epoxy resin

Epoxy resins are commonly used matrix material due to the advantages of high strength, low viscosity, low shrinkage rate, resistance to fatigue and creep, good chemical and electrical resistance.

Demerits of epoxy resin

Epoxy resins also have few inherent disadvantages like toxic in nature, moisture absorption resulting into change in dimensions and physical properties, high degree of thermal coefficient of expansion, high degree of smoke release in a fire.

2 CURING OF EPOXY RESINS

The curing practice is a chemical reaction in which the epoxide groups in epoxy resin reacts with a curing catalyst (hardener) to shape a very cross linked, three-dimensional system. So as to change over epoxy resins into a hard, infusible, and inflexible material, it is important to cure the resin with hardener. Epoxy resins cure rapidly and effectively at any temperature from 5-150 ^{0}C depending upon the choice of curing agent. The large varieties of curing agent for epoxy resins are available depending on the manufacturing process and properties required. The generally available curing agents for epoxies include amines, polyamides, phenolic resins, anhydrides, polymercaptans and isocyanates. The phenolic and amine-based curing agents are generally used for curing of epoxy resins. These co-reactants are commonly called curatives or hardeners and the cross-linking reaction is often called to as curing. Generally, curing of epoxides makes them brittle in nature because of high degree of cross-linking [3]. Curing of ERs also results in the formation of thermosetting polymers with high mechanical strength and excellent thermal and chemical stability [4,5].

3 APPLICATIONS OF ER’S

The unique thing about composite materials in general is the fact that they can be tailored to suit specific applications. Typical products include automobile panels, roof, life gates, battery trays, fenders, hoods, bumpers, spoilers, air deflectors, furniture, kitchen bowls and trays, large containers, recreational vehicle body panels, medical equipments.

Application fields

3.1 Paints and coatings

Epoxy resins are widely used as heavy-duty anticorrosion coatings because of their exceptional properties, such as easy processing, high safety, excellent solvent and chemical resistance, toughness, low shrinkage on cure, mechanical and corrosion resistance, and excellent adhesion to many substrates. Metal cans and containers are often coated with epoxy resins to prevent rusting, especially when packaging acidic foods like tomatoes. Epoxy resins are also used for high performance and decorative flooring applications such as terrazzo, chip, and colored aggregate flooring [7,14].

3.2 Adhesives

Epoxy adhesives are a major part of the class of adhesives called ‘‘structural adhesives’’. These high-performance adhesives are used in the construction of aircraft, automobiles, bicycles, boats, golf clubs, skis, snowboards, and other applications where high strength bonds are required. When used as adhesives in cryogenic engineering applications, it is necessary to optimize the epoxy shear strength at both cryogenic and room temperatures. Commercial epoxy adhesives are engineered for optimal toughness by incorporating phase-separated thermoplastics, rubber particles, or rigid inorganic particles into the matrix. Typically, the adhesives are cured at elevated temperatures to increase their strength and activate chemical bonding at the substrate/adhesive interface [15-17].

3.3 Industrial tooling

Epoxy systems are used in industrial tooling applications to produce molds, master models, laminates, castings, fixtures, and other industrial production aids. This ‘‘plastic tooling’’ replaces metal, wood, and other traditional materials, and generally improves the process efficiency while either lowering the overall cost or shortening the lead-time for many industrial processes. Fiber-reinforced epoxy composites have proven effective in repairing metallic components and tubular pipes. The composites also act as load-bearing units in hydrogen storage cylinders [18-19]. Aerospace industry Epoxy resins have been extensively used for structural adhesive applications in the aerospace industry because of their high adhesive properties and low cost. Epoxy resins reinforced with high strength glass, carbon, Kevlar, or boron fibers have the greatest potential for use in the aerospace industry [20].

3.4 Electronic materials

Epoxy resin formulations are important in the electronics industry, and are employed in motors, generators, transformers, switchgear, bushings, and insulators. Epoxy resins are excellent electrical insulators and protect electrical components from short circuiting, dust, and moisture. Metal-filled polymers are extensively used for electromagnetic interference shielding [21]. Epoxy molding compounds (EMCs) are popularly used as encapsulation materials for semiconductor devices protect the integrated circuit devices from moisture, mobile-ion contaminants, and adverse environmental conditions such as temperature, radiation, humidity, and mechanical and physical damage [22,23]. Epoxy composites containing particulate fillers, such as fused silica, glass powder, and mineral silica have been used as substrate materials in electronic packaging applications [24,25].

3.5 Biomedical systems

The biomedical industry has taken advantage of this multi-component material in the design and manufacture of biomaterials that can be used for the repair or the complete replacement of different human tissues or organs [8]. [9] proposed wearable modules have been constructed on reinforcement epoxy material and fabricated on textile woven using the hand block printing method, these delivered results in the textile cotton and polyester materials. A 3.91 GHz have been offered the both the wearable woven materials. [11] the Epoxy/ Yahyali Stone composites can be suggested as a radiation shielding material for the low energetic gamma rays utilized in nuclear medicine applications.

epoxy (EP)/binary spherical alumina (S-Al2O3) composites with a high loading of 50 vol% were fabricated by incorporating different sizes of S-Al2O3 into EP to increase the thermal conductivity and yet retain the flowability of the composites. binary composites possessed superior electrical insulation, high thermal stability, significantly reduced thermal expansion coefficient and good mechanical properties. These combined desirable properties indicate that binary S-Al2O3 mixtures with an optimized size distribution and maximum packing volume are best candidates to develop high performance epoxy-based underfill materials which would improve the flip-chip reliability [12]. a new CF/flax/epoxy composite material developed; CF/flax/epoxy composite has the potential to be used in orthopedic fracture fixation [13].

4 ADDITIVES AND FILLERS

A variety of additives can be used to modify composite properties, performance, and appearance, including catalysts, inhibitors, colorants, release agents, flame retardants and ultraviolet absorbers. Smart use of additives will bring up new functionalities and savings in material use.

Fillers have specifically different properties to polymers, and by their sensible choice one can produce composite materials with improved properties for a given use and it is essential to recognize that while promoting a few properties. These materials are added into polymer matrix for the following reasons.

- Improve the Mechanical property
- Flame retardancy
- Enhance the Electrical and magnetic property
- Improve Surface property
- Improve processing aids
- Better abrasion and tear resistance
- Reduces cost
- Reduces shrinkage

Additionally, it may include improve degradability, antiaging characteristics, bioactivity, radiation absorption, warpage minimization etc.

The most commonly used fillers for thermoset resins are calcium carbonate, Kaolinite and alumina hydrate. Other commonly used fillers include clay, mica, silica, glass microspheres, glass whisker, and micro rubber balloon. The calcium carbonate of often used filler in unsaturated polyester and vinyl ester resins to reduce the cost as well as the mould shrinkage.

4.1 Epoxy with Additive

the challenges of joining composite materials together and the advantages that adhesives and tapes have over traditional metal fasteners. The report explore advice on choosing the right adhesive to use and what parameters to consider as well as comparing some of the new adhesives that are being used to bond composite materials, whilst evaluating the advantages some chemistries have over others. two recent Case Studies where Techsil has worked with manufacturers using carbon fiber composite parts in their product assemblies to overcome challenges in bonding their parts together are studied [10].

4.2 Epoxy with Filler

The addition of fillers in epoxy depends on the shape, size, colour, density, modulus and various studies of fillers are used to improve stiffness and heat deflection temperatures, crystallization, decrease shrinkage, voids and good appearance of the composites. One of the known fillers is glass fibre. Because of its good strength and stiffness, the size and volume fraction play an important role in mechanical and wear properties [4]. Processing of fillers with epoxy can be done by casting, in which a liquid material is usually poured into a mould. Particulate filled epoxy is a preferred choice for non-structural application such as polymer bearings, seals, tools etc. The reinforcing fillers range from particulates of metals, oxides, nitrides, carbides.

Effect of fillers on various sizes on mechanical Characterization

N. Saba et al. [26] noted the effect of nano oil palm empty fruit bunch fillers on natural fiber kenaf in the non-woven mat form with epoxy composite. The experimental results shows that addition of nano oil palm empty fruit bunch filler with kenaf epoxy composite improves the tensile strength in comparison to kenaf epoxy composite due to minimizing the free spaces by the nano fillers. The impact strength of nano filler hybrid composite is increased by 28.3%. K. Mohan et al. [27] observed the effect of multi wall carbon nano tubes on the hybrid composite of glass- flax fiber. Glass and flax fiber hybrid reinforced composites by epoxy resin with muti walled carbon nano tubes were fabricated using compression moulding technique. MWCNT are added in epoxy resin by using ultra sonic probe sonicator. The maximum tensile strength was raised upto 28.26% with incorporation of 1% MWCNT whereas compressive strength is increased with 1% of MWCNT by weight. The SEM images represent the uniform dispersion of MWCNT in the epoxy resin. Ahmer Hussain Shah et al. Wang et al. [28] inserted the nano TiO2 in unidirectional fiber of flax by method of immersion in nano TiO2, KH560 suspension through sonification. The quantity of inserted nano TiO2 is 0.89% by weight to 7.14% by weight, depends on the concentration of suspension. The drastic change in increase of 23.1% of tensile strength and 40.5 % of interfacial shear strength by the optimizes contents of nano TiO2 (2.34% by weight) was observed. Foruzanmehr et al. [29] studied flax fibers grafted with TiO2 were used to create Ploylactic acid (PLA) composites. The TiO2 film was inserted on the flax fiber by a technique of sol-gel-dip method and also the fibers were oxidized for the purpose to enhance the interfacial adhesion between the flex fibers & TiO2 film. The impact resistance of the composite of TiO2 grafted flax fibers was increased by three times as compared to pure poly lactic acid (PLA). The hygroscopic behavior was also observed and amount of moisture absorption was decreased by 18% in the composites of flax fiber grafted with modified TiO2. Mahesha et al. [30] investigated the mechanical and tribological behavior of Basalt fiber reinforced composites with Epoxy matrix with insertion of nano TiO2 alone as well as combination of nano TiO2 with nano clay by the method of vacuum assisted resin infusion technique (VARI). The experimental observations show s that tensile strength and dimensional stability of the basalt- Epoxy composite was increased with the fillers of nao Tio2. Wear test shows that minor increase in coefficient of friction in basalt-Epoxy with nano clay and decrease in coefficient of friction for basalt Epoxy with nano TiO2 and TiO2/clay. Prasob P.A. et al. [31] noted the increase in tensile strength by 30.79% and increase in compressive strength by 34.03% for composite with fillers of TiO2, 4% by weight in quantity. Nayak et al. [32] counted the effect of addition of nano TiO2 0.1% by weight on glass fiber reinforced polymer compostes (GFRP) and found that 9% water diffusion coefficient has reduced, residual flexural strength increased by 19%, residual interlaminar shear strength increased by 18%. The effect of nano OPEFB, MMT and OMMT to kenaf epoxy shows the significant increase in storage modulus, loss modulus, tan delta and glass transition temperature. Mechanical, moisture absorption properties and thermal behaviour was studied by added the nano

TiO_2 to the flax fiber reinforced epoxy composites fabricated by compression moulding technique. The best performance was obtained at 0.7% in the variation of 0.5, 0.7 and 0.9 nano TiO_2 in the matrix. Moisture absorption tendency is also decreased by addition of nano TiO_2. The diffusion coefficient is decreased by 31.66% for nano TiO_2 added to flax fibre epoxy composite when compared to flax fibre epoxy composite without nano TiO_2 addition. G. Seshanandan et al. [33] made the hybrid composites by taking jute and glass with different weight ratios of nano TiO_2 by hand lay up method. They noted the drastic increase in tensile strength, flexural strength and shear strength. The insertion of TiO_2 nano particles in FRP resulted in improved strength due to crack deflection and crack pinning toughening, crack-tip blunting mechanisms. Graphene oxide (GO) has been induced into the poly (p-phenylene benzobisoxazole) (PBO) fiber surfaces uniformly with a silane coupling agent (KH-540), improving largely the interfacial shear strength by 61.6% . Gujjala Raghavendra et al. [34] introduced the nano composites by inserting nano alumina (Al_2O_3) into a hybrid composite of natural fibers of Jute and glass fiber. The tensile and flexural strength found to be increased by the insertion of alumina nano particles. The maximum erosion takes place at 90 degree, therefore the composite shows the brittle behavior as the increases in alumina contents.

5. CONCLUSION

In this paper, we have reviewed various epoxy resins. The properties of cured epoxy resins depend on the type of epoxy resin, curing agent, and curing process used. The toughness of epoxy resins can be improved by incorporating thermoplastic components, inorganics, carbon fibers, clay, and carbon nanotubes. Epoxy resins have a wide range of application including coatings, aerospace industry, electronic materials, and biomedical systems.

Its mechanical characterization affected by the parameters like dispersion of fillers, interfacial bonding between filler and polymer matrix and distribution of fillers. Bulk literature is available related to use of fillers in metal matrix composites and synthetic polymers but in this paper an attempt is made to review the use of different fillers with natural fiber hybrid composites and their response on mechanical properties. The various fillers like Titanium Oxide (TiO_2), Aluminum Oxide (Al_2O_3), Silicon carbide (SiC), Zinc Oxide (ZnO), Zirconium Oxide (ZrO_2), Calcium Carbonate ($CaCO_3$) in varying ratios improves mechanical characters of natural fiber composites.

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