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REVIEW ARTICLE ON EFFECT OF HUMAN HAIR ON MECHANICAL PROPERTIES OF EPOXY RESIN

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ABSTRACT

Fiber reinforced polymer composites is a most important class of structural material due to their numerous advantages in present as well as future. Reinforcement in polymer is either engineered or characteristic. Engineered fiber, for example, glass, carbon and so on has high particular quality however their fields of requisition are restricted because of higher expense of creation. As of late there is an increment in enthusiasm toward common composites which are made by reinforcement of characteristic fiber. Human hair has solid malleable property; thus it could be utilized as a fiber reinforcement material. It gives great property at easier expense of generation. It additionally makes ecological issue for its deteriorations because of its non-degradable properties. To this end, an attempt has been made to study the potential utilization of human hair which is economically and effortlessly found in India for making value added products. The objective of present work is to evaluate the mechanical properties of human hair reinforced epoxy composites. The impact of fiber loading and length on mechanical properties like tensile strength, flexural strength, impact strength and hardness of composites is examined.

I. INTRODUCTION

Epoxy resins[1] are polyether pitches containing more than one epoxy aggregate equipped for being changed over into the thermoset frame. These gums, on curing, don't make unpredictable items disregarding the nearness of an unstable dissolvable. Applications for epoxy pitches are broad: glues, holding, development materials (ground surface, clearing, and totals), composites, covers, coatings, embellishment, and material wrapping up. They have as of late discovered uses noticeable all around and shuttle enterprises. Hair has brilliant solidness, rigidity property and genuinely great glue properties. Hair is equipped for withstanding high loads, explore has demonstrated that a solitary strand of hair can withstand up to 125grams of load. Hair particles are comprised of polymer constituents. Essential segment of hair fiber is keratin[2]. Keratins are proteins, long chains (polymers) of amino acids. Keratin proteins frame the cytoskeleton (small scale skeleton inside a cell) of every single epidermal cell. Hair contains a high measure of sulfur on the grounds that the amino corrosive cysteine is a key segment of the keratin proteins in hair fibre.

II. COMPOSITE FABRICATION

This chapter represents the materials used and detail fabrication techniques

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1.1 Materials

a) Human hair fibre (Fibre Material)

b) Epoxy resin (Matrix material)

c) Hardner

1.2 Fibre Material

[1] The common fiber human hair is taken out from the local sources[3]. It is a fiber which is easily and cheaply available in India. Fibers are generally utilized as a part of cement for the accompanying reasons:

[2] To control breaking because of both plastic shrinkage and drying shrinkage.

[3] They additionally decrease the porousness of cement and along these lines diminish draining of water.

[4] A few sorts of strands likewise generate more terrific effect, scraped area and smash safety in cement. The fineness of the strands permits them to fortify the mortar division of the cement, postponing split framing and spread. This fineness additionally represses draining in the solid, consequently diminishing porousness and enhancing the surface attributes of the solidified surface. Hair is utilized as a fiber fortifying material in cement for the accompanying reasons:

[1] It has a high elasticity which is equivalent to that of a copper wire with comparable width.

[2] Hair, a non-degradable matter is making an ecological issue so its utilization as a fiber fortifying material can minimize the issue.

[3] It is additionally accessible in wealth and with ease.

[4] It fortifies the mortar and keeps it from spalling.

1.3 Matrix Material

Around diverse sorts of framework materials, polymer networks are the most generally utilized in view of numerous points of interest, for example, cost viability, simplicity of manufacture with less tooling rate and they likewise have remarkable room temperature properties. Polymer networks could be possibly thermoplastic or thermosetting[4, 5]. The most normally utilized thermosetting gums are epoxy, polyester, vinyl ester, Polyurethanes and phenolics. Around them the epoxy resin is the most commonly used polymer due to numerous points of interest, for example, enormous attachment to wide assortment of filaments, prevalent mechanical and electrical properties furthermore great execution at lifted temperatures. Notwithstanding that they have low shrinkage after curing and great synthetic safety. Because of various points of interest over other thermoset polymers, epoxy is picked as the lattice material for the present examination work. It synthetically fits in with the "epoxide" family and its regular name of epoxy is Bisphenol-A-Diglycidyl- Ether.

1.4 Specimen preparation

The fabrication of the various composite materials is carried out through the hand lay up technique short human hair fibre with various length (0.5, 1, 1.5, 2) cm are rainforced with Epxoy LY556 resin chemically belonging to the 'epoxide' family is used as the matrix materials. Its comman name is Bisphenol A diglycidy Ether. The low temp. curing epoxy resin (Araldite LY 556) and corresponding hardner (HY951) are mixed in the ratio by

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weight as recommended. The prepared composite is stirred manually to disperse the fibre in the matrix after some time the mixture is poured into suitably mould whose dimensions are specially designed. The dimension of mould is (10×10×3) cm. Then composite is left untouched for sometime so that mixture get solidify. A few sheet of composite of different length and different weight percentage are cut down for mechanical testing. The dimension of sheet are 0.5 cm × 1 cm 1.5 cm. or 10% × 20%×30% weight loading utmost care has been taken to maintain uniformity and homogeneity of composite.

1.5 Composite Fabrication

The human hair fiber is gathered from local sources. Epoxy is taken as matrix material. The low temperature curing epoxy and the corresponding hardener (HY951) are blended in a degree of 10:1 by weight as prescribed. A mold of size (10×10×2) cm is utilized for fabrication of composites. The human hair fibers are blended with epoxy by the basic mechanical mixing[6,7]. The composites are prepared with four distinctive fiber lengths utilizing hand lay-up process. The mixture is put into different molds adjusting to the necessities of different testing conditions and characterization models. The designation and detail composition of composites are presented in Table 1. Finally, the specimens of suitable dimensions are cut for mechanical tests.

III. FIGURES AND TABLES

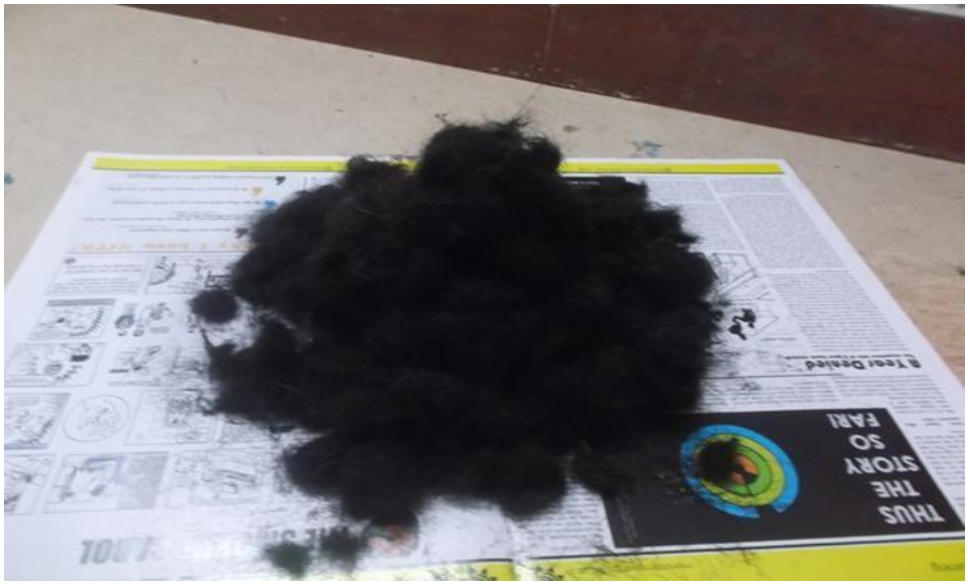

Fig: 1 Human hair fiber

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Fig: 2 Human fiber reinforced epoxy composite

Table1: Designation of Composites

Composites	**Compositions**	**Percentage of fiber loading**
C_1	Epoxy (90 weight percentage) + Hair fiber (fiber length 0.5 cm)	10%
C_2	Epoxy (90 weight percentage) + Hair fiber (fiber length 1 cm)	10%
C_3	Epoxy (90 weight percentage) + Hair fiber (fiber length 1.5 cm)	10%
C_4	Epoxy (80 weight percentage) + Hair fiber (fiber length 0.5 cm)	20%
C_5	Epoxy (80 weight percentage) + Hair fiber (fiber length 1 cm)	20%
C_6	Epoxy (80 weight percentage) + Hair fiber (fiber length 1.5 cm)	20%
C_7	Epoxy (80 weight percentage) + Hair fiber (fiber length 2 cm)	20%
C_8	Epoxy (70 weight percentage) + Hair fiber (fiber length 0.5 cm)	30%
C_9	Epoxy (70 weight percentage) + Hair fiber (fiber length 1 cm)	30%
C_{10}	Epoxy (70 weight percentage) + Hair fiber (fiber length 1.5 cm)	30%
C_{11}	Epoxy (70 weight percentage) + Hair fiber (fiber length 2 cm)	30%

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IV. CONCLUSION

Human hair is applicable for various manufacturing processes and also more research in needed in the field of weather fore casting of various composites taking the human hair as their chief fiber. Till now none of the studies have inspected the human hair with various size/length in different ambient conditions to understand the basic physics of this god gifted composite fiber. So exploration of this area can be used to exploit the human h air as a more competent biological composite fiber in future. Human hair section provide excellent samples for demonstrating the potential of mid-IR AIR imaging. Compared with pure plastic specimen. Adding human hair fiber into plastic materials could increase tensile strength, Impact strength because fibers provides strength to reinforced composite. After a point, strength of composite starts decreasing because interface bonding between fiber and resin goes on decreasing as fiber weight percentage increase in composite.

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