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Improvement Of Chemical Resistance Of Jute, Glass,Epoxy Hybrid Composites.

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Absract:
Chemical resistance hybrid fibers (i.e. jute/glass) composites are prepared to assess the influence of treated and untreated hybrid composites to various acids, alkalis, and solvents were studied as a function of silica at 2, 3, 5 and 12 wt % filler loadings respectively. Jute was treated with 5% solution of NaOH was taken into the tray allowed to soak in to in it for about 4hrs. Weave Glass fiber length undo in to 20 mm length where as jute length was taken 10mm and yet 3% vol. of hybrid fiber were impregnated with matrix. Hybrid composites were pre-weighed and dipped in all chemicals thereof for 24hrs taken it out and washed it with distilled water weighed again to know the change in % weight loss/gain in order to find out resistance to chemicals. Hybrid fiber composites are made up of hand layup process. Author hence proved all hybrid composites are resistance to attack of all chemicals except Toluene.
Keywords: Hybrid composites, Glass fiber, Jute fiber, Silica, Epoxy, chemical resistance

INTRODUCTION

Ubiquitous plastics are inevitable these days as it is versatile material that lends itself to many uses. The turnaround in favor plastic happened not just because of colorful and durable for household products but also because plastics as an accessory became fashionable and trend setters. Thus this is the day of plastics (composites).Real aircrafts and cars are made of composites to lighten their weight. Glass fiber reinforced composites due to their high specific strength and specific stiffness have become attractive structural materials not only in weight sensitive aerospace industry, but also in marine, armor, automobile, railways, civil engineering structures, sport goods etc. Epoxy resin is the most commonly used polymer matrix with reinforcing fibers for advanced composites applications. They have been used widely as a matrix to hold the high performance fiber reinforcement together in composite materials, as well as a structural adhesive. Many approaches have been explored in Available online at http://www.urpjournals.com

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 an attempt to improve the performance of epoxy resins including, the addition of rubber agents, thermoplastic fillers, diluents and modification of its chemical structures. Among all reinforcing fibers, natural fibers have gained substantial importance as reinforcements in polymer matrix composites. A lot of work has been done by many researchers on the composites based on these fibers [1-3]. Hybrid composites are materials made by combining two or more different types of fibers in a common matrix. They offer a range of properties that cannot be obtained with a single kind of reinforcement. Natural fiber composites or biocomposites are defined as composite materials composed of biodegradable natural fibers as reinforcement and biodegradable or non-biodegradable polymers as matrix. Natural fibers are largely divided into two categories depending on their origin: plant based and animal based. In general plant-based fibers are lignocellulose in nature composed of cellulose, hemicellulose, and lignin, whereas animal-based fibers are of proteins e.g., silk and wool The two fibers can be combined in the same matrix to produce hybrid composites which impart distinctive properties that cannot be obtained with a single kind of reinforcement [4].Many researcher has been done on the jute fiber[5-12].In this present work chemical resistance of epoxy/silica/hybrid fiber (glass/jute) composites are studie

Table.1 Chemical resistance of epoxy based untreated and treated hybrid fiber composites

Chemical	Matrix	Treated	Untreated
Hydrochloric acid	+1.217	+0.873	+0.985
Acitic acid	+1.282	+0.241	+0.249
Nitric acid	+2.459	+1.678	+1.879
Sodium hydroxide	+1.123	+0.568	+0.714
Sodium Carbonate	+0.235	+0.245	+0.557
Ammonium Hydroxide	+0.919	+0.767	+0.321
Benzene	+2.380	+10.426	+11.235
Toluene	-2.479	-4.810	-6.879
Carbon tetrachloride	+2.941	+2.145	+3.458
Distilled water	+1.630	+1.023	+1.548

MATERIALS AND METHODS Materials Commercially available Epoxy resin is taken ARALDITE LY-556 Huntsman, Ciba-Geigy India ltd. curing agent has taken as ARADUR HY-951 from HUNTSMAN Ciba-Geigy India Ltd. Weave Glass fiber reel weight is 350g/m² and so is Jute fiber weight is 450g/m² obtained from Saint Gobain Industries Ltd., Bangalore. **Jute Fiber Treatment** The jute fibers were placed in a glass tray with a 5% NaOH solution was added to the tray and the fibers were allowed to soak in the solution for 4 h. The fibers were washed with water to remove the excess of NaOH sticking to the fibers. Finally the fibers were washed with distilled water and dried in a hot oven at 60ºC for 1 h. The jute fibers were cut into 10mm (wt.3%) with a sharp scissors [13].

Synthesis of Sample A weave Glass fiber reel dismantled and cut with sharp scissors into length 20mm up to 3% volume. A glass mould with required dimensions was used for making sample on par with ASTM standards and it was coated with mould releasing agent which enable to easy removal of sample. Next the resin and hardener is taken in the ratio of 10:1 parts by weight respectively. In fact, first Silica is mixed with stipulated quantity of resin based on the stoichiometric ratio is mixed thoroughly in a beaker for about 1hr at ambient temperature conditions. Pre-calculated amount of hardener is then mixed and stirred another 30min with mixture prior to poring in to the mould. Stacking of hybrid fiber (glass and jute 3 vol. % each) carefully arranged in the direction of perpendicular to the resin flow after pouring some amount of resin onto the mould to keep the poor impregnation at bay. Rest of the quantity of mixture was poured over the glass fiber. Brush and roller were used to impregnate fiber. After all, left it for about 24hr at ambient temperature and post cured hot oven for 1hr at 70ºC. Last but not the least removed samples are cut in accordance with ASTM standards. **Chemical Resistance Test** In the present study ASTM G 543-87 [8] was used to study the chemical resistance tests of the composites. The effect of some acids, alkalis and solvents, i.e., glacial acetic acid, nitric acid, hydrochloric acid, ammonium hydroxide, aqueous sodium carbonate, aqueous sodium hydroxide, carbon tetrachloride, benzene, and toluene were

used on the matrix and hybrid composites were studied. In each case, the samples (10X10X3 mm) were pre-weighed in a precision electrical balance and dipped in the respective chemical reagents for 24 h. They were then removed and immediately washed in distilled water and dried by pressing them on both sides with a filter paper at room temperature [13].

RESULTS AND DISCUSSIONS Table.1 speaks volumes about %age of the weight gain (+) or weight loss (-) values of the matrix and hybrid composites when the matrix and hybrid composites were immersed in acids, alkalis, and solvents for both treated and untreated. Author found good feedback from the entire chemical particularly in case of Treated. From the table it is clearly evident that weight gain is observed for almost all the chemical reagents except Toluene. Therefore the above observations suggest that these hybrid composites can be used for making water and chemical storage tanks.

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