**INVESTIGATION OF MECHANICAL PROPERTIES OF POLYCARBONATE CORE COMPOSITE WITH STEEL REINFORCEMENT FOR ORTHOPEDIC IMPLANT**

**Abstract:**

* The aim of this study is to characterize and evaluate the mechanical properties of dispersed POLYCARBONATE and STAINLESS-STEEL composites with various fibers mass fraction.
* The composites materials and sampling are to be prepared in laboratory by using hand layup method with a suitable fabrication procedure & quality control. Prepared polycarbonate and STAINLESS STEEL dispersed composites are evaluated by means of destructive tests.
* Composite Materials Are Engineering Materials Made from Two Or More Constituent Materials That Remain Separate (sandwich Composites) While Forming A Single Component. In This Work the Mechanical Properties of POLYCARBONATE and Their Composite with STAINLESS STEEL Were Evaluated with Reference to ASTM D638-02 A. while applying Load, The Maximum Strain, And Stress Are Obtained. The Maximum Strength Is Found in Composite GFRP Instead of STAINLESS STEEL and Composite POLYCARBONATE. Composite Material Has Shown an Improvement of Mechanical Properties When Compared with Individual Materials.
* To Analyze Structure in Any Shape By Modeling In PRO-E W/F 5.0 And Analysing By Using Finite Element Analysis Is Performed On ANSYS Workbench
* Existing material - STAINLESS TEEL
* Alternate material - SS – **Polycarbonate** -SS **Application:** **ORTHOPEDIC IMPLANT**

Experiment and Modelling Assessing Mechanical Properties of Jute, Kenaf, and Pineapple Leaf Fiber-Reinforced Polypropylene Composites

Abstract

The application of natural fibers is increasing rapidly in the polymer-based composites. This study investigates manufacturing and characterization of polypropylene (PP) based composites reinforced with three different natural fibers: jute, kenaf, and pineapple leaf fiber (PALF). In each case, the fiber weight percentages were varied by 30 wt.%, 35 wt.%, and 40 wt.%. Mechanical properties such as tensile, flexural, and impact strengths were determined by following the relevant standards. Fourier transform infrared (FTIR) spectroscopy was employed to identify the chemical interactions between the fiber and the PP matrix material. Tensile strength and Izod impact strength of the composites significantly increased for all the composites with different fiber contents when compared to the pure PP matrix. The tensile moduli of the composites were compared to the values obtained from two theoretical models based on the modified “rule of mixtures” method. Results from the modelling agreed well with the experimental results. Furthermore, an improvement in flexural strength but not highly significant was found for majority of the composites. Overall, PALF-PP displayed better mechanical properties among the composites due to the high tensile strength of PALF. This comparison will help the researcher to select any of the natural fiber for fiber-based reinforced composites according to the requirement of the final product.

**Design and analysis of Natural fibre sandwich layered industrial safety helmet**

ABSTRACT

The ultimate aim of the project is to design and analyse a hybrid sandwich layered safety helmet that is made from natural materials like epoxy resin and different types of fibres. The safety helmet is designed using design software and simulated with different types of load tests like static load applying. Stress analysis tests and deformation tests are performed using software like an ANSYS workbench.

The helmet is designed and constructed in a lightweight pattern not compensating the safety in comparison with existing helmets

The helmet is made cost-efficient in comparison with existing models as it eliminates moulding costs.

The usage of fibres in this helmet results in fire resilience and moisture resistance compared to conventional products available.

The usage of natural fibres KENAF and JUTE fibre results in the production of a bio-degradable helmet that is eco-friendl*y.*

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Mechanical Properties of Reinforced Natural and Hybrid Composites

ABSTRACT

Environmental awareness and trends to develop sustainable resources have directed much research attention towards kenaf fibre as an alternative reinforcement in composite manufacturing. Numerous studies have been conducted on kenaf and its hybrid composites. Most studies were conducted on kenaf/glass hybrid composites compared to other kenaf/Jute (Natural fibres) composites. Similar with other materials, mechanical properties were the fundamental knowledge identified by the researcher. Limited studies conducted on other properties have restricted the use of kenaf composites to non-structural applications. To extend the potential of kenaf composites to automotive exterior or other critical applications, studies on impact properties can be a valuable contribution in the material field. Layer of fibre, the angle of orientation in fibres and the chemical treatment applied to the fibre before compounding are the three major parameters that affect the mechanical and impact properties of the composites. This review provides insights into the mechanical and impact properties of kenaf/glass hybrid composites compared with Fully natural Fibres (kenaf/Jute) Composites for future research.

**Material optimization for aircraft interior application by using natural fibers**

**ABSTRACT**

*Polymers and their composites are one of the most advanced and adaptable engineering materials. The strength of any composite depends upon number of factors such as volume/weight fraction of reinforcement, types of fibers, orientation angles, chemical treatment of reinforcement, and many others*

*The present work focuses on the analysis of mechanical properties* ***(tensile and flexural)*** *of synthetic and natural fiber (****Hemp and Flax****)-reinforced with epoxy composites. An attempt is made to reduce the usage of synthetic glass fibers by incorporating natural banana fibers such that the resultant hybrid composite shows increased strength when compared with single synthetic fibers* ***(Glass fibers).*** *The test specimens were prepared and tested according to ASTM standards. Experimental results revealed that reinforcement of natural fibers up to some extent increases the mechanical properties and reduces the overall cost of fabrication of composites.*

Application - Interior aircraft applications, flooring

Existing material - Synthetic fiber ***(Glass fibers).***

Alternate material - ***Hemp and Flax with Glass Fiber***

**Testing of mechanical behavior of Walnut shell reinforced with almond shell composite using Epoxy for interior application**

Abstract

A large number of almond shells and walnut shells are disposed of every year. The mechanical properties of almond and Walnut shells composite with epoxy are investigated in this paper in order to contribute to better utilization of these shells.

In the present work walnut particle reinforced composite material was developed. 25 wt% and 25 wt% (weight percentage) of walnut & Almond Shells particles were mixed with 50 wt% epoxy resin. However, addition of walnut particles in bio composite increased the hardness.

**Molding and Testing of natural fiber composite using ASTM Standard**

**Abstract**

Polymers and their composites are one of the most advanced and adaptable engineering materials. The strength of any composite depends upon number of factors such as volume/weight fraction of reinforcement, types of fibers, orientation angles, chemical treatment of reinforcement, and many others

The present work focuses on the analysis of mechanical properties (tensile and flexural) of natural fiber (Hair, Coconut coir & Egg Shell fiber)-reinforced with epoxy composites. An attempt is made to reduce the usage of synthetic glass fibers by natural fibers such that the resultant composite shows increased strength when compared with both natural fibers (Hair, Coconut coir & Egg Shell). The test specimens were prepared and tested according to ASTM standards. Experimental results revealed that reinforcement of natural fibers up to some extent increases the mechanical properties and reduces the overall cost of fabrication of composites.

Existing material – Natural fiber – coconut coir & Hair

Proposed Material – Natural fiber - coconut coir & Hair with Egg Shell

**Mechanical Properties of Epoxy Based Hybrid Composites Reinforced with Flax, Glass Fibres with epoxy added nano silicon carbide**

**Abstract –**

Development of the Polymer Composites with natural fibers and fillers as a sustainable alternative material for some engineering applications, particularly in aerospace applications and automobile applications are being investigated. Natural fibre composites such as sisal, jute, hemp and coir polymer composites appear more attractive due to their higher specific strength, lightweight and biodegradability and low cost. In this study, Flax/glass/Sic fibre reinforced epoxy composites are prepared and their mechanical properties such as tensile strength, flexural strength and impact strength are evaluated. Composites of silicon carbide filler (without filler, 3, 6 & 9Wt %) sisal fibre and glass fibre are investigated and results show that the composites without filler better results compared to the composites with silicon carbide filler.

Experimental Analysis of Mechanical Properties of Natural-Fibre-Reinforced Hybrid Polymer Composites and the Effect on Matrix Material

**Abstract:**

The impact of matrix material on the mechanical properties of natural-fibre-reinforced hybrid composites was studied by comparing their experimental, and numerical analysis results. In the present work hemp and flax fibres were used as reinforcement and epoxy resin along with hardener were used as matrix materials. To study the influence of the matrix material, two sets of hybrid composites were fabricated by varying the matrix material. The composite samples were fabricated by using the compression-molding technique followed by a hand layup process. A total of Two different composites were fabricated by varying the weight fraction of fibre material in each set based on the rule of the hybridization process. After fabrication, the mechanical properties of the composite samples were tested in Lab to find the Flexural, Hardness and Tensile. The results showed that the hybrid composites had superior properties to individual fibre composites. Overall, epoxy resin matrix composites exhibited superior properties to epoxy matrix composites.

Material:

Sample 1 : Hemp, Bamboo fiber, Almond shell (Filler), Epoxy

Sample 2 : Flax, Bamboo fiber, Almond shell (Filler), Epoxy

**Mechanical Properties of Natural Jute Fabric/Jute Mat Fiber Reinforced Polymer Matrix Hybrid Composites**

Recycled needle punched jute fiber mats as a first natural fiber reinforcement system and these jute mats used as a core needle punched with recycled jute fabric cloths as skin layers as a second natural fiber reinforcement system was used for unsaturated polyester matrix composites via modifying the hand lay-up technique with resin pre impregnation into the jute fiber in vacuum. The effect of skin jute fabric on the tensile and bending properties of jute mat composites was investigated for different fiber weight contents. Moreover, the notch sensitivity of these composites was also compared by using the characteristic distance do calculated by Finite Element Method (FEM). The results showed that the tensile and flexural properties of jute mat composites increased by increasing the fiber weight content and by adding the jute fabric as skin layers. On the other hand, by adding the skins, the characteristic distance decreased and, therefore, the notch sensitivity of the composites increased.

*Experimental analysis in Mechanical properties of* ***Natural Hybrid Composite***

*Abstract:*

*In the scenario the environment the demands for technologies of the best suitable composite materials has begun instead of Roof steel. Materials having required characteristics along-side remaining non-pollutant are being researched and formulated to be put them in use. With the availability of natural fiber composites which share proportionate properties with that of manmade fibers are added together with a matrix to achieve best and good outputs. The hybrid composite materials are a blend of natural and synthetic fibers which are either in same proportion ratio to have desired properties. This present work deals with the study mechanical properties of basalt fiber mat(Uni directional) composites having bamboo fibres pulps to which reinforced with epoxy resin as the matrix. The overall mechanical properties of the composites showed improvement to change the roof material into Hybrid composites.*

**INFLUENCE OF COIR AND BANANA FIBER GEOMETRY ON MECHANICAL PROPERTIES OF SIC FILLED EPOXY COMPOSITES**

**Abstract**

The objective of this study is to attempt the possibility to employ eco-friendly fiber in composite material for engineering applications. Also, evaluate its mechanical properties like tensile strength, impact strength, flexure strength, and Hardness with various fibers geometry. Natural fiber reinforced composite (NFRC) is fabricated using hand layup technique. The composite is tested with three different fiber configurations i.e. Random orientation with chopped fiber. Silicon carbide particles are used as filler material in the epoxy matrix. The strength of the fabricated composite was experimentally examined. The results are verified it is observed that, fiber geometry play an important role in providing good strength to the composite.

**Coconut coir + Banana Fibre + Silicon Carbide (nano particles as Filler Material) + EPOXY**

**20% + 20% + 10% + 50 % respectively**

**TENSILE & IMPACT BEHAVIOUR OF NEEM FIBER - POLYESTER COMPOSITES**

**ABSTRACT**

natural fibers have been investigated much more than ever before by the research community all over the world. Our work mainly focuses on converting waste material into raw material and to increase the strength of the fiber reinforced polymer composite. The study has been carried out in view of highlighting advantages of natural fibers over synthetic fibers. Neem tree stem fibers have been extracted and incorporated in polyester resin matrix to prepare Neem tree stem fiber reinforced polyester composites and the tensile strength and impact strength of the resultant composites studied. The work of fracture measured in impact at a fiber volume of 50% is found to be ~0.4 J which is about 4 times to that of plain polyester. Tensile test & Impact test specimens are made as per ASTM standards. Mechanical properties of the composite have been studied with different lengths of fiber and equal weight ratios of matrix to fiber

Existing Composites : Neem Leaf with epoxy

Proposed : Neem Leaf stem with polyester resin

**Mechanical behavior of natural fiber composite and Testing**

**Abstract**

Polymers and their composites are one of the most advanced and adaptable engineering materials. The strength of any composite depends upon number of factors such as volume/weight fraction of reinforcement, types of fibers, orientation angles, chemical treatment of reinforcement, and many others

The present work focuses on the analysis of mechanical properties (tensile and flexural) of natural fiber (Hair, Coconut coir & Egg Shell fiber)-reinforced with epoxy composites. An attempt is made to reduce the usage of synthetic glass fibers by natural fibers such that the resultant composite shows increased strength when compared with both natural fibers (Hair, Coconut coir & Egg Shell). The test specimens were prepared and tested according to ASTM standards. Experimental results revealed that reinforcement of natural fibers up to some extent increases the mechanical properties and reduces the overall cost of fabrication of composites.

**Mechanical properties of composite aluminum matrix reinforced with Magnesium, Silicon carbide and Fly Ash hybrid composite**

**Abstract**

Metal matrix composites are formed by combination of two or more materials having dissimilar characteristics. In the present investigation, Aluminum is taken as base matrix metal, Silicon Carbide particulate, Magnesium and Fly Ash as reinforcements. The metal matrix composites are fabricated by stir-casting process. The silicon Carbide particulate was added in proportions of 1.5% and Magnesium added in proportion of 5.5% Fly Ash was added in constant proportion of 1% on mass fraction basis to the molten metal. The different combination sets of composites were prepared. Mechanical properties like hardness and tensile strength were studied for reinforced Al356 samples. From the results, it was found that the hardness and tensile strength of the prepared metal matrix composites.

**Mechanical properties of composite Al with Fly ash and activated carbon are fabricated through ‘Stir Casting Method’ by powder metallurgy**

**Abstract**

The ever-increasing demand for light weight, economy and environmental purpose has lead to the development of advanced materials. MMCs are widely used in industries, as they have excellent mechanical properties and wear resistance. So in this project introduced Particulate-reinforced hybrid composites because of it is cost less than fiber-reinforced composites owing to the lower cost of fibers and manufacturing cost. In addition to improved physical and mechanical properties, particulate-reinforced hybrid composites are generally isotropic and they can be processed through conventional methods used for metals. Thus, the fly ashes, aluminum A356, activated carbon reinforced with aluminum composites are increasingly used as substitute materials for high temperature applications.

This project deals with the selection of better material for the process of more hardness and temperature resistance, in that Aluminum hybrid composite are produced by AL A356 as matrix material and fly ash and activated carbon as reinforcement in different composition. Different sample are produced by using stir casting methods. Various tests have been conducted to evaluate the different properties of Aluminum composites and they are compared with commercial Aluminum alloy.

**Mechanical properties of composite aluminum matrix reinforced with tungsten carbide and molybdenum disulphide hybrid composite**

**Abstract**

Metal matrix composites are formed by combination of two or more materials having dissimilar characteristics. In the present investigation, Aluminium (7075) is taken as base matrix metal, Tungsten Carbide particulate and Molybdenum Disulphide (MoS2) as reinforcements. The metal matrix composites are fabricated by stir-casting process. The Tungsten Carbide particulate was added in proportions of 1%, 1.5% and 2% and Molybdenum Disulphide was added in constant proportion of 1%, 1.5% and 2% on mass fraction basis to the molten metal. The different combination sets of composites were prepared. Mechanical properties like hardness and tensile strength were studied for both reinforced 7075 samples.

**Investigation on Machining Characteristics of Al 6061 Hybrid Metal**

**Matrix Composite Using Electrical Discharge Machining**

**ABSTRACT**

**It is necessary to develop a new modern manufacturing process and machining techniques to ensure the high surface finish and metal removal rate of the composite. The most of the problem is raised in machining of composite due to the high hardness and stiffness. The research work is mainly concentrating on the effect of Electrical Discharge Machining (EDM) parameters on the predominant machining criteria. The aluminum based metal matrix composite reinforced with silicon carbide, aluminum oxide and E- glass fiber is fabricated by stir casting technique. The Al based metal matrix composite reinforced with 5 % wt of Al2O3, 3% wt of SiC and 2% wt of E-glass short fiber are used as work material, the copper material is used as an electrode. The input parameters are selected in EDM like current, pulse on time and pulse off time to measure the metal removal rate (MRR) and surface roughness. The optimal conditions of input parameters are found by using Box-Behnken design of experiments of response surface methodology (RSM).**

**EXPERIMENTAL ANALYSIS OF WELD CHARACTERISTICS OF STAINLESS STEEL 409 and EN8 MILD STEEL THROUGH GTAW**

**ABSTRACT**

Austenitic stainless steel is widely used materials in the current industrial area including higher and lower temperature applications such as storage tanks, pressure cups, furnace equipments etc. Using ratio of those materials are increasing constantly due to having superior corrosion resistance and mechanical properties, GTAW process are widely used for stainless steel welding, especially for full penetration welds in thin gage materials. Selection of shielding gas and filler material is crucial parameter for the quality, the microstructure and properties of weldments. The weldment properties strongly depended on the shielding gas, since it dominates the mode of metal transfer.

Shielding gas not only affects the properties of weld but also determines weld ability, the appearance, the shape and penetration of bead as well. Pure argon is mainly used for GTAW as shielding gas at present. The most common shielding gases are argon riches mixtures, such as argon with a few percent helium, carbon dioxide, hydrogen, oxygen, nitrogen for GTAW process. In this project we will be made many attempts for made test pieces on SS409 and EN8 MILD STEEL compared with ARC welding to predict the process parameter of TIG for getting maximum weldment and good weld deposition, best mechanical properties and min HAZ. The planned experiments are conducted in the TIG are welding machine; the test piece examination is carried out by following process

1. Tensile Test
2. Hardness test
3. Impact test

**AN INVESTIGATION AND JOINING EFFICIENCY OF UHMW-PE PLATE BY FRICTION STIR WELDING PROCESS USING TRIANGULAR TOOL PROFILE**

**ABSTRACT**

Polypropylene is one of the thermoplastic materials used in the lot of engineering applications such as marine, aerospace, automotive, toys and etc. Friction Stir Welding (FSW) is a solid-state method of used for joining metals. FSW process was successfully extended to join thermoplastic materials. Friction Stir Welding (FSW) is a solid-state process in joining thermoplastic materials. Polymers are engineering materials used for future technological development as the polymer processing and fabrication techniques have developed novel plastic products and components in major industries. Particularly UHMWPE is one of the polymer materials with a lot of engineering applications and a study on the behavior of the joining properties of polyethylene by FSW is necessary at this stage. In this investigation, FSW process has to be applied to join a polyethylene plate of 8 mm thickness with specially designed threaded tool pin profile. The research will be applied Taguchi Method on UHMWPE specimen of dimensions 100 × 100 × 6 mm, which have following parameters: various RPM, Feed and Axial Load. The experiments will be done in following aspects: Ultimate tensile strength and other mechanical properties. The main objective of the experimental of factors affecting to mechanical property of UHMWPE with FSW at different welding parameters and it has to be followed by L4 arrays.

**Analysis and Experimental Investigations of Weld Characteristics for A MIG Welding with Ss 304 &410**

Abstract

The analysis and optimization joining two similar grade ss410 & ss304 of stainless steel by using by TIG welding process and mechanical testing. Material of using voltage gas flow rate strike of distance light weight structures high strength weight ratio of good corrosion of resistance. Scope of TIG welding has to been increased various engineering field like aerospace nuclear and under water complex geometry and hazardous environments necessitate fully automated system.in this work experiment has to be carried out on ss410&ss304 stainless steel plate are using tungsten inert gas process the argon gas are using panned of experiments stainless steel specimen of dimension 8cm width, 15cm length,5mm of thickness which have to plate same parameter of two grade demand for improved productivity of efficiency and quality pose of challenges to the welding industry the common of operation two similar dissimilar part with heating the material applying pressure or using the filler material increasing productivity with less time of cost current gas flow rate of welding speed responsive parameter welding speed hardness of testing the weldment ss410 and ss304 are using TIG welding different frequencies are 5mm thickness two different grade of two plate of welding two material grade successful to weld of stainless steel there are mechanical testing tensile testing , impact testing , hardness testing ,flexural testing , micro structure testing experimental work is to see the effect of pulsed current on the characteristics of weldment.