



Weariness split; wear Also erosion property of aluminum short carbon fiber MMC

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ABSTRACT

There are a wide range of materials available for the design and manufacture of products for various applications. Today's engineers face the greatest challenge in selection of the right material and the right manufacturing process for a particular application. The repeated quest for materials which can exhibit improved performance specified in terms of weight, strength and cost resulted in the emergence of composites. Carbon fiber reinforced composites are used in construction where reduction in the component weight is an extremely important factor. To produce such composites, aluminum alloys can be the matrix as they can be operated at high temperature

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INTRODUCTION

There are a wide range of materials available for the design and manufacture of products for various applications. Today's engineers face the greatest challenge in selection of the right material and the right manufacturing process for a particular application. The repeated quest for materials which can exhibit improved performance specified in terms of weight, strength and cost resulted in the emergence of composites

A composite material is a macroscopic combination of two or more distinct materials having a recognizable

interface between them. Composites consist of one or more discontinuous phases embedded in a continuous phase. The discontinuous phase is usually harder and stronger than the continuous phase and is called the 'reinforcement' or 'reinforcing material', whereas the continuous phase is termed as the 'matrix'.

unreinforced matrix. They result in service benefits like increased strength to weight ratio, higher elastic modulus at higher temperature, improved corrosion and fatigue resistance [3], high strength and stiffness, lower density, high electrical and thermal conductivity, lower coefficient of thermal expansion etc. A few limitations of composites include higher raw



material and assembly cost, greater difficulty in repairing, non visible impact damage, adverse temperature and moisture effects etc

ELECTRO LESS COATING:

Electro less coating is an autocatalytic process of depositing the coating with the aid of chemical agents in a bath without the application of external power. A potential is developed when a substrate is immersed in an electroless bath which contains a source of metal ions, reducing agent, complexing agent, stabilizer and other components. Both positive and negative ions are attracted towards the substrate surface due to the developed potential and energy is released through charge transfer process.

Electroless nickel coating is a simple, flexible and economical process which increases the overall surface energy of the reinforcement. In the present experimental investigation, an attempt is made to perform electroless nickel coating on the PAN based continuous short carbon fibers and study the morphology of the coated fibers.

STIR CASTING:

Liquid state fabrication of metal matrix composites involves incorporation of dispersed phase into a molten matrix metal, followed by its solidification. In order to provide high level of mechanical properties of the composite, good interfacial bonding or wetting between the dispersed phase and the liquid matrix should be obtained. Wetting improvement may be achieved by coating the dispersed phase particles or fibers. Proper coating not only reduces interfacial energy, but also prevents chemical interaction between the dispersed phase and the matrix. The simplest and the most cost effective method of liquid state fabrication is stir casting.

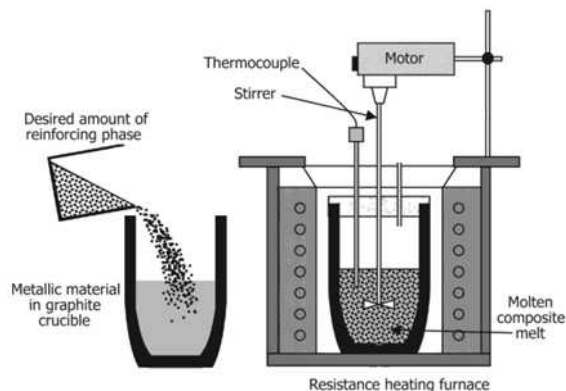


Fig. Schematic of the stir casting set up

Stir casting is a liquid state method of composite materials fabrication, in which a dispersed phase (short fibers) is mixed with a molten matrix metal by means of mechanical stirring. It is then followed by solidification of the melt containing suspended



particles and the desired distribution of the dispersed phase is achieved. The liquid composite material is then cast by conventional casting methods and may also be processed by conventional metal forming technologies.

MECHANICAL TESTING A. Wear test:

A comprehensive picture of wear under different working conditions has been presented by conducting laboratory tests in pure sliding mode using a pin on disc machine. A pin-on-disc test apparatus is used to investigate the dry sliding wear as per ASTM G99-95 standards. Before testing the wear pin is held in a brass holder in the wear machine and abraded against a sheet of abrasive paper on the rotating steel disc in order to generate a flat wear surface. The pin and disc were then removed and cleaned ultrasonically, the pin was weighed on a microbalance and then both components are inserted into the machine and aligned. At the conclusion of each test the pin is cleaned in the same way and reweighed. [4] discussed about a project, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. When they send "unit request" to the microcontroller which is placed in home. Then the unit value is sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced, in which during the restriction mode only limited amount of power supply can be used by the customer.



Fig. Wear testing machine



B. Fatigue Test:

Fatigue testing machines apply cyclic loads to test specimens. Fatigue testing is a dynamic testing mode and can be used to simulate how a component/material will behave/fail under real life loading/stress conditions. They can incorporate tensile, compressive, bending and/or torsion stresses and are often applied to springs, suspension components and biomedical implants.



Fig. Specimen before fatigue test



Fig. Fatigue testing machine

C. Corrosion Study:

The metal matrix composite are the composites where metal plays the role of matrix. or it can be a alloy with hard ceramic material or fibers as the reinforcement. Composite will have good properties like strength, wear resistance and also better corrosive resistance property. To know the corrosive behaviour of aluminium 7075 short coated carbon fiber gravimetric test is done. Here the specimen is exposed to corrosive environment made by the HCl with different normality or concentration. Specimens are prepared according to the ASTM standards from the casings and with the dimensions of 20x20mm. The ASTM standard used for corrosion study is G69-80.



Different concentration solution of HCl is prepared and specimen are dipped for various duration of time. Finally specimen is taken out from the solution, difference in weight is tabulated.



Fig. Specimen before corrosion study

CONCLUSION

In this Paper, The mechanical properties of the Aluminium 7075 short coated carbon fiber are altered by the addition of the different weight percentage of carbon fiber.

The electro less coating of the carbon fibers were uniform with the coating thickness of 0.6 - 1 μm with Activation, sensitization and metallization stages at different time intervals.

The stir casting technique with the addition of Magnesium metal powder improved the mixture ability of the Al7075 metal matrix with the coated carbon fiber.

The ultimate tensile strength is found to be increasing by 13.80, 29.45, and 41.25% with increase of weight percentage of carbon fiber.

The ultimate compressive strength is also found to be increasing with the increase of weight percentage of short coated carbon fiber.

Ductility is found to be decreasing as the percentage in weight of short carbon fiber increases. Wear rate found to be decreasing with increase in weight % of short carbon fiber for the different conditions like sliding distance, sliding velocity and for normal load acting on the specimen.

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