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MECHANICAL PROPERTIES OF METAL MATRIX COMPOSITES CONSISTING OF AL7075, CENOSPHERE, AND E- GLASS.

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Abstract— Efforts are being made to investigate the mechanical characteristics of Cenosphere and e-galass fibres reinforced Al7075 in this current project. Cenosphere, a low-density, low-cost reinforcing material, is a byproduct of coal combustion in thermal power plants and is readily accessible. As a result, Al 7075 metal matrix with cenosphere as reinforcement can easily overcome the cost barrier and may serve as the best supplement with varied physical and mechanical qualities for servicing a broad variety of applications providing wide usage in today's world. Variations in the E-glass and cenosphere were used to create the specimens. The specimens used in the tensile test were constructed in accordance with ASTM specifications. Improved features including improved specific strength, specific modulus, damping capacity, and superior wear resistance may be achieved by using metal matrix composites (MMCs) instead of ordinary alloys. The great strength-to-weight ratio of aluminium composite MMCs makes them the most popular.

Key words: Al7075 alloy composite, E-glass, MMCs, and short E-glass fibres

1 INTRODUCTION

Two or more unique constituent materials may be combined into a single component in the form of composite materials, which are engineered materials built from two or more discrete components. In the context of structural materials, a composite material is onethat has been synthesised or intentionally constructed by mixing two or more materials that have distinct properties. The matrix phase is one of the constituents, whereas the reinforcing phase is another. The phase of reinforcing is included into the matrix in order to provide the required property.

For its low density, isotropic nature, cheap manufacturing costs, and simpler secondary processing like fabrication and usage than typically used materials, Particulate Aluminum Reinforced Composite Materials (PARCMs) are frequently employed. Al-7075's mechanical characteristics are now being studied in relation to the effects of reinforcing materials such as cenosphere and e-glass. The weight percentages of cenosphere, e-glass, and Al-7075 alloy in stir-casting hybrid composites were varied, and the castings were then machined to a standard test specimen size. The specimens are next subjected to tensile testing.

2. THE GOALS OF CURRENT RESEARCH

Using the stir-casting method, this research aims to produce an Al 7075/Cenosphere-E glass composite. In this method, the particulate is mechanically mixed into a molten metal bath before being transferred into a mould before solidification is complete. Aluminum alloy 7075 ingots must be roasted in this method in order to The molten condition of the furnace. It's possible to use a mechanical stirrer to produce a vortex at 800-850oC temperature. furnaces are used to preheat Cenosphere particles. The furnace's temperature is kept between 825 and 855 degrees Fahrenheit. Preheated cenosphere particles and e-glass should be added while stirring of the melt. After the cenosphere and E- Glass fibres have been added, the melt must be stirred for another 15 minutes to ensure that they are evenly mixed.

To make a casting, the melt is poured into a mould that has been heated to a certain temperature. For mechanical testing, these specimens are compared to pure Al 7075.

2. EXPERIMENTAL DETAILS In our experiments, we take the following steps:

3. Selecting a Substance

4. 2. Preparation of the composite

5.

6. 3. Testing

1.1 **Material selection**

It was made of Al 7075 alloy (matrix), E-glass short fibres (reinforcement) and cenosphere (reinforcement). Table 1 shows the chemical composition of Al7075.

Table 1: Chemical Composition of Al 7075

Composition	Zn	Fe	Mg	Mn	Cu	Si	Cr	Ti
% Composition	5.6	0.5	2.5	0.3	1.6	0.4	0.23	0.

1.2 **Composite preparation**

E-glass short fibres were utilised as reinforcement, and the percentage of E-glass short fibres changed from 1% to 5% by weight in step-by-step increments for the cenosphere concentration in the composite. For the production of the composite materials, a liquid metallurgical process using an alumina-coated stainless steel stirrer generated a vortex in the

molten metal pool where the cenosphere particles were inserted. Adding a layer of alumina to the stirrer prevents the migration of ferrous ions into the molten metal from the stirrer's substance. 550 rpm was the rotational speed of the stirrer, and its depth of immersion in the molten metal was about two-thirds of the depth of the metal. The period prior For 3 to 4 minutes, the liquid melt was degassed with pure nitrogen before adding the cenosphere particles and short E-Glass fibres. Preheated permanent moulds were tilt poured with the final slurry to set it up.

Figure 3.1 Furnace

Figure 3.2 Die

Figure 3.3 pouring

Figure 3.4 specimen after casting

1.3 **Machining**

Casted specimens must be further shaped using a Lathe in the Machine shop since they lack the requisite dimensions. Casted specimens. The specimen's centre section diameter must meet the standard before it can be tested on the machine

Figure 3.5 Lathe machine

figure 3.6 Hardness specimens

Figure 3.7 tensile specimens

1.4 Hardness test

Hard steel or carbide spheres of specified diameter are used to indent a material's surface, and the diameter of the indentation left after the test is used to measure Brinell hardness. An indentation with a surface area of square millimetres is referred to as having a Brinell hardness number, or simply a Brinell number. Even if a pressure reading is obtained as a by-product, its units are seldom specified.

The BHN is determined using the following formula:

Where

Number of Brinell hardness in Brinell hardnessF = the imposed load in kg

D = the spherical indenter's diameter in millimetres

Di is the resultant indenter impression's diameter, measured in millimetres

and Glass fibres rises, it is apparent that ductility is diminishing. AA7075 alloy had the

Conclusion

1. A composite metal matrix of aluminium 7075 and titanium It was possible to effectively synthesis E-glass and cenoshere composites with varied weight fractions using the stir casting process.

When compared to an unreinforced alloy, the Al7075-GF-cenoshere composite has a twofold increase in hardness due to the addition of glass fibres.

When secondary aluminium particles are added to the alloy, the composites' ductility decreases. When compared to the hybrid composites, however, Al7075 alloy has a greater ductility.

4. The ultimate tensile strength of Al7075 alloy and Al7075-GF-Cenoshere composites rises when the proportion of dual reinforcement is increased.

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