Investigation of Composite Material

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Abstract- *Metal Matrix Composites play a vital role for its high strength and low wear rate. The Aluminium metal matrix composites are gaining widespread acceptance for Automobile, Composites present study is aimed at evaluating the physical properties of Aluminium 7075 in the presence of silicon carbide. This project is an investigation on Mechanical properties of Aerospace, Agriculture farm machinery and many other Industrial applications. The recent trends of composites have led to a wide scope of research in the field of Material Science. Engineered materials are the current techniques to enhance the mechanical properties of Metal Matrix Al7075 reinforced with varying. The compositions are added up to the ultimate level and stir casting method is used for the fabrication of Aluminium metal matrix composites. The mechanical behaviors of metal matrix composites like tensile strength, and hardness test are investigated by conducting laboratory experiments percentage of Silicon carbide (4, 8 and 12) by Stir casting process. In this process investigation was carried out on the mechanical properties such as hardness, ultimate tensile strength respectively. Results revealed that, the addition of Silicon Carbide reinforcement in the Al7075 matrix increases the hardness and ultimate tensile strength gradually from ( ) with compare to pure Aluminum.*

I. INTRODUCTION

Composite materials are formed by reinforcing two or more materials of varying properties with matrix phase. Aluminium metal matrix composites are the composites in which aluminium is used as the matrix and several reinforced materials are embedded into the matrix. Aluminium metal matrix is considered because its strength, stiffness and density can be tailored with the help of reinforcement. Pure aluminum is used as the alloy. The reinforcement silicon carbide is varied in the multiples of 4%, 8% and 12%. As the materials as casted with the stir casting, the samples are tested for it microstructure study and mechanical properties. The reinforcement used for the current study is silicon carbide. Silicon carbide has chosen to be the reinforcement because of its unique property of high wear resistant with increased hardness and oxidation resistance. To manufacture the composite, stir casting technique is used because Stir casting technique is simple and the most commercial method of production of metal matrix composites. SiC consist of carbon and silicon in the crystal structure that produces very hard and strong material and cannot be attacked by acids. Therefore, the combination of this matrix and the reinforcement can be studied for its better performance.

II. LITERATURE REVIEW

Pradip p (2017), has fabricated AL7075 and Titanium DI boride (Tib2) via the stir Casting technique. The quantity fraction of Tib2 prompted are 4%, 6% and 8%. They Evaluted the microstructure, wear, hardness properties. At 8% wt of TiB2 notices the Maximum hardness of 126VHN and strengthens the base matrix. Explicate wear rate Diminishes as the sliding rate increments up to rotation speed (1.6m/s) and weight, In light of work solidifying of the material surface. Minimal effect of the wear got From the 8wt of TiB2 fortified composite. The speed and the weight. The micro image Indicates the Aluminium debris are unvaryingly dispered within the highest volume Fraction of particulate matrix 8wt.%.

Arunkumar D T (2018) successfully fabricated the AL-7075 composites with mica and kaolinite reinforcement using stir casting technique. They used equal volume fractions of mica and kaolinite are [(2+2)%, (4+4)%, (6+6)%, (8+8)%] and conducted a wear test for various test for various time intervals at constant load. The wear loss in composites with 8% volume of mica and kaolinite are observed to decrease at a slower rate. The SEM microstructure of the composite indicates a homogeneous reinforcement distribution into matrices and no evidence of agglomerate

Madhuri Deshpande successfully prepared pitch based carbon fibre added to AL matrix composites from powder metallurgy (PM) technique. Weight % of carbon fibre are (5-50)% uncoated (Uncf) and coated milled pitch based carbon fibres (Nicf) and AA7075 Aluminimum alloy powder and subsequently hot pressed and they studied on density and hardness strength. A highest of 11% reduction in density is noticed for 50vol% cf composite developed with uncoated carbon fiber shows minimum values of hardness as compared with pure AL7075 hot pressed specimen. Whereas the Ni

coated carbon fiber composites show the increase in hardness up to 20Vol%. It is observed from the microstructures that carbon fibers are homogeneously distributed in the Aluminium matrix for all wt% composites.

Manoj Singla successfully conducted exeperiments by changing various wt% of Sic (5%-30% at intervals of 5%) they conducted tests on hardness and impact strength. Uniform dispersion of SiC particles in the AL matrix represents raising trend in the specimen preparation through liquid vortex process. The results of study propose that with increament in the particle of SiC, the expansion in hardness, impact strength and standardlizad strain have been observed. The supreme results for hardness 45.5BHN and maximum impact strength 36.6N-m have been obtained for 320 grit size particles at 25% weight fraction

Neelima Devi. C et al, studied the tensile strength of the aluminium silicon carbide composite by varying the mass fraction of silicon carbide. It was observed that the composites are found to three times better than the conventional materials like mild steel during the tensile test also two times less in weight [1]. Suryanarayanan K et al, showed the silicon carbide aluminum metal matrix composites, for the application of aerospace industry. The composites were used in the application of the fuselage skins. This area of application was considered because they offer higher yield stress and ultimate tensile stress. It was also observed that as the volume fraction of reinforcement crossed 15%, the yield strength was observed to be low

Rajesh Agnihotri et al, identified the importance of the aluminium silicon carbide composites through the stir casting technique. In the study it was observed that the settling of the silicon carbide particles was restricted due to stirring in the semi solid state. The micro structure study showed the distribution of SiC, due to which the wear rate of the MMC was reduced and found to be stable at the elevated temperatures [3]. Manoj Singla et al, the weight fraction of Aluminium (98.41% C.P) and SiC (320-grit) has been chosen as matrix and reinforcement material respectively. The percentage of the matrix was considered in the multiples of 5% up to 30%. An increasing trend was observed in the hardness and impact strength at the 25% weight fraction of SiC. Two step stirring was done, manual and mechanical stirring gave a uniform distribution of the SiC in the composites [4]. The detailed literature survey showed that the stir casting gives a uniform distribution of the reinforcement in the matrix. As there is increase in the reinforcement of silicon carbide in the aluminum matrix composites, better the mechanical properties of the composites.

III. METHODOLOGY

The alloy used is pure aluminium . This material has found its application in the field of automobile and aerospace industry because of its light weight and density. But this material has a disadvantage of poor mechanical strength. This found some limitations in few areas of its applications. With the help of silicon carbide as a reinforcement the strength of the conventional material can be improved in the form of metal matrix composite rather alloy. This metal matrix composites was considered based on the literature survey. The reinforcement is used in the multiples of 4%, i.e. 4%, 8% and 12%.The below listed Figures, Fig 1 and 2, shows the procedure of manufacturing the samples. Stir casting technique is used so that the distribution of the SiC is uniform in the metal matrix composites. The aluminium matrix is heated at a temperature ºC, at ºC

Fig1.Furnace

Fig2. Sample

Fig3.Experimental Procedure:

1.stir casting process

Stir casting technique is the simplest and the most cost effective method in all liquid state fabrication processes. Figure shows the schematic diagram of the stir casting setup for the fabrication of metal matrix composites

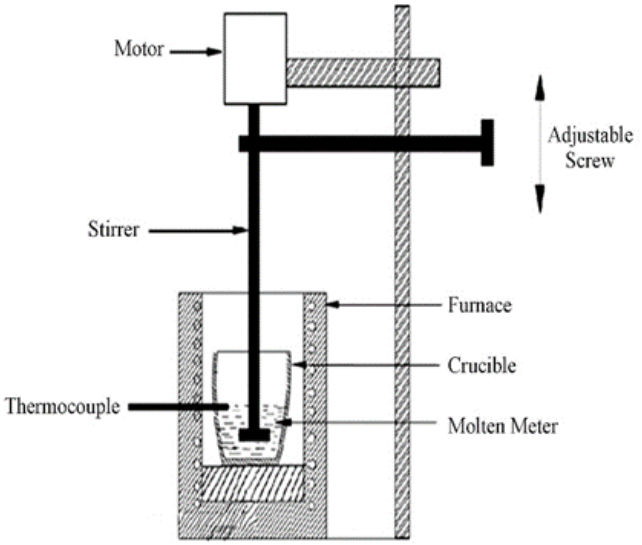

Fig. 4. Schematic diagram of stir casting Setup

2. Composition of mixtures for each composite

Matrix	Reinforcement
	Sic 4 %
	Sic 8%
	Sic 12%

3. Mechanical Properties Evaluation

The tensile specimen was prepared by machining as per the ASTMD638 standard. ASTMD638 specifies methods for testing the tensile strength of plastics and other resin materials and for

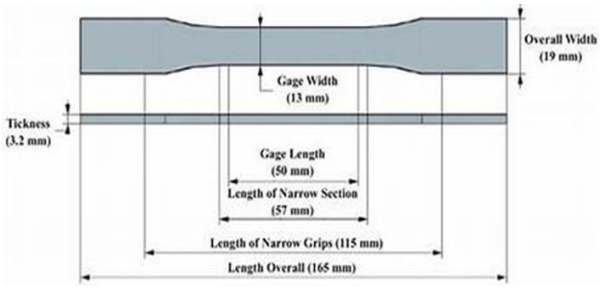

Fig. 5

Fig. 6 Charpy impact testing machine