Mechanical Behavior of Aluminum Metal Matrix Composite for Wheel Hub Application

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Abstract: *Now the days of light weight application in a industry. In light weight application the material also strength of the material also important once. The material behavior load character station and application area also important once. The most of the material not suitable for the application. In this work the aluminum MMC material has been chosen in this work. The main focus of the work is aluminum alloys wheel hub area. The main problem is wear resistance. Generally the alloy wheel hub are with stand in a 50000 KM in motor cycle. Then after they are wear out. When increase the hardness of the material hence the decreasing wear out corresponding wear resistance also improved. In this work the aluminum MMC as taken different level and observed which one material as chosen for the application. Finally we are discussed with fracture surface of the materials*

Keywords : *Wheel hub material, wear character station, Fracture surface, material Character station*

I. INTRODUCTION

In the current scenario, Metal Matrix Composites (MMCs) are plays a vital to replace the existing conventional materials into high tribologically behaviour materials by low cost to make the world as attractive option. It is mostly used for structural applications ship, wind turbine and aerospace. The author observed of the different volume percentage of the material added in the composites and observed the character station of the materials [1]. The author observed that the materials different aluminum grades and makes a casting of the composites finally they tested and concluded of the projects. The paper has studied and prepared the Structure of hexagonal boron nitride (h-BN) consist of hexagonal layers with strong covalent bonds and weak Vander Waals bonds between them. Such specific structure and usually plate-like grains cause anisotropic properties of aluminium oxynitride-h-BN based materials with anisotropic properties. The thermal properties were found much higher in the perpendicular direction during hot pressing. The grains were found to be in plate shape [3]. This work has proposed and demonstrated a simple electrical resistance heat assisted pressing technique is for the surface graphitization of

aluminium alloys. The aluminium substrate is first coated with a graphitic layer by solution casting. Raman spectroscopic observed of the graphitized surface shows a significant shift in major graphitic peaks with an increase in the intensity ratio (ID/IG). The graphitised surface shows new graphite peaks and increase in the intensity ratio. No peaks were found corresponding to the aluminium. The surface was found to be five times harder than the normal surface [4]. In this project improved the corrosion resistance of the material. when added the oxide in a material they has prevent the corrosion resistance. In the author produced by the way of the different oxide based composite and finally concluded the results [5]. The project was prepared the Metal matrix composites in the aluminium oxynitride-hexagonal boron nitride system with anisotropic properties by using SHS technique to obtain complex powders with both phases [6]. In this work has been done in the different percentage composite material was prepared and finally tested and concluded the composites [7]. Formation of alumina (Al_2O_3) was detected in X-ray diffraction studies but no peaks corresponding to aluminium carbide (Al_4C_3) was observed. The surface mechanical properties were evaluated through microhardness testing. The surface hardness depends mainly on the processing parameters and subsequently the amount of graphite flakes impregnated on to the surface [8]. The aluminium substrate is first coated with a graphitic layer by solution casting. In the way preheated the composite and make a casting of the composite. Finally they tested of the composites and concluded the results [9]. K. Jeshurun Ilijay et al [10] was studied the field emission scanning electron microscope (FESEM) and electron backscatter diffraction (EBSD) for and found the TiC particles were characterized with homogeneous distribution, clear interface, good bonding and various shapes such as cubic, spherical and hexagonal. EBSD maps showed the grain refinement action of TiC particles on the produced composites of the prepared AA6061/TiC AMCs.

II. MATERIALS AND METHODS

The following material are chosen in this work Al 6061, Sic various percentages, the percentages shown in a figures. The objective of the material selection is to observed of the wear character station of the materials

III. PROCESS METHODOLOGY

Stir casting process is the one of the best process for castings it having the vast measurable parameters such as processing temperature and holding time on the uniform distribution of particles and resulting in good mechanical properties such as Tensile, ductility, hardness and impact behaviour. In this process increase the particles cluster corresponding to an increase in the processing temperatures.

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Which were stirred for a constant speed with longer period at higher temperature, the particles were agglomerated in the melt. The schematic diagram of stir casting process is shown in fig.1

Fig.1. Stir casting process setup

Composition of Metal Matrix composite

Table.1. Casting calculation

Samples	Aluminium (6061)	Silicon Carbide	Nano Titanium dioxide
Sample 1	96%	2%	2%
Sample 2	94%	3%	3%
Sample 3	92%	4%	4%

Testing of Composite

The different type of tests that the materials were subjected to testing's to found their mechanical properties

3.1.Tensile test

The tensile test image shown in figure below. The test specimen as per ASTM Standard. The standards shown in table below the figures

Fig. 2 Tensile test specimen

3.2 Flexural test

The Flexural test image shown in figure below. The test specimen as per ASTM Standard. The standards shown in table below the figures

Fig. 3 Flexural test samples

3.3 Impact test

The Impact test image shown in figure below. The test specimen as per ASTM Standard. The standards shown in table below the figures

Fig. 4 Impact Test Specimen

Table . 2 Testing Standards

[1] Testing Standards	
Tensile Test	ASTM: B-557M
Flexural test	ASTM: A-370
Impact test	IS: 1757

IV. RESULT AND DISCUSSION

The results of the tests are discussed below

4.1 Tensile Test

Table . 3. Tensile Testing Standards

Sam ples	F max (kN)	UTS (Mpa)	%Elongat ion	Yi eld Stress (Mpa)
Sam ple 8	.08	57.72	5.06	52.68
Sam ple 1	2.11	[1] 92.22	7.63	66.61
Sample 3	20.85	164.06	7.63	110.53

Fig 5. Tensile data Result

The tensile test output result shown in graphs. The graphs shown in a the maximum ultimate tensile strength the sample no 3. The corresponding all data shown in tables

2 Flexural test

Sl.No	Sample No	F _{max} in kN
1	1	4.58
2	2	5.57
3	3	4.40

Table . 4. Flexural Testing Result

The Flexural test output result shown in graphs. The graphs shown in a the maximum ultimate tensile strength the sample no 2. The corresponding all data shown in tables

Fig 6. Flexural data Result

The Impact test output result shown in graphs. The graphs shown in a the maximum ultimate tensile strength the sample no 3. The corresponding all data shown in tables

4.3 Impact test

Table . 5. Impact Test Result

Sl.No	Sample no	Value
1	1	8 joules
2	2	7 joules
3	3	12 joules

Fig 8. Impact data Result

4.4 Hardness test

Table . 6. Hardness Test Result

[2] Sl.No	[3] Hardness valve In HRB
[4] 1	[5] 39
[6] 2	[7] 40
[8] 3	[9] 44
[10] 4	[11] 42
[12] 5	[13] 46

The Hardness test output result shown in graphs. The graphs shown in a the maximum ultimate tensile strength the sample no 5. The corresponding all data shown in tables

Scanning Electron Microscope Observed

Fig 9. SEM image for tensile load specimen

Fig 10. SEM image of impact sample

Fig 9&10. Shows that the image as ductile fracture surface. The image shown that cup and cone. Hence the fracture has been ductile. And distribution of particles showed in figures. The nano particles also shown in figures.

V. CONCLUSION

The result shown that the aluminum composite material used in a wheel rim application. The result shown that the tensile, flexural, impact and hardness test results as different composites. The result shown in the which one the best results. The sem image also shown in the fracture surface of the material. The material formed in the cup and cone shapes. The images shown in the ductile fracture surface. Hence we concluded that the higher hardness value can be wear resistance of the material.

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