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Mechanical properties of Aluminium 5052- SiC MMC

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ABSTRACT

The metal matrix composites are mostly used in aerospace applications and in automobile sectors due to its light weight to strength ratio. Aluminium 5052 has been used as matrix and SiC as reinforcement. A liquid metallurgy route of stir casting technique was adapted to prepare cast composites. Taguchi method orthogonal array of L9 is used to design experiments. The weight fraction of Sic 6%, 8% and 10%, stirrer speed of 1400 rpm, reinforcement preheating temperature of 800 0 c is used. Hardness test, surface roughness test and microstructure evaluation tests were conducted on the specimens. The hardness improvement and micro structure are appreciable in 10% of SiC.

KEYWORDS: Metal Matrix Composite, Stir Casting, Hardness, surface roughness, microstructure evaluation

1. INTRODUCTION

1.1 INTRODUCTION TO ALUMINIUM

Aluminium is the world's most abundant metal and is the third most common element, comprising 8% of the earth's crust. The versatility of aluminium makes it the most widely used metal after steel. Although aluminium compounds have been used for thousands of years, aluminium metal was produced around 170 years ago. In the 100 years since the first industrial quantities of aluminium were produced, worldwide demand for aluminium has grown to around 29 million tons per year. About 22 million tons is new aluminium and 7 environmentally compelling. it takes 14000 kWh to produce 1 tonne of new aluminium. Conversely it takes only 5% of this to remelt and recycle one tonne of aluminium. There is no difference in quality between virgin and recycled aluminium alloys. Pure aluminium is soft and ductile, and corrosion resistance and has a high electrical conductivity. It is widely used for foil and conductor cables, but alloying with other elements is necessary to provide the higher strengths for needed for other applications. Aluminium is one of the lightest engineering metals having strength to weight ratio superior to steel. By utilizing various combinations of its advantageous properties such as strength, lightness, corrosion resistance, recyclability and formability, aluminium is being employed.in an ever-increasing number of applications. This array of product ranges from structural materials through to thin packaging foils.

1.2 PROPERTIES:

Some of its properties are outlined in the following sections:

*A.**STRENGTH TO WEIGHT RATIO:***

Aluminium has a density around one third that of steel and it is used advantageously in applications where high strength and low weight are required. This includes vehicles where low mass results in greater load capacity and reduced fuel consumption.

*A. **CORROSION RESISTANCE:***

When the surface of aluminium metal is exposed to air a protective oxidised coating form almost instantaneously. This oxide layer is corrosion resistance and can be further enhanced with surface treatment such as anodising.

B. ***ELECTRICAL AND THERMAL CONDUCTIVITY:***

Aluminium is an excellent conductor of the heat and electricity. There great advantage of aluminium is that by weight, the conductivity of aluminium is around twice that of copper. This means that aluminium is now the most commonly used material in large power transmission lines. The best alternative to copper is aluminium alloys in the thousand or six thousand series. This can be used for all conduction applications including domestic wiring. Weight considerations means that a large proportion of overhead, high voltage silicon carbide can be bonded together by sintering to form very hard ceramics that are widely used in applications requiring high endurance, such as car brakes, car clutches and ceramic plates in bulletproof vests. Electronic applications of silicon carbide such as light-emitting diodes (LEDs) and detectors in early. power lines now use aluminium rather than copper. They do however low strength and need to be reinforced with a galvanised or aluminium coated high tensile steel wire in each strand.

C. **LIGHT AND HEAT REFLECTIVITY:**

Aluminium is a good reflector of both visible light and heat making. It is a idle material for light fittings, thermal rescue blankets and architectural insulations.

D. **TOXICITY:**

Aluminium is not only nontoxic but also does not release any odours or taint products with which it is in contact this makes aluminium suitable for using packaging for sensitive products such as food or pharmaceuticals where aluminium foils is used.

1.3 INTRODUCTION TO SILICA CARBIDE

Silicon carbide (SiC), also known as carborundum is a semiconductor containing silicon and carbon. It occurs in nature as the extremely rare mineral moissanite. Synthetic SiC powder has been mass-produced since 1893 for use as an abrasive. Grains of radios were first demonstrated around 1907. SiC is used in semiconductor electronics devices that operate at high temperatures or high voltages, or both. Large single crystals of silicon carbide can be grown by the Lely method and they can be cut into gems known as synthetic moissanite.

1.3.1 ***PROPERTIES OF SILICA CARBIDE***

The major advantages of Silica Carbide are tied directly to its remarkable properties. Some of its properties are outlined in the following sections

- Low Density
- High Strength
- Good high temperature strength
- Excellent thermal shock resistance
- Excellent chemical resistance
- Low thermal expansion
- High thermal conductivity

2. STIR CASTING FOR AL 5052 ALLOY STIR CASTING ROUTE FOR FABRICATION OF MMC

The base material used is Al5052 alloy. The required amount of Al 5052 alloy was placed in crucible in an electric heating furnace to a temperature of about 750-800 ^{0} C maintained. The stirrer was carefully placed at a required depth in the crucible and stirred at 1400 rpm to form a vortex. The reinforcement material added in to vertex and stirred for about 25 to 30 min to obtain a homogenous mixture. The molten mixture carefully poured into the moulds box to obtain the castings, which are later allowed to cool and checked for any defects in the castings. Further samples were prepared as per the ASTM standards for the evaluation of mechanical properties of proposed composites. Stir casting furnace After it is cooled down to temperature between liquid and solidus state means it is in a semi-solid state.

Then preheated reinforcement particles are added to molten matrix and again heated to fully liquid state and are stirred thoroughly for a homogeneous mixture with the matrix alloy. In this method, the particles get accumulated often; the accumulated particles can be dissolved at higher temperature by vigorous stirring. The liquid composite materials are then poured into the sand/die casting mould and then allowed to solidify. Stir casting is suitable for manufacturing composites with up to 30% volume fractions of reinforcement. A major concern in associated with the stir casting is segregation of reinforcement particles due to various process parameters and material properties result in the non- homogeneous metal distribution. the preheated mixture in molten metal Stirring is done for 3 - 4 min Molten Metal (MMC's) is poured into the die Stir casting technique implemented Varying process parameters done Cast the solid component Samples are prepared Specimen preparation as per the ASTM standards Metallurgical & Mechanical properties of MMC (Microstructure, SEM, Hardness, Tensile).

Figure 1: stir casting equipment

3. METHODOLOGY

1. First of all, we collect the data of topic which we are working
2. We select appropriate reinforcement materials i.e., SiC based on its mechanical properties
3. Now, we select appropriate concentration of the reinforcement material.
4. We select the type of casting techniques and make a pattern according to the required dimensions
5. The dimensions of pattern are as follows Length of the pattern – 120 mm Width of the pattern – 20mm Height of the pattern – 10 mm
6. The mould is made by using sand casting techniques
7. The Al 5052 rods are melted inside a reverberatory furnace at 750°
8. Different concentrations of SiC powder is added to the molten metal and is stirred for sufficient time
9. After stir casting the metal is casted
10. The molten metal is allowed to cooled down and later subjected to heat treatment process
11. After heat treatment, the MMC is subjected to various operations like cutting, grinding for making specimen in required dimension
12. After cutting and grinding, the MMC is subjected to various finishing operations and finally, specimen is created
13. After making the specimen, it is subjected to different testings.

    4. After hardness test, structural evaluation and surface roughness testing the mechanical properties are calculated and compared with parent metal.

5. Finally, the project is ready.

4. MATERIAL SELECTION AND MAKING OF AL 5052 SIC COMPOSITE

4.1 SELECTION OF BASE MATERIAL

Pure aluminium matrix on mechanical properties of stir casting of aluminium composite materials reinforced with silica carbide particles using simple foundry melting alloying and casting route. The experimental results indicate that aluminium matrix cast composite be manufactured via conventional foundry method giving very good responses to the strength and ductility up to 10% in aluminium matrix. The properties of aluminium include low density and therefore low weight, high strength, superior malleability, easy machining. excellent corrosion resistance and good thermal and electrical conductivity are amongst aluminium's most important properties. Aluminium metal matrix composite consists of silica carbide of 6%, 8%, 10% (by weight). The presence of silica improves machinability and increases the brittleness of the MMC.

4.2 SELECTION OF SILICA CARBIDE POWDER

Silica carbide is directly available in powder form in market in different grit sizes.The silica carbide is directly purchased from the market of required grit size. It is then heated to remove the impurities. It is then filtered so that proper grain size is available.

4.3 PREPARATION OF DIE

soap surfaces of the die which will be in contact with the molten metal to be cast. The applied die is then allowed to be dried and must be free from moisture during casting process for this the die is usually preheated by placing the die in the oven for about 3-5 minutes.

4.4 PREPARATION OF WORK PIECE BY STIR CASTING

Preparation of Casting: The base material used is Al5052 alloy. The required amount of Al 5052 alloy was placed in crucible in an electric heating furnace to a temperature of about 750-800o C maintained. The stirrer was carefully placed at a required depth in the crucible and stirred at 1400 rpm to form a vortex. The reinforcement material added in to vertex and stirred for about 25 to 30 min to obtain a homogenous mixture. The molten mixture carefully poured into the moulds box to obtain the castings, which are later allowed to cool and checked for any defects in the castings. Further samples were prepared as per the ASTM standards for the evaluation of mechanical properties of proposed composites. Stir casting furnace After it is cooled down to temperature between liquid and solidus state means it is in a semi-solid state.

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4.5 PREPARATION OF SPECIMEN BY MACHINING

The casted work pieces are then machined by kuding them in the head stock spindle of the lathe and fixing rigidly in the 3-jaw chuck and HSS (high speed steel) is employed for machining process. Firstly, the facing operation is performed by adjusting the single point cutting tool (HSS) position so that it contacts the work piece at the centre and the tool is fixed rigidly at an angle of 45 degrees and by giving longitudinal feed so that the tip of the tool contacts the work piece and by giving cross feed till the tool reaches and removes the material at the centre of the work piece. Then the work piece is unloaded from the head stock spindle and similarly the facing operation is performed on the other end of the work piece Then remove the dead centre from the quill of the tail stock and place the drill chuck in the quill and tighten it and perform drilling operation on the right end of the work piece by rotating the hand wheel to appropriate depth. The drill chuck is then removed from the quill of the tail stock and the dead centre is placed and tightened in the tail stock and by rotating the hand wheel of the tail stock such that the tip of the dead centre inserts into the drilled hole for supporting the other end of the work piece. The plane turning operation is then performed on the work piece throughout its length by adjusting the cutting tool position at an inclined position to the work piece and giving less depth of cut and slow feed.

4.5.1 *PREPARATION OF MICROSTRUCTURE SPECIMEN*

The micro structure specimen is prepared by machining the work piece on the lathe by doing the facing operation on the work piece at both of its ends and the dimensions are marked over the work piece the length of the specimen should be usually about 20mm to 40mm with a sufficient diameter having a minimum limit of 10mm. The plane turning operation is on the work piece over its entire length by giving less depth of cut and slower feed rates then the depth of cut is gradually given until the diameter of the work piece is reduced to 10mm. Then hack sawing operation is performed by cutting work piece with hack saw by applying water as coolant to the blade to obtain the length of 20mm and again the facing operation is performed at the end. After performing the machining operation of the work piece as per the specified dimensions the specimen for the micro structure is obtained and finally surface finishing operation is performed with the help of an emery paper of grain sizes 150 and 120 microns respectively for obtaining fine surface finish of the specimen. The same above procedure is employed for the preparation of other specimens of different micron sizes.

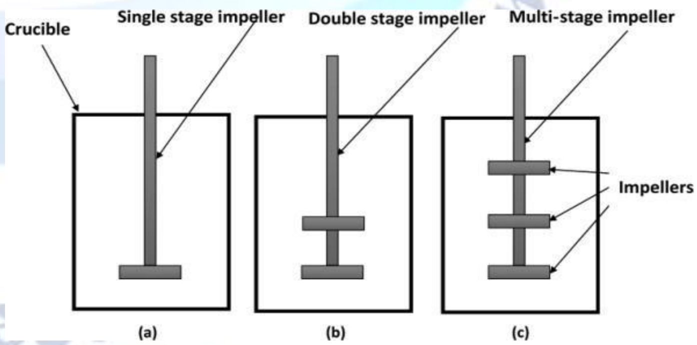
Figure 2: mounted specimens

The hardness specimen is prepared by machining the work piece on the lathe by doing the facing operation on the work piece at both of its ends and the dimensions are marked over the work piece the length of the specimen can be taken arbitrarily with a sufficient diameter to take enough trial readings on the cross-sectional face and to ensure sufficient contact of the probe tip of the equipment (Brinell hardness tester) to be made with the specimen for applying load. The plane turning operation is performed on the work piece over its entire length by giving less depth of cut and slower feed rates then the depth of cut is gradually given until the diameter of the work piece is reduced to appropriate value. Then hack sawing operation is performed by cutting work piece with hack saw by applying water as coolant to the blade to obtain the sufficient length of and again the facing operation is performed at the end. After performing the machining operation of the work piece as per the specified dimensions the specimen for the micro structure is obtained and finally surface finishing operation is performed with the help of an emery paper of grain sizes 150 and 120 microns respectively for obtaining fine surface finish of the specimen. The same above procedure is employed for the preparation of other specimens of different micron sizes.

4.5.3 PREPARATION OF SURFACE ROUGHNESS SPECIMEN

The micro structure specimen is prepared by machining the work piece on the lathe by doing the facing operation on the work piece at both of its ends and the dimensions are marked over the work piece the length of the specimen should be usually about 20mm to 40mm with a sufficient diameter having a minimum limit of 10mm. The plane turning operation is on the work piece over its entire length by giving less depth of cut and slower feed rates then the depth of cut is gradually given until the diameter of the work piece is reduced to 10mm. Then hack sawing operation is performed by cutting work piece with hack saw by applying water as coolant to the blade to obtain the length of 20mm and again the facing operation is performed at the end. After performing the machining operation of the work piece as per the specified dimensions the specimen for the micro structure is obtained and finally surface finishing operation is performed with the help of an emery paper of grain sizes 120, 220, 320, 400 and 600 microns respectively for obtaining fine surface finish of the specimen. Next The same above procedure is employed for the preparation of other specimens of different micron sizes. Then the specimen is employed for polishing process. It includes the applying of aluminium paste on the specimen of different grades. This process is continued for other specimens for different weight ratio of silicon carbid.

5. FACTORS EFFECTING AL 5052 SIC COMPOSITE



5.1 MELTING OF MATRIX MATERIAL

Out of various furnaces, bottom pouring furnace is suitable for fabrication of metal matrix composites in stir casting route, this type of furnace consists of automatic bottom pouring technique which provides instant pouring of the melt mix (matrix and reinforcement). Automatic bottom pouring is mainly used in investment casting industry. In this technique, a hole is created in the base of melting crucible to provide bottom pouring and was shielded by a cylinder-shaped shell of metals in stir casting process, the matrix material is melted and maintained a certain temperature for 2–3 h in this furnace. Simultaneously, reinforcements are preheated in a different furnace. After melting of the matrix material, the stirring process has been started to form the vortex.

5.2 MECHANICAL STIRRING

In stir casting process, the mechanical stirrer is coupled with the varying speed motor to control the speed of the stirrer. There are various stages of impeller stirrer i.e., single stage, double stage and multistage impeller. Double stage and multi stage stirrer is mainly used in chemical industries whereas single stage impeller stirrer is commonly used for fabrication of AMCs and HAMCs due flexibility and to avoid excessive vortex flow Figure shows various stages of impeller stirrer.

Figure 3: stirrer

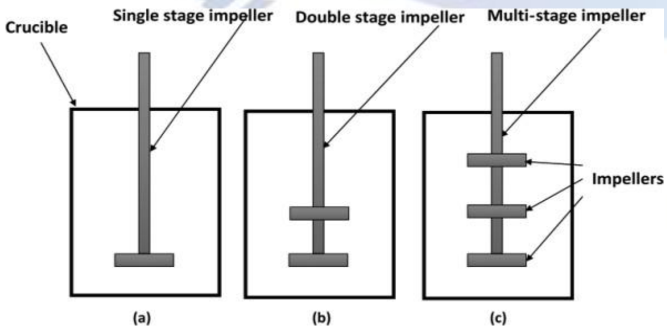


Figure 4: Process of stir casting

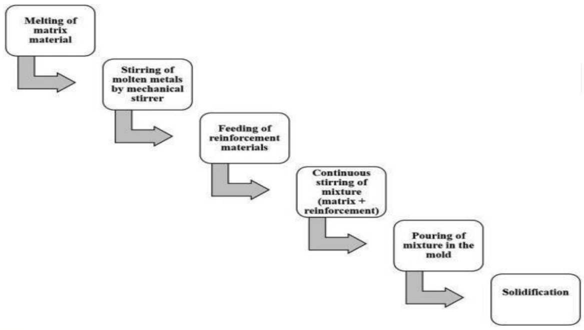


Figure: 5 (a) Single stage impeller stirrer (b) double stage impeller stirrer (c) multistage impeller stirrer.

Stirring plays a vital role over the final microstructure and mechanical properties of the casted composites as it controls the distribution of reinforcements within the matrix. Optimum mechanical properties can be attained by the uniform distribution of reinforcement and this problem is a common to most of processing techniques, including stir casting This problem can be solved by optimal selection of stirring parameters.

5.3 STIRRING SPEED

Stirring speed is a significant parameter which affect the distribution of the reinforcement particles within the matrix material. Prabu et al. investigated the effect of stirring speed and stirring time on the hardness of casted silicon carbide reinforced aluminium matrix composite, in which the stirring speed were selected 1400 and rpm and the stirring time was taken as 5, 10 and 15 min. The experimental study concluded 1600 rpm and 10 min is the best combination of stirring speed and stirring time for uniform hardness value through the composite which confirms the uniform distribution of SiC particles over the aluminium matrix. Further, Design of impeller i.e. impeller blade angle plays a vital role over the flow characteristic and power consumption by the stirring motors.

5.4 STIRRING TIME

Stirring time is a significant process parameter in stir casting process. Lower stirring time may lead to clustering of particle reinforcements and results non-homogeneous distribution of reinforcement particles. Whereas, higher stirring time may lead to the deformation of the Stainless steel stirrer impeller blade at very high working temperature. The working temperature of some reinforcement such as boron carbide with aluminium matrix are very high. This temperature range is 800^{0}c which may deform the stirrer impeller. Moreover, unwanted high stirring time also consumes more power which leads to rise in fabrication cost of composite. Therefore, optimal value of stirring time is essential. studied effect of stirring time on microstructure and hardness of Al5052/SiC composite has been investigated and suggested 10 min as optimal value of stirring to achieve better distribution of reinforcements and uniform value of hardness throughout the composite [Apart from stirring time, the position of stirrer is important and discussed further.

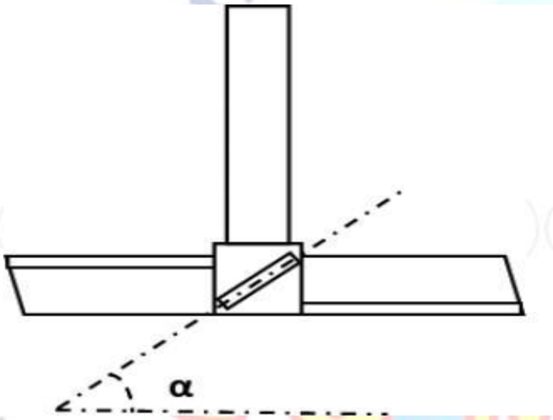


Figure 6: impeller blade angle

5.5 BLADE SIZE

The impeller blade size is the diameter of the impeller blade which is given in term of the diameter of the crucible. The size of impeller plays a substantial role over the distribution of particles. If the size impeller is too small then the reinforcement particles persist suspended at the periphery of the crucible which cause lack of suspension of particles at the center. Whereas if the impeller size is too large then the reinforcements particles concentrated at the center of the crucible bottom. Hence, optimal size of impeller is that size which provides distributed particle in both centre as well as the periphery of the crucible at the similar speed.

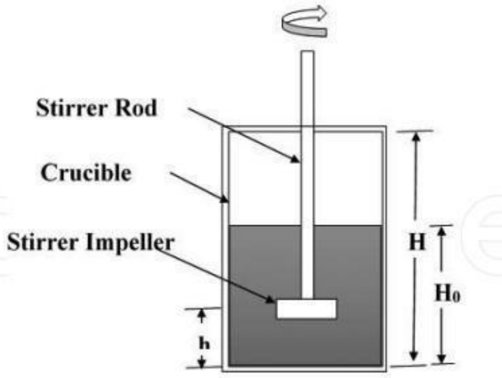


Figure:7: Position of stirrer in the crucible.

5.6 FEED RATE

Mechanical stirrer forms vortex and reinforcements particles are feed in the centre of the vortex. Feeder should be designed in such a manner that it allows continuous flow of particles. High feed rate results particles accumulation in the composite and low federate is difficult to achieve due to the formation of lumps of small solid particles. Thus, selection of optimal rate of feeding is crucial. Less than 0.8 g/s is very difficult to achieve and greater than 1.5 g/s results particle accumulation, hence the optimal rate of feeding is in the range of 0.8–1.5 g/s to avoid the accumulation of reinforcements in the composite and achieve homogeneous dispersion of reinforcement particles throughout the composite Fabrication of AMCs and HAMCs by stir casting method with optimal combination of above stated stirring process parameters govern the mechanical properties of the composites and discussed further.

6. MECHANICAL TESTING AND MICROSTRUCTURAL EVALUATION

6.1 HARDNESS TEST

The Brinell hardness test method is used to determine Brinell hardness and is defined in ASTM E10. Most commonly it is used to test materials that have a structure that is too coarse or that have a surface that is too rough to be tested using another test method, e.g., castings and forgings. Brinell testing often use a very high-test load (3000 kg-f) and a 10mm wide indenter so that the resulting indentation averages outmost surface and sub-surface inconsistencies. The Brinell method applies a predetermined test load to a carbide ball of used diameter which is held for a predetermined time period and then removed. The resulting impression is measured across at least two diameters usually at right angle to each other and these results are averaged. A chart is then used to convert the averaged diameter measurement to Brinell hardness number. Test forces range from 500 to 3000 kg-f

6.2 MICRO STRUCTURE EVALUATION: SAMPLE PREPARATION

In order to identify and evaluate the microstructure of material, it is very important to prepare the test sample carefully and properly. The various steps in sample preparation for microstructural examination include:

- Selecting a representative sample of the materials
- Sectioning the sample to avoid altering or destroying the structure of interest
- Mounting the section without damage to the test sample

Grinding to achieve a flat sample with a minimum amount of damage to the sample surface Polishing the mounted and ground sample Etching in the proper etchant to reveal the microstructural details. The Metallographic specimens were prepared by mounting and grinding and polishing by using aluminium oxide powder, diamond paste and etched with keller's reagent. Micro structural observations were carried out by employing optical microscope of the cross-section's perpendicular to the tool transverse direction. Micro structural observations were carried out at 400X by optical microscope. Examination of the microstructure of a material provides information used to determine if the structural parameters are within certain specifications. Microstructural examination is generally performed using optical or scanning electron microscopes to magnify features of the material under analysis. The amount or size of these features can be measured and quantified, and compared to acceptance criteria. These examinations are often used in failure analysis to help identify the type of material in question and determine if the material received the proper processing treatments. Metallurgical examinations may evaluate:

- Extent of decarburization and carburization, grain size, intergranular attack of corrosion Depth of alpha case in titanium alloys
- Percent spheroidization
- Inclusion ratings
- Volume fraction of various phases or second phase particles in metals.

Figure 8: Mounting specimens

6.3 SURFACE ROUGHNESS TESTING

The casted workpiece undergoes cutting process for required dimensions of specimen. Now the specimen is employed for surface roughness testing by surface roughness tester. Surface roughness is measured in micrometres by root mean square method which is inbuilt in the system (tester). There are different methods to find the surface roughness of the specimen. The methods include centre line average method, maximum peak to valley height of roughness, root mean square method. Among all these roots mean square method gives the best values. These all are statistical methods to find the surface roughness. Now a days mostly electrical testers are using to find out surface roughness. This gives not only accurate results but also avoiding the manual calculations.

7. RESULTS AND CONCLUSION

7.1 MICRO STRUCTURAL EVALUATION

Optical Metallurgical microscope is used to study the distribution of silicon carbide inside the aluminium matrix. Average size of the aluminium particles visualized is 100 μm. It is observed that the distribution of ceramic particles inside the matrix of aluminium is uniform over the matrix, which is maintained by constant stirring the melt and the uniformity is verified in the microstructure. It is to be noted that the ceramic particles appear black against a bright background. Further, the distribution of aluminium particles is more even.

In order to make the crystal structure visible, the sample surface must be initially ground even and then polished. After completion of the last polishing step, first predictions about the purity of the material can be ascertained through the different reflexions. In order to make crystal structure visible for being contrasted. If the crystalline structure contrasts correctly in this manner, then the sample can be evaluated if and when a hardness test is to be performed (micro and universal hardness tester) then all common –phase test procedure. In the present work, research on the SEM examination of Al5052 alloy and its nanocomposites produced under optimum conditions mentioned above show that distribution of reinforcement particles is homogeneous; reactions on the Al 5052/ Sic matrix interface are not observed. The mechanical behaviour of the composites increases with increasing wt. % of nano (Al5052 + SiC) when compared with the unreinforced alloy.

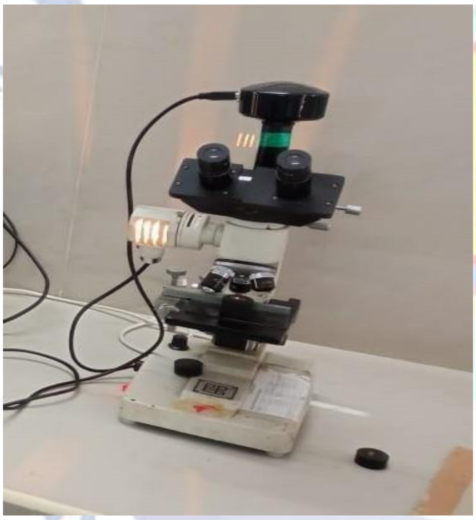


Figure 9: electronic microscope

AL 5052 – 6% OF SiC:

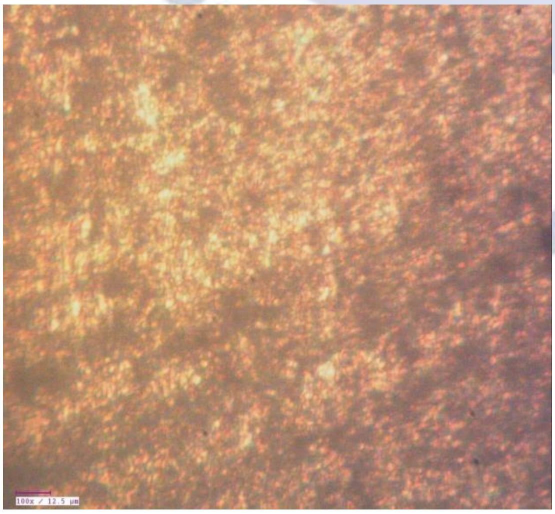


Figure 10: microstructure of Al 5052 with 6% of Sic (100x)

AL 5052 – 8% OF SiC:

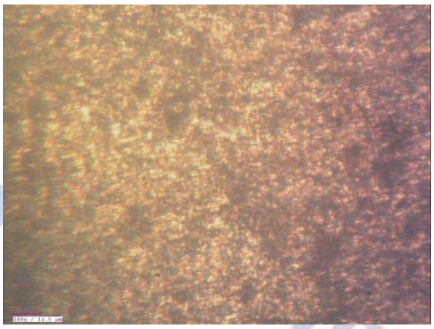


Figure 11: microstructure of Al 5052 with 8% of SiC (100x)

AL 5052 – 10% SiC:

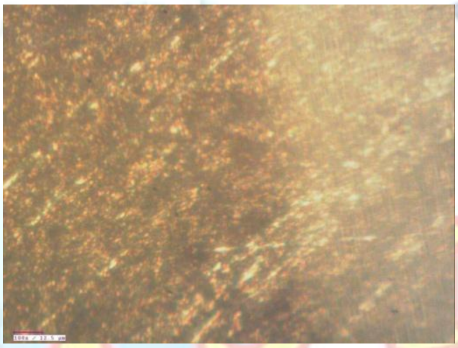
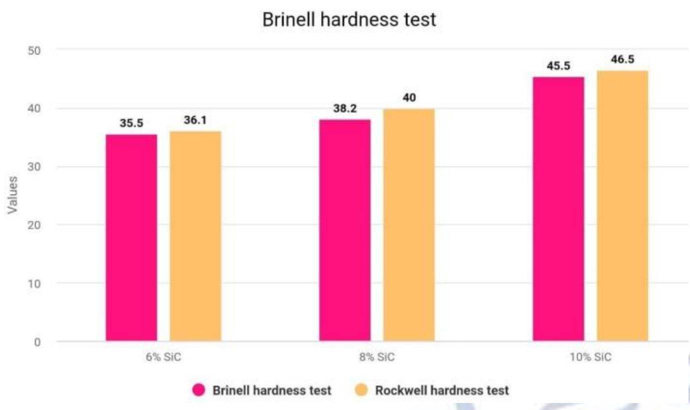


Figure 12: microstructure of al 052 with 10% of Sic (100x)

From the observations of al 5052 specimens with different compositions of Sic under electronic microscope, we evaluated that as weight ratio of SiC increase porosity increases. Capacity of reinforcement diffusion with MMC decreases with increase of weight ratio of reinforcement. As the composition of SiC increases, intermolecular spacing between the MMC and reinforcement increases.

Table No 9.1Rockwell Hardness Testing Values

s.no	Load applied (Kg-f)	Rockwell hardness number (6% of SiC)	Rockwell hardness number (8% of SiC)	Rockwell hardness number (10% of sic)
1	187.5	36	39	47
2	187.5	37	39	46
3	187.5	35	40	46
4	187.5	35	40	45
5	187.5	37	41	47
6	187.5	36	40	47
7	187.5	36	41	46



From the above observations that average Rockwell hardness for the specimen with different reinforcement composition is

- For 6% of SiC RHN is 36.1
- For 8% of SiC RHN is 40
- For 10% of SiC RHN is 46.5

With the above observations we can evaluate that with increase of Sic composition the hardness value increases.

Table no 9.2 Brinell hardness testing values

s.no	load applied	BHN (6% of SiC)	BHN (8% of SiC)	BHN (10% of SiC)
1	187.5	35	38	40
2	187.5	35	37	45
3	187.5	36	36	42
4	187.5	36	36	41
5	187.5	36	38	41
6	187.5	37	35	45
7	187.5	36	36	43

From the above observations we can evaluate that average Brinell hardness for the specimen with different reinforcement composition is

- For 6% of SiC BHN is 35.5
- For 8% of SiC BHN is 38.2
- For 10% of SiC BHN is 45.5

With the above observations we can evaluate that with increase of Sic composition the hardness value increases.

Figure 13 comparison between Rockwell and Brinell hardness number

7.2 SURFACE ROUGHNESS:

Surface roughness is defined as the shorter frequency of real surfaces relative to the troughs. If you look at machined parts, you will notice that their surfaces embody a complex shape made of a series of peaks and troughs of varying heights, depths, and spacing.

Table no 9.3 horizontal surface roughness evaluation

s.no	Sic composition (in %)	Surface roughness value(μm)
1	6	1.085
2	8	0.76
3	10	0.69

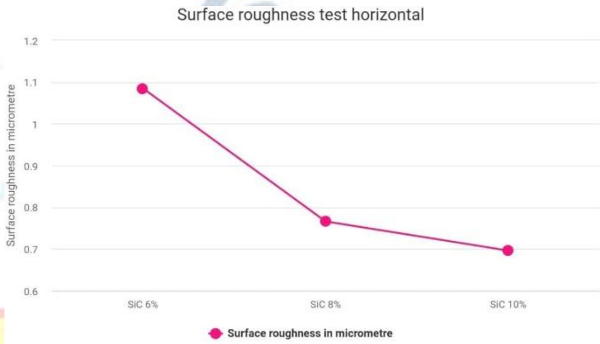


Figure 14: surface roughness in horizontal direction of specimens

Table 9.4 vertical surface roughness evaluation

S.no	Sic composition (in %)	Surface roughness (μm)
1	6	3.784
2	8	2.444
3	10	1.060

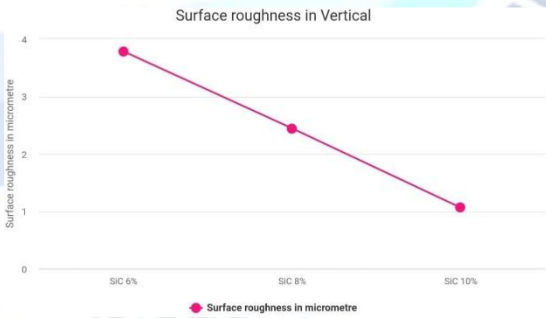


Figure 15: surface roughness in vertical direction of specimens

8. CONCLUSION

Now a days challenges in the fabrication of metal matrix composite are growing vigorously. In this paper the method for the manufacturing of Al5052 by various research are discussed from discussion discovers the importance of the selection of the stirring parameters over the properties of the stir casted composite desired for current demand of the industries. This review has investigated the effect and optimization of stirring parameters. The range of stirring speed may vary depending upon the properties of the reinforcements and matrix mat- erisal, wettability and chemical properties from 1200 to 1400,1600 rpm. Also, it is concluded that Impeller Blade angle at 30^0angle gives optimal value, which will provide suitable combination axial flow and shearing action with lower power consumption. Position of the impeller should be kept at more the 25–30% of the height of the liquid from bottom the crucible. Optimal stirring time of 10 min is suggested. Diameter of the impeller should in the range of 50–55% of the diameter of the crucible and reinforcement federate, as in the range of 0.8–1.5 g/s-

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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