To Study The Tribological Property Evaluation of Aluminium 7050 Reinforced with B4C and Mos2 Composites

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***Abstract*— Composite materials are made of more than one material which is mixed at microscopic level and which are chemically insolvable. The main reason for selecting the Aluminum composite is based on its excellent mechanical properties such at high strength and low weight which is thebasic requirement of aerospace applications also for the automotive applications. Matrix materials 7xxx series is one of the best materials in the Aluminum family. Among 7xxx series Al7050 is good with high strength to weight ratio which is more preferred in aeronautical applications with more than 92% of the in as-cast state. The density of Al7050 is 2.83 g/cm^3. Fabrication of composite is done by stir casting method which is a liquid state technique for the production of composite materials. In this the elements are mixed in a molten matrix with the help of stirring activity. Stir casting is simple and cost-effective method of fabricating composite. The Al7050 reinforced with B_4C andMoS_2 composite is prepared with stir casting.**

All the tests' results give that the wear rate is high in as cast samples of Al7050. But the wear rate goes on decreasing with increase in weight percentage of B_4C and MoS_2 reinforcement in Al7050 matrix. B_4C is known for best wear resisting materials. The MoS_2 materialis known for its properties like good chemical stability and thermal stability. So presence of B_4C and MoS_2 in composite reduces the wear rate and also preferred for the various aerospace and automotive applications.

Keywords*— Al7050 Matrix materials series, stir casting method, B_4C and MoS_2 composite, pin-on-disc wear testing setup, SEM analysis, load, velocity and sliding distance.

I. INTRODUCTION

Network materials 7xxx arrangement is perhaps the best material in the aluminum family. Among 7xxx arrangement Al7050 is acceptable with high solidarity to weight proportion which is more favoured in aeronautical applications with over 92% of the in as-cast state.

In this procedure especially mix throwing process is progressively helpful to create aluminum composite with B_4C and MoS_2. Circulation of B_4C and MoS_2 particles in aluminum lattice is all the more testing one due to their non-uniform dispersion and their interfacial contact zone when contrast with other fortification materials [1, 2]. Since the expansion of B_4C and MoS_2 particles with aluminum combination lattice impacts tribological property of the composites, the levels of weight fractions of B_4C and MoS_2 are chosen dependent on the application prerequisite.

The accompanying variable boundaries are to be thought of while setting up the metal grid composites by mix throwing process. Such boundaries are speed of turn, mixing temperature, support preheat temperature, mixing speed, blending time, pouring temperature, impeller sharp edge point, impeller position, feed rate, and so on are to be kept up for accomplishing great mechanical properties of metal network composites.

1.1 Aluminum 7050

Aluminum 7050 is a heat treatable composite that has high tribological properties and high resistance to wear rate. This material is well known in aviation businesses. The vast majority of the Aluminum 7050 in plate structure has the thickness over 2 inches. The primary structures of Aluminum 7050 are as per the following – 2.3% Mg – 2.302%, Zn – 6.308%, Zr – 0.1220%, Si – 0.121%, Fe – 0.15%, Mn – 0.103%, Ti – 0.062%, Aluminium –Balance volume

1.2. Wrought Aluminum alloy designation system

The table 1 illustrates the alloy designation system for wrought Al,

Table 1 Wrought Aluminum designation system

Alloy series	Principal alloying element
1xxx	99.000% minimum Al
2xxx	Cu
3xxx	Mn
4xxx	Si
5xxx	Mg
6xxx	Mg and Si
7xxx	Zn
8xxx	Other elements

This chief alloying component is added to the Aluminum combination. This term additionally portrays the Aluminum composite arrangement. i.e., 1000 arrangement, 2000 arrangement, 3000 arrangement, 4000 arrangement, 5000 arrangement, 6000 arrangement, 7000 arrangement and 8000 arrangements as appeared in above table.

The second single digit (xXxx), on the off chance that it is not quite the same as 0, demonstrates an alteration of the particular amalgam. The self-assertive numeric value given to notify a particular combination present in the arrangement is shown by third and fourth digits.

Model: In composite 6185, the number '6' demonstrates that it is of the magnesium and silicon combination arrangement, the '1' shows that it is the primary alteration to the first amalgam 6085 and the '85' recognizes it in the 6xxx arrangement. The main special case to this numbering framework is with 1xxx arrangement Aluminum composites which is an unadulterated Aluminum. For this situation the last two digits give the base Aluminum rate above 99%. That is compound 1450 with 99.50% least Aluminum.

1.3 *Aluminum alloys and their characteristics*

i. 1xxx series alloys: These series alloys are non-heat treatable. These alloys have the UTS about 69 to 186MPa. This series contains 99.00% Al so this series is called as pure Aluminum series. These alloys are selected for fabrication due to their excellent corrosion opposition and thermal resistance. These alloys are utilized for fabrication of specialized chemical tanks and pipings. These alloys have relatively poor mechanical qualities due to lose bonding.

ii. 2xxx series alloys: These series alloys are warmth treatable. These alloys have the UTS about 186 to 428MPa. These are Aluminum/copper alloys. It has the Cu addition range about 0.7 to 6.8%. These are peak level performance series and high strength alloys which are often used for aviation and aircraft applications.

These materials have good strength to resist the large range of temperature. In these series some alloys are having the weld able property and some are not weld able. So it requires different welding processes such as arc welding processes.

iii. 3xxx series alloys: These series alloys are able to non-heat treatment with UTS of 110 to 283Mpa. These alloys are composed with Al/Mn alloys. It has the Mn addition range about 0.05 to 1.81%. These alloys have moderate strength; have good corrosion resistance and good formability. These alloys are utilized for elevated temperatures. These alloys are the main components today for heat controllers as heat exchanger in power plants and automotives. These base alloys have ability to weld with 4xxx, 1xxx and 5xxx series filler materials.

i. 4xxx series alloys: These arrangement amalgams have ability of both heat treatment and non-heat treatment with extreme rigidity of 172 to 379Mpa. These composites are Al/Si combinations. It has the silicon expansion run about 0.6 to 21.51%. These have main arrangement which contains both warmth treatable and non-heat treatable amalgams. Silicon expansion in Al lessens it is dissolving point and improves its ease when it is in liquid stage. This arrangement of combinations is increasingly utilized as material called filler.

ii. 5xxx series alloys: These arrangement combinations are non-heat treatable. It has a definitive rigidity around 124 to 352Mpa. These amalgams are the Aluminum/Magnesium composites. It has the magnesium expansion go about 0.2 to 6.22%. These arrangements had the most elevated quality of non-heat treatable amalgams. This compound is promptly welded capable. These combinations are utilized for wide range applications, for example, transportation, spans, transport structures, structures and weight vessels.

iii. 6xxx series alloys: These arrangement alloys are heat treatable. It has the UTS about 124 to 400Mpa. These alloys are the Al/Mg-Si alloys. It has the magnesium and silicon additions around 0.1%. These combinations are fused in numerous basic components. These amalgams are normally cementing break delicate. Consequently, they not to be circular segment welded without fillermaterial. These compounds have ability to weld with both 4xxx and 5xxx arrangement filler materials based on the application and administration necessities.

iv. 7xxx series alloys: These arrangement alloys are heat treatable. It has the UTS about 221 to 607Mpa. These alloys are the composition of Al/Zn alloys. This alloy was utilized in high performance requirement for example aviation and sporting equipment's. These alloys are unsuitable candidates for arc welding.

II. OBJECTIVES AND METHODOLOGY

2.1 *Objectives*

Objective is the goal or object of any efforts and actions. Objectives lead to the activities towards achieving goals of the project work. Objectives provide the guidelines to perform any work. Following are some important objectives,

i. Fabrication of the composite Al7050 reinforced with B_4C and MoS_2.
ii. To evaluate the tribological property of the composite Al7050 reinforced with B_4C and MoS_2.
iii. To analyze the samples by SEM image.

2.1.1 *Fabrication of the composite*

Fabrication of composite includes the objective of deciding the sample composition. Sample composition is determined from the different sets of samples to study the alternative solutions. Different sample composition sets helps to conduct the comparative study of behavior of the material. The sample composition used in this project is mentioned in below table 2,

Table 2 Sample composition used in this project

Set number	Al 7050 (%)	B_4C (%)	MoS_2 (%)	Number of samples
1.	100	0	0	9
2.	98	1	1	9
3.	96	2	2	9
4.	94	3	3	9

Once the sample composition is decided then the fabrication of the samples is to be done with the help of proper casting method. Casting of samples is done by choosing the proper casting process. In this project by considering the various literature reviews we have chosen the stir casting process to cast the sample.

The casting of samples is in the form of circular rods of diameter 10 to 12 mm with any length based on the number of samples. It is also the one of important objective of the project work to do efficiently. Optimization techniques are implied to choose the optimized casting activity. Stir casting process is easy and economical processof casting the MMC.

2.1.2 *To evaluate the tribological property*

To evaluate the tribological property the samples are tested on pin on disc wear testing setup for the study of worn-out percentage of samples. The main parameters of the pin on disc wear test are speed, distance and load. These parameters are kept constant for specific set of samples and varied for every sample. In pin-on-disc setup the main objective is to achieve the contact between the sample and that of the rotating disc. After the test conducted on the pin-on-disc setup further study of material behavior is studied. The wear property is evaluated as a tribological property in this project.

III. EXPERIMENTAL DETAILS

Fabrication is composite is done various casting methods. But stir casting is a liquid phase technique for the production of composite materials, in these the elements are mixed in a molten matrix by the help of stirring activity. Stir casting is simple and cost-effective method of fabrication. Main parts of stir casing setup are motor, furnace, crucible and stirring blades [3].

3.1 Stir casting setup

Stir casting setup consists of a feeder for reinforcing material, mechanical stirrer and furnace. The furnace was utilized to heat and melt the material.

The stirrer was utilized to frame the vortex that drives the blending of the support materials those are presented in dissolve. Stirrers comprises of the blending bar and the impeller cutting edge.

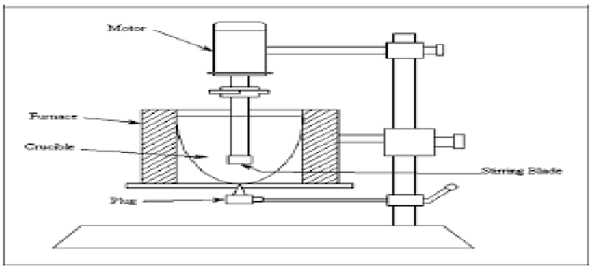

Figure 1: Line diagram of the stir casting.

Base pouring heater is utilized for creation of metal grid composites in mix throwing process procedure which gives moment pouring of the soften blend. Figure 1shows the courses of action of mix throwing process.

3.2 Casting Procedure

I. The first and most significant step of mix throwingincludes softening the Al.
II. During the softening process, Al softens responsesto the environment and dampness and originates afilm of Al_2O_3 as stated by following equation.

$$2Al + 3H_2O \rightarrow Al_2O_3 + 6H$$

III. This film covers the surface of the melt from further response with environment.
IV. Then mix throwing process includes blending of dissolve, the melt is mixed continuously which exposes the melt surface to the environment whichtend to continuous oxidation of aluminium melt in mix throwing process.
V. Addition of wetting agents for example Mg, Borax and TiK_2F_6 in the dissolve. Figure 1 shows steps involved in stir casting.

3.3 Mechanical stirrer

The stirrer is combined with the changing rate engine to limit the stirrer velocity. The three primary states of stirrer are single stage; two-fold stage and multi stage impeller. Two-fold step and multi-step stirrer are fundamentally utilized in compound ventures while single step impeller stirrer is regularly utilized for manufacture of aluminum grid composites (AMC's) and half and half aluminum framework composites (HAMC's). Figure 2 showsthe phases of impeller stirrer.

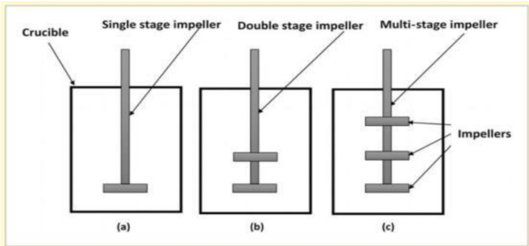

Figure 2 various stages of mechanical impeller stirrer.

3.4 Stirring time

Blending time is a progressively noteworthy procedure boundary in mix throwing process. Higher blending time may prompt the disfigurement of the hardened steel stirrer cutting edge at extremely high working temperature. While lower mixing time may prompt bunching of particles fortification and results in non-homogenous conveyance of support particles. In this way, ideal benefit of mixing time is basic. For Al/Sic compositesthe analysts recommends that 10mins time is an ideal benefit of mixing to accomplish better conveyance of support.

3.5 Feed rate

Stirrer from swirl and fortification of elements is distribution in the focal point of the swirl. Low feed rate is hard to accomplish because of the development of pieces of little strong particles. High feed rate brings about centralization of particles in the composites. Therefore, choice of ideal pace of taking care of is significant. Therefore, the ideal pace of taking care of is in scope of

0.78-1.49 grams/sec to maintain a strategic distance from the amassing of fortification in the composite and accomplish uniform scattering of support particles all through the composites.

3.6 Wear

It is a process in which the material loss takes place at the surface due to some mechanical actions which leads to the reduction of weight fraction of the samples in percentage. Wear can be reduced by using thermal spray coatings. In thermal spray coating process the hard material with wear resistance properties and high corrosion resistance is sprayed on the base metal.

3.6.1 Pin-on-disc

Pin-on-disc is an important setup for the characterization and analysis of the tribological property like wear. Pin-on-disc is a lab process for determining the wear of samples during sliding motion under contact using a pin moving on a rotating disc.

3.7 Pin-on-disc experiment steps

Pin on disc testing setup is utilized for tribological properties study. The test steps are presented as follows;

a. The first step is to check the weight of sample by using higher precision digital weighing machine.
b. Pin surface is made level with the end goal that it will bolster the heap over its whole cross area called as second step. This was accomplished by cleaning the pin test ground by utilizing emery paper of 80 coarseness size before testing.
c. The third step is to avoid the initial turbulence period associated with wear curves and friction.
d. The fourth step is the genuine testing called consistent state wear. This stage is the dynamic rivalry between move of material from pin onto the plate and development of wear flotsam and jetsam and their ensuing evacuation.
e. At the initial stage of each experiment, precaution steps are taken to make sure that load is applied in normal direction.
f. Then the final step is to check the weight loss of the samples. After removing the sample from the setup it was cleaned with acetone reagent. Then each sample is weighed by using the digital weighing machine. Then the specific wear rates of the samples are obtained by following equation [4-5],

$$W= (w_l)/(L x S.D)$$

Where,

W= specific wear rate (mm^3/N-m).

S D = sliding distance (m).

W_l=weight loss of samples (Grams) ρ=Density of the worn sample (Grams/mm^3).

L = Applied load (N).

3.8 Wear calculations

a. Velocity = Sliding Distance/ Time
b. Time= Sliding Distance/ Velocity
c. Density of Composite = (ρ_{Al} x V_{Al}) + (ρ_{B4C} x V_{B4C}) + (ρ_{MoS2} x V_{MoS2})
d. Weight loss = Initial weight – Final weight.
e. Volume loss= Weight loss / Density
f. Specific wear rate (SWR)=Volume loss/ Load x sliding distance

3.9 Applications of pin on disc wear testing setup

a. The pin on disc setup is applicable in research, product development and quality assessment.
b. It is applicable in quality assessment of lubricants and additives.
c. It is applicable in researches for mining technology development with wear characterization of the materials.
d. It can also be used to research and quality assessment related space, metal forming and plastics.

IV. RESULTS AND DISCUSSION

4.1 *Wear Test*

The main aim of the tests is to find out the control factors which influence the minimum specific wear rate. A conventional method was chosen to develop the experiments [6]. The as cast Al 7050 alloy and Al 7050 alloy with different weight fraction of B_4C and MoS_2 are subjected to wear test below with the help of pin on disc wear test setup. The wear tests were conducted on 10mm diameter and 30mm long solid cylindrical samples against rotating steel disc of EN-32 type [7]. The wear is measured with respect to load, velocity and sliding distance. The process parameters for the tests are shown in illustrated table 3.

Table 3 Process Parameters for the wear testing

		Levels				
Parameters	**Unit**	**1**	**2**	**3**	**4**	**5**
Load	N	10	20	30	40	50
Sliding Velocity	m/ s	0.5	1.0	1.5	2.0	2.5
Sliding Distance	m	500	1000	1500	2000	2500

4.1.1 *Wear test for load variation*

The main purpose is to analyze the most contributing factors of weight of B_4C and MoS_2 with 0%, 1%, 2% and 3% on wear rate. The results of wear test for all compositions for load variation are shown in below tables 4 and 5 [8-9].

Table 4 Results for wear test of as cast samples for load variation.

Load (N)	SV (m/s)	SS (rpm)	SD (m)	ST (sec)	I W (g)	FW (g)	W L (g)	Volume loss (mm^3)	SWR (mm^3/Nm) (x10^{-3})
A06 L_1 = 10	1.5	287	1500	1000	6.131	6.097	0.033	0.0010	1.07
A01 L_2 = 20	1.5	287	1500	1000	6.132	6.098	0.011	0.0011	1.12
A07 L_3 = 30	1.5	287	1500	1000	6.134	6.006	0.128	0.0011	1.12
A03 L_4 = 40	1.5	287	1500	1000	6.241	6.108	0.133	0.0012	1.20
A02 L_5 = 50	1.5	287	1500	1000	6.193	5.953	0.240	0.0013	1.36

Table 5 Results for wear test of Al-98%+B_4C-1%+MoS_2-1% samples for load variation.

Load (N)	SV (m/s)	SS (rpm)	SD (m)	ST (sec)	I W (g)	FW (g)	WL (g)	Volume loss (mm^3)	SWR (mm^3/Nm)(x10^{-3})
A_{11} L_1 = 10	1.5	287	1500	1000	6.208	6.138	0.069	0.0010	1.02
A_{14} L_2 =20	1.5	287	1500	1000	6.278	6.111	0.166	0.0010	1.03
A_{16} L_3 =30	1.5	287	1500	1000	6.268	6.154	0.114	0.0010	1.06
A_{17} L_4 =40	1.5	287	1500	1000	6.192	6.137	0.055	0.0011	1.14
A_{18} L_5 =50	1.5	287	1500	1000	6.311	5.917	0.393	0.0012	1.25

Effects of input parameters such as weight percentage, load, time rate of distance travel and sliding distance on wear rate [10, 11]. The below figure 3 shows the results of wear test for 0%, 1%, 2% and 3% composition.

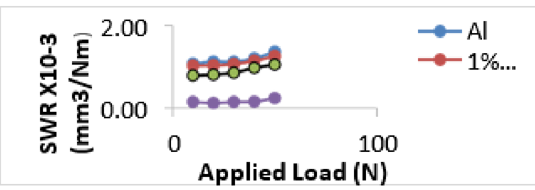

Figure 3: Load Vs SWR for different weight percentage ofB_4C and MoS_2 in Al 7050.

From the graph it is clear that the wear rate of as cast, 1% and 2% composition is copious higher than that of 3% composition material. So, the conclusion of the test is the as the volume fraction of reinforcement increases the wear rate goes on decreases. So, the composite with 3% of reinforced B_4C and MoS_2 in Al 7050 is better for wear resistance for load variation [12, 13, 14].

4.1.2 *Wear test for velocity variation*

As the tests for load variation are done in the previous section, in this segment the tests are conducted to investigate the influence of velocity on SWR. The tests are conducted on 10milimeter diameter and 30mm length solid cylindrical examples onrotating steel disc. The wear is measured with respect to velocity, load and sliding distance [15-16].

Table 6 Results for wear test of as cast samples forvelocity variation

Velo city (m/s)	Load (N)	SS (rpm)	SD (m)	ST (se)	I W (g)	FW (g)	WL (g)	Volume loss(mm3)	SWR (mm3/Nm) (x10^{-5})
A_{01} S_1 =0.5	30	95.5	1500	3000	6.098	6.092	0.005	0.0020	5.5329
A_{02} S_2 =1.0	30	191	1500	1500	5.953	5.939	0.013	0.0048	6.6792
A_{03} S_3 =1.5	30	287	1500	1000	6.108	6.103	0.004	0.0453	7.06675
A_{06} S_4 =2.0	30	382	1500	750	6.117	6.107	0.010	0.0037	6.402
$A_{04}S_5$ =2.5	30	573	1500	500	6.241	6.182	0.039	0.0209	4.65646

Table 7 Results for wear test of Al-98%+B_4C-1%MoS_2-1% samples for velocity variation

Velocity m/s	Load N	SS rpm	SDm	ST sec	IW g	F W g	WL g	Volume loss(mm^3)	SWR (mm3/Nm) (x10^{-5})
A11 S1 =0.5	30	95.5	1500	3000	6.17	6.16	0.009	0.0032	4.23149
A14 S2 =1.0	30	191	1500	1500	6.15	6.14	0.003	0.0010	4.83984
A16 S3 =1.5	30	287	1500	1000	6.17	6.17	0.002	0.0329	5.33149
A17 S4 =2.0	30	382	1500	750	6.15	6.14	0.009	0.0032	4.4975
A18S5= 2.5	30	573	1500	500	5.91	5.72	0.191	0.0670	2.22696

Effects of input parameters such as weight percentage, load, time rate distance travel and sliding distance on wear rate [17, 18]. With the help of graph of load versus SWR it was easy to comprehend the most influencing parameters for the different composition of the composite material. The below fig 5 shows the velocity versus specific wear rate for 0%, 1%, 2% and 3% composition.

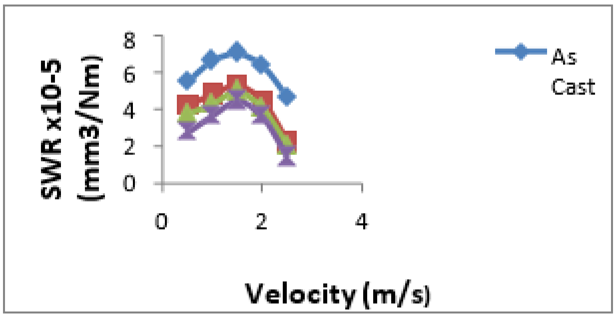

Figure 4: Velocity Vs SWR for different weight percentageof B_4C and MoS_2 in Al 7050

4.1.3 *Wear test for Sliding Distance variation*

As the tests for load and velocity variations are done in the previous section, in this section the test is done on composite to check the influence of sliding distance on the wear rate. Basically, from works I came to know that the presence of B_4C and MoS_2 will reduce the wear rate with respect to increase in the weight percentage of reinforcement [19]. In this section, as cast Al 7050 alloyand Al 7050 alloy with different weight fraction of B_4C and MoS_2 particles are subjected to wear test with the help of pin on disc wear testing setup.

For every type of composite sample tests are done at 5 different sliding distance levels such as 500m, 1000m, 1500m, 2000m and 2500m possession the load and velocity constant at 30N and 1.5m/s respectively.

Table 8 Results for wear test of as cast samples for sliding distance variation.

S D m	Lo adN	Velocity m/s	SS rpm	ST sec	I W g	F W g	WL g	Volume loss m m^3	SWR mm^3/ Nm $x10^{-3}$
A04 D_1 = 500	30	1.5	287	334	6.24	6.16	0.07	0.027	2.1987
A05 D_2 = 1000	30	1.5	287	667	6.19	6.10	0.08	0.029	3.1430
A08 D_3= 1500	30	1.5	287	1000	6.11	6.07	0.04	0.053	3.5621
A09 D_4 = 2000	30	1.5	287	1334	6.09	6.04	0.05	0.019	3.8841
A01 D_5= 2500	30	1.5	287	1667	6.09	6.05	0.03	0.014	4.0446

Table 9 Results for wear test of Al-98%+B_4C-1%+MoS_2-1% samples for sliding distance variation

SD m	Lo adN	Velocity m/s	SS rpm	ST sec	I W g	F W g	WL g	Volume loss mm^3	SWR mm^3/N mx10^{-3}
A12 D1 = 500	30	1.5	287	334	6.21	6.16	0.04	0.0307	1.27769
A13 D2 = 1000	30	1.5	287	667	6.21	6.17	0.03	0.0126	2.1260866
A15 D3 = 1500	30	1.5	287	1000	6.21	6.14	0.06	0.0332	3.14522
A19 D4 = 2000	30	1.5	287	1334	5.64	5.63	0.01	0.0391	3.6783
A11 D5= 2500	30	1.5	287	1667	6.16	6.09	0.07	0.0251	3.59257

As conduct the several experiments on Al 7050 as cast and Al 7050 alloy with different weight percentage such as 1%, 2% and 3%. I observed the results and relevant graphs. The factors such as velocity, load and SD influences the wear rate on the composite. The presence of B_4C and MoS_2 will decrease the wear rate on each influencing parameter. The wear rate is high in as cast samples because the strength of as cast Al 7050 is low as compare to the strength with 3% reinforcement of B_4C and MoS_2. The wear rate goes on decreasing with increase in the weight percentage of B_4C and MoS_2 due to the strong bonding strength between matrix and reinforcement. By observing the results, the conclusion is the wear rate by each influencing parameter on 3% reinforcement is less because of the bonding strength and it is preferred to the use in the industries.

Al 7050/B_4C and MoS_2 composite examples were presented to microstructure appraisal to evaluate its properties. By utilizing new emery papers with various evaluations the examples are cleaned to acquire the fine the surface completion. The best reagent called Keller's reagent was used on the sample for engraving the sample surface to see the microstructure. Interfacial and solid interfacial holding between the network and support (B_4C and MoS_2) metal grid composite assumes a significant job in deciding the impacting factors on wear pace of the composites. The higher volume portion of particles of support is relied upon to produce the more noteworthy warm burdens. Bunches can shape high warm burdens and lead to wear at the surface. The examination gives that the surface wear is seen in the Al 7050/B_4C and MoS_2 composites having higher volume division of fortification, for example, 2% and 3% which are appeared in figure (a, b, c and d).

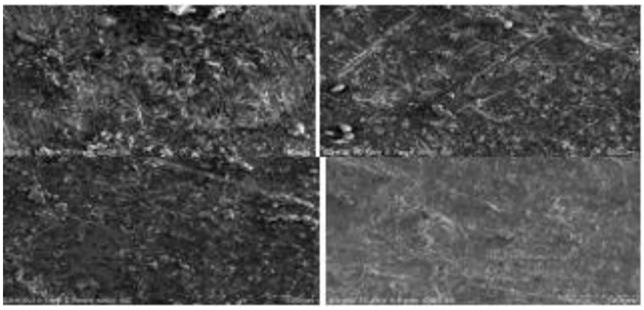

Figure 5 (a, b, c and d) shows the SEM pictures of wear trash of Al 7050/B_4C and MoS_2 composites. Anyway, the morphology of the wear particles didn't rely upon B_4C and MoS_2 volume portion. The well-used surfaces of Al 7050/B_4C and MoS_2 composite half and half composite was primarily equal shallow scratches demonstrating gentle scraped spot. What's more, the break of oxidized layer and plastic distortion are likewise watched.

V. CONCLUSIONS

1 The Al 7050 reinforced with B_4C and MoS_2 composite was successfully fabricated by stir casting process. Stir casting method is easier and economical.

2 Tribological property was increased because of the addition of B_4C and MoS_2 which go about as successful fortification in aluminum.

3 The wear rate goes on decreasing with increase in weight percentage of B_4C and MoS_2 because of higher bonding strength between matrix and reinforcement.

4 SEM is used to study the sample surface at microscopic level and investigate the properties.

5 Fabrication of composite is done by stir casting method which is a liquid state technique for the production of composite materials. In these the elements are mixed in a molten matrix with the help of stirring activity. Stir casting is simple and cost effective method of fabricating composite. The Al7050 reinforced with B_4C and MoS_2 composite is prepared with stir casting.

6 Samples of Al7050 reinforced with B4C and MoS2 are subjected to wear test by utilizing the pin-on-disc wear testing setup. The process parameters for the tests are taken as load, velocity and sliding distance. The tests are done with five levels for variation of all three parameters. Then specific wear rate is calculated by utilizing the data of weight loss. Then some samples are subjected to SEM analysis to evaluate the properties byanalyzing the SEM images.

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