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Mechanical Properties of Fly-ash Reinforced Aluminium (AA1050A) Composite

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Abstract – *Addition of filler particles in restricted volume results in better mechanical properties. Flyash is a pozzolanic material which is the most promising ,cheap and low density matrix reinforcement available in large quantities .Fly-ash is majorly obtained from thermal power plants as a waste byproduct.*

Fly-ash is used as a filler material in aluminium, polyster, epoxy etc. ,due to its advantages such as strong filling ability, high fluidity and excellent properties. Here mechanical properties such as tensile strength, compressive strength, hardness, impact strength have been investigated for Aluminium (AA1050A) Fly-ash reinforced composite.

Key Words: **Fly-ash, AA1050A, Fluidity, Hardness, Impact Strength.**

1. INTRODUCTION

Now a days Metal Matrix Composites(MMCs) accounts for better mechanical properties of the component and are widely used in all fields of material engineering. Flyash , a fine particulate material produced as a result of coal combustion in abundance. For every hundred ton of coal burnt approximately 11 tons flyash is produced , hence disposal has always been a problem.

Our study was focused on utilization of waste by product flyash by mixing it in Aluminium(AA1050A) Matrix to produce a composite.

The expected result of our research is that aluminium flyash composite will act as a low cost substitute of conventional aluminium products used in automobile industry and other small machine components. Also it will reduce the cost of aluminium accessories.

2. MATERIALS AND METHOD

2.1 MATERIALS-

The matrix material used for the fabrication of the composite consisted of aluminium (AA1050A) Alloy. Flyash

was obtained from NTPC ,Dadri Thermal Power Station .Size range of flyash provided was between 0.1-100 µm .Stirrer was used to make flyash aluminium composite homogeneous.

2.2 SAMPLE PREPERATION

The flyash was preheated to 350˚C and maintained for 20 minutes. Predefined quanties of AA1050A Aluminium Alloy was taken and melted in the crucible at 775˚C which is above its melting temperature (675˚C).After mixing , the melt was poured in mould for preparation of specimen. All testings were as per ASTM Standards.

3. TESTING RESULTS

3.1 TENSILE TEST

The tensile test were carried out as per ASTM Standards. The results of tests are shown in the graph. The percentage improvements with different weight fractions of reinforcements are also given.

From the graph , it can be noted that tensile strength increase initially with the increase in weight percentage of fly ash up to 10% , then there was decrease in ultimate tensile strength with further increase in percentage of fly-ash .The decrease in tensile strength of the samples with fly-ash fraction beyond 10% may be due to poor weld ability of reinforcement with the composite.

Weight Percent Reinfocement(%)	Ultimate Tensile Strength (MPa)
0	124
5	129
8.57	130
9.04	131
9.52	131.5
10	133
10.47	132.5
11	13.7

Table -1: Ultimate Tensile Strength of Aluminium Flyash Composite

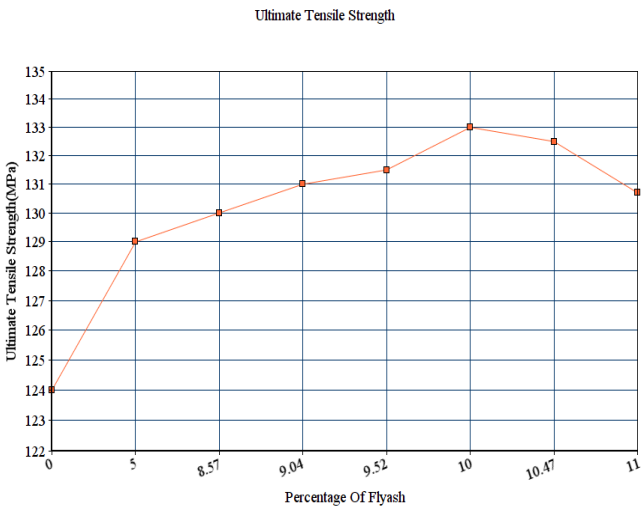


Chart -1:compressive strength of aluminium flyash composite.

3.2 COMPRESSIVE STRENGTH-

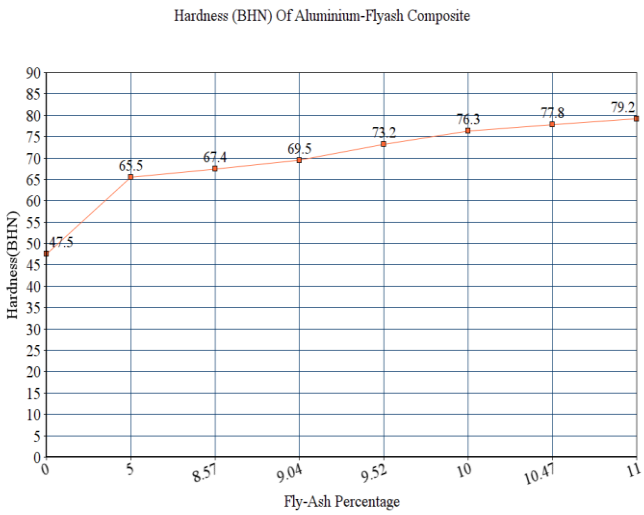
The compression test was carried out as per ASTM Standards. The results of the tests are shown in the graph. It is observed from the graph that compressive strength of the composite increases with the increases in flyash content(%).

This is due to the hardening of base alloy by the flyash particles.

Weight Percent Reinforcement (%)	Ultimate Compressive Strength(MPa)
0	388
5	498
8.57	512
9.04	514.5
9.52	515.7
10	517.4
10.47	519.5
11	520.4

3.3 HARDNESS TEST-

The hardness test were carried out as per ASTM Standard. The results of the tests are shown in the graph. It can be noted from the graph that the hardness of composite increases with increases in flyash contents. Thus, the flyash particles help in increasing the hardness of aluminium AA1050A Alloy.



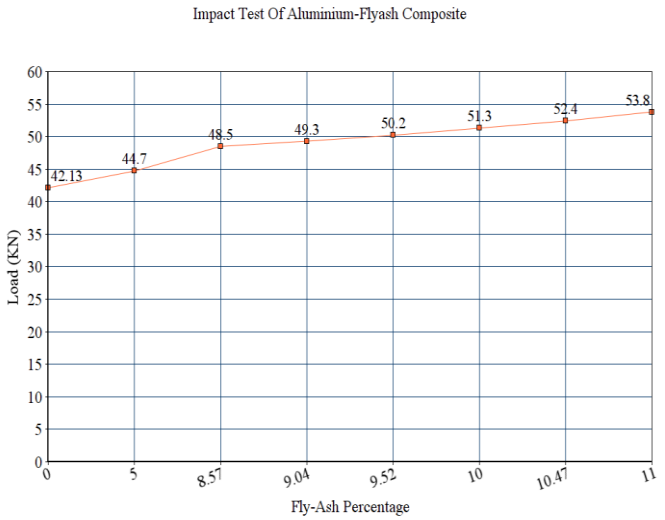
Weight Percent Reinfocement(%)	Hardness (BHN)
0	47.5
5	65.5
8.57	67.4
9.02	69.5
9.52	73.2
10	76.3
10.47	77.8
11	79.2

3.4 IZOD TEST –

The IZOD tets was carried out to determine the impact strength of aluminium Composite.

From the graph, it is observed that impact strength of aluminium composite alloy increases with increase in flyash content.

Weight Percent Reinfocement (%)	Impact Load(KN)
0	42.13
5	44.70
8.57	48.50
9.04	49.30
9.52	50.20
10	51.30
10.47	52.40
11	53.80



3. CONCLUSIONS

From the study done we concluded the following –

1. We can use flyash for the production of composite and can convert this waste into a use full product.
2. Flyash up to 20% by weight can be added successfully to pure aluminium by stir casting method .
3. Ultimate tensile strength of the composite was increased from 124 MPa to 133 MPa .
4. Ultimate compressive strength of the composite was increased from 388 MPa to 520.4 MPa .
5. The Brinell hardness was increased from 47.5 BHN top 79.2 BHN.

4. ACKNOWLEDGEMENTS-

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