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DEVELOPMENT AND CHARACTERIZATION OF AL / BAGASSE ASH GREEN METAL MATRIX COMPOSITE- A Review

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ABSTRACT

In This Investigation Exhaust Literature review of aluminum 6063 /Bagasse was carried out individual effect of Bagasse of al 6063 observed from the Result of Various researcher. It was find that material properties were improved. While cast density reduces.

Keywords:-Aluminum6063, Bagasse, *Density* ***,Hardness,*** *Porosity* ***,Tensile Strength,*** *Toughness, Etc.*

I INTRODUCTION

The project aims in determining the microstructure and ageing characteristics of Al/bagasse ash particulate composites with a view to obtaining the optimum age hardening procedure that would enable the desired mechanical properties achieved.

1.1 Composite

A composite metal is one of which is composed of at list two element working together to produce martial properties that are different to properties of those elements on their own .Nowadays, research all over the globe is focusing mainly on aluminum because of its unique combination of good corrosion resistance, low density and excellent mechanical properties. Composite have already proven the their worth as weight saving and high strength material the current challenges is to make them cast effective a composite consists of a bulk material ,the matrix and reinforcement of some kind, added primarily to increase the strength and stiffness of the matrix. The reinforcement is usually in fiber form. Usually the reinforcing component is distributed in the continuous or matrix component. When the matrix is a metal, the composite is turned a metal matrix composite. The report is concerned with aluminum matrix composite

1.2 Combination of Composite

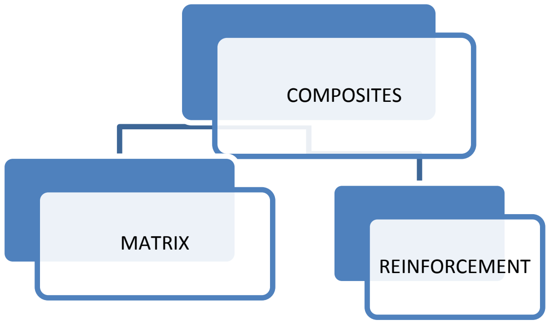

Fig1-Combination of Composite

1.2.1 Matrix

The matrix is the monolithic material into which the reinforcement is embedded, and is completely continuous this means there is a path through the matrix to any point in the material, unlike to material sandwiched together. The matrix is usually a lighter metal such a aluminum and provides a complaint support for the reinforcement.

1.2.2 Reinforcement

The reinforcement material is embedded into the matrix. It is used to change physical properties such as wear resistance, friction coefficient, or thermal conductivity. The reinforcement can be neither continuous nor discontinuous. Reinforcement for metal matrix composite have a manifold demand profile , which is determine by production and processing and by the matrix system of the composite material .the following demands are generally applicable.

a) Low density
b) Mechanical compatibility
c) Thermal stability
d) High young modulus
e) High compression and tensile strength
f) Good process ability
g) Economic efficiency

II .LITERATURE REVIEW

S.Schettino et al.(2013) was analyzed regarding chemical composition, mineralogical analysis, particle size distribution ,morphology, particle density, and organic matter. Floor tile pieces containing up to 2.5 wt% sugarcane bagasse ash waste as apartial replacement of quartz were prepared by uniaxial pressing and sintered at 1190 °C. The followingg technological properties were determined using standard procedures: flexural strength, apparent density, linear shrinkage, and water absorption. The experimental results indicated that the sugarcane ,bagasse ash waste is rich in quartz particles, and has potential be used as an alternative raw material for the production of ceramic floor tile[1].Santhanamet al.(2014) have reported that the use of sugarcane bagasse ash as supplementary cementitious material in the concrete can improve its properties. The utilization of bagasse ash has beenconstrained because of inadequate understanding of the material and lack of suitable processing methodology for use in a large scale. Processing methods significantly influence the pozzolanic activity of any supplementary cementitious material. Proper assessment of pozzolanic activity and processing methodology of bagasse ash were not investigated in earlier research studies. This paper describes a study that involves pozzolanic performance evaluation and microstructural characterization of sugarcane bagasse ash for use as pozzolanic material in concrete. A comprehensive evaluation of pozzolanic activity of sugarcane bagasse ash based on different processing methods including burning, grinding, complete removal of coarse fibrous particles by sieving and combinations of these methods were examined in this study. Suitable processing methodology to attain maximum pozzolanic activity of sugarcane bagasse ash with minimum level of processing is described in this paper.[2].Bahurudeen et al. (2014) was observed that polycarboxylic ether based superplasticizer was more compatible with bagasse ash blended cement than sulphonated naphthalene based superplasticizer.[3].Bahurudeen et al.(2015) study, namely oxygen permeability test, rapid chloride penetration test, chloride conductivity test, water sorptivity test, DIN water permeability test and Torrent air permeability test. The results from this study show that use ofsugarcane bagasse ash in concrete prominently enhances its performance. Low heat of hydration, additional strength gain due to pozzolanic reaction, significant reduction in permeability because of pore refinement and similar drying shrinkage behavior were observed for bagasse ash blended concrete compared to control concrete.[4]Aukkadet et al.(2015) results showed that concrete with 50% of GB produced at least 90% compressive strength as compared to control concrete (CT concrete) at the ageof 28 days. The rapid chloride ion penetration in term of charge passed (Coulombs) was at a very low level when 20–50% of GBA was used to replace OPC in the concrete. Moreover, the same trend of chloride penetration depth was found by the immersion test, i.e., the chloride resistance increased with the increase of GBA replacement. The results suggest that the use of GBA of up to 50% to replace OPC by weight ofbinder can increase the durability properties of concrete, especially its chloride penetration resistance.[5].P. Moretti et al.(2016) were used to partially replace basalt stone and quartz sand, respectively. The compressive strength, modulus of elasticity, void ratio, dry bulk density, water absorption and the carbonation depth of concrete produced with different contents of these wastes were determined. Samples produced with the joint use of CW and SBAS achieved 93% of the compressive strength of the reference concrete (without waste). It is worth mentioning that this study presents pioneering results for the joint use of SBAS and CW in concrete for use in construction.[6].

III MATERIALS AND METHODS

3. 1 Selection of matrix material

In the present investigation Al 6063 is considered as a matrix metal. 6063 is the mostcommon alloy used for aluminium extrusion rod shown in figure 2. It allows complex shapes to be formed with very smooth surfaces fit for anodizing and so is popular for visible architectural applications such as window frames, doorframes, roofs, and sign frames. Applications requiring higher strength typically use 6063 or 6082 instead

Fig 2 Aluminium 6063 Rod

Table 1 Physical Properties

A6063	
Physical properties	
Density (ρ)	2.69 g/cm^3[1][2]
Mechanical properties	
Young's modulus (E)	68.3 GPa (9,910 ksi)
Tensile strength (σ_t)	145–186 MPa (21.0–27.0 ksi)
Elongation (ε) at break	18-33%
Poisson's ratio (ν)	0.3
Thermal properties	
Melting temperature (T_m)	615 °C (1,139 °F)
Thermal conductivity (k)	201-218 W/m*K
Linear thermal expansion coefficient (α)	2.34*10^{-5} K^{-1}
Specific heat capacity (c)	900 J/kg*K
Electrical properties	
Volume resistivity (ρ)	30-35 nOhm*m

3.1.1Chemical composition

Table 2

Silicon	**minimum 0.2%, maximum 0.6% by weight**
Iron	no minimum, maximum 0.35%
Copper	no minimum, maximum 0.10%
Manganese	no minimum, maximum 0.10%
Magnesium	minimum 0.45%, maximum 0.9%
Chromium	no minimum, maximum 0.10%
Zinc	no minimum, maximum 0.10%
Titanium	no minimum, maximum 0.10%
Aluminium	Remainder

3.2 Selection of Reinforcement

Bagasse is a heterogeneous material containing around 30-40% of pith fiber, which is derived from the core of the plant and is mainly parenchyma material, and waste rind or stem fiber which makes up the balance and is largely derived from sclerenchyma material. These properties make bagasse particularly problematic for paper manufacture and have been subject of large body of literature. Bagasse is by product from the sugar industry it is a fibrous low density material, When mixed with Al it reduces the density of Al. .A Typical chemical analysis of washed and dried bagasse might show. Bagasse shown in fig 3 and fig 4

Fig 3 Bagasse

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Fig 4 Bagasse powder

Table 3

Cellulose	**45-55%**
Hemicellulose	20-25%
Lignin	18-24%
Ash	1-4%
Waxes	<1%

3.3Development of composite

There are following step involves in development of composite-

a) Arranging the bagasse and Aluminium.
b) Cleaning the bagasse
c) Making powder form of bagasse.
d) Melting the aluminium
e) Mixing Aluminium and bagasse powder
f) Testing of mechanical properties

3.4 Mechanical Properties

3.4.1 Tensile strength is a measurement of the force required to pull something such as rope, wire or a structural beam to the point where it breaks. The tensile strength of a material is the maximum amount of tensile stress that it can take before failure, for example breaking. The most common testing machine used in tensile testing is the universal testing machine.

3.4.2 Hardnessrepresents the resistance of material surface to abrasion, scratching and cutting, hardness after gives clear indication of strength. In all hardness tests, a define force is mechanically applied on the piece, varies in size and shape for different tests. Common indentors are made of hardened steel or diamond. Rockwell hardness tester presents direct reading of hardness number on a dial provided with the m/c. principally this testing is similar to Brinell hardness testing. It differs only in diameter and material of the indentor and the applied force. Although there are many scales having different combinations of load and size of indentor but commonly 'C' scale is used and hardness is presented as HRC

3.4.3 Toughness is the ability of a material to absorb energy and plastically deform without fracturing. One definition of material toughness is the amount of energy per unit volume that a material can absorb before rupturing. It is also defined as a material's resistance to fracture when stressed. The toughness of a material can be measured using a small specimen of that material. A typical testing machine uses a pendulum to strike a notched specimen of defined cross-section and deform it. The height from which the pendulum fell, minus the height to which it rose after deforming the specimen, multiplied by the weight of the pendulum is a measure of the energy absorbed by the specimen as it was deformed during the impact with the pendulum. The Charpy and Izod notched impact strength tests are typical ASTM tests used to determine toughness.

3.4.4 DensityA material's density is defined as its mass per unit volume. It is, essentially, a measurement of how tightly matter is crammed together. The principle of density was discovered by the Greek scientist Archimedes.

3.4.5 Porosity is a phenomenon that occurs in materials, especially castings, as they change state from liquid to solid during the manufacturing process. It has the form of surface and core imperfections which either effects the surface finish or as a leak path for gases and liquids.

4. Stir Casting Technique Stir Casting method is a liquid metallurgy technique in which the second phase materials (reinforcements) are introduced into the molten matrix and allowing the mixture to solidify. Here, the critical thing is to create good wetting between the reinforcements and the molten aluminium or aluminium alloy.

this is the simplest and most commercially used technique and known as vortex technique or stir-casting technique. The vortex technique involves. To reduce gravitational segregation in the crucible, the vortex technique is developed to involve the introduction of pre-treated ceramic particles into the vortex of molten aluminium alloy created by the rotating impeller

In case of some molten metal like aluminum, inert gas such as nitrogen and argon can also be used to remove hydrogen; this method involves introducing bubbled inert gas into the liquid aluminum. The hydrogen is drawn to the inert gas bubbles, then carried up through the aluminum and released on the surface. In recent development, the composite is stirred while the molds are filled by pouring the melt through the bottom of the crucible.

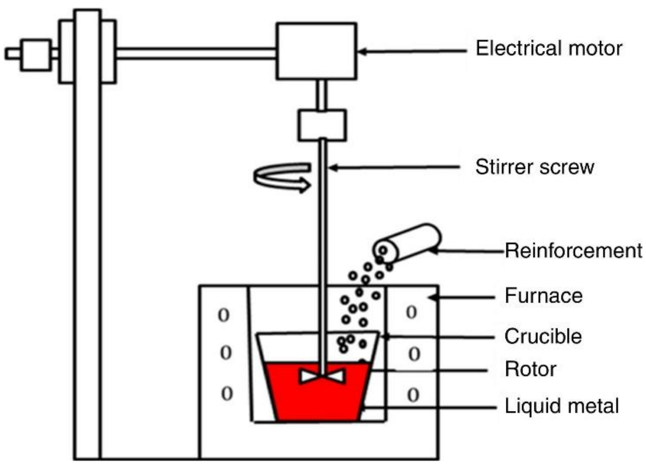

Fig: 5 Stir casting machine

Choose the appropriate method and material are the most important and effective criterion to produce MMCs. In case of MMC's manufacturing via melt stirring technique, increased reinforcement volume ratio (RVR) and decreased particle size resulted more difficult production process and increased porosity and particle agglomeration. This technique is attractive because of simplicity, flexibility and most economical for large sized components to be fabricated.

V CONCLUSIONS

a. From The review Following Conclusions Can be drawn.
b. Mechanical properties were improved after adding Bagasse in aluminum.
c. Density and cast reduces**.**

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