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A REVIEW ON EXPERIMENTAL INVESTIGATION OF MECHANICAL BEHAVIOR OF ALUMINIUM MATRIX COMPOSITE BY EXPERIMENTAL & ANALYTICAL APPROACH

Prof. Dombale. S. N[1], Mr. Zagade. N. S[2], Mr. Vanage. S. P[3], Mr.Nagane. S. N[4], Mr.Anpat A. P[5]
[1]Professor, [2]PG Student, [3,4,5]UG Students,
Department of Mechanical Engineering, S.I.E.T.C. Paniv, Solapur, India.

Abstract: This paper presents a scenario literature review to understand manufacturing a composite material. Aluminium alloy are widely used in aeronautical and automobily industries due to their less density and good mechanical properties. Because of good resistance to rusting ability and wear, less thermal coefficient of expansion as compared to newly available metals and alloys. By using fly ash and alumina reinforced manufactured the aluminium alloy composite samples processed by stir casting. Tensile strength decreases when in composite material maximum amount of reinforcement added. In which Aluminium and SiC, Fly Ash has been used as a matrix and reinforcement material. These compositions are added up to the maximum level and stir casting method is used for the formation of aluminium metal matrix composites.

Keywords: Aluminium, Fly Ash, Stir Casting method. Strength, Toughness, hardness.

I. INTRODUCTION

Composite material is defined is a mixture of two different substances. Composite materials are new generation materials developed to meet the demands of fast growth of technological changes of the industry. Composite materials or composites are engineering materials made from two or more compounds materials that remain seperated on macroscopic level while forming a single component. A composite material is defined as a structural materials manufactured by combining two or more materials having different properties. It consist of two phase's 1.matrix phase and 2.reinforcing phase. The aim of manufacturing metal matrix composites is to achieve the highest possible strength to weight and weight to stiffness ratios in a less cost light material. Particulate reinforced aluminium matrix composites are widely used in its application in the automobile industries because of their less cost. In that with the increase of weight percentage of reinforcement particles. In the aluminium metal matrix, the new material are formed and it has low wear rate against abrasive wearing. Metal matrix composites possess significantly increase properties like high specific strength, specific modulus, damping capacity and good wear resistance. The Metal matrix aluminium composites are predominant in use due to their low weight and high strength.

II. LITERATURE REVIEW

[1]Mr.Sharanabasappa R Patil carried out experimental investigation of the mechanical properties of composite material. Many of common materials also have a less amount of scattered phases in their structures, however they are not considered as composite materials since their properties are same to those of their base compounds. Some properties of composites materials are high stiffness, high tensile strength, low density, high temperature stability. And also in some of the applications electrical and thermal conductivity properties are also taken into consideration, the properties like coefficient of thermal expansion, less resistance to corrode with increases wear resistance. The mechanical properties of fly ash and Alumina reinforced Aluminium alloy composite samples, processed by stir casting. Three sets of composite are used with constant weight fraction of fly ash and different weight percentage are used in this investigation. Improved mechanical properties can be incorporated in metal matrix composites very simple. That is the reason why these MMC materials are getting more attention in recent years. The Aluminium metal matrix compounds material has been prepared by stir casting method in an induction furnace.

[2]Er. Sandeep Kumar Raveshdetermine to develop aluminium based silicon carbide particulate MMCs with an objective to develop a conventional low cost method of producing MMCs and to obtain homogeneous dispersion of ceramic material. To achieve this objective stir casting method are used. Scope for developing metal matrix composites for use in maximum performance application have significantly improved in the recent times. These aluminium alloy matrix composites attract much attention due to their light weight, more conductivity and medium casting temperature. Some types of ceramic materials are used like SiC, Al2O3, MgO and B4C. Some properties of these materials are more hardness, good tensile strength, wear resistance etc.The major advantages of aluminium matrix composites compared to unreinforced materials have more strength, improved stiffness, decreaseddensity, and improved temperature properties, controlled thermal expansion.

[3]MahendraBoopathidetermine the physical properties of Aluminium 2024. The compositions were added up to the ultimate level and stir casting method are used for the fabrication of aluminium metal matrix composites. The mechanical behaviours of metal matrix compounds like density, tensile strength, yield strength, elongation and hardness tests are performing carefully designed. In the presence of silicon carbide and fly ash with aluminium, it is observed to the density of the composites are decreased and

the hardness is increased. Thestudy can be further extended by evaluating the wear and corrosion of the resultant material. It should be also used in high temperature applications such as in automobile engines and in other rotating and reciprocating parts such as piston, drive shafts, brake rotors and in other structural parts have require light weight and high strength materials. In above investigation we define the density of composites material have decreased by increasingthe content of the reinforcement.

[4]K.K.Alanemedetermine thedeveloping of low cost and high performance aluminium matrix hybrid composites with the use of bamboo leaf ash and silicon carbide. In which used two step stir casting method. The bamboo leaf ash and silicon carbide particles are initially preheated separately at a certain temperature to remove moisture and to help improve wet ability with the molten alloy. In which gasfired crucible furnace are used.The stirring operation was performed at a speedof 400 rpm for 10 minutes before casting intoprepared sand moulds inserted with chills.

[5]D.Chandramohancarried outthe aim of involves to designing metal matrix composite materials from combination of the metals and ceramics. The addition of following properties i.e high strength, high modulus refractory particles to a ductile metal matrix produce a material these mechanical properties are intermediate between the matrix alloy and the ceramic reinforcement.Advantages of Aluminium are light weight, highly corrosion resistant, excellent heat and electricity conductor, totally impermeable and odourless. Properties of metal first is tensile strength it dictate how the material will react to forces being applied in tensile force. This test is used to determine the modulus of elasticity, elastic limit, elongation, and reduce in area. Hardness is oppose of a material to deformation. Toughness deforms plastically and to absorb energy in the process before fracture is termed toughness. Wear resistance occurs when two surfaces are contact between each other in motion.Uses stir casting method of fabrication of MMC for metal forming technologies.

[6]Ashok Kr. Mishra determine the tribological behaviour of aluminium alloy Al-6061 reinforced with silicon carbide particles fabricated by stir casting process are investigated. For analysis of the data A L9 Orthogonal array are selected. Find the influence of applied load, sliding speed and sliding distance on wear rate as well as the coefficient of friction at that time wearing process are carried out using ANOVA. Selection of material Al-SiC alloy is chosen as the base matrix, so its properties can be tailored through heat treatment process. Reinforcement average size of 150 to 160 microns, and there are improve the wear properties. Property of SiC have high hardness and more thermal conductivity due to this after accommodation in soft ductile aluminium base matrix, enhance the wear resisting behaviour of the Al – SiCApplied load, sliding speed, and sliding distance.

[7]R. S. Ranacarried out this experimental investigation by using conventional stir casting technique micron and nano-sized ceramic particle reinforced aluminium matrix composites fabricated. By using ultrasonic assisted stir casting process AA 5083 alloy micron and Nano SiC composites have been fabricated. Scanning electron micrographs are applied for showing uniform distribution of Sic particles. For synthesis of AMCs Aluminium alloy 5083 has been selected as matrix alloy.As reinforcement particlesmicron and nano size silicon carbide particles have been used. Atfabrication of aluminium matrix-SiCp composites standard size were machined the pins for wear test from the cast cylindrical samples. Ultrasonic assisted stir casting setup is used. Applied load is important factors influencing the wear rate of the composites. Aluminium matrix micron and nano SiCp composites have been successfully fabricated by using ultrasonic assisted stir casting process. At increasing in sliding distance there is increase in wear rate.

[8]YanamandalaRaghuramChowdarycarried out this experimental investigationto studies the mechanical properties like ultimate tensile strength and young's modulus are formed composites of different weight, % of graphite. The composites were developed by technique of pressure die casting and the specimens. Increase in the percentage reinforcements which results tensile strength and Young's modulus of the hybrid composites increases. But at higher percentages there are no changes at both. At material selection and preparation of composites technique of pressure die casting was used prepare composites and Al-6061.As well as modified pressure die-casting was used for preparingAl6061/SiC & Gr specimens. To fabricate the hybrid composite materials liquid metallurgy techniquewas used. At this method SiC and graphite particles were added into the molten metal. Tensile tests were applied at room temperature using UTM at accordance with ASTM E8-82. It observed that the increase at percentage of SiC s also increased the Young's modulus significantly. Finally it results that an increase at percentage of graphite & SiC in aluminium alloy increases the ultimate tensile strength and young's modulus.

[9]D. Sujandetermineto study of the performance of stir cast Al2O3 SiC reinforced metal matrix composite materials. The results indicates that it improves physical and mechanical properties, such as, less coefficient of thermal expansion, more ultimate tensile strength, good impact strength, and hardness.Production of composite material the stir casting method are used. For Al-Al2O3 composite material, Al356 alloy powders are mixed with Aluminium oxide (Al2O3) particles of uniform size (400 μm) in the weight fraction of 5%, 10%, and 15%. Analytical theoretical results were calculated by using these equation r =rmvm+r pvp, ps =s v +s v, a = a E v +a E v E v + E v. The conversion of Rockwell hardness into Brinell hardness number is obtained by using the standard scale. Tensile strength (σ) =3.45×Brinell Hardness (HB).

III. CONCLUSION

Aluminium alloy matrix composites reinforced with Hybridcan be successfully synthesized by the stir casting method.For synthesizing of hybrid composite by stir casting process, stirrer design and position, stirring speed andtime,

melting and pouring temperature, particle-preheating temperature, particle incorporation rate, mould type and size, and reinforcement particle size and amount are the important process parameters. At the addition of hybrid reinforcement with single reinforcement the hardness, strength, corrosive toughness, and wear resistance of the composite will be increases. Aluminium matrix and nano (1, 2, 3 and 4 wt. %) SiCp composites have been successfully fabricated using ultrasonic assisted stir casting process. At increase in sliding distance wear rate of Al-SiCp composites increases. As the sliding distance increases the wear rate of the composite also increases with sliding distance which gives a direct relation between sliding distance and wear rate.

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