experimental assessment, we can turn up with the following conclusions. Agglomeration and uniform spreading of TiC/Graphite particles in Aluminium Hybrid matrix and Porosities were observed in the microstructures. Adding of TiC and graphite in Al Hybrid matrix improves hardness and tensile strength of composites where compared with various TiC content weight percentage in AHCs

40.The high carbon steel addition effect on the mechanical properties of AA6063 Aluminium alloy has been examined. It was experimental that there was significantdevelopment in the mechanical properties of the alloy with the steel dust addition. The maximum UTS of 167.86 MPa for the as-cast condition was attained for 10wt% high carbon steel addition, compared with the UTS of control sample of 155MPa and the standard UTS of AA6063 aluminium alloy of 160 MPa. The hardness values were also examined to increase with the use of High Carbon steel chips are reinforcement.

41. On the whole, achieving any strengthening in composites is needy on the strength of the matrix/reinforcement interfaces. Weak interfaces can fail before any load transfer happened between matrix and reinforcement and can even decrease the whole strength of the composite. Accordingly strong interfacial bonds are desirable. Researchers in aerospace, marine and defence applications need a material which gives good specific strength and wear resistance. The metal matrix composites obtain good demand for their use in automobile and aerospace applications. They are also important in thermal shock absorption.

42. The Hardness, Impact energy, Tensile strength, Compressive strength of the samples increases with increase in reinforcement weight percentages. The Hardness, Impact energy, Tensile strength, Compressive strength of Sample 4 of 9% (SiC-6%/ZrO23%) reinforcement is identified improvingWhen compared to Sample 1,2,3. The metallurgy of the samples shows that there was homogeneous distribution between the alloy and the reinforcements by increasing the bonding strength of the AHMMC's. The Chemical composition analysis and Elemental analysis reveals good concentration levels in chemical substances in the samples.

43. A356-SiC composites with a reinforcement particle size of 37 µm and changing percentages of reinforcement were produced by the stir casting process. The microstructure and hardness properties were studied.

1. From the microstructural analysis, it was identified that stir casting process with 300 rpm's stirring speed and 15 minutes stirring time was successful in fabricating A356-SiC composites. 2 The composites hardness values increased with increasing of the percentage of reinforcement up toabout 15wt%.

44. This research study provides the information, how the properties changed to the base material withceramic particles reinforcement addition. The outcomes are summarized as follows: SEM microstructures of A6082/SiC/ZrO2 Hybrid Composites have displayed the homogeneousallocation of ceramic particles. But clustering are identified in 1.5 wt. % ZrO2 composite because ofagglomeration effect. The impact strength of Charpy test of the composite materials improved with the adding of 1 wt. % ZrO2 so as tois 60% compared to base alloy.

45.Reinforcing Aluminium matrix material and it is alloys with ceramics particles has shownanconsiderable increase in itsmechanical properties. Adding of alumina, SiC, B4C etc. particles in aluminium increases the hardness, yield strength, tensile strength although ductility is decreased. Addition of graphite in aluminium increases the tensile strength and elastic modulus but hardness is decreased. Also it displays a decrease in friction coefficient in case of tribological behaviour. Organic reinforcements like coconut ash, rice husk ash also enhanced the mechanical properties of the aluminium along with the tribological behaviour of the composite.

46. The following below significant conclusions were attained from this present research. The AA6351-Gr composites were fabricated by the liquid state stir casting technique. Thecomposites hardness and the tensile strength properties reduced with the increase in weight percentage of Gr particulates. The addition of Gr particulates to the AA6351 matrix hassled to reduce the composite mechanical properties and this may be because of low density and brittle in nature ofgraphite particle content. The SEM photographs showed the non homogeneous distribution of the Gr particles inthe matrix alloy.

47. Hybrid LM25- B4C-Gr- Fe3O4 composite has been successfully produced by stir casting technique. The density,porosity, hardness, ultimate tensile strength, optical microstructure and wear were estimated. By means of compared with pure LM 25 aluminium alloy, the density of LM 25 composite and hybrid composite improved. TheLM 25hybrid porositycompositeis fewer compared to LM 25 alloy and LM 25–B 4composite.Hardness value of LM 25–B4C composite is greatassociated to LM 25 alloy and LM 25–B4C–Gr hybridcomposite. Likewise, tensile strength of composite reduced whileassociated to alloy and hybrid composite.

48. An effort has been made to study the behaviour of the aluminum base alloy by adding two alteredceramic stage particles (SiC and MgO).The metal matrix strength like tensile strength, yield strength and young’s modulus improved as the adding of reinforcement particles improved. But the base metal ductility affects by the occurrence of hard reinforcement particles and progressivelydecreased as these particles increased in the metal matrix. The increase in tensile strength (15.33 %), yield strength (26.36 %) and Young’s modulus (33.47 %) was noted by addition 7.5 weight percentage of reinforcement particulate as associated to adding 5 and 2.5 weight percentage of reinforcement particulate.

49. Aluminium MMCs was successfullyproduced using in-situ reaction stir casting processing method by using allowing for various weight percentage (5, 7 and 9) of TiC particles. The composites microstructural characteristics and mechanical properties were estimated. The morphological research study shown the occurrence of TiC with evendispersal throughout the composites nevertheless of the weight fraction. This uniform dispersalforms to fine interfacial bonding between the Aluminium matrix and TiC particles, which improved the mechanical properties of thecomposites.

50. In the present research study, an examination is achieved on the squeeze cast unreinforced aluminum alloy (Al 7075) and hybrid nano composite (Al 7075 reinforced with 0.5 wt% BN and 1 wt% Al2O3 nanoparticles) to analysis the influence of feed rate on the surface roughness, forces produced and tool wear below dry and MQL machining environment. The results of the experimental researchinvestigation are abridged and presented below. 1. 0.5 wt% BN and 1 wt% Al2O3 reinforced squeeze cast aluminium nano composite is identified to have higher Brinell hardness and ultimate tensile strength than unreinforced aluminum alloy.

Challenges and opportunities

Although the aluminium composite material has been demonstrated to be a powerful substitute for conventional materials replacement, there are still some challenges in development and materials research. Researcher's main concern is improving composite properties, which are influenced by processing system, structure, and process parameters. Attaining homogeneous reinforcement distribution in the matrix is a significant challenge with the casting process, which has been proven to be the most advantageous processing route. Composite development began in the early 1970s, but no standardisation in terms of process parameters, composition, and so on has been achieved. Some standardisation institutes must carry out their work in a governed environment, and some standardised rules must be framed in relation to composite fabrication.

Some research must be conducted in order to use some low-cost materials as reinforcement, such as agricultural waste and industrial scrap, which will help to reduce overall composite costs; however, using this type of reinforcement to achieve better desirable composite properties is difficult. Because there are currently very few manufacturers in India working with aluminium sintered components, the majority of manufacturers' only option is casting. Government regulations must be enacted to encourage the development and use of lightweight composites, so that manufacturers pay attention to these materials. If process parameters are properly controlled, composite materials will undoubtedly replace conventional materials in many sectors, particularly automobiles, ushering in a composite revolution. It is light in weight, has a high strength, is more resistant to wear and corrosion, and has greater toughness. Because of the presence of hard reinforcement, it is difficult to machine composite while maintaining a good surface finish and reliability. Graphite reinforcement has superior lubricating properties, and its presence in composite materials improves the machinability of aluminium composite materials.

Conclusion

Insufficient wettability and improper particle size distribution are the major causes of composite material quality in the stir casting technique, and porosity also degrades the composite material's properties. Porosity forms as a result of gas entrapment, and it has been eliminated by injecting particulates with an inert gas through an injection gun. Hardness and yield strength are harmed by porosity. The mechanical property and surface integrity are reduced as the size and quantity of porosity increases. Other important factors that influence porosity include pouring temperature, melt degassing, pouring distance, mould pre-heating temperature, and holding time. Wetness is an issue. This wetting agent weakens the material's wear resistance, corrosion resistance, and mechanical properties; to avoid this wetting agent, add it to the melted matrix material; this will improve wettability between the matrix and reinforcement. The addition of a wetting agent, such as magnesium or potassium fluortitanate (K_2TiF_6), improves the mechanical properties of the composite material. By optimising process parameters in the stir casting method, such as stirring speed, stirring temperature, stirring time, and matrix, wettability parameters can be improved. Wettability has been enhanced by lowering the surface tension of the melted matrix material and increasing the surface energy of the reinforcement particles. Particle distribution is distorted as a result of density differences between the reinforcement and matrix materials. Wettability and density variation are important factors in determining uniform reinforcement distribution in metal matrix composites. Some factors influence particle distribution, including reinforcement particle size, reinforcement amount, matrix material melting temperature, impeller diameter, and solidification rate. Following a review of the literature, it was determined that the stirring temperature, stirring speed, stirring time, impeller diameter, and matrix material melting temperature, impeller position all of these important common factors have an impact on the quality of properties of metal matrix composites, and by using optimised common parameters, porosity, wettability, and particle size distribution have been maximised. By means of using optimized common parameters, the properties of aluminium composite materials have been improved.

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