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Experimental Analysis & Simulation of Tugsten Inert Gas (TIG) Welding on Aluminium Alloy AA6061

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Abstract: *Tungsten inert gas welding process have the joining of two unlike metals.tungsten inert gas welding is one of the best technique used for jooining the ferrous & non ferrous matals in this paper we are study of the mechanical properties of aluminium alloy AA6061 of different welding current,voltage,gas flow rate.the aluminium alloy of tungsten inert gas welding are invested the vickers rockwell hardness test & surface roughness test & behaviour of the material.the output parameters are used by the hardness of the material,ultimate tensile strength,rockwell hardness test.the rockwell hardness test can be tested by the welded surface are check the roughness of the welded surface.*

Keywords: *AA6061, gas flow rate, hardness test, ultimate tensile strength, welding current.*

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I. Introduction

Tungsten inert gas welding is the joining of two similar or dissimilar materials with the use of filler material.in welding is use the non-consumable electrode.in tungsten inert gas welding gas are argon, helium & also mixture or Ar-He is used for the good welding purpose. Gas tungsten Arc Welding (GTAW) welding process is used by the non-consumable electrode & base metal. In TIG welding the use the AA6061 for the use of good fabrication equipment, road tankers, air craft industry & railway transport for the high strength, better weldability & corrosion resistance.

II. Literature Survey

L Naitik. S.Patil, Rahul.B.Patil [1] [2014] :- it was observed that the tungsten inert gas welding used different parameters such as current, voltage, gas flow rate,& welding speed. they are given the output parameter such as tensile test, roughness, tensile strength of welded joints they optimize machining parameters & good welding quality with high productivity.

A K Hussain,A.Lateef,M.Javed,T.Pramesh[2][2010] :- the analyzed by the effect of welding speed of tensile strength of welding joints the welded joints are in V butt joints at bevel angel the AA6061 material are testing by the universal testing machine it was observed by that the welded joints strength is weaker than base metal and they increased HAZ & strength

S.Mayur,K.M.Pavan,L.S.Sachin,A.Chandrasekhar,S.A.Kumar[3][2013] :- the AA5083 having size are 125mm*60mm*3mm of tungsten inert gas welding of filler wire AA5356 the AA5083 are joined by the TIG welding of optimal current. The welding material are tested by the Vickers Rockwell hardness test, ultimate tensile strength, the result was the optimal current gives the good microstructure & mechanical strength of welded joints

I.R.M.Indira,R.N.Marpu[4][2012] :- the mechanical properties of AA6351 by gas tungsten arc welding (GTAW)/tungsten inert gas (TIG) with non-pulsed welding current at two frequencies are different having 3 HZ & 7HZ the size are 300mm*150mm*6mm the welding current are 70-74A AT SPEED 700-760 mm/min the observed that the depth of penetration & filler material are obtained by improves strength & welding ductility

Verma Niahant,Rao.P.S,Vettivel.S.C[5][2017] :- the effect of varies reinforcement material in AA6061 & AA 7075 alloy it was observed that the friction stir casting method for fabrication of metal composition

Kandpal.B.C. singh .H[6][2017] :- they have used stir casting welding technique used in TIG welding at AA6061 having percentage of Al2O3 at 5%,10%,15%,20% it was found that addition of Al2O3 in percentage of weight it can increased the microhardness, tensile, compression strength

Kumar.H.P. Xaviour.M.A[7][2017] :- the AA6061 using the matrix of nanocomposites in aluminum used graphers pf % weight i.e. 0.25,0.5,0.75 are in percentage the ultrasonic liquid processing the graphene dispersion of uniform mixture of power metallurgy the mixture are molded at various temp & found the graphene weight & sintering hotness was done mechanical properties are hardness & density

Pramanik.A[8] [2016]:- they have analyzed the parameters like pressure, distance of sliding & speed of AA6061 steel disc are used for wear machine for wear study the investigation of study it found that the high wear resistance of material matrix

Khalil.H.A,Bhat.I.U,Jawaid.M,Zaidon.A,Hermawan.D,Hadi.Y.S[9][2012]:- the analyzing of bamboo fiber reinforced composites material was used the bamboo fiber material are more stronger than the other fiber of raw material also use in product designing & high quality of products

Rhee.H,Whittington.W.R,Oppedal.A.L,Sherif.A.R,King.R.L,Kim.H.J,LeeC[10][2015]:- the performed aluminum metal composites of micro structure under different process of different material structure & properties they are mixed the composition of AA6061 &AA1050 they verify the percentage of weight it was found that yielded strength of mixture of composite material having percentage of weigh of two matrix & reinforcement alloys

Qua.J,Xu.H,Feng.Z,Fredeck.D.A,Heinrich.H[11][2011] :-they performing composites surface layer on aluminum alloys by used solid surface engineering in method wear resistance & hardness are improved without conductivity & ductility

Anil kumar H.C,Hebbar.H.S,K.S.Ravi Shankar[12][2011]:- they have analyzed he mechanical properties if fly ash &AA6061 are combined they are used by the stir casting welding process the particle size are 5-28,46-52,78-95 um having these composites are used in process it was found that the size of flyash are increased the mechanical properties are decrease

Bharath.V,Nagaral.M,Auradi.V,Kuri.S.A [13][2014]:- composition of metal by AA6061 & ceramic AL2O3used the stir casting welding technique to improve the particles of reinforcement they are heated at room temp 200c these test are used by before & after the addition of reinforcement

Kini.U.A,Sharma.S.S,Jagannath.K,Prabhu.P.R,Shankar.G[14][2015]:- the AA6061 material with reinforcement of material having silicon carbide & aluminum alloy can be used the Aluminum alloy of percentage of weight was 3 to 5 %& silicon carbide is const it was found that the wear of material resistance increased also increased the aluminum alloy

Kalaiselvan.K,Murugon.N,Parameswaran.S[15][2011]:- the AA6061 the material composition of different fabrication of B4C by using stir casting welding process the fabrication of material mechanical properties & microstructure are optimized the mechanical properties can increased the fabrication weight B4C in aluminum properties

Reddy.A.C, & zitoun.E[16][2009] :-the various properties are analyzed by using AA6061,AA6063,AA7072 aluminum alloy it can be observed that the AA6061& AA6063 &AA7072 having decreases the properties of ductility, strength,& ultimate strength the ductile mode was fracture in nature

Shankar.M.G,Jayashree.P.K,Shetty.R,Kini.A,Sharma.S.S[17][2013] :- the effect of Aluminum alloy reinforcement material composition can be studied it was founded that material properties are improved by use of different application the metal manufacturing matrix the liquid metal process are important

L.R.Anil & kulkarni.S.K[18][2014] :- the composition of Aluminum alloy & fly ash having the 9%,12%,&15% of Al2O3 weight fraction is 6% of casting it was found that the composition with 15% fly ash & 6% of Al2O3 are good in fatigue with Aluminum alloy

Kumar.G.V,Rao.P.S,Slvaraj.N,Bhagyashekhar.M.S[19][2013]:- the AA6061 are composition of aluminum silicon with liquid metallurgy having the percentage of weight are 2-6 % it can made by tensile test specimen & various testing equipment's having improved the material hardness it observed when adding the aluminum alloy & silicon increased the tensile strength of material.

III. Conclusion

Co-axial dendrite micro-structure weld deposits are formed towards the fusion line and tensile fracture occur near to fusion line of weld deposit. Weldments tensile strength and yield strength is closer to base metal failure location of weldments occurred at HAZ and from this we said that weldments have better weld joints strength. It was revealed that strength of the weld zones is less than base metal and with reduction of welding speed tensile strength increased.

It was found that the use of SiO2flux improve the joint penetration, but Al2O3 flux depreciate the weld depth and bead width compared with conventional TIG process. Stress was found in pulsed current compared to constant current welding. Tensile and hardness properties of the joints enhance due to formation of finer grains and breaking of dendrites by the use of pulsed current. UTS and YS value of non-pulsed current were more than the parent metal and pulsed current weldments.

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