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A Review on Reducing Cross contamination on M.S. and S.S

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Abstract** — Cross Contamination Defect is Occurred in Generally Metal Joining Process. In this Process Cross Contamination is Occred in Joining of Mild Steel and Stainless Steel. This Defect is occurred by Mixing of mild steel and stainless steel by arc welding process.Stainless steel is used to made of Pressure vessels,but stainless steel is high cost material,so for reducing of cost by metal joining process of ms and ss is necessary. The joining of the materials by welding provides a permanent joint of the components. The objective of this research is used to determine the influence of various welding parameters on the weld bead of AISI 316 welded joint. Stainless steel is a candidate material for the structural material in fusion reactors. Rewelding of irradiated materials will have a large impact on the design and the maintenance of in-vessel components. The rewelding of unitradiated and/or irradiated stainless steel was performed by the tungsten inert gas (TIG) welding method and the weldments of unit-radiated and/or irradiated SS316 were characterized by tensile testing. An attempt is made in the present study to obtain the relationships among process parameters and physical dimensions of AA6063 aluminium alloy coating on IS2062 mild steel obtained through friction surfacing and their impact on strength and ductility of the coating. Factorial experimental design technique was used to investigate and select the parameter combination to achieve a coating with adequate strength and ductility. Spindle speed, axial force and table traverse speed were observed to be the most significant factors on physical dimensions.

Keywords-*TIG Welding, MIG Welding, Hardness testing, Chemical Testing.***

I. INTRODUCTION

Welding is one of the fabrication processes that is used for joining the metals, by causing coalescence which replaces other joining processes like bolting, riveting. A good joint will be obtained through TIG welding and a preferred by most of the manufactures for mechanical assemblies.[2] Generally filler material is used in metal joining processes, even in TIG welding. The acceptance of the welded samples is most important. In order to meet its requirements and standards, non destructive evaluation of these materials is done in various stages to evaluate weld quality.[2] The weld joint inspected found that it does not meet its requirements due to lack of penetration, under cuts, cracks etc. even though necessary precautions were taken during welding process.[2]

Some of the techniques used in non destructive evaluation are Radiography, Ultrasonic tests, Acoustic testing. These tests can be done in a simpler way to find out the defects in the weldment .[2] Mostly these tests are preferably done on the products that are produced using casting process. Now a day's welding is mostly used in fabrication of many components including critical shapes and structures.[2] TIG welding is also known as Gas Tungsten Arc Welding (GTAW) in which an arc is maintained between the base metal and the non consumable tungsten electrode. The heat affected zone, tungsten electrode, molten metal are shielded by a blanket of inert gases fed through GTAW torch protects atmospheric contamination[2]. In TIG welding inert gases like argon, helium are used which acts as shielded gases because they prevent atmospheric contamination of molten weld pool and also they do not react with the base metal. This shielding gas acts as a blanket to the weldment and excludes active properties surrounded in the air. TIG welding results in increase in the weld penetration in the austenitic stainless steel and penetration overcomes as a result of chemical composition. Stainless steel is a candidate material for the structural material in fusion reactors[4]. Rewelding of irradiated materials will have a large impact on the design and the maintenance scheme of in-vessel components.[4] Recently, joining technology with irradiated structural materials has been investigated, using tungsten inert gas (TIG) welding, laser welding and so on. However, helium is one of the most prominent transmutation products generated in stainless steels because of the high cross section for nuclear reactions of high energy neutrons of fusion reactions and because helium is essentially insoluble in metals. The generation of helium is known to degrade the properties of materials.[4] During irradiation of stainless steels, it is thermodynamically favorable for entrapped helium to precipitate as bubbles at relatively low temperatures. The formation of grain boundary (GB) bubbles can ultimately lead to drastic changes in properties, including severe embrittlement at elevated temperature. At high temperature, these bubbles will grow under the influence of stress and temperature. In the present work, weldments of unirradiated and/or irradiated type 316 stainless steel (SS316) were performed by the TIG welding and MIG welding method, and mechanical properties of their weldments were evaluated.[4]

II. LITERATURE REVIEW

U.Savitha et al. [1] Discrete and composition allygrade dual materials basedon SS316 and IN625 alloys were made using LENS™process by layer wise deposition,controlling feed rate so find individual alloy powders.The two-alloy interface regions were characterized with respect to microstructure,elemental distribution,micro- hardness, and tensile properties of the deposits. For discrete as well as grade deposits,change in composition near the interface is gradual.This observation is explained on the basis of dilution by the substrate.
Interface and transition zone structure and properties of the deposits were characterized.EPMA quantitative analyses revealed that the layer composition could be controlled using LENS technique.Though the change over from SS316 to IN625 powder feed is discrete in DI samples,the compositional profile changed from SS316 to IN625 over three deposited layers.These observation explained on the basis of contribution of re- melted substrate layer to the overall composition of the deposited layer.In the case ofCG specimens,non-observation of this effect is attributed to small variation in composition between adjacent layers. The observation of fracture on SS316 side far away from the interface in both discrete deposits (DI) and grade deposits(CG) indicates good interfacial strength between different materials.

P. Bharath, et al. [2] Welding is one of the most popular methods of metal joining processes. The joining of the materials by welding provides a permanent joint of the components. The objective of this research is used to determine the influence of various welding parameters on the weld bead of AISI 316 welded joint. In this research work the ANOVA technique is used to identify the influence of the welding speed, current, electrode, root gap on the strength of the material. The result shows that speed is most influencing factor to have highest bend strength and current that is to be used while welding is the most influencing factor to get
higher tensile strength.
Further it has found that root gaps has some influence on both tensile and bend strengths. Micro structure study shows some inclusions near the heat affected zone due to change in weld material and also change in grain sizes that are developed during welding process.

B. Shashank Dutt, et al. [3] The composition of the welding consumable for the SS 316 L(N) components of prototype fast breeder reactor is adjusted such that the weld deposit contains 3 to 7 % delta ferrite, to balance between resistance to hot cracking during welding, and embrittlement of the weld metal during service. The operating temperature range for these components is 623-823 K, which is the range for the so-called "748 K embrittlement", noticed in cast duplex stainless steel. Therefore, a study was taken up to assess the degradation, if any, in the mechanical properties of this weld due to long term service exposure. Tensile, charpy-impact and fracture (J-R curves) toughness tests were done at ambient temperature, in the as-welded condition and after thermal ageing at 643, 748 and 823 K for durations in the range 1000 to 20000 hours.

A general decrease in resistance to crack initiation (*J0.2*) of SS 316 (N) welds was observed on ageing at 643, 748 and 823 K for 20000 h. Decrease of charpy energy values subjected to ageing at 748 K for 20000 h. Changes in tensile properties was marginal. This decrease in mechanical properties, despite lower specified ferrite content in the weld microstructure, indicates the effect of embrittlement at 643-823 K can be significant after longer durations.
The embrittlement is due to the formation of new phases in δ ferrite regions. A α′ spinodal decomposition is predominant at lower temperatures (643 and 748 K) causing strain inhomogeneities leading to reduction in toughness, while σ phase formation is important at 823 K.

Kunihiko Tsuchiya, et al. [4] Stainless steel is a candidate material for the structural material in fusion reactors. Rewelding of irradiated materials will have a large impact on the design and the maintenance of in-vessel components. In the present work, the welding specimens made of type 316 stainless steel were irradiated in JMTR (Japan materials testing reactor) to a fast neutron fluence of - 2.0 x 10" n/cm* (E > I MeV) at a temperature of - 200°C. The rewelding of unitradiated and/or irradiated stainless steel was performed by the tungsten inert gas (TIG) welding method and the weldments of unit-radiated and/or irradiated SS316 were characterized by tensile testing (test temp.: 20°C and 2OO"C), hardness. metallographical observation and SEM/XMA analyses.

Weldments of unirradiated and/or irradiated type 316 stainless steel were performed by the TIG welding method, and mechanical properties of their weldments were systematically evaluated. Tensile strength and yield strength of weldments of unirradiated/unirradiated and unirradiated/irradiated SS3 I6 were almost similar to that of the unirradiated base materials. Tensile strength and yield strength of weldments of irradiated/irradiated SS316 were smaller than that of the irradiated base materials. The main fracture mode of three kinds of weldments was ductility. The hardness at the parts of weld metal and HAZ was smaller than that of base materials.

B. VIJAYA KUMAR, et al. [5] An attempt is made in the present study to obtain the relationships among process parameters and physical dimensions of AA6063 aluminium alloy coating on IS2062 mild steel obtained through friction surfacing and their impact on strength and ductility of the coating. Factorial experimental design technique was used to investigate and select the parameter combination to achieve a coating with adequate strength and ductility. Spindle speed, axial force and table traverse speed were observed to be the most significant factors on physical dimensions. It was observed that the thickness of the coating decreased as the coating width increased. In addition, the width and thickness of the coatings are higher at low and high torques. At intermediate torque values, when the force is high, the width of the coating is high, and its thickness is thin; and when the force is low, the width and thickness are low.

The influences of process parameters on coating width and thickness in friction surfacing of mild steel with aluminium alloy AA6063 were studied. It has been observed that the physical dimensions of coating were influenced by process parameters. Heat input calculations revealed that the parameter combinations with heat input in the range of 67.1 and 40.82 J/ mm result in better combination of strength and bend ductility. Either higher heat input or low heat input is not favourable. The coefficient of friction for these parameter combinations is the highest (0.3744) Analysis of the mechanical properties by Yates' Order revealed that the increase in axial force leads to improved strength as higher axial force results in lower coating thickness.

Lukman O.Olasunkanmi, et al.[6] The corrosion inhibition potential off our quinoxaline derivatives namely,1-[3-(4-methylphenyl)-5- (quinoxalin-6-yl)-4,5-dihydropyrazol-1-yl]butan-1-one(Me-4-PQPB),1-(3-(4-methoxyphenyl)-5-(quinoxalin-6-yl)-4,5-dihydropyrazol-1-yl)butan-1-one(Mt-4-PQPB),1-[3-(3-methoxyphenyl)-5-(quinox- alin-6-yl)-4,5-dihydropyrazol-1-yl]butan-1-one(Mt-3-PQPB)and1-[3-(2H-1,3-benzodioxol-5-yl)-5- (quinoxalin-6-yl)-4,5-dihydropyrazol-1-yl]butan-1-one(Oxo-1,3-PQPB)was studied for mild steel corrosion in 1MHCl solution using electrochemical,spectroscopic technique sand quantumch mi calcalculations. The results of both potentio dynamic polarization and electrochemical impedance spectroscopic studies revealed that the compound saremixed-type inhibitor sand the order of corrosion inhibition efficiency at100ppmisMe-4-PQPB4Mt-3-PQPB4Oxo-1,3-PQPB4Mt-4-PQPB. Fourier transform infrared(FTIR) and ultraviolet–visible (UV–vis) spectroscopic analyses confirmed the presence of chemical interactions between the inhibitors and mild steel surface.The adsorption of the inhibitor molecules on mild steel surface was found to be both physisorption and chemisorptions but predominantly chemisorptions.
Me-4-PQPB,Mt-4-PQPB,Mt-3-PQPBandOxo-1,3-PQPBinhibit the corrosion of mild steel in1MHCl solution and the inhibition efficiency increases with increase in concentration of the inhibitors.Both polarization and impedance electrochemical techniques showed that the studied compounds are mixed type inhibitors and the order of inhibition efficiency at100ppmisMe-4- PQPB4Mt-3- PQPB4Oxo-1,3 PQPB4Mt-4-PQPB. The inhibitors adsorbspontaneously on mild steel surface and the iradsorption behaviour obeys Langmuir adsorption isotherm.

III. CONCLUSION

Micro structure study shows some inclusions near the heat affected zone due to change in weld material and also change in grain sizes that are developed during welding process. . Tensile strength and yield strength of weldments of irradiated/irradiated SS316 were smaller than that of the irradiated base materials. The main fracture mode of three kinds of weldments was ductility. The hardness at the parts of weld metal and HAZ was smaller than that of base materials.

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