ISSN No:-2456-2165

Surface Enhancement of SS 304L via Polyurethane (PUR) using Airbrush Spray Coating

Waseem Akram [1], Afzal Khan [2]
Department of Mechanical Engineering,
University of Engineering & Technology, Peshawar

Abstract:- Material alteration and the enhancement of its mechanical properties needs a lot of cost and time investment, therefore an alternative which would result in a cost effective, light weight, aesthetically acceptable product with the required capabilities to cope with environmental state is desirable. In order to increment the life of metal segments, the adverse impact of working condition on parts may be diminished by coating. Coating can be applied by various methods such as electroplating, galvanizing, painting, thermal spray coating, cold spray coating and many more. A coating of polymer was applied on stainless steel and morphology and compositional analysis were performed through SEM. polyurethane coating on 304l SS via Airbrush exhibits that polymer coating on 304L SS results smooth and fine.

Keywords:- *Scanning Electron Microscopy (SEM), 304L Stainless Steel, Polyurethane, Coating, Airbrush Spray Gun.*

I. INTRODUCTION

AISI 304L steel are largely utilized in construction, mechanical appliance and in biomaterial, more explicitly, because of its remarkable mechanical properties and biocompatibility. AISI 304L SS is utilized in various fields of engineering for last three decades.

Even though 304L SS has enough amount of Nickle (8.00-12.00%) and Chromium (18.00-20.00%) but is still vulnerable to pitting corrosion, because of its rough surface. Corrosion resistance behavior of 304L SS can be reduced by surface modification technique [2]. Modern technology attracts the researcher to the application and implication of thin or thick film coating [3].

In Coating two different materials bind in order to improve protection against corrosion, wear, environmental effects, biological and thermal effects. Coating are using for wood and metals to improve the materials life and appearance [4].

Wear and tears occur due to high temperature, rough surface, mechanical, thermal stress, corrosive media, in order to protect it from these all effects low budget technique must be applied like thermal spraying. Thermal spraying procedure is simple and sophisticated [5].

Polymer i.e. Polyurethane (PUR) is class of polymers [6, 8], having properties of abrasion resistive, non-conductive, corrosion resistive, impact resistive [9-11], and excellent non-stick properties [12].

II. EXPERIMENTAL PROCEDURE

A. Materials

AISI 304L SS specimens were cut from long sheet through laser cutting in specific dimensions i.e. 10*10*0.5 mm^3. The specimens were cleaned and polished through distilled water and 100-1800 grit sized SiC paper. Further cleaning of specimens were achieved with the help of ultra sonicator.

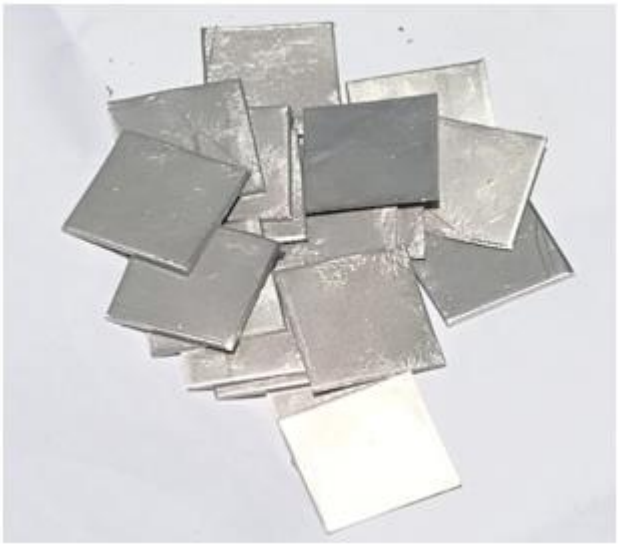

Fig 1:- AISI 304L SS Samples

Fig 2:- Ultra Sonicator

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B. PUR Coating on AISI 304L SS

Airbrush (RX-301) was used for spraying coating of polymer on 304L Stainless steel. The fundamental standard is making a pressure distinction. When spray gun trigger is pressed the fluid mix with compressed air of compressor and release smooth & fine spray on AISI 304L SS specimens.

Fig 3:- Air Brush RX-301 with SS Samples

C. Characterization of PUR coating on AISI 304L SS Specimens

Morphological properties of uncoated and coated specimens were examined using Scanning Electron Microscope (SEM). Coatings thickness was also measured through SEM.

The SEM images shows that uncoated sample surface is rough having holes, scratches and discontinuous grain structure but after coating its surface is fine and smooth no hole and disorders were detected. The white debris shows the existence of dust particle which mix with spray during coating process. The Airbrush flow were smooth and cover the samples roughness in fine mean.

III. RESULTS AND DISCUSSION

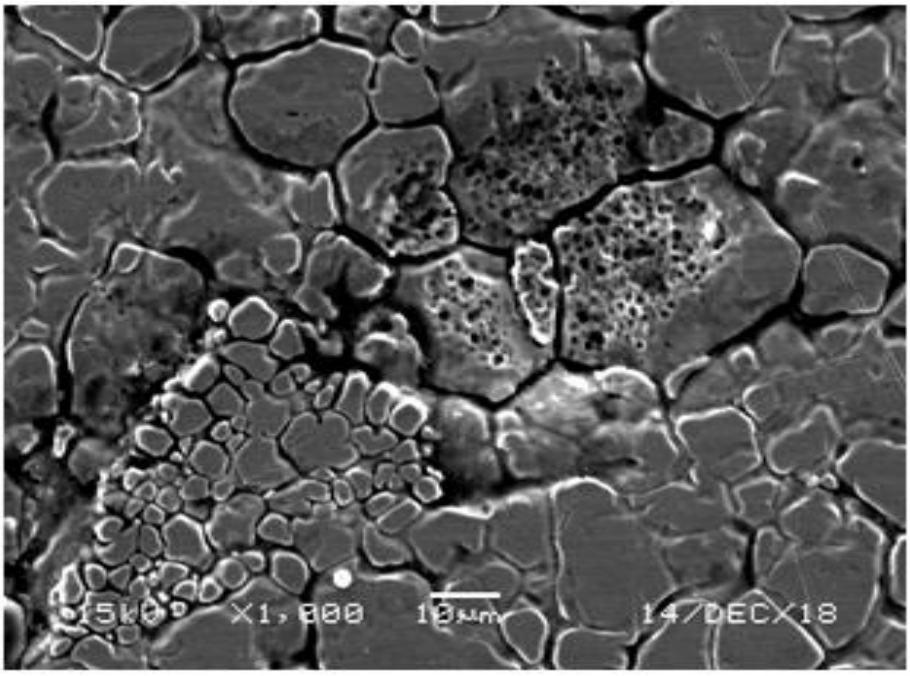

Fig 4:- SEM Micrograph of 304L Uncoated Sample

ISSN No:-2456-2165

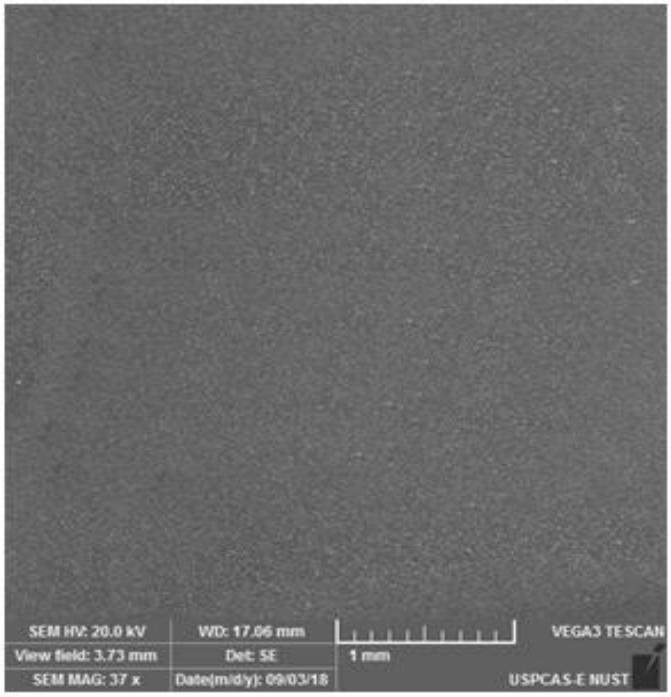

Fig 5:- SEM Micrograph of Polymer Coated Sample

The compositional analysis was also study on SEM by fixing the 304L SS sample in vertical. The SEM image shows that the thickness of coating is 0.32 µm which comes in thin film boundary.

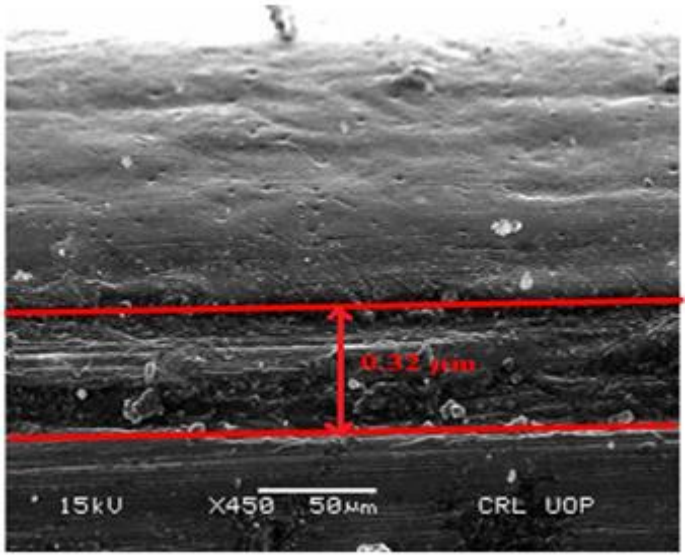

Fig 6:- Cross Sectional of the Coated Region

IV. CONCLUSION

To conclude, many coating and binding techniques are available for various metal segments and machining to reduce natural impact like Corrosion, disintegration and wear. Airbrush spray coating is single cheap and low-cost source to provide thin film coating to enhance the surface protection from environmental as well as from harsh condition. Scanning Electron Microscopy (SEM) confirm that the rough surface of 304L stainless steel were purely enhanced with polyurethane coating. It is possible to mechanize and develop the procedure of Airbrush spray gun to create massive coating by low cost coating technique.

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