



# STUDY OF WEAR CHARACTERISTICS ON CHROMIUM- NICKEL(X5CrNi18- 10) AND MILD STEEL PLATE(S355) BY APPLYING ALUMINIUM OXIDE (AL<sub>2</sub>O<sub>3</sub>) IN PHYSICAL VAPOUR DEPOSITION(THERMAL SPRAYING METHOD)

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## ABSTRACT

The purpose of this investigation was to document and understand the wear characteristics of AISI(304 SS) and MS plate under thermal spraying method. Wear was determined by weight loss, the surfaces were characterized, and electrochemical measurements were also performed. In this process we used for the coating material is "ALUMINIUM OXIDE" (Al<sub>2</sub>O<sub>3</sub>) in both stainless steel and "MILD STEEL PLATE". In this process we have to study about the life time of both stainless steel and mild steel to the comparison of both life time.

## INTRODUCTION

In our project we discuss the following phenomenon. In physical vapour deposition contains many types of coating methods. We have to select "Thermal Spraying" method. Physical vapour deposition is the process in which material goes from a condensed phase to a vapour phase and then back to a thin film. The most common Physical vapour deposition is "Sputtering" and "Thermal spraying". We choose Thermal spraying method. In

micrometers). Coating materials available for thermal spraying include metals, alloys, ceramics, plastics and composites.

In Analyse part we can choose "Scanning Electron Microscope" method analyzing because, SEM is domain effect that occurs when an incident beam of monochromatic SEM interacts with the target material. Polycapillary SEM optics can be used to overcome the drawbacks. In SEM analysis is used to analyse the surface in coated materials. So the result of coating is better than other analyzing method.

In our project we have to find the wear characteristics of the materials of stainless steel and mild steel. Wear is erosion or sideways displacement of materials from "derivative" and original position on a solid surface performed by the action of another surface. Wear characteristics usually applied for the problem has become the apparent in the service. The precise of role physical and mechanical property of metals wear is understood.

We take the material for the project is stainless steel 304 and mild steel plate. In stainless steel 304, contains both chromium and nickel metals as the main non-iron constituents. It is an austenite steel. In mild steel plate, contains iron and



## EXPERIMENTAL PROCEDURE

Type of the stainless steel- X5CrNi18-10. Dimension of the material is (55×5)mm. In fig1. Before coating some pre-process we have done in this material. That is surface removing, turning and drilling these process were be continued by the required dimension of the material.

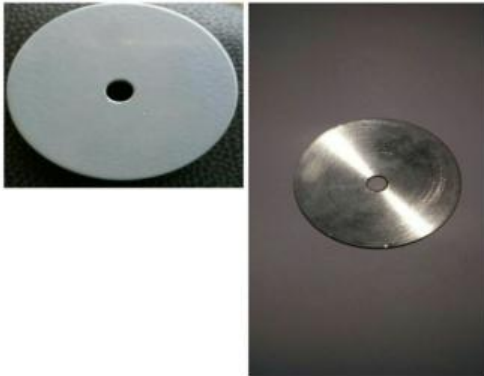


Fig1. Stainless Steel 304 after coating and before coating

Then the material was rinsed in 2 to 3 hours in sulphuric oxide. The material was phosphate into 2 hours in nitric acid. Then the material was ready to coating process. In mild steel disc the required dimensions of (55×2)mm, is take down and the same process are followed the above steps. Then the material is to ready for coating process. [3] proposed a system, this fully automatic vehicle is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to AGV. The speed of rotation of DC motor i.e., velocity of AGV is controlled by the microprocessor controller. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

After the pre-processing we have to process the coating step. In 120°C to mix the  $Al_2O_3$  and the hydrogen gas to spray the material, then the material was heated by 180°C in the oven. The time

material. After the heating the coated material was cooled by environmental air.



Fig2. Mild Steel disc before coating and after coating

We have to choose the analyse process is Scanning Electron Microscope because which is analyse the surface of materials. Then mostly used analyse is SEM. The SEM process is based on the main three components, Electron beam, Magnetic lens and Scanning coils. The steps of the SEM are given below.

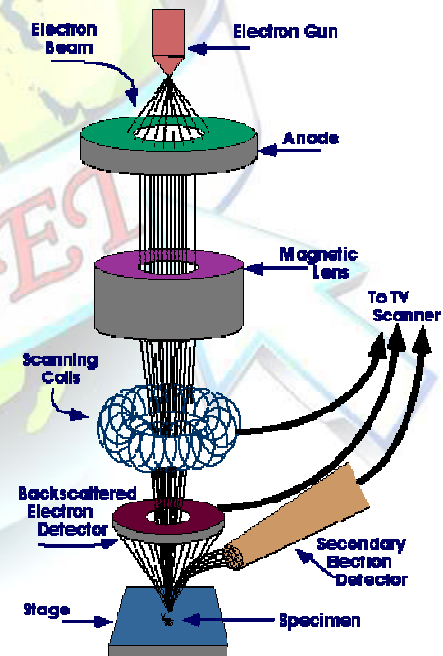


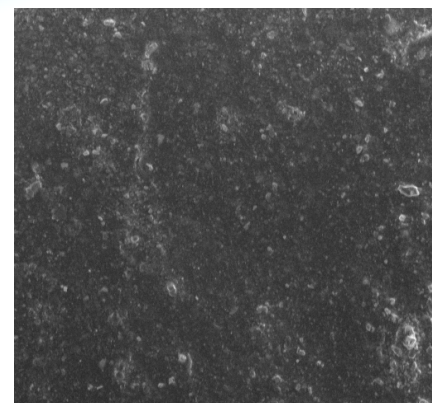
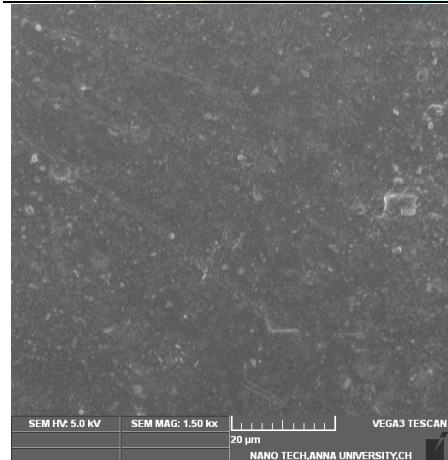
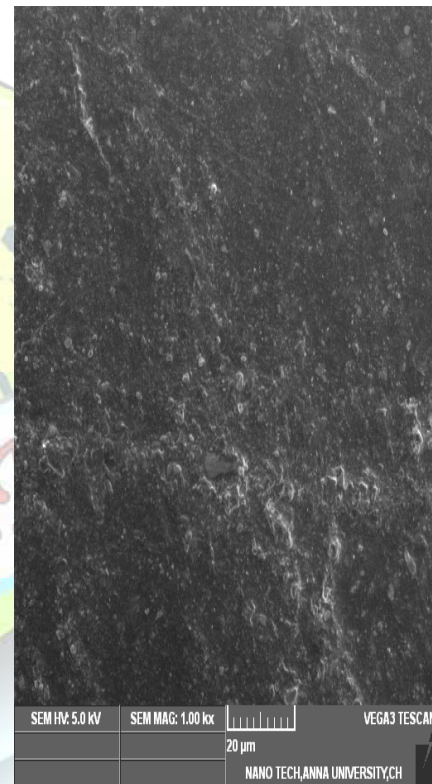
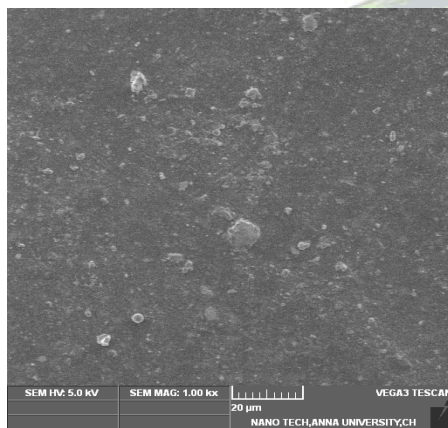
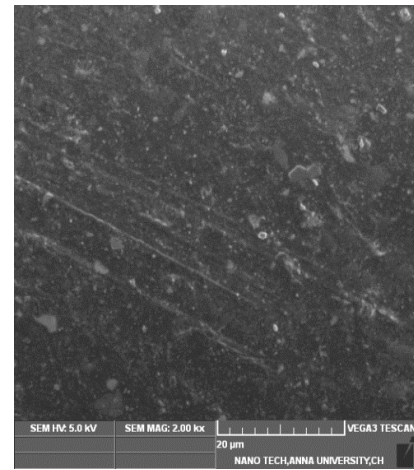
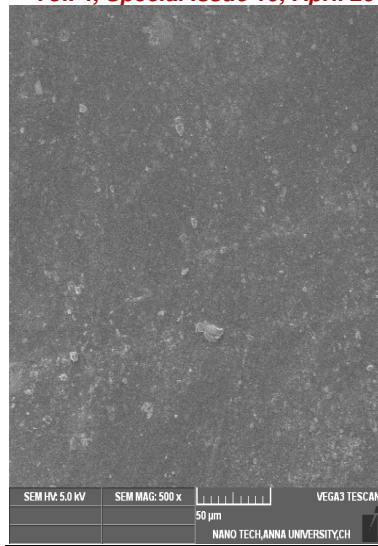
Fig3. Scanning Electron Microscope

The result will be shown after the analysing of the material. It shows that the coating of the mechanical property.

### SEM ANALYSIS IMAGES:

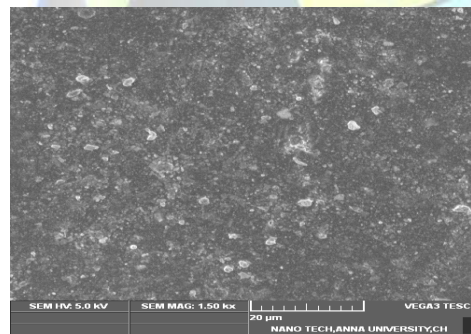
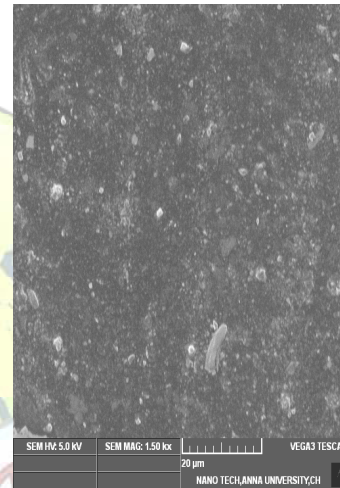
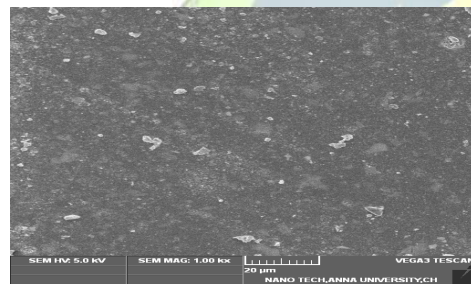
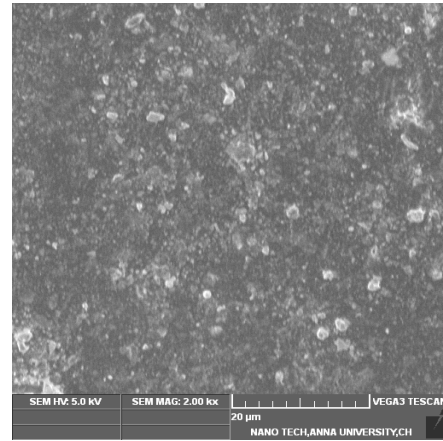
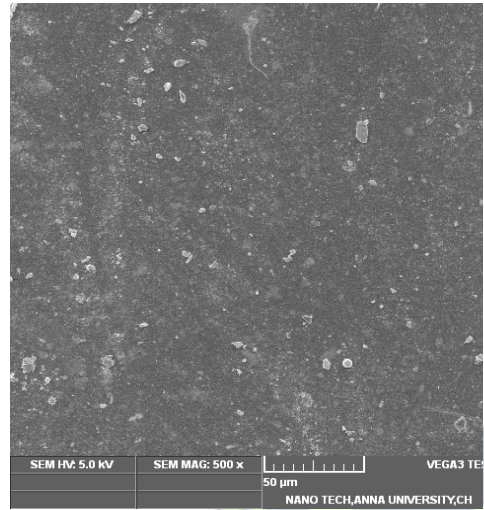
### SEM IMAGES FOR MILD STEEL

DISC:





SEM IMAGES FOR STAINLESS STEEL:

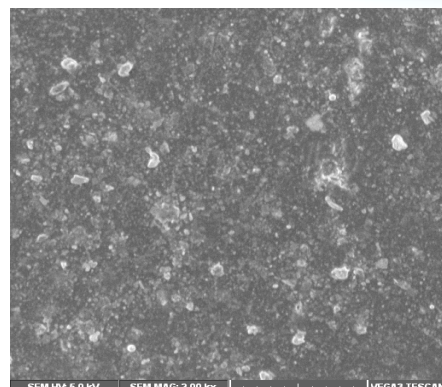


**CONCLUSION**

In this project we use the aluminium oxide as the coating material and the base materials of AISI 304 & MS disc. Aluminium is the best coating material to give some additional wear characteristics on both stainless steel and mild steel.

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