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Engineering

Aluminium oxide(Al2O3) and zirconium(zr) coating was deposited by Physical Vapour deposited on stainless steel. The corrosion study will we carried out by 3. 5% NaCl solution corrosion testing method. The result will be compared with aluminium oxide and zirconium coated sample material and bare material. After this comparison the materials will be show betters performed coated stainless steel then the uncoated stainless steel. Zirconium is nuclear energy applications such as in the cladding (outer layer) of fuel rods through which it is important that neutrons can travel easily. When it is finely divided into a powder, zirconium is a highly ignite the temperature the coating materials. Besides, zirconium is very resistant to corrosion by many common chemical and alkalis and by sea water. It is therefore used for chemical industries, glass manufacturing and ceramic related industries and metrological industries

Aluminium oxide is a chemical formua of Al2O3 . It is one of the compound of Alumina. It is the most commonly occurring of several aluminium oxides, and specifically identified . It occurs polymorphic phase α-Al2O3 naturally called as the mineralcorundum. Al2O3 is use to produce aluminium metal, as high hardness resistance and has high melting point. Al2O3 is an electrical insulator. The high thermal conductivity (30 Wm−1K−1) for a ceramic material in a Aluminium oxide is insoluble in water. It is hardness makes it suitable for use as an abrasive and as a component in cutting tools. Ceramic materials has the Zirconium oxide. ZrO2has the higher temparature adopts a monoclinic crystal structure tetragonal and cubic at higher temperatures at room temperature resistance.

Stainless steels is chromiumcontains 10-20% chromium as the high corrosion resistance main alloying material has 12% chromium steel is compare to 200% more corrosion resistance in mild steel.

Aluminium oxide coating procedure

Stainless steel are machined in required dimension (75mm*13mm). the machine material are oil cleaned in sulphuric acid (2-3)hrs. Then stainless steel are rinsed (distilled water) wash (2-3)times. Which means to adding the ionic layer for the wear resistance of the materials. Then the material stainless steel are rinsed at two times. Then material are coated in aluminium oxide by power coating. After the coating materials heated at 1000c in the over 5-8 hrs. then the heated material are cooled by atmospheric air. The coating thickness is 40 microns.

Stainless steel are machined in required dimension (15mm*10mm).(15mm diameter). The substrate heater feed through Quarts crystal sensor feed through. Substrate drive speed 2-15 rpm. Substrate heater 35 0c maximum. Operating pressure below 5*10-4. beam deflection 270 deg . In physical vapour deposition(PVD). The coating material zirconium oxide (ZrO2) on coated Stainlesssteel. The coating thickness is 2 micron.

Salt fog method

The classical salt spray test stainless steel (316L) after the atomising temperature between 33. 8-33. 50C. The salt solution is contain at 6. 3% (in wt) of NaCl. The exposure zone salt spray champers is maintained at 35 0C. The PH of salt solution such that when atomized of 350C the collected solution will be in PH range 6. 9. The test continuous for the entire test

period. The test period of exposed in mutually agreed upon between the purchase and seller it can reaches 24hrs.

Material test procedure short description main impact

Stainless steel ASTM B117-16(Salt spray test) Salt mist, condense water, stand climate.

Hardness test

Testing Machine: Micro Vickers hardness testing machine.

Based on the non contact type surface hardness measurement on the coated specimen, the granularity of the coated surface indicates that the aluminium compound got deposited on the substrate surface. it possesses higher surface hardness value (HV= 17, 18, 16) on coated specimen zirconium compared with hardness value(HV= 20, 19, 20), the surface of coated specimen reveals that the presence of coarse particle in the coating raises its rough value. chao-minwang et al (2007) also stated in their research paper that the coated particle size slightly increase the surface hardness.

Result and discussion aluminium oxide (al2o3)

The salt spray method is conducted in aluminium oxide coating after 12 hours the materials shown in no corrosion condition. And further 12 hours also conducted in same result. So aluminium oxide is better corrosion resistance.

Material test procedure short description main impact

Stainless steel ASTM B117-16(Salt spray test) Salt mist, condense water, stand climate.

Corrosion not formed

Stainless steel (Uncoated) ASTM B117-16(Salt spray test) Salt mist, condense water, stand climate.

Corrosion formed

Zirconium oxide (zro2)

The salt spray method is conducted in Zirconium oxide coating after 12 hours the materials shown in no corrosion condition. And further 12 hours also conducted in same result. So Zirconium oxide is better corrosion resistance.

Material test procedure short description main impact

Stainless steel ASTM B117-16(Salt spray test) Salt mist, condense water, stand climate.

Corrosion not formed

Stainless steel (Uncoated) ASTM B117-16(Salt spray test) Salt mist, condense water, stand climate. Corrosion formed

In this research study an attempt was made to measure the corrosion characteristic aluminium oxide and zirconium oxide of coating with stainless steel . The comparison of aluminium oxide and zirconium oxide coating with stainless steel uncoated stainless steel corrosion test done. Aluminium oxide coating under distilled water provide better corrosion resistance compared with zirconium oxide coating. Zirconium oxide coating under distilled water provide slightly reduced corrosion resistance compared with zirconium oxide coating. Combination of aluminium oxide and zirconium oxide coating the

aluminium oxide is the better corrosion resistance provide so the aluminium oxide coating is will be used ship and thermal power station. The zirconium oxide is better corrosion resistance in carbon steel compared to the stainless steel but zirconium oxide value is higher than aluminium oxide so only default zirconium oxide.