TCR Advanced Engineering P. Ltd

Experts in Metallography, Failure Investigation and RLA

Metallurgy for Industries

Power | Petrochemical | Fertilizer | Chemical | Refinery | Engineering | Automobile

A Monthly News Letter | November, 2015 | **Volume 35**

Metallic coatings

An insight.

Overview of plating:

Metallic plating is an application of metal over another material. It imparts number of desirable physical, chemical and appearance qualities on manufactured parts. Nearly all manufactured and fabricated products made out of metals will possess some surface finish. Metallic coating increases sturdiness, prevents corrosion, improves hardness, wear resistance or offers an attractive finish to an object.

The wide range of metallic coated steels is an integral part of our daily usage; they are used to protect, shelter, package and transport and at the same time meets the demand for a solid, durable and aesthetically pleasing material. Continuous metallic coated steel has a remarkable growth and continues to be used increasingly in variety of new fields because of its outstanding economic, technological and environmental advantages. Metallic coated steel is certainly demand cul-de-sac to conform present and future environmental regulations.

Types of Plating

Metallic plating is carried out by various methods. Each method has its own advantages and limitations. Some of the most common coating methods are highlighted here.

Electroplating

Electroplating is used to change the surface properties of a metal part by adding a metal coating through electrochemical process. The parts are dipped in a solution bath and applied an electric current to deposit the desired metal on surface. It is also called "electro deposition". Electro plating technique is used for coating several metals such as Zinc, Copper, Nickel, Chrome, Silver, Gold, Bronze, Tin etc.

Electroplated Bolts

TCR News

- Industrial visit to TCR Advanced Engineering Pvt. Ltd. was arranged for students of Dr. S. S. Gandhy College of Engineering, Surat. 40 students of final year metallurgy have gained understanding of mechanical, metallurgical as well as non-destructive testing.

- TCR Advanced completed FFS assignment at Chambal fertilizers on Heater Tubes and allowed the tubes with increased diameter for further operation by restricting operating parameters.
- Demonstration and awareness session of Non-destructive testing techniques was organized for students of Metallurgy and Materials Engineering, M S University at TCR.

EVOLVE by TCR

- Conducted training courses on Metallography for Engineers and Boiler Tube Failures Interface between Operation & Maintenance.
- Procured new portable and light weight Helium Leak Detector ASM 310 to array of NDT testing facilities.

Electroless Plating

As indicated by its name it is a plating process is done entirely by chemical reaction; no external source of electric current is required. The cleaned parts are dipped in a bath containing solution for a predetermined period. This technique is most commonly employed for Nickel plating.

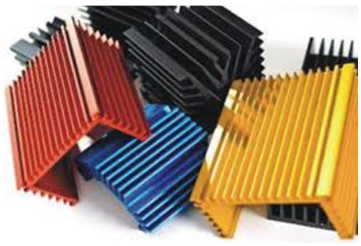
Anodizing

Anodizing process creates a coating both on the surface and into the metal; it is usually performed on aluminium for protection and cosmetic purposes.

PVD/CVD

The Physical vapor deposition (PVD) method deposits the coating over the entire object all over rather than in localized areas. The PVD process directs concentrated, high energy plasma onto a metal surface. The thickness of the coating is approximately 2 to 4 microns for improved corrosion resistance.

Chemical vapor deposition (CVD) is a subset of PVD. It occurs in vacuum chamber filled with reacting chemical vapor heated around 900 ^{O}C.



Anodized aluminum

PVD Plasma nitride samples

Hot Dipping

Hot dipping is a process in which a component is immersed in a molten bath of another metal that has to be coated. But the condition is that the melting point of first metal should be higher than the melting point to be plated.

Coating Evaluation

There are several techniques available for evaluating metallic coatings. The selection of method depends upon intended use of the coated part. Following are some of the techniques used for characterize metallic coatings performance.

Coating Thickness Measurement

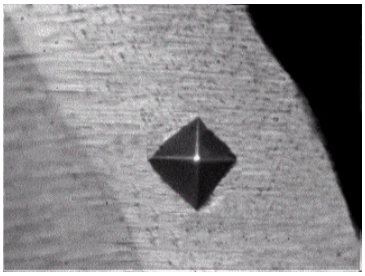
Coatings applied to base materials impart properties like corrosion and wear resistance, conductivity, color and solderability that are not inherent in the base. The amount of coating applied to a material (the coating thickness), is crucial to the product's final use with cost implications. The most commonly used methods for coating thickness measurement are listed below.

Destructive Test- Optical Microscopy

Non Destructive Test -Magnetic Induction, Eddy current, X-Ray Fluorescence and beta Backscatter

Micro Hardness test

Measurement of Vickers and Knoop micro-hardness at 10 gm to 100 gms load provide clues about wear resistance and strength of coating. It is generally performed for hard chrome, Electroless nickel plating and other coatings meant for wear resistance.



Vickers Micro-hardness indentation

Mass of Coating

It is an alternate method of specifying required coating thickness. It is carried out by weight loss method and gives information about mass of coating per unit surface area.

Adhesion Test

There are several test procedures to evaluate the adhesion property of the metallic coating. The following is an exhaustive list of test procedures. Bend test, peel test, thermal shock and impact tests are the most commonly performed.

- Bend Test
- Scribe Test
- Draw Test
- Peel Test
- Push Test
- Heat & Quench Test (Thermal Shock)
- Chisel/Knife Test
- Grind & Saw Test
- Burnish Test
- Impact Test

Salt spray test

Salt spray test is mostly used for evaluation of corrosion resistance of coatings. It is an accelerated corrosion test that produces a corrosive attack to the coated samples in order to predict its suitability for coating as a protective finish.

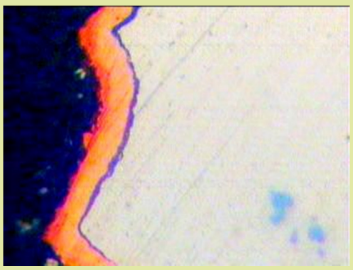
Salt spray test can be used to evaluate the quality of galvanizing, Phosphating, anodizing, metallic plating, paint and other decorative coatings. This test is widely used in the industrial segments such as automotive, paints, electroplating, galvanizing, corrosion prevention, aircraft, shipping etc. for the evaluation of corrosion resistance of finished parts. Other variations of this test are acetic acid solution (ASS test) and acetic acid with copper chloride (CASS test). The test duration of salt spray testing can be as short as 4 hours and it can prolong up to 2000 hours.

Copper Sulphate Test

This method is used to check the uniformity of coating and identifying the pinholes or porosity in coating.

TCR advanced offers an array of coating testing facilities for evaluation and characterization of metallic and non metallic coatings.

Microstructure of the Month



Magnification: *1200X*
MOC: Copper plating on Aluminium
Component: Cylindrical contact drum
Observation: The optical micrograph in as polished condition reveals dark oxide layer between base material and copper coating indicating improper adhesion.
Useful Hint: inadequate cleaning of component before the plating process can lead to poor adhesion in metallic coatings.

* * *

For Further details Contact us at testing@tcradvnaced.com , Ph: +91-7574805595