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Surface Coating: A Review

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ABSTRACT: The main method of control of corrosion is protective coating. These are used in the long term in a wide array of corrosive environments, ranging from exposure to frost immersion in a highly corrosive solution. Protective approach offers little to no structural strength, but provides sufficient material so that a structure can preserve its support and integrity. Extremely thin WO3/TiO2bilayerthin films with varying amounts of WO3materials were deposited on the glass surface, with the aid of RF reactive magnetron sputtering to increase the photocatalytic activity of titanium-based hydrophilic conversion. Increasing thickness of the AFM pictures show changes in surface morphology. XPS core level and value band spectra show a narrowing of the band gap with the increase in atomic concentration in the two-layer structure. The calculation of the contact angle ratio was used for both hydrophilic transformation and photocatalytic operation of the surface. Lastly, the monitoring of the changes in contact angles caused by the breakdown of additional oleic acid overlay as an effect of UV light radiation was involved. The safety coating purpose is to avoid the interaction of reactive underlying substrates to highly corrosive industrial chemicals, liquid, solids or gases. The fact that the layers are typically a relatively thin film separating the two reactive materials shows that the coating and the idea of a corrosion free structure are of vital importance. The coating must be a completely continuous film to fulfill its function according to this concept. Any imperfection becomes a subject of corrosion and structural failure.

KEYWORDS*:* corrosion, protective approach, AFM, hydrophilic, UV light radiation

I. INTRODUCTION

Applied on the surface and cured, or dried, any mixture of film-forming materials plus pigments, solvents and other additives, which gives a functional, often decorative thin film as displayed in fig 1. Surface coatings include paints, drying oils and coats, synthetic clear coatings and other products, primarily aimed at protecting an object's area against environment. The majority of surface coatings that are used by industry and consumers based on synthetic polymers—that is, industrial substances composed of extremely large, often connected molecules, which, when applied to surfaces, form strong, durable and sticky films. The other surface coating products are pigments that provide color, clarity, gloss and other characteristics; liquid or carrying agents that provide a liquid medium for adding film-forming ingredients; and additives that have a number of special characteristics. [1]

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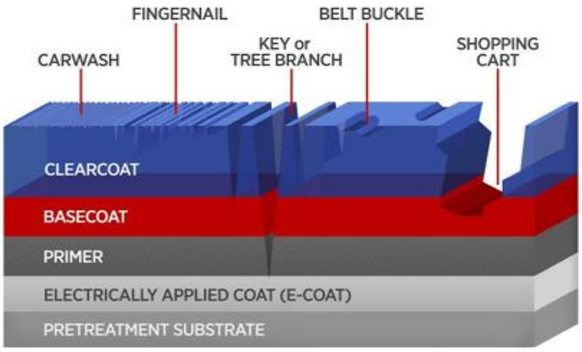

Fig.1: Different Layers of Composite Material

This paper examines the structure and film-forming properties, beginning with polymer ingredients, of polymer based surface coatings. The reader is advised to begin with the paper on industrial polymers, chemistry, for a greater understanding of polymer compounds, which form the basis of surface-coatings. See Industrial Polymers: Outline of coverage for an overview of the role of surface coverings in the broader industrial polymer sector. Two-phase composites of pigment particles and other additives, distributed in a continuous polymer matrix, may be called polymer-based surface coatings. Polymers provide the coating film with its ability, chemical resistance and versatility to bind to the substrate. Furthermore, the stability of the film is highly dependent on polymers and on its longevity in the presence of environmental stress, gloss properties, the majority of its mechanical and thermal properties and most of its chemical reactivity. [2]

The introduction of flexible cellulose products as a functional membrane, supporting component or paper in medicinal, electronic and packaging applications, such as micro fibrillated cellulose or cellulose nanofibers attracts considerable attention. For the nature of the-OH Group on cellulose surfaces it is essential for the mechanical durability or anti degradability of these cellulose materials to be able to easily absorb moisture or contact directly with water during delivery, storage and application. In addition, additional functional properties such as good antibacterial activity for cellulose material preparation are also generally preferred. [3]

II. COATING PROPERTIES

Some basic properties must be used in corrosion-resistant coatings. These may vary greatly depending on the particular use of the coating, but all coating materials have several basic characteristics. Molecular weight, molecular weight distribution, glass transition temperature (Tg) and solubility are the main characteristics of the polymer covering. Reactive molecular groups consisting of the polymer and the kinetic and mechanism by which the polymer is formed are also important –that is, whether it is formed by steadily increasing polymerization or polymerization with chain growth. (In the article Industrial Polymers, Chemistry of these deluxe polymerization reactions are described in detail). The structure of the polymer is another key attribute. Polymer may have linear or branch structures of the industrial polymers or network architecture. The latter type of structure, composed of polymer chains that are bonded. [4]

Water Resistance: Water resistance may be the main characteristic of the coating since all coats come into contact with humidity. The basic solvent is water. Water. In even normal basic water conditions both iron and steel oxidize. Under all water conditions, no one coating can be effective. These mechanical problems are only exacerbated by the various types of water. Swamp water, which may be pure enough to drink, is ordinarily acidic and will corrode both steel and concrete. Sulfide water, which is prevalent in many areas, reacts readily with metals. The rapid formation of anode-cathode areas on steel causes high conductivity of water and seawater, leading to extreme pitting. [5]

Calcium is absorbed easily by pure water from the snowfields, leaving the total exposed. High oxygen content water will also create corrosion areas of anode cathode form. The problem is therefore extremely complex since there is no universal response for a single type of material. For a high-performance corrosion-resistant fabric, it must not only withstand constant water or seawater immersion but also without blistering, cracking, softening, swelling or lack of adhesion. The water must also be very water-resistant. The coating properties are shown in fig 2.

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Fig.2: Coating Properties of Composite Materials

Chemical Resistance: Chemical defense is a capability to withstand the deterioration of the chemical products, and in specific of the resins from which it is formulated. Resilience to chemicals relies on both the composition of the layer and on the resins of the sheet. A layer regarded chemical-resistant and used to resist rust in a chemical environment should usually be impervious to salts, acids and alkalis with a rather broad range of pH. It should also be natural, for instance, substances found in nearly all industries, as diesel oil, gasoline, lube oil & exotic alloys are impervious. Naturally, alkaline resistance is critical in a first. Since the formation of strong alkalis on the cathode is one of the chemical reactions in the corrosion phase, any primers which are not highly resistant to alkaline will usually fail in this region, which results in the coating being undercut and corrosion being spread underneath the sheet. [6]

III. TYPE OF COATING

Metallic coating can be applies to the mechanical, micro-electronics, and thermal performance of a material by means of many different methods. The procedure used depends in large part on the application of materials and the appropriate surface treatment material coating or depth. Although a vast topic with many advanced methods is the subject of metallic and non-metallic coating processing, there are a few basic principles and techniques that can be understood to be the key to a wider understanding of the surface layer processes. The two most popular families of surface coating techniques may be classified either as plating processes or as steam deposition processes at the risk of over-generalization. There are, however, more variations between these two similarities; specific examples for each method are given and profiled below. [7]

Hot-Dipping: Typically, this procedure is a permanent or batch immersion process where the base metal (typically steel) is fully immersed into a molten zinc bath. Thanks to the steam bands that form at high bonding temperatures between metal base and zinc, the hot-dipped zinc coatings provide a seamless cover. This technique is popular in applications where the corrosion of the base steel requires a high degree of atmosphere safety. While the galvanic hot dip process is most widely used in steel alloys, improvements can also be made when coating other metals such as aluminum. Types of coating are displayed in fig 3.

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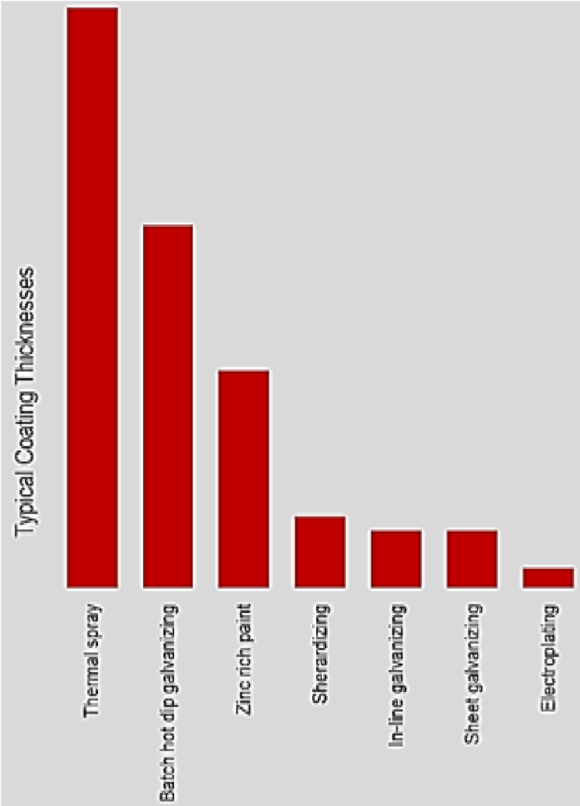

Fig.3: Types of Coating Process

Electroplating:

It is an electro-chemical process in which metallic ions are positioned via a cathodic polarization reaction on the surface of the bulk material. Chromium is an electrically plating metal that is commonly seen in a wide variety of "chrome-plated" automotive parts to improve wears resistance to or simply decorative finish to the steel. Thicker chromium coated coatings offer excellent resistance to abrasion and wear. [8]

Cladding:

The method basically consists of connecting two different metals by mechanical means like rolling or extruder together the materials in high temperatures, resulting in a pressure-softened joint between two different metal alloys. The "composite" material preserves the advantages of both the necessary content.

Physical Vapor Deposition (PVD):

It is a type of processes in the physical process of the material surface coating, which involves moving particles across physical phase boundaries (gas to solids), through the condensation of the vapor-coating of the alloy. Simply put, the surface alloy is first drawn into vapor and then sprayed to (usually in the vacuum) the surface of the base metal. There are other PVD combinations and subsets, but behind the definition is the basic operating principle. PVD is widely used for using thin titanium nitride (TiN) coatings to harden the metal cutting tools and improve the tool's wear resistance greatly. [9]

Chemical Vapor Deposition (CVD):

Contrary to PVD in CVD the actual chemical reaction between a gaseous mixture and the bulk surface of the material requires a significant coating for the surface of the base material to allow chemical decomposition of certain gas components. CVD is used in a broad range of industry applications, for example in the repositioning of refractory material(s) on turbine blades, so as to increase the wear resistance and the thermal shock resistance of blades considerably. There are further forms of polymer coating methods that can be used to enhance structural, thermal and/or electrical properties of one substance such as diffusion, ion application, or coating techniques for conversion, but

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these methods are not necessarily material coating processes where various bulk materials are overlaid. This brief review of material coating technology will also provide design engineers with an understanding of the processes behind surface coating so that both desired coating and coating processes for each desired application can be better defined. [7], [10]

IV. CONCLUSION

The types of curing mechanism of the coating and the proper curing should be well known. Before it is top coated and before it is put into service, the coatings applied must be fully cured. If the coating is top-coated before the primary or intermediate has properly cured, premature failure occurs. If the surface is top coated, the uncured coating will blister with encased solvents. This can cause the coating film to be removed. Most coatings have the longest recovery times, like carbon tar and epoxy's. However, if the layer cures for top layer over the required time, the topcoat will not be tied correctly. Coatings that cure by oxidation or air drying depend on oxygen, after the solvent is evaporated, to enter the film. The film thickness is restricted, and this type of coating can be used to achieve it. Alkyds are examples of the cure by this type of coating. The solvent will evaporate from the surface, the oxygen will cure the top layer of the coating film and the solvent will find it difficult to evaporate from the lower layers of the coating. Simultaneously, the oxygen penetrates the rest of the film and the coating does not cure properly.

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