International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 06 | Jun 2022 www.irjet.net p-ISSN: 2395-0072

A REVIEW OF STUDY ON CORROSION BEHAVIOUR OF ZINC COATED MILD STEEL

Mahee Husain Ismail[1], Alfaz[2], Sujith[3], Shamanth Shetty[4], Dr. Mohan Kumar[5], Girish L V[6]

[1,2,3,4.] Under Graduate Students, Department of Mechanical Engineering, MITE
[5] Associate Professor, Department of Mechanical Engineering, MITE, Karnataka, India
[6]Head Operations, Entec Engineering Corp, Bangalore, Karnataka, India

---

Abstract - *Steel is one in all the biggest and oldest materials utilized in all engineering application. Steel is employed in construction, industries, in plant etc. The aim of providing steel in appropriate form is to strength the actual member. Researchers within the area of zinc coatings on steel are rather unending due to the unique properties and therefore the very low cost that it offers. Coatings, either soft or hard, are commonly accustomed protect steel against corrosion for extended service life. With coatings, assessing the corrosion behaviour and standing of the substrate is challenging without destructive analysis. Zinc, a crucial nonferrous metal, is that the fourth most used metal within the world. It's the fourth most used metal within the world. Its innumerable uses in industrial also as in other segments. The first utility of zinc is in galvanization and as an anode within the battery. Steel coated with zinc, which is understood as galvanized steel, is widely utilized in industries. While zinc protects many metals from undergoing corrosion, by itself, it undergoes corrosion in several acids, alkaline, and neutral environments.*

Key Words: **Corrosion, Hot dipping, Mild steel, thin film application, galvanized steel.**

1. INTRODUCTION

The corrosion is that the unavoidable destruction of metals likewise as alloys due to their interaction with surroundings. Proper selection of alloys will be employed as a method for curbing severe corrosion. One in all the foremost weaknesses of steel is its corrosion and wear behaviours. Zinc is usually used for coatings and other materials, predominantly steel. Zinc will undergo severe corrosion at pH not up to 6 and above 12. Since corrosion needs the presence of both water and oxygen, coatings which isolate the metal substrate from environments is an efficient approach to safeguard steel against corrosion. Supported the hardness, coatings may well be categorized as soft coating or hard coating. It's been recognized that zinc is appreciably inhibit the corrosion of steels in aqueous chloride solutions. Corrosion of steel is inventible in both production and standard of living. However, although the steel alloys have increased carbon content which increases its hardness, it causes a discount in its ductility. Thanks to its relatively cheap price and economic usage, Zinc has been generally accepted and used as an electrodeposited metal for safeguarding various steel from corrosion. However, Zinc possesses limited resistance to corrosion. In recent years, various resources are put into trying to boost the corrosion stability of pure zinc coatings by making it alloys with more noble metals. The mechanical properties of the coatings will be studied.

2. LITERATURE REVIEW

M.S. Noor Idoraa et.al [1] conducted a study on weight loss technique and polarization method for coating Zinc on mild steel with different coating thickness to identify the corrosion of mild steel. They have found zinc has good corrosion resistance for mild steel for different coating in different environment. The study revealed that as the coating thickness decreases corrosion rate of mild steel increased. It was observed that in the long term corrosion performance of zinc coated mild steel depends on initial coat thickness. The study was carried out under two different marine environments, viz., salt spray and sea water immersion. From the results obtained it was concluded that salt spray shows higher corrosion rate for zinc coated mild steel.

Ojo Sunday Isaac Fayomi et.al [2] explored that the appearances of Mild steel degradations are often traced to the varying conditions and changes in fluid compositions, changes in operating conditions of the pressures and temperatures, the underlying or contact materials with working metals, and other atmospheric conditions. The degree of corrosion reactivity would depend upon the sensitivity of a selected metal or alloy to a selected medium or environment and mild fall within this space. This study has attempted to critically observe the challenges of steel in industrial operation.

According to Abioye O. P. et.al [3] it can be understand that materials degradation and component failure continue to be major challenges worldwide. Engineering materials that are expected to function in life-threatening environments is one of the biggest challenges engineers face today. Experts in materials and corrosion are responsible for the conflicting choice of a suitable material for a specific application and its protection from

environmental hazards. Therefore, the electrodeposited zinc coating technique has been employed to provide solutions to mild steel surface degradation in marine environments. A coat structure and the weight gain of the deposited particles determine how hard, corrosion-resistant, and wear-resistant mild steel is after electro-deposition. A variety of factors can influence the morphology of deposited Zn (uniformity, grain size, porosity, stresses built up on the coating). Enhancing corrosion properties and adhesion becomes possible with this approach.

Asmae El Fazazi et.al [4] zinc coating done by electro-deposition technique from free additives bath on mild steel the effect of current density on the deposition potential, thickness of deposited, deposition rate, and current efficiency was investigated and also composition and morphology of elaborate deposits. The outcome can be summarized. The reduction of zinc is slow reaction which becomes difficult with increased scan rate because of HER, and associated charge transfer as well as mass transfer. Increased zinc concentration leads to improved zinc deposition efficiency. Further increase in current density leads to shift of ED towards negative valve and intense hydrogen evaluation. The thickness increases as current density increases as current efficiency decreases.

The change in morphology zinc deposit was due to increase in current density. The EDX analyses the presence of zinc and oxygen. The Zinc electro-deposition is achieved using 0.4 M $ZnSO_4$, 0.4 MH_3BO_3, 1.25 M KCL and applying current density of 16 MA cm^{-2} for 20 min.

Kanagalasara Vathsala et.al [5] To generate Zinc-chitosan composite, sulphate bath electrodeposition was used. As part of the co-deposition process, precipitated chitosan was also coated with zinc. In addition to burden loss, polarization, impedance, and salt spray tests, composite coatings were evaluated for their performance. Overall, these studies show that Zn-chitosan composites exhibit better anti-corrosion properties. Based on the SEM images of the surface, chitosan is present in the coating and has a crystalline structure. As compared to zinc coatings, the composite corrosion rate was uniform and lower.

A. Amirudin, D. et.al [6] The work has been done to determine the corrosion resistance of zinc coated and also zinc alloy coated automotive material. The material has been used in same environment and result have been analysed in the same technique. In this article purpose of different mechanism in order to extend in difference in observed result. Most of the work have been concentred on studying the influence different alloy coating in sodium chloride environment. Some have been done to study the effect of Nitrogen and Sulphur gases in corrosion of zinc alloy coated metal.

Naveen Manhar Chavan et.al[7] The cold-sprayed zinc coatings are thick and dense, and supply effective corrosion protection to soft-cast steel substrates, for a minimum of up to a 72-hour period of time. The sacrificial nature of zinc coatings and their life is enhanced by an order of magnitude by an appropriate post-treatment practice which brings a couple of beneficial changes in its microstructure. However, long-term natural exposure tests have to be distributed to judge the long-term advantage of heat treatment of the coating. The complex nature of the corrosion process occurring in a cold sprayed Zn coating has been understood on the basis of AC impedance studies. Cold spray is a competitive technique capable of increasing the lifetime of sacrificial zinc coatings both by virtue of thicknesses achievable and suitable post-coating heat treatment

3. CONCLUSIONS

In this review, we have concentrated on coating mild steel with zinc to improve its corrosion resistance electro-deposition as there are many coating techniques and we have come across some techniques such as electro-deposition, cold spray coating, and zinc alloy coating. In all these techniques they have kept the zinc-coated mild steel in a different environment it has been seen that zinc-coated mild steel which was exposed to salt water spray was been corroded more. As cold-sprayed zinc coating is thick and dense and had seen that it was corroded less.

REFERENCES

[1] M.S. Noor Idoraa , M.M. Rahmanb , M. Ismailc , W.B. Wan Nikd, Effect of Zinc Coating Thickness on Corrosion Performance of Mild, Applied Mechanics and Materials, Vol. 554 (2014) 213-217.

[2] Ojo Sunday Isaac Fayomi, and Abimbola Patricia Idowu Popoola, Corrosion propagation challenges of mild steel in industrial operations and response to problem definition, Journal of Physics: Conference Series 1378 (2019) 022006.

[3] Abioye O. P., Musa A. J.1, Loto C. A., Fayomi O. S. I., Gaiya G. P., Evaluation of Corrosive Behavior of Zinc Composite Coating on Mild Steel for Marine Applications, Journal of Physics: Conference Series 1378 (2019) 042051.

[4] Asmae El Fazazi, Moussa Ouakki * and Mohamed Cherkaoui, Electrochemical deposition of Zinc on mild steel, Mediterranean Journal of Chemistry 2019, 8(1), 30-41.

[5] Kanagalasara Vathsala, Thimmappa Venkatarangaiah Venkatesha, Beekanahalli

Mokshanatha Praveen, Kudlur Onkarappa Nayana, Electrochemical Generation of Zn-Chitosan Composite Coating on Mild Steel and its Corrosion Studies, Engineering, 2010, 2, 580-584.

[6] A. Amirudin, D. Thierry, Corrosion mechanisms of phosphated zinc layers on steel as substrates for automotive coatings, Progress in organic coating 28 (1996) 59-76.

[7] Naveen Manhar Chavan, B Kiran, A Jyothirmayi, P Sudharshan Phani, and G Sundararajan, The Corrosion Behavior of Cold Sprayed Zinc Coatings on Mild Steel Substrate, JTTEE5 22 (2012) 463–470.