



## STUDY ON CORROSION PROTECTION: BY DEVELOPMENT OF ACID VAPOUR CORROSION RESISTANCE COATING OF PLATYCLADUS ORIENTALIS (MORPANKHI) SEEDS

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### ABSTRACT

HCL is a very dangerous corrosive pollutant. This gas produces dangerous effect of corrosion on materials. It reacts with moist oxygen to form chlorine which generates corrosion problems with materials. It changes their physical, chemical and mechanical properties and tarnishes their appearance. Iron is a very important engineering metal and it is used for several appliances in day to day life. Iron is highly sensitive toward moist HCL. It develops corrosion cell on the surface of Iron and undergoes with corrosion reaction. Metal exhibits galvanic corrosion, pitting corrosion, crevice corrosion, and stress corrosion. The concentration of HCL gas is increasing day by day in the atmosphere due to industry, transport, road, housing, infrastructure development works and decomposition of living organisms. Its concentration was measured in summer, rainy and winter seasons in

industrial areas of different cities and its corrosive effect studied on Iron. It is observed that concentration of HCL gas varies from season to season. Its concentration is more in winter than in summer and rainy. This result shows that Iron corrodes more in winter seasons with respect of summer and rainy seasons. Chloride is reported to play a significant role in Corrosion reaction, products and kinetics of ferrous metals. Humidity and Temperature are two important parameters in addition to metal properties and chemicals involved in the process. Carbon Steel is more susceptible to chloride attack than Iron.

**KEYWORDS:** pH, Temperature, Pitting Corrosion, Metals, Hydrochloric Acid, Emery paper.

## INTRODUCTION

Corrosion is a common problem with materials. It cannot be fully controlled but its effect can be minimized with the help of corrosion protection techniques. It is major setback for economy because huge money expense for repairing, replacement and maintenance of materials. The corrosion protection of materials is a vital issue among scientists. Scientists developed various methods for its protection like designing proper shape; nano coating of silica & swelling clay (Sekino T *et al.*, 2004), encapsulated organic corrosion inhibitors (Khramov AN, & Voevodin NN, 2004), high performance primers (Seth A & van Ooij. Novel, 2004), corrosion inhibition (Iannuzzi M & Frankel GS, 2007) but these techniques do not provide full protection of materials. Metallic coating is used for the corrosion mitigation of materials in HCL environment but this type of coating is also not very effective. Paint coating adhered on the surface of metal gets deteriorated in HCL environment. Polymeric coating applied in HCL environment for the safety of metals but HCL disbands bond connectivity between polymeric materials. It enters into covered metal surface through diffusion and corrodes base metal. Sol gel coatings (Moutarlier V *et al.*, 2008) are protected metal in above mentioned corrosive environment. Such organic coatings are disbands by moist Hydrochloric Acid and it also produces dissolving and swelling attack on their interfaces. Cerium conversion coating (Code A *et al.*, 2008) are used as inhibitors in different hostile environment. Sol gel coatings (Shem M *et al.*, 2009) like anodic and cathodic was applied for corrosion protection of metal but this technique didn't save metal for corrosion. The above mentioned corrosion protection methods give unsatisfactory results in HCL environment. New economical and effective method are being explored by various investigators. Corrosion problem affect the economy of the chemical process. The Corrosion prevention has become important area of research because of the growing need to implement effective and economical Corrosion prevention method. The present review summarizes research carried out on Corrosion and its prevention by *Platycladus Orientalis(morpankhi)* coating.

## Experimental

Iron strips were cut into size of (4x10) cm<sup>2</sup>. Its surface was rubbed with emery paper and samples were washed with double distilled water. Finally it was erased with acetone and dried with air dryer and kept into atmospheric heat. The sample was coated with *Platycladus*

*Orientalis(morpankhi)* seeds paste and its porosities were filled with *Yolk*. Iron samples without coating, with coating *Platycladus Orientalis(morpankhi)* seeds paste and *YOLK* filler and were kept in HCL environment for corrosion analysis. The corrosion rate was measured by Weight measurement method.

Weight before coating and with coating in HCL environment is measured by Weighing Scale Machine. Studies the effect of mineral acid on corrosion property of metal, carried out experimentation on the corrosive propensity on Iron, studied effect of acid strength on the metal loss by using the method of weight loss.



**Fig: 1: *Platycladus Orientalis(Morpankhi)* Seeds.**

## RESULTS AND DISCUSSION

The corrosion rates of IRON without coating, with coating were determined by using equation1 in HCL environment.

$$K \text{ (mmpd)} = 87.6 \frac{W}{D A t} \quad (1)$$

Where:

- W                      weight loss of test strip expressed in gm,  
A                      Area of test coupon in square centimeter,  
D                      Density of the material in gm/cm<sup>3</sup>.

The surface coverage areas occupied by coated materials was determined with the help of equation 2.

$$\theta = (1 - K / K_o) \quad (2)$$

Where:

$\theta$  Surface coverage area,  
 $K_o$  corrosion rate without coating,  
 $K$  corrosion rate with coating,

The coating efficiencies of coated materials were calculated with the use of equation 2.

$$CE \text{ (coating efficiency)} = (1 - K / K_o) \times 100 \quad (3)$$

Where:

$K_o$  corrosion rate without coating,  
 $K$  corrosion rate with coating

The corrosion rates of Iron, surface coverage area and coating efficiencies were calculated using equation 1 and equation 2

$$K \text{ (mmpd)} = 87.6 W / D A t \quad (1)$$

Where:

$W$  weight loss of test strip expressed in gm,  
 $A$  Area of test coupon in square centimeter,  
 $D$  Density of the material ( $\text{gm/cm}^3$ ).

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K	corrosion rate with coating

The corrosion rates of Iron, surface coverage area and coating efficiencies were calculated by equation 1, equation 2 and equation 3 at fixed concentration of HCL and its values were determined in the experiment. Iron strip was coated with *Platycladus Orientalis(morpankhi)* seeds paste and kept in environment of HCL for the observation of corrosion phenomenon. The observation was found that corrosion rate had decreased and surface coverage area and coating efficiency had increased but the results are not satisfactory. In order to mitigate such corrosion, *YOLK* was used as filler over the coated surface. The results mentioned show that after *YOLK* filler, corrosion rates were highly controlled and improve surface coverage area and coating efficiency. This indicated that *Platycladus orientalis(morpankhi)* seeds paste has anticorrosive characters. It is impossible to fully control corrosion but it can be minimized by the application of suitable coating materials using filler. Iron is an important engineering metal and is used in various appliances used for different purposes in our daily life. It gets corroded badly in HCL environment. The corrosion protection of IRON by coating of *PLATYCLADUS ORIENTALIS(morpankhi)* SEEDS PASTE and *YOLK* as a filler can be used in HCL corrosive environment which have highly effective anticorrosive properties. The coated metal strip by these materials were kept into HCL environment for the analysis of corrosion phenomenon. The experimental results found by the use of Weight measuring techniques provide information that this coating and filler materials produced anticorrosive effect in HCL medium.

## CONCLUSION

The corrosion control is an important activity for the metals from the technical and economical point of view. Iron is an important metal and of versatile use in industrial application. The study of corrosion effect on Iron in acid media of *HCL* acid in both academic and industrial concern has received an important attention towards it.

The corrosion protection performance of *Platycladus Orientalis(morphanki)* seeds on Iron in *HCL* medium has been examined using weight loss method after a specific period of time and temperature.

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