

**TO STUDY THE MECHANISM AND CORROSION PROTECTIVE EFFICIENCY
OF SOME NEWLY SYNTHESIZED ORGANIC INHIBITORS ON METALLIC
ALLOYS.**

Thesis

ABSTRACT

Submitted For the degree of Doctor of Philosophy

In

Chemistry

SUBMITTED

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Corrosion is recognized as one of the most serious problems of our modern societies and the resulting losses each year are in the hundreds of billion dollars. Cost of corrosion studies have been undertaken by several countries including the United States, the United Kingdom, Japan and India etc. The studies have ranged from formal and extensive efforts to informal and modest efforts. The common finding of these studies was that the annual corrosion costs ranged from approximately 1 to 5 percent of the total Gross National Product (GNP) of each nation.

The inhibition efficiency of organic compounds depends upon the structure and their functional group, nature of metal and aggressive solution. The corrosion inhibitors in acidic solution can interact with metal and affect the corrosion reaction in a number of ways. Most of well-known acid inhibitors are organic compounds containing heteroatom like, nitrogen, sulphur and oxygen atoms. The aim of the present work has been undertaken on corrosion inhibition of metallic alloys mainly in mild steel in acidic media by using certain organic compound namely [N-(3-Methylthio-5-acetamido-1,2,4-thiadiazolyl)cytosine], 3-Hydroxy-2-methylquinazoline-4-one, N-(4,6-Diphenylpyrimidine-2-yl)thiourea, Agar-agar and the synergistic effect of Hexamine and Pyrogallol acid, these compounds are selected due to their ability to be adsorbed on the metal surface.

This thesis contains mainly eight chapters, the first chapter describes the introduction and review of literature, classification of corrosion, losses due to corrosion, type of inhibitor and a detailed discussion of the past work from various aspects has been included along with the all relevant references for the corrosion inhibition. The objective of this work was to synthesize some newly organic inhibitor and their utilization for the protection of materials from acidic attack.

In second chapter, synthesis of organic inhibitor and their characterization using I.R. and T.G.A has been explained briefly. Preparation of alloys coupons, assembly of electrochemical cell, preparation of working electrode and various block diagrams had also been presented.

The third chapter "Corrosion inhibition efficiency of 3-Hydroxy- 2-Methylquinazoline-4-one on mild steel in 1M H₂SO₄ and 1M HCl media at different temperature" has been studied using weight loss and galvanostatic polarization study. Results obtained reveals that this organic compound was a very good inhibitor and its inhibition efficiency increases with increasing concentration to attain 92 % at 1000ppm on 25 °C.

In fourth chapter "Inhibiting effect of Cytosine derivative on the corrosion of mild steel in acidic medium" gives about the detailed study of galvanostatic polarization in absence and presence of inhibitors at various concentration (100-1000) ppm and temperature (298-328) K in 1M H₂SO₄ medium and it was found that this compound shows good inhibition efficiency in all studied condition. The scanning electron microscopy was also used for the known of surface morphology of used metallic surfaces.

In fifth chapter “Inhibition of acid corrosion of mild steel with N-(4,6-Diphenylpyrimidin-2-yl) thiourea” gives the detailed studied of synthesis of N-(4,6-Diphenylpyrimidin-2-yl) thiourea and their corrosion protective study on mild steel at various concentration at different temperature and it was found that this compound behaves a very good inhibition on mild steel in all studied condition. The percentage inhibition efficiency reached to about 94% with solution containing 1000ppm of inhibitor where as at the lower conc.100ppm, the percentage inhibition was about 70.55% at 25 °c.

In the sixth chapter “Synergistic effect of Hexamine and pyrrogallic acid on G.I. sheet in HCl medium at different temperature (313-343) k” has been studied. The experimental results suggest that the mixture of (1000H+100p) gives 90% inhibition efficiency on studied temperature.

In the seventh chapter “Inhibition of acid corrosion on mild steel with agar-agar in hydrochloric acid medium at different temperature ” has been investigated by using gravimetric and electrochemical techniques . The percentage inhibition efficiency was found to increase with increasing the temperature and conc. of inhibitor. The percentage inhibition efficiency reached to about 98% with solution containing 1000ppm of inhibitor at 60 °c while the percentage inhibition was about 88% at 30 °c.

In the eighth chapter “ To study the atmospheric corrosion at Delhi Industrial area and their protection by using some synthesized vapor phase corrosion inhibitors” had been studied . In Indian climate the change of temperature, humidity and environmental condition vary their time period it is dependent on the range of environmental condition. Corrosion rate of mild steel, aluminums, zinc and copper was determined under outdoor exposure at Delhi industrial area and it was found that all studied metallic materials corroded in atmosphere. An effort has also been made to study the protection of these industrial materials from atmospheric corrosion by using some vapors phase inhibitor.