SUMMARY OF MINOR RESEARCH PROJECT

ORGANIC CORROSION IN INHIBITORS, FOR METAL AND ALLOY METAL

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Corrosion is a surface phenomenon known as the attack of metals or alloys by their environment as air, water or soil in chemical or electrochemical reaction to form more stable compounds. It is necessary to devote more attention to metallic corrosion now a day than earlier due to:

1. A more corrosive environment due to the increasing pollution of air and water.
2. An increased use of metals within all field of technology.
3. The use for special applications as in the atomic energy field of rare and expensive metals.

The corrosion costs in most of the counties are in the range of 2-4% of the gross national product. So it is imperative that economically, useful measures should be taken to minimize corrosion.

Corrosion is the deterioration of materials by chemical interaction with their environment. The term corrosion is sometimes also applied to the degradation of plastics, concrete and wood but generally refers to the metals. The consequences of corrosion are many and varied and the effects of these on the safe, reliable and efficient operation of equipment or structures are often more serious than the simple loss of a mass of metal.

Copper is a valuable material especially in electronics, solar cell fitting, household products, structural engineering, art and decoration. Now

a day 20% of transformers and good conductor consists of copper and copper alloys.

Tin has a remarkable economic and industrial importance owing to its low cost, light weight nature and good semiconductor.

Compounds containing functional groups with hetero atoms which can donate lone pair of electrons are found to be very efficient as inhibitors against metal corrosion in many environments. Many N-heterocyclic compounds with polar group and/or pi electrons are also acting as efficient corrosion inhibitors in acidic solution. Schiff base, an organic compound which has both these features combined in one molecule, will be a potential inhibitor. Schiff bases have been previously reported as effective corrosion inhibitors for copper, mild steel, bronze, tin in acidic medium like hydrochloric acid, sulphuric acid, acetic acid etc.

Schiff bases of aromatic aldehydes having an effective conjugated system are more stable while those of aliphatic aldehydes are relatively unstable and undergoes readily polymerization. In chemistry, Schiff bases find a versatile use, some of them are the basic units in certain dyes, whereas, some are used as liquid crystals. In organic synthesis, Schiff bases reactions are useful in making carbon - nitrogen bonds. Schiff bases appear to be important intermediates in number of enzymatic reactions involving interaction of an enzym with an amino or carbonyl group of the substrate.

Heteroatom such as nitrogen, sulphur presents in the inhibitors play a leading role in this interaction by donating their free electron pairs. Hence most of the organic compounds containing these heteroatom generally act as good inhibitors. In addition, compounds with multiple bonds behave as efficient inhibitors due to the availability of pi-electrons for interaction with the metal surface. Certain inhibitors possess both the above two features, *viz.,* availability of lone pair from heteroatom as well as pi-electrons in the same molecule, and such compounds show extraordinary

inhibition characteristics. Schiff bases are the best known examples of this category and have been investigated for the inhibition of acid corrosion of mild steel, and copper, and for the neutral halide corrosion of copper.

The protection of metals or alloys against corrosion can be achieved either by special treatment of the medium to depress its aggressiveness or by introducing into it small amounts of special substances called corrosion inhibitors. Inhibitors are classified according to their action (as anodic, cathodic and mixed inhibitors) and according to their mechanism of action (as hydrogen evolution, scavengers, vapour-phase and adsorption inhibitors).

In the present study four new Schiff bases have been synthesized namely

1. **N-(4-Dieghylamino Salicylidive)-2 amino-5-chloropysidive (SB_1)**
2. **N-(4-ethylbenzalidive)-2-amino-5-chlorobromopyridive (SB_2)**
3. **N-(4-ethylbenzalidive)2-amino-5-bromopysidive (SB_3)**
4. **N-(4-diethylamino)salicylidine-2-amino-5-bromopyridive (SB_4)**

Structural elucidation of these synthesized Schiff bases has been done with the help of infra red (I. R.) spectral analysis. The spectral analysis reveal the presence of -HC=N imine linkage in the two Schiff bases.

The inhibitive effect of Schiff bases were investigated by employing mass loss measurements.

To study the inhibitive effect of the newly synthesized Schiff bases on the corrosion rate of copper tin and bronze in the presence of hydrochloric acid test solutions of various strength i.e. 0.5 N, 1.0 N, 2.0 N. 5.0 N have been used. The data obtained was carefully recorded and tabulated and the results obtained were compared with mass loss measurements in uninhibited acid test solutions of similar strengths. The

results obtained are in fairly good agreement and are directed in the tendency of copper, tin and bronze.

A study of four synthesized Schiff bases has shown effective corrosion inhibitors for alloy metal and metals in HCl acid solutions.

The adsorption of four new Schiff bases on alloy and metals surface obeys the Langmuir adsorption isotherm. The corrosion process is inhibited by adsorption of the Schiff bases on metal surface. These compounds obey Langmuir adsorption isotherm, in which one molecule of inhibitor occupying one active site.

CONCLUSIONS:

(1) Four Schiff's bases namely N-(4-diethylamino)-Salicylidine-2-amino-5-chloropyridine (SB_1) from 2-amino-5-chloropyridine and 4-(diethylamino) Salicyladehyde, N-(4-elghyl benzalidine)-2 amino-5-chlorophyridine (SB_2) from 2-amino-5-chloropyridine and 4-ethylbenzeldehyde, N-(4-ethyl benzlidine)-2-amino-5-bromo pyridine (SB_3) from 2-amino-5-bromopyridine and 4-thylben zeldihyde, N-(4-ethylamino) salicyladine-2-amino-5-bromopyridine (SB_4) from 2-amino-5-bromopyridine and 4-dielthylamino) salicyladehyde were synthesized and their IR spectrum and NMR spectrum confirmed the **presence of C = N bond**.

(2) Industrially important metals like mild steel and aluminium tend to corrode in presence of acid like Hydrochloric acid **(HCl)** sulphuric acid **(H_2SO_4)** and Nitric acid **(HNO_3)**.

(3) The corrosion rate of both the metal **mild steel** and **aluminium** increases with increase in acid concentration.

(4) For mild steel maximum corrosion rate has been observed in presence of Nitric acid **Aluminium** has been observed to corrode with maximum rate in **Hydrochloric acid** media.

(5) A number of **complex reactions** needs to be considered carefully besides the covered surface are for arriving at conclusions.

(6) When the four newly **synthesized Schiff's bases** were used as additives they provided efficient corrosion inhibition in acid media and exhibited maximum inhibition efficiency of **99-78% and 99-19%** for mild steel and aluminium respectively.

(7) Increase in concentration of inhibitor **increases their efficiency** in reducing corrosion rates.

(8) SB_3 proved to be an excellent inhibition in all the three acid viz. like Hydrochloric acid**, Sulphuric acid and Nitric acid** solution for both metals.

(9) The inhibitor efficiency of the four Schiff's bases as per calculation was found to **SB_3>SB_2>SB4>SB_1.**

(10) It is evidences the Schiff's bases acts as a good corrosion for mild steel and aluminium in acid mixture solution **(HCl + H_2SO_4)** compared to the **HCl and H_2SO_4**.

(11) Reduction in values of reaction number in presence of **Schiff's bases suggests effective inhibitors**.

(12) Consequently it may be concluded that the four Schiff's bases subjected to study are efficient corrosion inhibitors for both **mild steel and aluminium of HCl, H_2SO_4 and HNO_3**.

(13) Comparison of inhibitor efficiency of Schiff's bases with constituents for mild and **aluminium in all the three acids** (HCl, H_2SO_4 and HNO_3).

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