Work Plan & Methodology

1, Synthesis of Direct Chemical Corrosion

Corrosion occurs due to direct Chemical contact. It is known as dry corrosion. It may form product insoluble, soluble and liquid form. There are two types of Corrosion.

(A) Oxidation Corrosion               (B) Liquidmetalcorrosion

(A) Oxidation Corrosion (Machanisim)

Mg $\rightarrow$ Mg$^{2+}$ + 2e$^{-}$  2Mg $\rightarrow$ 2Mg$^{2+}$ + 4e$^{-}$

$\frac{1}{2}$O$_2$ + 2e$^{-}$ $\rightarrow$ O$^{2-}$  O$_2$ + 4e$^{-}$ $\rightarrow$ 2O$^{2-}$

Mg$^{2+}$ +O$^{2-}$ $\rightarrow$ MgO                   2Mg$^{2+}$ + 2O$^{2-}$ $\rightarrow$ 2MgO

(B)Liquid metal corrosion

This type of corrosion mainly occurs in nuclear powers. This takes place when liquid metal flow over metal at higher temp. There are to possibilities of corrosion.

- Either the liquid dissolves the solid metal surface.
- Liquid penetrates into the solid surface and thus weakness the bond.

(2) Synthesis of electrochemical corrosion (immerse corrosion) Electrochemical corrosion is also known wet corrosion well by synthesized. Wet corrosion is generally of there types.

(A) Wet Chemical corrosion: - Reaction between alloy metal and its liquid environmental.

(B) Underwater corrosion: - Water in sufficient amount but air is limited e.g. in water pipes, steam boilers etc.

(C) Soil corrosion (Underground corrosion):- It takes place in pipes and other underground structures and in ferrous materials in concrete. It is complicated type of corrosion because of various. Salts present in it.
3. **Synthesis of metal complexes:**

The different molar reaction of iron, copper, aluminum and derivative of some specific metals with the corrosion of stereo chemical as well as electrochemical significance will be investigated. The resulting derivatives will be isolated in a stage of efficient purity then systematically examined.

4. **Structural Studies:**

The structural studies of newly synthesized derivatives will be carried out by

- Elemental analyses
- Melting point determination
- Molecular weight determination
- Conductance measurements
- Electronic Spectra
- Chemical Kinetic of corrosion
- Multinuclear magnetic resonance

5. **Industrial Studies:**

Extensively used in refrigeration and air conditioning, electrical machines especially electromagnetic motors, generators and transformers integrated circuits increasingly replacing aluminum because of its superior electrical conductivity copper has been used as water proof roofing material. Initially copper oxide forms, replaced by cuprous and cupric sulfide and finally by copper carbonate.

Compounds, such as Fehling’s solution have application in chemistry complexed with a chelate in can be used to treat cancer through radiation therapy.
The importance of reporting all data as completely as possible cannot be overlooked. Correlating the result with tests of other investigators will be possible only if all pertinent information is properly recorded. Few points to be kept in mind-

- Corrosion media and concentration changes.
- Volumes of test solutions.
- Duration of each test.
- Exact size, shape and area of specimen.
- Number of specimen of each material tested, and whether specimens were tested separately or with other specimens.
- Chemical composition of the test samples.
- Treatment used to prepare specimens for test.
- Actual weight loss for each specimen.
- Method use to clean specimen after each test.
- Statistic can be a valuable tool for analyzing the result from test programs designed to produce adequate data and should be used wherever possible

**Mass Loss Measurements:**

The use of inhibitors for the mitigation of corrosion is the method of choice. The evaluation of the effectiveness of corrosion inhibitors is an important research and development activity among both users and manufacturers of these products. Such an evaluation is made by performing concurrent corrosion tests in the corrosive system—one test with inhibitor and the other test without than comparing the results. Usually some type of quantitative measurement of the rate or amount of corrosion is made, a number or factor being calculated which represents the effectiveness of the inhibitor. Accepted methods for preparing and handling corrosion test specimens are used. Corrosion system vary therefore the corrosion
Comparative study of mass loss of metals in inhibited and uninhibited acid solution can lead to useful predictions about the effectiveness of inhibitors.

Mass loss measurements were carried out according to the ASTM standard procedure as describe in literature.

**Calculation:**

The corrosion inhibition efficiency of the compounds will be calculated by mass loss method by using following equation:

\[
\% \text{ inhibition Efficiency } I_E = \left( \frac{M_u - M_i}{M_u} \right) \times 100
\]

Where \( M_u \) = Mass loss of the metal in uninhibited acid

\( M_i \) = Mass loss of the metal in inhibited acid

The degree of surface coverage (q) can be calculated as -

\[
q = \frac{D_M_u - D_M_i}{D_M_u}
\]

Where q is the surface coverage, \( M_u \) is Mass loss of the metal in uninhibited acid and \( M_i \) is Mass loss of the metal in inhibited acid.

The corrosion rate in mm/yr (milli mils per year) can be obtained by

Following equations.

\[
\text{Corrosion rate (C.R.)} = \frac{\text{Mass loss} \times 87.6}{\text{(Metal Density)}(\text{Area})(\text{Time})}
\]

\[
\text{Corrosion rate} = \frac{D_M \times 87.6}{D_A T}
\]
Where DM is the mass loss expressed in milligrams, ‘A’ is the area expressed in square cm of metal surface exposed, time is expressed in hours of exposure and represented by ‘T’, metal density ‘D’ is expressed in gms/cm³.

**Work Plan:**

Expected duration of work is two years. Year wise detail of work to be done has been given as under.

1\textsuperscript{st} Year Programme:

(1) It is prosed to prepare Schiff’s bases taking different aromatic and many metal complexes for this purpose 2-amino Pyridine, 2-amino-3-methyl Pyridine, P-anisaldehyde may be used.

(2) Schiff’s bases are prepared by taking any of the above amine and refluxing it with aldehydes in a suitable solvent like ethanol, n-hexane.

(3) Elucidate the structure of prepared nitrogen ligand by IR and NMR spectral studies.

2\textsuperscript{nd} Year Programme:

(1) To observe the inhibition effect of Schiff’s bases on different metals like Iron, Aluminium, Copper in different acids like HCl, HNO\textsubscript{3} and H\textsubscript{2}SO\textsubscript{4}.

(2) Studies will be carried out in different concentration of acids as well as Schiff’s bases.

(3) Corrosion inhibition efficiency of the compound will be calculated by mass loss methods computation of data obtained and its interpretation.

**IMPORTANCE OF SCHIFF’S BASES:**

Schiff’s Bases and its various co-ordination compounds have steadily become more and more important with time, because of their use as models in biological, biochemical,
analytical and anti microbial system. The complexes also find unique and important pharmacological and therapeutic applications.

Schiff’s Bases derived from sulpha drugs and Salicylaldehyde have found to be good fungicides, bactericides as well as chelating agents.

Recently synthesized Schiff’s base plays the role of an excellent ion carrier in the construction of Cu (II) membrane sensor, which was successfully used to determination of copper in different water samples and as indicator electrode in potentiometric titration of copper ion with EDTA.

Many anticancer drugs induce formation of lipid peroxidation products that are toxic for lung cancer cells in vitro. It was tested whether changes of serum thiobarbutric acid reactive substances (TSARs) and Schiff’s bases (SB) are associated with treatment efficiency in 37 small cell lung cancer (SCLC) patients and the results indicated that monitoring of circulatory TBARs and SB may be helpful for screening of SCLC patients with high risk of early disease progression and chemotherapy failure.

A new development is the synthesis and analytical application of novel tetra dentate $N_2O_2$ Schiff’s bases as Chromogenic reagent for determination of nickel in some natural food samples. The biologically active Schiff’s base derived from sulphonamide displays conformational polymorphism and thermo chromic behavior upon heating.