Chapter 5

Summary
CHAPTER 5

SUMMARY

Aldimines, the condensation products of amines and aldehydes have very good corrosion inhibition for mild steel in acid media. In the present work twelve aldimines were synthesised by condensing 1,2-diaminoethane and 1,3-diaminopropane separately with each of six aldehydes – four aliphatic and two aromatic – chosen. They are evaluated for their inhibition efficiency in 1M hydrochloric acid and 0.5M sulphuric acid. The major inferences drawn from the studies are as follows:

Evaluation of inhibitor efficiency by weight loss method for all the twelve compounds in 1M HCl and 0.5M H₂SO₄ at 30±1°C revealed that the inhibitor efficiency increases with concentration. From these studies the order of inhibition efficiency of Compounds A to L in 1M HCl is found to be

\[
L \leq F > E > K > D \geq J \geq I \geq H > C = B \geq G = A
\]

and the order of inhibition efficiency of compounds A to L in 0.5M H₂SO₄ is found to be

\[
F \geq L \geq K = E \geq D \geq J \geq I \geq H \geq G > C = B \geq A
\]

Aldimines formed from aliphatic aldehydes do not exhibit appreciable increase in efficiency for the same concentration of the inhibitor with increase in number of carbon atoms in the alkyl group connected to the carbon of > C = N - group. Those formed from aromatic aldehydes have very high inhibition efficiency.

Compounds formed from same aldehyde with 1,2-diaminoethane and 1,3-diaminopropane show more or less the same inhibition efficiency indicating that introduction of one more methylene group in between the two nitrogen atoms has no observable effect.

The aldimines obey Temkin's adsorption isotherm showing that inhibition is by adsorption.
Results of gasometric method support the order of inhibition efficiencies obtained by weight loss method indicating that there is no reaction between hydrogen evolved and inhibitor and no hydrogen penetration into the metal.

Photomicrographs taken using optical microscope confirm the inhibition efficiency of the compounds.

A.C impedance measurements indicate that corrosion process is under charge transfer control.

Hydrogen permeation studies indicate that there is considerable reduction in permeation current in the presence of inhibitors suggesting that these can be used in acidic environment with iron metal without any hydrogen damage.

Potentiostatic polarization studies reveal that these inhibitors adsorb on the surface of the metal through $\pi$ - electrons in their molecule and the adsorption is flat type adsorption.

The inhibition efficiencies of all the inhibitors are generally higher in 1M HCl than in 0.5M H$_2$SO$_4$.

Of all the compounds studied, N,N'- bis (cinnamaldehyde)-1,2-diaminoethane (F) and N,N'- bis (cinnamaldehyde)-1,3-diaminopropane (L) are the most effective inhibitors for the acid corrosion of iron.