7. CONCLUSIONS

In the chapter conclusion, the overall outcome of the study of corrosion inhibition in acid media and effect of green inhibitors with factors affecting corrosion and its inhibition has been concluded.

- The corrosion rate of mild steel increases with the increase of hydrochloric acid and sulphuric acid concentration.
- The corrosion loss of mild steel in hydrochloric acid and sulphuric acid increases with time.
- As the acid concentration increases the rate of corrosion increases.
- At constant inhibitor concentration, the I.E. decreases with increase in acid concentration.
- As inhibitor concentration increases in constant acid concentration, the I.E. increases.
- Among Calotropis procera, Caesalpinia crist, Achras zapota, Mangifera indica, Caesalpinia crist was proved as the most efficient inhibitor.
- The degree of surface coverage ($\theta$) was found to increase with inhibitor concentration.
- The mode of inhibition action appears to be the chemisorptions because the plot of $C/\theta$ versus log $C$ obtained as straight line, suggest that the inhibitors cover both the anodic as well as cathodic regions through general adsorption following Langmuir isotherm.
- The corrosion rate of mild steel increases while I.E. decreases with increase in temperature. Desorption is aided by increasing temperature and physisorption mechanism is shown by all the inhibitors.
- The mean $E_a$ values found higher than that of the uninhibited system indicates physical adsorption of the inhibitors on metal surface. Thermometric parameters like $Q_{ads}$ (Heat of adsorption), $\Delta G_{ads}^0$ (Gibb’s free energy of adsorption), $\Delta H_{ads}^0$ (Enthalpy of activation) and $\Delta S_{ads}^0$ (Entropy of activation) were calculated.
7. Conclusions

- A study at different temperature reveals that values of $Q_{ads}^0$ were negative for all inhibitor studied. The negative values of $Q_{ads}^0$ show that the adsorption and hence the I.E. decrease with rise the temperature.

- The $\Delta G_{ads}^0$ values are all negative which shows strong interaction of the inhibitor molecules and spontaneous adsorption of the inhibitor on the metal surface. As the temperature increases the value of $\Delta G_{ads}^0$ increases (become less negative).

- The positive values of enthalpy of activation changes ($\Delta H_{oa}$) for all inhibitors studied suggest that the corrosion of mild steel was endothermic reaction.

- The positive value of all $\Delta S_{oa}^0$ indicates the affinity of the adsorbent for the inhibitor. The negative Q values show that the adsorption hence the inhibitive efficiency decrease with rise in temperature.

- Measurement of open circuit potential of the system of a specimen of mild steel immersed in 1.0 M hydrochloric acid and 1.0 M sulphuric acid develop a corrosion potential of $-0.529$ mV and $-0.540$ mV respectively using silver-silver chloride as reference electrode. In presence of inhibitors, the corrosion potential shifted in noble direction from initial value suggesting inhibition property of the green inhibitors in hydrochloric acid and sulphuric acid. It may be due to the successive adsorption of the inhibitor molecules on the surface of mild steel.

- The galvanostatic polarization has been taken with and without inhibitor in 1.0 M hydrochloric acid and sulphuric acid concentration at inhibitor concentration. The curves show both anodic and cathodic polarization. There is a good agreement in the values of I.E. calculated using polarization technique and weight-loss data.

- Parameters like $i_{corr}$, $E_{corr}$, $\beta_a$, $\beta_c$, $R_{ct}$ and $C_{dl}$ values were evaluated using electrochemical measurements.

- The electrochemical polarization results indicate that inhibitors used in the study act as mixed type and predominant cathodic in nature. The value of corrosion current ($i_{corr}$) was higher in uninhibited acid then that for inhibited acid.

- From EIS study, it was found that the charge transfer resistance ($R_{ct}$) increases in presence of inhibitor compare to blank system. This reveals high resistance offered by the inhibitors due to adsorption of inhibitor constituents.
7. Conclusions

- The Nyquist plots obtained were semicircles both in the absence and presence of inhibitor. The general shape of the curves were very much similar for all inhibitors.
- Decrease in $C_{dl}$ values and increase in $R_{ct}$ values confirmed the inhibition action of the inhibitors, owing to increased thickness of the adsorbed layer.