



SUMMARY AND CONCLUSION

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Corrosion control of metals is an important activity of technical, economical, environmental and aesthetical importance. Thus, the search for new and efficient corrosion inhibitors has become a necessity to secure metallic materials against corrosion. Over the years, considerable efforts have been deployed to find suitable compounds of organic origin to be used as corrosion inhibitors in various corrosive media, to either stop or delay the maximum attack of a metal [Umoren S.A. et al., 2008]. Nevertheless, the known hazard effects of most synthetic organic inhibitors and the need to develop cheap, non – toxic and environmentally benign processes have now made researchers to focus on the use of natural products. These natural organic compounds are either synthesized or extracted from aromatic herbs, spices and medicinal plants.

In this direction, to arrive at an inexpensive, non-toxic, eco-friendly inhibitor formulations the present study on the use of Leaf Sheath and Staminate Flower extract of *Cocos Nucifera* has been carried out by the classical weight loss measurements and electrochemical measurements.

The weight loss measurements were conducted for mild steel in 1M HCl with and without the inhibitor for various concentration of the investigated extract at different time interval and temperature change (from 303K – 355K). From the calculated weight loss data, the inhibition efficiency of each concentration was calculated.

Temperature study helped in predicting the mechanism of inhibition and to calculate the thermodynamic parameters of the corrosion process. Efforts have been taken to fit the adsorption isotherms such as Langmuir and Temkin.

Polarization techniques such as Tafel, Linear polarization resistance and Electrochemical impedance spectroscopy have been conducted to find out the inhibitor efficiencies of the acid extracts and nature of the inhibitor.

The results obtained by Tafel, Linear polarization resistance and impedance spectroscopy have been correlated with the classical weight loss measurements. The shelf life of the extracts was determined by weight loss measurements. The morphological characteristics of the inhibitors were examined by using optical

electron micrograph. The FT-IR technique was followed to confirm the presence of inhibitor constituents on the metal surface.

The results obtained during this investigation have been summarized as follows:

- ❖ The inhibitors (leaf sheath and staminate flower) proved as promising inhibitors to protect MS from acid corrosion.
- ❖ Maximum efficiency of L.S.E and S.F.E. was found to be 94.9% and 97.3% at 24hrs of immersion.
- ❖ The extracts under study resist corrosion at higher temperature in 1 M HCl, the optimum temperature being 335K for L.S.E and 345K for S.F.E.
- ❖ Statistical analysis of experimental data confirmed that the adsorption of inhibitors on MS obey Langmuir and Temkin isotherms.
- ❖ Thermodynamic parameters are relative which indicate a strong adsorption of inhibitors on the surface of the electrodes.
- ❖ The E_a values infer that L.S.E and S.F.E decrease the activation energy of the reaction. This may be a result of strong adsorption of inhibitor on surface of the electrodes.
- ❖ Electrochemical measurements indicate decrease in I_{corr} values and increase in R_p values which confirm that the inhibition process is accelerated in the presence of the inhibitors.
- ❖ The values of Tafel slopes b_a and b_c obtained from Tafel intercept method would confirm the inhibition of corrosion of MS is under mixed controls.
- ❖ No noticeable shifts in E_{corr} infer that inhibitor acts as mixed mode of inhibition.
- ❖ Increase in R_{ct} values on MS surface confirms the corrosion of MS was controlled by charge transfer process.
- ❖ The adsorption phenomenon of L.S.E. and S.F.E. on metal surface is noticed by decrease in C_{dl} values.
- ❖ High resistance values and low capacitance values indicate the highly protective nature of inhibitors.
- ❖ The inhibition effect of L.S.E and S.F.E was quite comparable with conventional weight loss methods and electrochemical techniques.
- ❖ Results obtained for the durability test infer the strong inhibitive action of the inhibitor kept at room temperature as well as in the refrigerator for 3 months.

- ❖ Examination of the surface of the metal in the presence of both the inhibitors confirmed the deposition of inhibitors on the metal surface.
- ❖ The inhibitor L.S.E and S.F.E can be adsorbed on the metal surface through their oxygen atom of the constituents present in the extracts.
- ❖ Inhibition of steel in HCl solution by L.S.E and S.F.E is attributed to adsorption of the phytochemical compounds in this extract.
- ❖ The present study on corrosion inhibition of MS in the presence of L.S.E. and S.F.E could reduce the pollution problem effectively and the inhibitor could act definitely as environmentally friendly corrosion inhibitor at room temperature.