SUMMARY & CONCLUSION

CHAPTER V
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Metal corrosion processes can be controlled by different methods such as the modification of the corrosive medium or the metal and the use of protective agents like corrosion inhibitors. Acid pickling baths are employed to remove undesirable scale from the surface of the metal. Once the scale is removed, the acid is then free to attack the metal surface. Because of the general aggressive nature of the acid solution, metal dissolution takes place leading to corrosion. Corrosion problems have received a considerable amount of attention because of their attack on materials

The use of inhibitors is one of the most practical methods for protection against corrosion. Several researchers have studied the influence of organic compounds containing nitrogen on the corrosion of steel in acid media. Most organic inhibitors act by adsorption on the metal surface. Corrosion inhibitors function by interfering with either the anodic or cathodic reactions or both. Many of these inhibitors are organic compounds containing nitrogen, sulphur or oxygen atoms or N-heterocyclic compounds.

Many N-heterocyclic compounds such as triazole derivatives, tetrazole derivatives, pyrrole, pyridine derivatives, pyrazole derivatives, indole derivatives, quinoline derivatives have been used for the corrosion inhibition of iron and steel in acidic media. As an important N-heterocyclic compound, imidazoline derivatives are non-toxic and biodegradable. This makes the investigation of their inhibiting properties significant in the context of the current priorities to produce eco-friendly inhibitors.

In this direction, **"Adsorption Behaviour and Corrosion Inhibitive Potential of Imidazoline Derivatives on Mild Steel/Acid Interface"** was examined by weight loss, Electrochemical studies and Surface analytical studies. Experimental results were also verified using Quantum chemical calculations. Thermodynamic and kinetic parameters were arrived at using weight loss method. Experimental results coupled with theoretical Quantum Chemical calculations are done on the basis of the objectives setforth.

The corrosion inhibition potential of imidazoline derivatives was examined by weight loss method, electrochemical method, surface analytical methods and quantum

chemical studies. All these methods confirmed the inhibitive potential of the investigated inhibitors.

Salient features of the current investigations are summarized and presented :

1. Imidazoline derivatives were synthesized using standard procedure.
2. Characterisation of imidazoline derivatives were carried out using FT IR technique.
3. Imidazoline derivatives act as potential inhibitors for the corrosion of mild steel in 0.5M H_2SO_4 and 1M HCl.
4. Inhibition efficiency increases with increase in inhibitor concentration for all the investigated inhibitors in both acidic media.
5. Inhibiton efficiency of the studied inhibitors are temperature dependent and their addition led to change in the activation energy.
6. In the present investigation E_a values were found to be greater or smaller than those calculated in the absence of the inhibitors. This can be explained by the fact that at higher degree of coverage, the dissolution process is not only determined by the reaction of the metal from the bare surface but also involves the adsorbed inhibitor.
7. The value of ΔG_{ads} indicate that the adsorption of the inhibitor on the mild steel is mixed adsorption and the ability of the molecule to chemisorb on the steel surface was dependent on the nitrogen atoms present in the imidazoline ring and the pi- electrons of the aromatic ring. The values of ΔG_{ads} ranges between -25 kJ/mole to -40 kJ/mole indicating that the adsorption of the inhibitors on the surface of the mild steel may be a combination of physisorption and chemisorption (mixed adsorption).
8. The adsorption process is spontaneous, exothermic and accompanied with an increase in entropy from thermodynamic point of view.
9. Analysis of the statistical data indicates that the adsorption of the investigated inhibitors obeys Langmuir and Temkin adsorption isotherm in both the acid media.

The current investigation **on "Adsorption Behaviour and Corrosion Inhibitive Potential of Imidazoline Derivatives on Mild Steel/Acid Interface"** highlighted the adsorption behaviour of Imidazoline derivatives on mild steel surface and the effectiveness of Imidazoline derivatives as corrosion inhibitor in investigated acid media.

Research on non-toxic inhibitors is of considerable interest in investigations into the replacement of hazardous classical molecules.