Preface

The metals have mesmerized peoples for many centuries, because these materials have shown unrivaled properties in wars as well as in general applications. Among all the metals, iron is one of the most promising materials for various engineering and industrial applications. Since iron is strong, safe to handle and economical to use, it is widely employed in manufacturing of various products, such as, cars, trucks, roads, machines, buildings, bridges and home appliances. Despite having high strength against physical damage, iron products are greatly susceptible to corrosion attack of various working environments. Generally, metals develop an oxide film over their surface due to corrosion attack. The oxide films of some metals, such as, nickel and aluminum, passivate them in various environments. But, in case of iron, oxides films are found highly unstable as iron oxide occupies more volume than iron metal causing drastic metal loss. The rate of metal loss may become very high in aggressive environments (especially in acid media). Hence, there is a strong need to protect iron products in various working environments.

For effective prevention of metals, scientists have developed several methods. However, application of inhibitors for corrosion prevention has been proven as one of the most economical, effective and practical methods. Inhibitors are the chemical substances that retard corrosion of metals and alloys, when added in the working environments in a small amount. A number of chemical compounds have been tested as corrosion inhibitors to date. These synthetic inhibitors are found very efficient for corrosion inhibition in various environments; however, major disadvantages of using these chemicals are their toxicity and high preparation cost. Hence, scientists and researchers have turned out their focus on ‘green’ corrosion inhibitors in recent years. Natural products, such as, plants, fruits,

peels, herbs, etc., have attracted great attention of peoples due to their biodegradability, non toxicity, cost effectiveness and source of effective organic molecules. Scientists and researchers have reported that natural organic products are highly efficient in corrosion prevention of metal and alloys in various media. High inhibition efficiency of these extracts can be attributed to the occurrence of alkaloids, saponins, flavonoids, tannins, azo and phenolic compounds like molecules in natural products, which are rich in aromatic rings and heterocyclic compounds. The employment of natural products as corrosion inhibitors is not only economic and effective but also eco friendly. So, we have screened natural products on the basis of presence of organic molecules, aromatic rings, hetero-cyclic groups and cost effectiveness. Thus, selected organic molecules have been explored for corrosion inhibition studies.

Chapter 1 deals with the basic concepts and theories related to corrosion. This chapter also provides descriptive information about corrosion prevention methods, corrosion inhibitors, adsorption isotherms, reason of corrosion prevention, effects of corrosion on social and economic life of mankind and techniques employed for corrosion testing. At the end of this chapter, literature on corrosion inhibitors is reviewed, which has helped us in selection of inhibitors for corrosion inhibition study.

Chapter 2 provides the details of experimental procedures and instruments used in the present research work. This chapter briefly describes the methods for preparation of the extracts of selected inhibitors, preparation of test samples, characterization techniques and details of techniques employed for corrosion testing.

Chapter 3 is related with the investigation of the inhibitive effects of *Argemone Mexicana* leaves extract on mild steel in HCl and H_2SO_4 solutions. The results suggest that the extract effectively suppress mild steel corrosion in both acid media; however, higher inhibition efficiency of the inhibitors is acknowledged in HCl solutions. The characterization of the extract is performed by UV-Visible spectroscopy, FTIR spectroscopy and HPLC techniques. The effects of changes in various parameters, such as, acid concentration, temperature and immersion time on inhibition efficiency of *Argemone Mexicana* extract are also discussed in this chapter.

Chapter 4 deals with the corrosion inhibiting effects of *Chlorophytum Borivilianum* root on mild steel in HCl and H_2SO_4 solutions. The result illustrate that the roots successfully retard corrosion of mild steel in both acid media via mixed type inhibition mechanism; however, higher inhibition efficiency of the extract is achieved in HCl than in H_2SO_4 solution. The characterization techniques, viz., UV-Visible spectroscopy, FTIR spectroscopy and HPLC, are used for knowing the chemical properties of the inhibitor. This chapter also shows the effects of change in acid concentration, working temperature and immersion time on inhibition potential of *Chlorophytum Borivilianum* extract.

Chapter 5 covers the results of corrosion inhibition experiments performed on mild steel in presence and absence of M. Paradisica (banana) peels in HCl and H_2SO_4 environment. For a complete study, the extracts prepared at three stages of ripening of the peels, i.e., raw, ripe and over ripe, are used for investigation. The results show that the extracts retards mid steel corrosion in both acid media, but in the order of their ripening, i.e., raw>ripe>over ripe. The phytochemical constituents of the extracts are characterized by UV-Visible spectroscopy, FTIR spectroscopy and HPLC techniques, which shows strong

presence of gallocatechin in raw banana peel extract while catechin in ripe and over ripe banana peel extract. This chapter also shows the effects of various crucial parameters on inhibition efficiency of the extracts.

Chapter 6 summarizes the results and findings of the thesis. This chapter concludes that raw M. Paradisica peel is the best corrosion inhibitor for mitigation of acid corrosion of mild steel among the studied inhibitors. At the end of this chapter, some ideas to enhance the performance of the extracts are also discussed.